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Evolutionary Perspectives on Imaginative Culture

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Editors
Joseph Carroll
Department of English
University of Missouri–St. Louis
Saint Louis, MO, USA

Mathias Clasen
Department of English
Aarhus University
Aarhus C, Denmark

Emelie Jonsson
Department of Language and Culture
University of Tromsø, Tromsø, Norway

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About the Editors

Joseph Carroll is Curators' Distinguished Professor in the English department at the University of Missouri, St. Louis. Since the early 1990s, he has been working to integrate evolutionary research and literary study. He has developed an evolutionary theory of literature, produced interpretive essays on literary works ranging from plays of Shakespeare to modern novels, written essays in intellectual history, and conducted empirical research on protagonists and antagonists in Victorian fiction.

Mathias Clasen is associate professor in literature and media in the English department, Aarhus University, and associate editor of *Evolutionary Studies in Imaginative Culture*. His research focuses on horror entertainment from an evolutionary perspective. His book *Why Horror Seduces* was published by Oxford University Press in 2017.

Emelie Jonsson is assistant professor of English literature at the University of Tromsø, Norway. Her research centers on the friction between human psychology and naturalistic cosmology. She has published evolutionary interpretive arguments on E. M. Forster, H. G. Wells, Arthur Conan Doyle, T. H. Huxley, and Edward Bulwer Lytton, as well as collaborated on quantitative projects concerning intellectual history, biocultural theory, and poetic archetypes reflecting mating strategies. She is an associate editor of *Evolutionary Studies in Imaginative Culture*.

Contributors

Stephen Asma is Professor of Philosophy and Founding Fellow of the *Research Group in Mind, Science and Culture* at Columbia College Chicago. Asma is the author of ten books, including *The Evolution of Imagination* (University of Chicago Press, 2017), *On Monsters: an Unnatural History of Our Worst Fears* (Oxford, 2009), and *The Emotional Mind* (Harvard University Press, 2019). He writes regularly for the *New York Times* and *Aeon*, and he has played guitar onstage with many musical artists, including Bo Diddley and Buddy Guy.

Rebecca L. Burch is an associate professor of psychology at SUNY Oswego. Her main research interests are the evolution of sexual behavior, sexual signaling, domestic violence, and cultural differences and similarities in a variety of human behaviors, including sex, parenting, play, gender, and development.

James Carney is Wellcome Fellow in the medical humanities at Brunel University London. His current research centers on how machine learning and artificial intelligence can be used to predict the impact of cultural objects on audiences suffering from depression or anxiety. He has published on a wide variety of topics across the humanities and quantitative social sciences and maintains a particular interest in blending interpretive, experimental, and computational methodologies.

Richard G. Coss is Professor Emeritus of Psychology at the University of California, Davis. He has published more than 120 academic pieces examining the interactive roles of natural selection and environmental experiences shaping the neurobiology and behavior of 22 different species in the lab and field, including children and adults. His long-term interest is identifying specific aspects of visual aesthetics shaped by natural selection that might account for cross-cultural continuity in artistic expression.

Henry R. Cowan is a graduate student in Clinical Psychology at Northwestern University, in Evanston, IL. He works in personality and clinical psychology to understand how self-referential processing, self-concept, and narrative identity

impact well-being and psychopathology. He is the author of diverse research articles and a frequent presenter at academic conferences.

Henrik Høgh-Olesen is Professor of Social and Personality Psychology, Department of Psychology and Behavioural Sciences, Aarhus University, Denmark. He has published 13 academic books, most recently *The Aesthetic Animal* (Oxford University Press, 2019), and more than 120 articles. He has published fiction and drama. His fields of interest are ethology, comparative psychology, behavioral and evolutionary psychology, cognitive archaeology, and pre-historic art, and he has studied the behavior of humans, apes, and monkeys in naturalistic and experimental settings.

Jens Kjeldgaard-Christiansen is a graduate student in the Department of English at Aarhus University, Denmark. His research is mainly concerned with the heroes and villains of popular culture. He applies a cognitive perspective to these characters to investigate their psychological functions and appeal. For more information, including contact information, detailed research interests, and a full list of publications, see http://au.dk/en/jkc@cc.

Aaron Kozbelt is a professor of psychology at Brooklyn College and the Graduate Center of the City University of New York. His research focuses on creativity and cognition in the arts. He has published more than 80 peer-reviewed articles and book chapters and is a co-editor of the forthcoming *Cambridge Handbook of Expertise and Expert Performance* (2nd ed.). He serves on several editorial boards and has received several national and international awards for his research.

E. Thomas Lawson is Honorary Professor of Cognition and Culture at Queen's University Belfast and Professor Emeritus of Comparative Religion at Western Michigan University. He is the author of *African Religions: Traditions in Transformation* and co-author (with Robert N. McCauley) of *Rethinking Religion: Connecting Cognition and Culture* and *Bringing Ritual to Mind: Psychological Foundations of Cultural Forms* and Executive Editor of the *Journal of Cognition and Culture*. He has also written on the psychology of creative writing especially in science fiction.

Dan P. McAdams is the Henry Wade Rogers Professor of Psychology and Professor of Human Development and Social Policy at Northwestern University, in Evanston, IL. A personality and lifespan developmental psychologist, McAdams examines concepts of self and identity in contemporary American society, especially in the midlife years, with an emphasis on the stories people construct to make sense of their lives. He is the author most recently of *The Redemptive Self: Stories Americans Live By* (2006/2013) and *The Art and Science of Personality Development* (2015).

Bruce McConachie is professor emeritus in Theatre and Performance Studies at the University of Pittsburgh. A past President of the American Society for Theatre Research, his recent books include *Evolution, Cognition, and Performance* (Cambridge, 2015), *Theatre Histories: An Introduction*, 3rd ed. (with three co-authors, Routledge, 2016), and *The Routledge Companion to Theatre, Performance, and Cognitive Science* (co-edited with Rick Kemp, 2018).

Catherine Salmon is a professor of psychology at the University of Redlands in California. She is the co-author of *Warrior Lovers: Erotic Fiction, Evolution and Female Sexuality* as well as *The Secret Power of Middle Children*. She has written chapters in numerous books, including the *Handbook of Evolutionary Psychology, The Literary Animal,* and *Darwin's Bridge*. Her research interests include birth order and family dynamics, eating disorders and reproductive suppression, and sexuality and popular culture. She is also the editor of the journal *Evolutionary Behavioral Sciences.*

Judith P. Saunders is a professor of English at Marist College in New York State. She has published evolutionary analyses of fiction, poetry, and autobiography in the British and American literary traditions. She is the author of *Reading Edith Wharton Through a Darwinian Lens: Evolutionary Biological Issues in Her Fiction* (2009) and *American Classics: Evolutionary Perspectives* (2018).

Jamshid J. Tehrani is an associate professor at the Department of Anthropology, Durham University (UK), and a founding member of the Durham Cultural Evolution Research Centre (DCERC). He was formerly a research fellow at the AHRC Centre for the Evolution of Cultural Diversity (CECD) at University College London, where he trained for his PhD. His research examines how culture evolves as it gets transmitted from person to person and from generation to generation, with a special focus on popular narratives, such as traditional folktales, urban legends, and modern-day conspiracy theories.

Valerie van Mulukom is a Research Fellow at Coventry University, United Kingdom. Valerie completed her PhD in the cognitive neuroscience of imagination at the University of Auckland, New Zealand, after which she held postdoctoral positions at Aarhus University and the University of Oxford, where she did research on memory and the cognitive science of religion. Currently, she combines her backgrounds to do research on the cognitive science and evolution of imagination, memory, and belief at Coventry University.

Dahlia W. Zaidel conducts research at the University of California, Los Angeles. Her subjects include the brain's underpinning of behavior in neuropsychology, hemispheric specialization, face and beauty, and art. The elusiveness of art's neural basis has driven her current research and writing. She combines findings from neurology, neuropsychology, archaeology, anthropology, biology, and evolution.

Introduction

Joseph Carroll, Mathias Clasen, and Emelie Jonsson

1 What Imaginative Culture Is and Why It Matters

Evolutionary research into subjects traditionally studied in the humanities is often designated "biocultural." Proponents of biocultural theory argue that human behavior is produced by interactions between human nature and culture. "Human nature" in this usage means a species-typical array of behavioral and cognitive dispositions regulated by evolved, genetically transmitted features of the human anatomy, physiology, nervous system, and endocrine system (Brown, 1991, 2000, 2004, 2017). "Culture" means a transmissible body of widely shared skills, practices, beliefs, values, and imaginative experiences. From a biocultural perspective, cultural processes are rooted in the evolved and adapted structures that govern the human life cycle. Culture is driven by biologically grounded impulses, and those impulses, in turn, are constrained, organized, and developed by culture (Baumeister, 2005; Cochran & Harpending, 2009; Henrich, 2016; Hill, 2007; Lumsden & Wilson, 1981, 1983; Richerson & Boyd, 2005; Sterelny, 2003; Tomasello, Carpenter, Call, Behne, & Moll, 2005; Wilson, 1998; and in this volume, see Asma; Hogh-Olesen; Kozbelt; Lawson; Tehrani; and van Mulukom).

The bulk of the work done so far in evolutionary cultural theory concerns itself with technology and social organization. But culture also includes what we are calling "imaginative culture": shared and transmissible mental experiences that are

J. Carroll (✉)
Department of English, University of Missouri, St. Louis, St. Louis, MO, USA
e-mail: jcarroll@umsl.edu

M. Clasen
English Department, Aarhus University, Aarhus, Denmark
e-mail: mc@cc.au.dk

E. Jonsson
Department of Language and Culture, University of Tromsø, Tromsø, Norway

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aesthetically and emotionally modulated: the enchantments of the arts, the strange and compelling narratives of religion and myth, and dramatic ideological pictures of social groups locked in morally charged struggle against one another. The media through which such mental experiences are communicated include language, rhythmically and tonally modulated sound, rhythmic and coordinated bodily movement, visible markings on surfaces, and shaped masses of rock, clay, or other malleable material. When used for depicting human behavior, evoking subjective experiences, or expressing emotion, these media make up the arts: oral and written poems, plays, and stories, vocal and instrumental music, dance, painting, sculpture, and composite media such as drama, opera, film, cartoons, and video games. Religion and ideology are made manifest to people in narratives, pictorial images, songs, and the composite media of religious and political ceremonies. Whenever people read novels, watch movies, listen to music, look at paintings, attend religious services, or watch a coronation or a ceremonial investiture of political power, they are participating in imaginative culture.

Even places and buildings form part of our shared imaginative experience. Parks, gardens, national monuments, cemeteries, and grand public edifices produce shared aesthetic sensations and sometimes elicit deep emotional responses. When Notre Dame cathedral burned, the world mourned. In the United States, the Vietnam monument—an immense, somber funeral stone inscribed with the names of the American dead—is a site at which a whole generation memorializes its grief and regret. Millions have visited it, and even more have seen pictures of it. The inscribed stone summons up innumerable memories of personal experiences, shared images projected on television and cinema screens, newspaper headlines and photographs, and narratives imbued with passion, anger, and sorrow.

Most of the contributors to this volume would agree that imaginative culture is an essential part of the human adaptive repertory. All the contributors would agree that the forms of imaginative culture reflect our evolved motives and emotions and give evidence of our evolved cognitive mechanisms. They believe that investigating these forms provides special opportunities for advancing our understanding of human behavior and the human mind.

Imaginative culture is the last major piece in the puzzle of human nature. In the past half century or so, evolutionary human scientists have made extraordinary progress in understanding the evolution of the human life cycle, with its distinctive characteristics of pair-bonded dual parenting, bilateral kinship networks, prolonged infant dependency, extended childhood and adolescence, intergenerational transfers of resources, post-menopausal longevity, male and female cooperative alliances, tension between dominance and egalitarianism, ingroup and outgroup morality, and cultural capacities for social learning, shared attention, internalized norms, and cumulative innovations in technology and social practices (Boehm, 2012, 2016; Bogin, 1997, 2009; Buss, 2016; Carroll, 2012; Carroll et al., 2017; Chapais, 2008; Chapais et al., 2014; Curry, 2016; Gintis, van Schaik, & Boehm, 2015; Henrich, 2016; Hrdy, 1999, 2009; Kaplan, Gurven, & Lancaster, 2007; Konner, 2010; Low, 2015; Muehlenbein & Flinn, 2011; Salmon & Shackelford, 2011; Tennie, Call, & Tomasello, 2009; Tomasello et al., 2005). All these established findings represent a

network of interdependent life history relationships. Taken together, they constitute our currently established model of human nature. Producing this model has been a major collective achievement. And yet, until we make evolutionary sense of imaginative culture, the model remains radically incomplete. Animals of no other species write and read novels, put on dramatic performances depicting fictional characters, use articulate language to express and evoke feelings, produce representational art, or convey shared public meanings in symbolic structures that are rich in emotion and aesthetic sensation.

2 The Historical and Disciplinary Context for Evolutionary Research on Imaginative Culture

Until fairly recently, the study of the arts, religion, and ideology was largely relegated to "the humanities." Up through the late 1970s, most scholarship in the humanities adopted an attitude of informed common sense about its subject (Abrams, 1989, 1997). Though influenced marginally by Freudian or Jungian psychology and by Marxist social theory, humanists for the most part eschewed grand theories and instead let folk psychology prompt their descriptions, classifications, and evaluations (Carroll, 1995; Crews, 1986). They had little interaction with the empirical human sciences. Their methods were almost exclusively qualitative, discursive, and historical. Their claims to disciplinary professionalism rested chiefly on their immersion in the minutiae of their subject matter.

In the 1970s and 1980s—just when the human sciences were moving away from a blank slate model and toward a biological understanding of human behavior—the humanities underwent a revolution in the opposite direction (Abrams, 1997; Carroll, 1995). Under the influence of poststructuralist theory, scholars in the humanities took a sharp and explicit turn away from common sense (Culler, 1997, p. 4). They systematically challenged the ideas that constituted the traditional humanist paradigm: rationality, individual identity, intentional meaning, and reference to reality. Eliminating rationality from the epistemic toolkit of the humanities coincided with adopting ideology as a disciplinary rationale. For at least three decades now, research in the humanities has operated under a liberationist ethos that envisions the world in terms of three social groups: oppressors, the oppressed, and an enlightened elite (humanist scholars) who expose iniquitous power relationships (Boyd, 2006; Carroll, 1995, 2013a; Gottschall, 2008a). Humanities scholars who publish in the flagship journals of their fields believe that culture is the primary cause of human behavior, that culture is unrestrained by biology, and that science cannot explain imaginative experience (Carroll et al., 2017).

Not all scholars in the humanities accepted the orthodoxies of poststructuralism. A fading remnant clung to the common sense of traditional humanism (Patai, 2005). Beginning in the late 1980s and early 1990s, another small group began integrating humanist subjects with the emerging paradigm of the evolutionary human sciences.

They were soon joined by social scientists interested in explaining imaginative culture (Boyd, Carroll, & Gottschall, 2010; Carroll, 1995; Cooke & Turner, 1999; Dissanayake, 1988, 1992, 2000; Salmon, 2003; Salmon & Symons, 2004; Storey, 1996; Tooby & Cosmides, 2001). Evolutionary scholars have attempted to provide evolutionary explanations that account for specific arts or for all of the arts together (Asma & Gabriel, 2019; Boyd, 2009; Dissanayake, 2000; Dutton, 2009). Narrative psychology has connected self-narratives to the evolution of self-consciousness and identity (McAdams, 2019). The origin and adaptive function of religion have been vigorously debated, with hypotheses ranging from cognitive byproduct to motivational regulator (Lawson, 2019; Wood & Shaver, 2018). Evolutionary literary theory has produced around 30 books and hundreds of articles (Carroll, 2015a, 2018a; Jonsson, forthcoming).

Some researchers have aimed to illuminate the arts using science but without being overtly evolutionary. See for instance the journals *Scientific Study of Literature* and *Empirical Studies of the Arts*. "Psychology of fiction" is a broad term for the psychological study of literature and narrative thinking. The field's main premise is that fiction engages real emotions through simulating social interactions (Jacobs & Willems, 2018; Mar & Oatley, 2008; Oatley, 2016; Oatley, Mar, & Djikic, 2012). Another group of researchers in literature, performance, and film designate their work "cognitive studies." That term covers a wide and diverse spectrum of attitudes toward science and imagination. "Cognitive literary study" can describe an assimilation of scientific information into literary study that is consistent with evolutionary literary theory (Beecher, 2016; Bordwell, 2010; Hogan, 2013, 2016; McConachie, 2008; Smith, 2017; Winkelman, 2013), or it can simply mean appropriating scientific concepts, ad hoc, to conventional literary theories (Richardson, 2015; Richardson & Spolsky, 2004; Spolsky, 1993, 2009; Zunshine, 2015).

3 Content and Plan of the Volume

The 17 chapters in this volume offer a fairly representative sampling of recent evolutionary research in imaginative culture. Seven of the nineteen contributors have a primary training in the humanities and eleven in the human sciences. Subjects include research on imagination, evolutionary cultural theory, the culture of specific places and periods, myth, religion, individual identity, aesthetic theory, creativity, and specific arts such as music, literature, the visual and plastic arts, film, and video games. Topics in the discussion of specific arts include the way those arts articulate basic human motives and emotions, the evolutionary and cultural history of the arts, their mechanisms and adaptive functions, and their manifestations in culturally specific periods and places. Discussions also include the character and world view of individual artists and close analysis of particular works of art.

The plan of the volume, communicated to the contributors when they were first contacted, was for each contributor both to give a broad view of his or her general subject—something like what one would find in a handbook survey of a given

field—and also to focus on some particular topic within that subject. Some of the contributors support their main contentions with evidence from empirical studies they have themselves conducted, and of course all cite empirical research conducted by others, but none of the chapters is primarily empirical.

4 A Biocultural Toolkit

In order to investigate imaginative culture, researchers have developed a toolkit of biocultural concepts and methods. This section describes concepts and methods used by multiple contributors to this volume. Tinbergen's four categories of ethological analysis apply to all animal species. Comparisons of humans with other animal species illuminate the characteristics that humans share with other animals and also the singular, distinctive characteristics of human life. Comparisons of different human cultures help identify what is universal in human behavior and what is distinctive about particular cultures. The psychology of individual identity provides an empirically grounded set of categories for characterizing what is distinctive about individual artists and individual responses to imaginative culture.

Religion, myth, ideology, and the arts reflect the ethological attributes that humans share with all animals, the species-typical dispositions that cross cultures, the distinct expression of particular cultures, and the characteristics of individual persons. Each particular form of imaginative culture also has features that distinguish it from other forms. Contributors to this volume use the tools in the common biocultural toolkit and also bring to their chapters concepts and methods that are peculiar to their own subjects—the imagination, myth and religion, aesthetics, music, the visual and plastic arts, film and video games, and the verbal arts.

4.1 Tinbergen's Four Categories for Ethological Analysis

Ethology is the study of animal behavior within the conceptual framework of evolutionary biology. In a classic paper, Niko Tinbergen (1963) identifies four standard categories for an ethological analysis of a trait or behavior: phylogeny, ontogeny, mechanism, and adaptive function. Phylogeny concerns the development of traits or behaviors over evolutionary time scales. Ontogeny concerns the development of traits or behaviors during the growth of the organism. Mechanisms consist in the anatomical, physiological, or neurological structures that produce the trait or behavior. An analysis of adaptive function describes the way the trait or behavior contributes to the organism's inclusive fitness, that is, to its success in passing on genes.

Phylogeny For the hominid lineage, phylogenetic analysis extends back to the last common ancestor humans shared with chimpanzees some 5–7 million years ago. Evolutionary psychologists emphasize the Pleistocene—from about 2.6 million

years ago to 11,700 years ago—as the period in which human foraging techniques and social behavior took a shape supposed similar to that of contemporary foragers. For the topic of imaginative culture, researchers often concentrate attention on the explosion of innovative cultural behavior between a hundred thousand and 50,000 years ago but also observe the way artistic representations reflect conserved features of hominid cognitive and motivational systems.

In his theoretical chapter on the aesthetic sense, Høgh-Olesen lodges aesthetic responses in the basic, conserved emotions that promote fitness. Conserved cognitive and motivational systems also make up the core themes in the interpretive chapters by Kjeldgaard-Christiansen, Clasen, Salmon and Burch, Saunders, and Jonsson. Kjeldgaard-Christiansen focuses on male dominance, Clasen on fear of death and male bonding, Salmon and Burch on male bonding and male and female mating strategies, Saunders on parental care, and Jonsson on moral social bonds. In the interpretive section of his chapter, Carroll focuses on male–female pair bonding, filial feeling, and multigenerational kin relationships.

Two of the contributors to this volume take Paleolithic life as their primary subject. Zaidel uses a cross-disciplinary array of findings—from archeology, comparisons of animal and human communication, human physiological traits, and evolutionary pressures on group survival—to explain how early humans would have used the arts to cement group identity and help ensure group survival. Coss uses a similar array of cross-disciplinary research—from archeology, paleoanthropology, neurobiology, cognitive and experimental psychology, and evolutionary aesthetics—to shine a bright light on the portrayal of cave lions in the Early Upper Paleolithic. Coss's argument about our ancestors' preoccupation with an especially dangerous predator reinforces Clasen's argument that horror literature originates in the deep tracks of fear laid down during the evolutionary history of our species. McAdams and Cowan locate their concepts of social identity within a history of human social evolution. "Among the most important innovations introduced by *Homo erectus* were collaborative hunting, cooking, and community child-rearing. Each likely contributed to the evolutionary growth of human brains and human groups."

Salmon and Burch locate the origins of male bonding in ancestral conditions that gave adaptive value to male cooperation for food acquisition, shelter, protection, and competition with other groups. McConachie envisions modern forms of dysphoric and euphoric rituals as continuations of ancestral practices. McAdams and Cowan correlate two forms of personal identity—trait attribution and self-narratives—with mimesis and myth (the two phases of human communicative evolution postulated by Merlin Donald). Kozbelt uses Paleolithic visual art to inform his understanding of the canalized aesthetic biases working in tension with impulses toward novelty in the art of multiple historical periods. Asma uses evidence from archeology and paleoanthropology to illuminate the mechanics and functions of music. Carroll uses research on the evolution of human brain shape and the explosion of creativity during the emergence from Africa to illuminate the functions of imagination in modern human life.

Ontogeny The human mind is born undeveloped but with strong innate tendencies to develop in specific ways. Human developmental psychology can now trace the phases during which imagination develops in children. Pretend play begins in the second year. Between ages 3 and 5 years, children start to reason about past and future states, make plans, and delay gratification. During that same period, children are developing the capacity for perspective taking: the ability to understand that other people have beliefs and thoughts that might differ from their own (Harris, 2000; Suddendorf & Corballis, 2007; Taylor, 2013). By the age of 3 years, children begin developing the capacity to construct narratives, but that capacity takes longer to mature than some other, more basic faculties. "Although 3-year-old children tell stories about events that occurred elsewhere in time and space, it is typically not until middle childhood [ages 8-9] that children are likely to tell a coherent story complete with explicit and elaborated portrayals of characters' thoughts and feelings" (Taylor, 2013, p. 800). At about the same age, children begin to develop clear ideas about survival after death (Harris, 2018). Narrative sophistication and the emergence of quasi-religious conceptions of an afterlife thus serve as markers for the maturing of imaginative capacity. That maturation occurs before the onset of puberty and suggests one main adaptive function for the evolutionary extension of human childhood—to provide time for cognitive development.

The emotional and imaginative experience of children has been a frequent subject of artistic representation in the plastic arts and in literature. It is, for instance, an almost obsessive preoccupation in the fiction of Charles Dickens (Carroll, 1998). In his chapter on Stephen King, Clasen argues that King often foregrounds the experience of children and that he uses a cunning and skilled adult's power to create an imaginative virtual world characterized by childlike terror and wonder.

Two contributors to this volume, Coss and Høgh-Olesen, cite infant aesthetic responses as evidence for innate human aesthetic dispositions. Høgh-Olesen argues that aesthetic responsiveness "occurs in our infants as an innate, pleasurable activity, which (like playing) does not need to be learned or rewarded in order to exist." Asma identifies mother–infant interaction as an originating influence on the development of musical sensibilities and speculates about a correlation between the ontogeny and phylogeny of musical responsiveness. "Mother-infant interaction, with its strong physiological, emotional, and even sonic synchronizing, may have helped create proto-music as early as *Homo heidelbergensis.*" Among other forms of evidence for species-typical preferences in the visual arts, Kozbelt cites "cross-cultural commonalities in children's drawings and adults' doodles, both of which employ a very limited graphic repertoire." Like Asma, Kozbelt links ontogenetic and phylogenetic lines of argument. "Better to ascribe aesthetic similarities to a common phylogenetic origin, rather than cross-cultural coincidence, and to regard variations as later developments superimposed on those initial regularities." Like Kozbelt, Coss notes continuity between infant and adult visual preferences. "Precocity of innate behavior results from the early installment of specific patterns of interneural connectivity on newly formed neurons with only initial dendritic

branch outgrowth that resist the remodeling that occurs during 'experience-dependent' dendritic growth and connectivity later in development."

Mechanisms Mechanisms can be anatomical (eyes, tongue, feet, and heart), physiological (the processes of digestion and metabolism and the intake of oxygen and expulsion of carbon dioxide), neurological (the brain, spinal column, and nervous system), or endocrinological (insulin, cortisol, and adrenaline). Various categories of mechanism overlap and interpenetrate. The brain is an organ, an anatomical feature, and also a mass of neurons that connects to other neurons throughout the body and that regulates other organs, metabolic processes, and hormones. To give an example of interconnected mechanisms, the hypothalamic–pituitary–adrenal axis is responsible for flight or fight responses. It involves the brain (the hypothalamus, hippocampus, and amygdala), the pituitary gland (located in the brain but not part of the brain), and the adrenal glands (set just above the kidneys). Activated by some threat, this axis floods the nervous system with cortisol, which produces a cascade of physiological responses. It increases blood glucose levels, blood pressure, and heart rate, sends more blood to skeletal muscles, and inhibits bodily processes not immediately necessary for fight or flight, for instance, sexual responses and the immune system (Nestler, Hyman, & Malenka, 2009; Smith & Vale, 2006).

All mechanisms that affect motives and social interaction are relevant to research on imaginative culture. For example, parenting and reproductive behavior (topics in chapters by Clasen, Salmon and Burch, and Saunders) prominently include anatomical, physiological, and neuroendocrinological mechanisms. Høgh-Olesen and Salmon and Burch discuss the male and female anatomical differences exaggerated for effect in art designed to elicit male and female mating responses. But the mechanisms that feature most prominently in this volume are those that are studied in neuroscience, cognitive psychology, and the psychology of emotion.

Neuroscience and Cognitive Psychology In the 1990s, evolutionary psychologists postulated cognitive "modules" for a wide array of more or less automatic adaptations to regularities in the Pleistocene environment (Barkow, Cosmides, & Tooby, 1992; Pinker, 1994, 1997). In the past 30 years, the rapidly increasing sophistication of neuroimaging techniques has largely supplanted speculation about modules with concrete empirical knowledge about neural networks.

Cognitive and affective neuroscience shade over into cognitive psychology and the psychology of emotions—disciplines that focus their subjects at levels of resolution closer to the phenomenology of behavior and experience. Discussing a phenomenon of vision, Coss suggests some such relationship between neuroscience and cognitive psychology. "This figure-background contrast applies to both the lowest level of neural organization and the highest level of perceptual organization that shapes the interaction of the organism with its environment." Taking a wider, more general scope, Kozbelt makes a similar distinction between neuroscience and cognitive psychology. "People everywhere share perceptual and cognitive systems with a common neural architecture, adapted for processing information from the environment to arrive at an understanding of the structure and content of our surroundings,

which in turn promotes reproductive success." Kozbelt thus identifies neural architecture as the substrate for conscious awareness and identifies both the substrate and the conscious awareness as mechanisms that have adaptive functions.

Carroll, van Mulukom, Asma, and Zaidel all discuss neuroscientific research that helps isolate the components of the imagination and identify their relationships. Carroll, van Mulukom, and Asma give particular attention to the brain's default mode network. Carroll isolates three main cognitive functions of that network—simulation, mental time travel, and perspective taking. Carroll argues that these three functions taken together help produce four more specialized forms of imagination: dreaming, mind-wandering, autobiographical narratives, and counterfactual thinking. Van Mulukom describes imagination as "a very broad cognitive ability, encompassing a capacity for simulation, symbolic processing, metathought, thinking about different times, places, and minds." Asma argues that music is universal and adaptive. To support this argument, he delves into the neural systems that support musical performance and appreciation. In addition to the default mode network, he gives particular attention to the mirror neurons that produce "embodied simulation." Simulation serves as a main concept in the chapters by Clasen, Kjeldgaard-Christiansen, and McAdams and Cowan. Zaidel and Asma both discuss the neurobiological foundations of rhythm. Zaidel and Coss give special attention to the neurobiology of vision.

Kozbelt discusses several cognitive processes active in aesthetic production and perception: perceptual grouping and binding, perceptual problem solving, metaphor, peak shift, behavioral contrast, association effects, mere exposure effects, and habituation. To explain fetishes, Høgh-Olesen invokes the principle of a "super stimulus," the idea that "the perceptual system reacts more strongly to an exaggeration of the original characteristics than to the original stimuli themselves." Working with information theory, Carney constructs a formal mathematical model to test his hypothesis that "the purpose of style is to establish a cognitive orientation towards the future—that is, it represents the world as being inherently more predictable."

Lawson argues that "religious thought and the behavior associated with it (for example ritual behavior) are non-adaptive byproducts of cognitive mechanisms" that are in themselves adaptive. Kozbelt and Lawson both discuss the cognitive psychology of creativity and of cultural transmission. Like Lawson, Tehrani discusses the cognitive psychology of cultural transmission and, again like Lawson, emphasizes minimally counterintuitive information (MCI). Tehrani divides the cognitive mechanisms of cultural transmission into context biases and content biases. Context biases include skill-based transmission, conformist transmission, and a law of self-correction. In addition to the preference for minimally counterintuitive information, content biases include preferences for information relevant to survival and social life.

Psychology of Emotion Emotions have evolved to regulate human behavior in ways that promote inclusive fitness. Avoiding danger, forming friendships, negotiating social hierarchies, finding and keeping mates, parenting, bonding with siblings and other kin, and identifying with social groups—all these behaviors are activated

by emotions. Emotions are thus mechanisms that fulfill vital adaptive functions (Asma & Gabriel, 2019; Ekman, 2016; Izard, 1978, 2007a, 2007b; Keltner, Oatley, & Jenkins, 2014; Keltner, Tracy, Sauter, & Cowen, 2019; Nesse, 2019; Panksepp, 2000; Sznycer, Cosmides, & Tooby, 2017; Tracy, 2014).

Darwin (1872) initiated research into the coevolution of motives and emotions, but the evolutionary understanding of emotions became a cumulative research program only in the 1960s. Working with cross-cultural recognition of facial expressions, Paul Ekman and his colleagues identified six "basic" or "universal" emotions: anger, disgust, fear, happiness, sadness, and surprise (Ekman, 2007). In the past 20 years or so, research about basic emotions has been developing very rapidly. More than two dozen basic emotions have now been empirically validated. Just in the past few years, researchers have made a breakthrough in understanding how these emotions cluster into distinct groups that are close to or distant from other distinct groups (Cowen, Elfenbein, Laukka, & Keltner, 2018; Cowen & Keltner, 2017, 2018, 2019; Keltner, Sauter, Tracy, & Cowen, 2019; Keltner, Tracy, et al., 2019). While expanding the number of basic emotions and refining our knowledge of their relationships to one another, empirical researchers have also been developing a more nuanced understanding about the way different cultural ecologies influence the combination and expression of emotions. In tandem with researchers working on basic emotions, affective neuroscientists have been achieving increasingly precise knowledge about the physiological and neurological mechanisms that produce emotions (Nummenmaa & Saarimäki, 2019; Panksepp, 2000; Panksepp & Biven, 2012; Shackman & Wager, 2019; and in this volume see Asma).

Emotions are fundamental components of meaning in the arts. Artists express emotion. In pictorial and verbal arts, emotions are invested in depicted subjects that audiences can share or against which they can react. In literary depictions, "agonistic" alignments of protagonists and antagonists elicit positive and negative emotions that help shape the moral dimensions of meaning in the work (Carroll, Gottschall, Johnson, & Kruger, 2012; Kjeldgaard-Christiansen, 2016, 2017; Kjeldgaard-Christiansen & Schmidt, 2019; and in this volume see Clasen; Kjeldgaard-Christiansen). Emotional tone in fictional narrative is the orchestrated sequence of emotional effects culminating in some moment of emotional realization that coincides with the culmination of action in a story. Such orchestrated emotional sequences bear a strong resemblance to the evocative emotional effects of musical sequences. Hence the use of music to channel emotional responses to films and video games (Asma and Gabriel, 2019; Johnson-Laird & Oatley, 2016; Mar, Oatley, Djikic, & Mullin, 2011; Oatley, 2011, 2012; and in this volume see Kjeldgaard-Christiansen). The meaning of art consists in good part in interactions among emotions expressed by artists, depicted in the artwork, and felt by members of the audience. Those emotional meanings converge with the aesthetic and thematic (conceptual) components of art to form a total artistic construct (Carroll, 2019).

Høgh-Olesen emphasizes the pleasure produced by aesthetic experience but includes in the category of the aesthetic the negative emotions of "disgust and repulsion." Like Høgh-Olesen, Asma emphasizes the biologically grounded pleasure

produced by art. “Music and dancing form a tour de force of neurochemical pleasures: serotonin, epinephrine, endorphins, and dopamine. Pain is blocked, and euphoria is increased in the musical experience.” Asma summarizes Jaak Panksepp’s system of neurologically grounded emotions and argues against social constructionist views of emotion. “We have inherited a small number of primary emotions from our phylogenetic history (affective systems). We share these affective systems with other mammals, and our neocortical conceptual sophistication transforms these into additional uniquely human emotions.” Most or all of the contributors to this volume would probably agree with these arguments.

Coss’s subject is the salience of predator images in the Paleolithic human imagination. The source of that salience is an emotion: fear. Clasen’s subject is horror, a genre defined by its elicitations of fear and disgust. Lawson’s discussion of religion focuses on ritual, which he explains as a psychological mechanism designed to assuage anxiety—that is, chronic fear. So also, Carney identifies “style” as a mechanism designed to assuage anxiety. McConachie’s subjects are two kinds of ritual that correspond to disintegrative and integrative social conditions. The two kinds of ritual are defined as an emotional polarity: dysphoric and euphoric. Saunders explains human parental behavior as a consequence of fitness algorithms that produce a wide range of emotions: tender love, resentment, guilt, possessiveness, pity, and passionate grief.

Exploring the psychology of agency in a video game, Kjeldgaard-Christiansen explains its appeal through the kind of emotion it evokes: sensations of prowess, power, speed, and might, all together producing a feeling of “primal and virtually limitless empowerment.” Kjeldgaard-Christiansen argues that this kind of feeling appeals especially to males. Salmon and Burch emphasize the positive emotionality in the male bonds that are depicted in fictional narrative and films and developed as romance in slash fiction. The key features of male relationships in slash are trust, love, intimacy, and commitment.

Clasen’s commentary on the value of Stephen King’s work is framed as an argument about the emotional and moral characters of that work. Clasen says that King’s best works evoke not sadistic pleasure but compassion and understanding. King’s characters are vulnerable people facing their deepest fears. Clasen quotes King’s claim that the most essential element of a good horror story is “Character. You’ve got to love the people…. There is no horror without love and feeling.” Giving close attention to two King novels, Clasen argues that King evokes “real emotional depth”—not just terror, but sympathy, grief, joy, rage, and tragic despair. A contrasting example helps define the positive moral and emotional quality of King’s work. A psychopathic boy who murders his infant sibling feels “No regret, no grief, no horror—not even sadness.” His “pathological selfishness” manifests itself as an absence of emotion.

Jonsson’s subject is Joseph Conrad’s struggle to come to terms, emotionally and imaginatively, with an amoral Darwinian cosmos. Conrad’s protagonist Marlow is “disturbed by the revelations that nature is amoral.” He is the more easily disturbed because he is “neurotic and depressive,” that is, especially susceptible to negative emotion. Conrad’s solution is to affirm basic moral values that are strictly limited to

the human sphere and that are defined in large part by an emotional response to the behavior he observes. “Marlow quietly judges the behavior of himself and those he encounters, admiring restraint and constructive effort, despising self-serving cruelty, cowardice, and loss of control.” The climax of the story is a single spoken phrase, repeated once. “The horror! The horror!” The language Conrad uses to describe the facial expression that accompanies that dying utterance has echoes in the evocative emotional words used by Saunders, Kjeldgaard-Christiansen, and Clasen: “I saw on that ivory face the expression of sombre pride, of ruthless power, of craven terror—of an intense and hopeless despair.”

Carroll’s reading of Wallace Stegner’s *Angle of Repose* is designed to illustrate three concepts in cognitive psychology: simulation, mental time travel, and perspective taking. Those abstract concepts have artistic meaning in good part because they are everywhere inflected by emotion. The narrator is “emotionally preoccupied with bitter resentment against the wife who has abandoned him.” He is trying “to make emotional and imaginative sense” of his life. Because the female protagonist is “disappointed with her husband’s career and exhausted by her own privations,” she “yields emotionally to the romantic entreaty” of her husband’s friend. The narrator’s mental time travel through his grandparents’ marriage traces an emotional trajectory. “The passion and anguish of the marriage settle into resignation and endurance.” In concordance with the interpretive commentaries by Saunders, Kjeldgaard-Christiansen, Clasen, and Jonsson, Carroll argues that authors purposefully aim to control the emotional responses of their audience. Stegner uses intuitive psychology to elicit “suspense, anxiety, affection, fear, relief, or dismay.”

Adaptive Functions Evolutionary theorists have reached no consensus on the adaptive function of imaginative culture. Researchers into religion are divided between arguments that it is adaptive and arguments that it is only a byproduct of cognitive adaptations that serve other, different adaptive functions (Dissanayake, 2011; Lawson, 2019; Wood & Shaver, 2018). One version of evolutionary psychology reduces all aspects of the mind, including the arts, to forms of sexual display (Dutton, 2009; Kenrick, 2011; Miller, 2000). In that view, the arts would contribute to reproductive success but would have no primary adaptive function. Another view holds that the arts can be explained as non-adaptive means of exploiting pleasure circuits in the brain (Pinker, 1997, pp. 521–538, 2007). Several evolutionary theorists have countered that argument by identifying adaptive functions fulfilled by the arts (Carroll, 1998, 2012; Dissanayake, 2000; Salmon & Symons, 2004; Tooby & Cosmides, 2001).

Natural selection is the source of complex functional structure in living things (Darwin, 1859; Dawkins, 1986; Tooby & Cosmides, 1992). In his chapter in this volume, Carroll subsumes the arts within the general functions of imagination and cites evidence from neuroscience that the imagination has complex functional structure.

Contributors to this volume display the full array of currently active hypotheses about the adaptive or non-adaptive functions of imaginative activity. Arguments by Lawson, Carney, and Kjeldgaard-Christiansen tend toward the non-adaptive side of

the debate. Lawson contrasts two views of religious behaviors: (a) that they have "led to survival and reproductive success" and can thus be considered adaptations and (b) that they are non-adaptive "byproducts of quite ordinary cognitive processes." Declaring a preference for the latter view, he suggests that ritual behaviors might alleviate anxiety and thus provide psychological satisfactions while not increasing fitness. Carney makes a similar suggestion about "style"—that it takes the place of valid explanation and thus alleviates anxiety about an unpredictable future. Kjeldgaard-Christiansen suggests that one specific form of imaginative activity—playing violent video games—provides psychological satisfaction but has no behavioral consequences. "*Doom* may benignly play off a violent impulse rather than perniciously stoke it."

Other contributors argue that imagination in general or specific forms of imagination have adaptive benefits. Asma, Zaidel, Høgh-Olesen, and McAdams and Cowan all argue that the arts contribute to social cohesion. As Asma puts it, "in part, music evolved to glue us together in social cooperative groups." In a similar vein, Clasen argues that fiction improves social cognition and can orient us toward prosociality rather than selfishness. Asma also argues that music has benefits for the individual. "Music helps humans hear better, move better, think better, and feel better."

Høgh-Olesen, Clasen, McAdams and Cowan, van Mulukom, and Carroll all argue that the arts can serve as a guide to behavior. Like Clasen, McAdams and Cowan maintain that stories function to simulate social experience and prepare for possible future situations. "After playing the story out in an imagined space, the narrator can decide how to respond to a difficult social problem based on the results of the simulation." In a similar vein, van Mulukom argues that "fiction is a safe way of engaging with problems and threats, just as mental time travel is." Kozbelt and van Mulukom emphasize the creative powers of imagination. Van Mulukom argues that "human culture cannot exist without imagination."

Carroll argues that the imagination has multiple adaptive functions: "creating the self as a values-directed, goal-oriented agent, understanding other people both for cooperative endeavor and for competitive manipulation, integrating individual identity and social group identity, creating new linkages among ideas, and understanding multiple alternative possible courses of action." All these particular functions, Carroll argues, "add up to one overarching adaptive function: creating an imaginative virtual world, an inner world, that guides our behavior in the actual, physical world."

4.2 Comparative Methods for Illuminating Human Nature

Cross-Species Comparisons Defining species-typical features is an exercise in "formal definition": placing an entity within a class and distinguishing it from other entities in the same class. Students of human behavior categorize humans as primates and distinguish features of human life history or anatomy from those of other primates, especially the great apes, and within the great apes, especially chimpanzees

and bonobos, our closest phylogenetic relatives. But animals of other species are also often brought in for comparison, especially very clever animals like corvids and cetaceans, very social animals, like canids, or pair-bonded species, like prairie voles and many bird species. One of the most fruitful forms of inquiry into specifically human forms of cognition is to combine cross-species comparison with developmental psychology—in particular, comparing the development of cognition in human children with the cognitive powers of chimpanzees (Suddendorf, 2013; Tomasello, 2019).

To support his argument that humans have a genetically transmitted alertness to the shape of leopards, Coss notes that "natural selection has fostered the ability to recognize these cats in a number of nonhuman primates." He also finds support in a parallel case with a very different species. "California ground squirrels … living in snake-absent and snake-rare habitats maintain innate recognition of their former rattlesnake and gopher snake predators for an estimated time frame of 300 k years of relaxed selection." Making a similar point but at a more general level, Høgh-Olesen argues that all species, including humans, "are predisposed to respond to certain key stimuli which have been associated with an expectation of functionality, fitness, and increased wellbeing." He compares the visible light spectrum in multiple species and concludes that "each species sees the world in its own colors, depending on which wavelengths the species is able to process." Assessing the aesthetic character of the color red, he suggests that humans' strong "response to red color is probably a remnant of the mating rituals of the higher primates."

Like Darwin in *Descent of Man* (1871), Asma argues for both continuity and discontinuity between nonhuman and human imaginative powers. He notes antecedents of human imaginative behavior in nonhuman animals but also argues that humans have special cognitive powers that transform these rudiments into full-blown artistic processes. Speaking of the human power for coordinated movement, he notes that "other animals, even our closest cousins, fail miserably to get a decent groove going…. There are rare exceptions—like Snowball the dancing cockatoo, and some chimps—but most animals seem incapable of synchronizing their own bodies to a beat, and coordinating multiple bodies to a pulse is nigh impossible." In contrast, Zaidel argues that "innate sound synchrony is a universal human trait … passed on from non-human primates." She cites examples from "group-coordinated, rhythmic vocally-produced choruses" in chimpanzees, lemurs, and gibbons.

Reflecting on the evolution of imaginative flexibility, Kozbelt notes that "Bengalese finches were bred into existence from the wild white rumped munia over several centuries, with the goal of enhancing its colorful plumage. To attract mates, the munia sings a stereotyped song, subject to substantial evolutionary selection pressure. For domesticated Bengalese finches, this pressure disappeared, yet their songs became more complex and unpredictable." On the basis of this comparison, he suggests that "the alternate dynamics of selection and relaxation mean that sometimes art is restricted by selective pressure imposed by a cultural niche and sometimes it is free to change, if those pressures relax." Van Mulukom argues that

humans are set apart from other species precisely because they have the "ability to deal with novelty or change instead of having to rely on fixed instincts."

Cross-Cultural Comparisons Behaviors or traits that appear in all known cultures are known as "human universals" and are strong candidates for characteristics grounded in genetically transmitted dispositions and capacities (Brown, 1991, 2004, 2017). Biocultural researchers typically seek to identify a common biological basis for the forms of imaginative culture but then also to analyze differences in how innate dispositions are organized in different cultural ecologies. Factors that influence variation include differences in physical environment and modes of provisioning, socioeconomic organization, modes of governance, location within specific cultural traditions (religious, artistic, and ideological), levels and kinds of technological development, and differences in the available media of communication and artistic expression (for example, metalworking, literacy, musical instruments, audio-visual technology, and the existence of digital media). Differences in the organization of imaginative culture both reflect and influence the qualities of experience in any given culture.

Lawson affirms that people imagine the gods "across cultures and through time." In examining depictions of male bonds, Salmon and Burch deploy a rich array of references, cross-cultural, ancient, but also popular and recent. Suggesting further lines of research in their subject, they point toward a Japanese form of fanfiction that "features female created homoerotic pairings that emphasize dominant and submissive partners." They pose a number of questions that could be examined in an empirical study of this form. Tehrani describes an empirical cross-cultural study designed to test a hypothesis about the correlation of oral fairy-tale traditions and linguistic families. "To investigate Grimm's 'cultural descent' hypothesis, Sara Graça da Silva and I used phylogenetic comparative methods to analyze 275 'Tales of Magic' … shared among the 50 Indo-European-speaking populations represented in the ATU Index." That comparison produced strong evidence in support of Grimm's hypothesis.

To assess prehistoric musical technology, Asma cites a "cross-cultural comparative study of modern human tribes, indigenous or small-scale social groups." To support his contention about the innate and universal character of musical activity in humans, he cites a cross-cultural study that analyzed "two massive data sets (NHS Ethnography and NHS Discography)." He observes a parallel between a synchronized warrior dance performed by the Maasai and synchronized movement among modern militaries "around the world." Like Ekman giving evidence for the existence of basic emotions by demonstrating that people cross-culturally recognize the same facial expressions, Asma cites a study of a native African people who heard Western music for the first time and were able to identify happy, sad, and fearful emotions in the music.

Like Asma and Høgh-Olesen, Kozbelt thinks it better to ascribe aesthetic similarities "to a common phylogenetic origin, rather than cross-cultural coincidence." The question governing Kozbelt's exposition is whether, "across cultures and traditions," variability or commonality are more important in art. In seeking to answer

this question, he ranges widely through the history of art, from prehistoric cave paintings to the art of ancient Egypt and classical antiquity, and from post-medieval Europe to the contemporary world of the avant-garde. He also considers the broad cultural differences in cognition that have been postulated as separating individualist Western cultures and collectivist Eastern cultures. He acknowledges that "ethnographic studies of indigenous peoples have documented cross-cultural variability in art's socio-cultural functions" but concludes that, on balance, "cross-cultural artistic similarities enjoy stronger empirical support than those emphasizing differences."

4.3 Individual Identity

Artists and their audiences are individual people. Each individual person shares in the genetic inheritance of the human species, each is immersed in some particular culture, but each is also a unique individual, with a history of experiences similar but not identical to that of other individuals. When we meet some new person, we almost automatically register distinguishing characteristics such as age, sex, social position, family role, bodily build, facial features, personality, education, intelligence, talents, and occupations. All such characteristics produce variations in behavior and experience. Differences in individual experience affect the way individual artists express themselves, the way people respond to artistic works, and the way people experience collective forms of imaginative culture such as religion, ideology, and public ceremonies.

The branch of psychology that deals with individual identity is sometimes called the psychology of "individual differences" and sometimes "personality psychology." For some decades now, personality psychology has been dominated by the five-factor model (extraversion/introversion, conscientiousness/carelessness, agreeableness/disagreeableness, emotional stability/neuroticism, and openness/conventionality) (Costa Jr. & McCrae, 1997; Nettle, 2007). Dan McAdams and his colleagues have expanded the model to take in motives and also self-narratives—the stories people tell about themselves to themselves and to others (McAdams, 2015, 2018, 2019; McLean, 2016; McLean & Syed, 2015). This expanded model incorporates a concept of narrative that can also be applied to fictional narratives. "At their core, stories are fundamentally about what happens when a human agent, equipped with wishes and plans, sets out to achieve a goal. For humans, goal-directed action is guided and motivated by the wants, desires, beliefs, and values that reside in the minds of human agents" (McAdams and Cowan, this volume).

Like McAdams and Cowan, van Mulukom and Carroll treat narrative as a medium for constructing individual identity. Carroll argues that poems, plays, and stories help "create the self as a values-directed, goal-oriented agent." Van Mulukom argues that "we define ourselves by constructing our identity through narratives." Narrative "brings together an individual's remembered past, experienced present, and anticipated future into a unified whole."

Jonsson examines a fictionalized autobiographical narrative by Joseph Conrad. She aims to understand how Conrad responds to the challenge of the amoral Darwinian cosmos in part by invoking core features of his personality. "Conrad faced the challenges of that natural world through an unusually conflicted personality profile: neurotic and depressive, sympathetic and highly imaginative, but also rigidly conscientious, extremely emotionally restrained, and intellectually humble."

Clasen makes a case for the value of Stephen King's work in part by delineating King's personality. He observes that as a child King had an unusually active and intense imagination, and he quotes King's declaration that he "often felt unhappy and different, estranged from other kids my age." He acknowledges that King delights in terrifying his readers but denies that King is sadistic or cruel. He emphasizes King's tenderness and compassion.

Like McAdams and Cowan, Kjeldgaard-Christiansen locates personality psychology within a dichotomy between two basic motives: getting ahead and getting along, agency and communion, asserting the self and belonging to a group. "Agency is a fundamental motive factor that subsumes competence, assertiveness, and individual goal-pursuit. It is contrasted with communion, which subsumes social and self-effacing motives." The subject of Kjeldgaard-Christiansen's chapter, the video game *Doom,* "submerges players in a first-person fantasy of unmitigated agency." Zaidel concentrates on the adaptive benefits of art as a medium of social cohesion. She argues that "the group as a whole" was "more significant for survival than the individual." Salmon and Burch describe adaptive benefits of communion within one well-defined social group: coalitions of agentic males.

5 Organization of the Volume

Dividing the chapters into sections in this volume has required making unavoidably imperfect decisions about fuzzy boundaries. Biocultural theory and criticism are inherently interdisciplinary. Contributors from different disciplines adduce similar kinds of evidence for different subjects, and subjects often overlap.

Carroll and van Mulukom focus primarily on the evolution, adaptive functions, and mechanisms of imagination, but they also give considerable attention to the verbal arts. Zaidel is concerned chiefly with the evolution and adaptive functions of imagination, but she discusses multiple arts, including music, dance, the plastic arts, and storytelling.

McAdams and Gowan focus primarily on personal identity, a topic also discussed in chapters by Carroll, van Mulukom, Kjeldgaard-Christiansen, and Jonsson, but they also discuss the evolution of imagination. Like McAdams and Gowan, Kjeldgaard-Christiansen invokes the basic dichotomy between the individual and the community. Kjeldgaard-Christiansen's emphasis on first-person agency overlaps with van Mulukom's and Carroll's emphasis on autobiographical narrative. The other side of that dichotomy, the emphasis on community, is represented by the

argument that imaginative culture functions to enhance social cohesion (chapters by Asma, Høgh-Olesen, McAdams and Cowan, and Zaidel).

Høgh-Olesen offers a biologically grounded concept of aesthetics in general. Asma's main subject is music, and Kozbelt concentrates on the visual and plastic arts, but both also suggest generalized aesthetic theories grounded in biology. Tehrani focuses on oral narrative traditions but generalizes in ways that suggest a broad view of evolutionary cultural processes. So also, Kozbelt's concern with evolutionary constraints on creativity in the visual and plastic arts broadens out into implications for evolutionary cultural theory in general. Creativity is discussed also in the chapters by Carroll, Lawson, and van Mulukom.

McAdams's and Cowan's study of personal identity includes a concept of myth as a major phase in the evolutionary development of imagination. Jonsson, though dealing with a single author and focusing on a single work by that author, is also dealing with that author's effort to construct a modern mythology. Lawson's study of religion emphasizes ritual, and in that respect his chapter has close affinities with McConachie's treatment of modern films as analogues of euphoric and dysphoric rituals.

Given the difficulty in neatly segregating topics in a volume such as this, readers especially interested in this or that specific topic might be well advised to make liberal use of the book's index.

6 Directions for Further Research

Many of the topics that form the main subjects of individual chapters in this volume have only recently come into the scope of biocultural commentary. Biocultural commentaries on subjects such as music, painting, sculpture, architecture, photography, and film are still fairly rare. Biocultural interpretive criticism of literary works are more numerous but still scanty in comparison with more conventional kinds of scholarship and criticism (Carroll, 2015a, 2018a; Jonsson, forthcoming). Whole periods and national cultures have scarcely been touched, and many major artists have yet to be considered from a biocultural perspective. Studies of popular culture have dealt with films, video games, cartoons, graphic novels, social media, professional wrestling, and literary genres such as horror, action-adventure, romance, science fiction, detective novels, and pornography (Boyd, 2010a, 2010b; Clasen, 2012, 2014, 2016, 2017, 2018; Clasen, Kjeldgaard-Christiansen, & Johnson, 2018; Grodal, 2009; Kjeldgaard-Christiansen, 2016; Kjeldgaard-Christiansen & Clasen, 2019; Kjeldgaard-Christiansen & Schmidt, 2019; Palmer, Newsome, Proud, & Coe, 2010; Salmon, 2003, 2012, 2016, 2018; Salmon & Diamond, 2012; Salmon & Symons, 2004; Vanderbeke & Cooke, 2019). Little has yet been done with advertising, political campaigns, night-club dance culture, casinos, style in industry and technology, fashion, fan clubs, political and military ceremonies, or holiday celebrations. Artistically serious cable television series have emerged as a long form of narrative rivalling the novel. That promising field has so far only been scratched by

evolutionists (Kjeldgaard-Christiansen, 2017). For all such underserved areas of research, we hope the chapters in this volume will give stimulus for further work.

A sufficient number of evolutionary empirical studies of imaginative works have been produced to give decisive evidence that such work is possible and fruitful (Clasen et al., 2018; Clasen, Andersen, & Schjoedt, 2019; Gottschall, 2008a; Gottschall, Allison, De Rosa, & Klockeman, 2006; Gottschall & Nordlund, 2006; Johnson, Carroll, Gottschall, & Kruger, 2008, 2011; Kjeldgaard-Christiansen, 2017; Kruger, Fisher, & Jobling, 2003; Kruger & Jonsson, 2019; McCrae, Gaines, & Wellington, 2012). Empirical work now done in the psychology of fiction or the more general field of empirical studies in the arts is sometimes framed within an evolutionary context, but often not. Situating empirical work within an evolutionary context would give considerably more shape and direction to the psychology of fiction and to empirical studies of the other arts. It would define problems in relation to established findings about human motives, emotions, and cognitive processes, and it would enable researchers to locate their topics within a set of systemic causal relationships lodged within the larger explanatory framework of evolutionary biology (Carroll, 2018b).

The complexity of meaning in works of imaginative culture poses a challenge for quantitative work. Should researchers try to isolate narrowly defined phenomena so as to achieve precision in analysis? Or should they devise big, complex studies that attempt to encompass the complexity of the subject matter? Both strategies have value and of course can be complementary. The empirical challenge parallels the challenge of historical scholarship in the humanities: some research focuses on individual artists or works of art, and some seeks to discern large-scale patterns across periods, genres, or themes. One major opportunity for evolutionary researchers is to synthesize large-scale evolutionary empirical studies of the arts with fine-grained analysis of individual works. Some of that kind of work has already been done in integrating the analysis of "agonistic structure" (protagonists and antagonists) with the analysis of specific works of literature or film (Carroll et al., 2012; Clasen, 2017; Kjeldgaard-Christiansen, 2017; and in this volume see Clasen; Kjeldgaard-Christiansen). Evolutionary literary scholars have produced both survey-style overviews of basic life history patterns in literature (Carroll, 2015b, 2018b, 2019; Clasen, 2011, 2017; Saunders, 2015; and in this volume see Salmon and Burch; Saunders) and studies that use life history structures to frame interpretive accounts of individual authors and works (Carroll, 2011, 2012, 2013a; Clasen, 2010, 2011, 2017; Easterlin, 2000; Gottschall, 2008b; Jonsson, 2013, 2018; Kruger & Jonsson, 2019; Saunders, 2009, 2018; and in this volume see Carroll; Clasen). Including empirical methods in both broad-scale and fine-grained interpretive study opens almost limitless opportunities for extending our knowledge about imaginative culture.

Integrating humanistic scholarship and criticism with empirical methods often requires collaborative work between researchers with a primary training in the humanities and other researchers with a primary training in the evolutionary human sciences. The disciplinary structure of university departments has hardly begun to change in ways that accommodate the changing structure of knowledge about

imaginative culture. Hopefully, the heavy mass of institutionalized disciplinary structures will gradually shift to accommodate the needs inherent in the character of empirically grounded knowledge. Accommodating those needs would involve reshaping traditional departments in both humanities and social sciences or at least creating new programs that integrate research in humanistic subjects with training in the evolutionary human sciences and in empirical methods. Working toward such institutional transformation offers a valuable line of effort for researchers in imaginative culture (Carroll, 2013b; Scalise Sugiyama, 2012; Turpin & Fuhrman, 2012; Wilson, 2007, pp. 6–7; Wilson, Geher, & Waldo, 2009).

Works of imaginative culture are always situated in some specific historical context: geographical, ecological, demographic, technological, socioeconomic, political, ethnic, artistic, and religious, ideological, or philosophical. The evolutionary human sciences have had a tendency to concentrate attention on human universals—evolved and adapted, species-typical features of human nature. Only a few works of scholarship and theory have attempted to integrate elementary concepts of evolutionary biology and human nature with well-informed accounts of specific historical contexts (Baumard, 2019; Fukuyama, 2011, 2014; Graham, Nosek, & Haidt, 2012; Hanlon, 2007; Smail, 2008; Turchin, 2006; Turchin, Currie, Turner, & Gavrilets, 2013; and in this volume see McConachie). In the degree to which the advancing structure of knowledge channels and generates research, works combining historical and evolutionary research will continue to increase. Traditional historical study often includes accounts of the way imaginative culture interacts with other factors such as socioeconomic and political organization. Work on integrating such traditional topics with the evolutionary human sciences and evolutionary humanities can move from any of three directions—from scholars and scientists whose primary concerns are the traditional subjects of history, from evolutionary human scientists, and from evolutionary researchers in imaginative culture. That sort of integration might well serve as a lodestar for future research. It also offers another opportunity for productive collaborative research across disciplines.

It is in the nature of empirical research to progress, to revise and refine old ideas, introduce new ideas, and recurrently to synthesize particular findings in explanatory principles of wide scope (Carroll, McAdams, & Wilson, 2016; Slingerland & Collard, 2012; Wilson, 1998). That is the case with the particular areas of empirical research taken up in this volume. New research is constantly being produced about the trajectory of human evolution, the structure and functions of neural networks and cognitive processes, the nature of emotions, individual identity, human social organization, the relationship between the human mind and the minds of other species, the similarities and differences among cultures, and the way all of these factors enter into religion, ideology, and the arts. Every new finding offers an opportunity for revising older formulations, identifying causal connections among diverse areas of inquiry, making new inferences, and framing new problems for research.

The established institutional, disciplinary structure of research into imaginative culture sometimes presents discouraging obstacles to the advance of knowledge. But there is a constant wellspring of encouragement in the nature of knowledge itself. People want to know. They are eager to find out. Many talented and

industrious scholars and scientists have already been galvanized by the opportunities for discovery offered by evolutionary thinking about imaginative culture. And discovery builds on itself. The more we find out, the more opportunities we have to make further discoveries.

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Part I
Imagination: Evolution, Mechanisms, and Functions

Imagination, the Brain's Default Mode Network, and Imaginative Verbal Artifacts

Joseph Carroll

1 Introduction

Until very recently, discussion of imagination was for the most part relegated to speculation in philosophy, literary scholarship, aesthetic theory, and intuitive, non-empirical psychology like that of Freud and Jung (Abrams, 1953; Eichner, 1982; Freud, 1959; Jung, 1966; Roth, 2007; Stevenson, 2003; Thomas, 2014). In the past two decades, that situation has changed decisively. Imagination is now the subject of intensive empirical research in multiple overlapping disciplines—in, for instance, the evolution of human cognition, developmental psychology, the psychology of self-narratives, the psychology of fiction, and, above all, cognitive neuroscience. We need no longer merely speculate about what imagination is and wonder whether it exists at all as a distinct cognitive apparatus separate from other cognitive mechanisms, or, assuming it exists, whether it serves any adaptive function. We can now say with confidence that the imagination is a neurological reality, that it is lodged in specific parts of the brain, that it consists of an identifiable set of components and processes, that these components and processes have adaptive functions, and that in fulfilling its functions imagination has been a major causal factor in making *Homo sapiens* the dominant species on earth.

The purpose of this chapter is to explain how imaginative verbal artifacts are produced by the imagination and in turn influence the imagination. For convenience, the term "literature" is here used synonymously with the term "imaginative verbal artifacts," but "literature" in this usage should be understood to include also the oral productions of non-literate peoples. The main forms of literature are poems, plays, and stories, but reflections on literature can often be extended to other media such as historical narratives, imaginative essays, songs, film, opera, cartoons, or video games. In the usage intended here, "literature" implies no distinction between

J. Carroll (✉)
Department of English, University of Missouri–St. Louis, St. Louis, MO, USA
e-mail: jcarroll@umsl.edu

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prestigious canonical works and works of popular culture. Literature can range from best sellers and pulp fiction to the works of Homer, Shakespeare, or Tolstoy. All such works, low or high, match the definition of "literature" used in this chapter: *imaginative verbal artifacts, often but not always fictional, that depict human behavior and the conditions of human life, evoke the subjective quality of experience, communicate authors' attitudes and beliefs, and elicit responses from readers that engage their own imaginations.*

Developmental psychologist Marjorie Taylor offers an incisive definition of imagination that corresponds well with the formulations of other researchers. "Imagination refers to the capacity to mentally transcend time, place, and/or circumstance to think about what might have been, plan and anticipate the future, create fictional worlds, and consider remote and close alternatives to actual experiences" (2013, p. 791). The various aspects of imagination described by Taylor all involve a common feature: the activity of the brain turned inward to mentally generated representations decoupled from the immediate external environment. That conception of imagination corresponds with descriptions of the brain's default mode network (DMN)—a neural system that has been aptly characterized as the "imagination network" (Kaufman & Gregoire, 2015, p. xxvii; also see van Mulukom, this volume). As Edward Pace-Schott describes it, "the default network consists of regions that, in the absence of exteroceptive [externally oriented] attention or narrowly focused mental effort, support self-directed concerns, immersion in one's inner life (e.g., daydreaming) or imagining the inner life of others (Theory of Mind)" (2013, p. 159). Reflecting on the varied functions of the DMN, Randy Buckner and his colleagues postulate that their common feature is to "simulate an alternative perspective to the present" (Buckner, Andrews-Hanna, & Schacter, 2008, p. 23). Drawing up memories from one's personal past, envisioning the future, intuiting the thoughts and feelings in other minds, and evaluating moral alternatives "rely on a common set of processes by which mental simulations are used adaptively to imagine events beyond those that emerge from the immediate environment" (p. 23).

Because literature depicts all aspects of human life, it also depicts the processes of imagination. Those processes are central to human experience and characterize much of what is most distinctively human about human mental life. To a degree unparalleled in the inner lives of other animals (Suddendorf, 2013), humans reflect on their own experiences, imagine the inner lives of others, and imagine themselves reflected in the minds of others. In the human mind, the present flows out of memories of the past, and both past and present flow into imagined futures. Humans fashion their experiences into life narratives modulated by dramatic structures and dominant themes. They locate their own individual life stories within multigenerational stories that include their ancestors, their extended families, their imagined descendants, and the lives of their communities—tribal, ethnic, religious, ideological, regional, vocational, socioeconomic, cultural, or national (McAdams, 2015; McLean, 2016; and see McAdams & Cowan, this volume). Humans form imaginative conceptions of the world, invest those conceptions with moral codes and systems of value, and often populate their imagined worlds with supernatural agents and spiritual forces. In human experience, the value and meaning of behavior

are seldom simply physical and immediate. Behavior takes on a definite value and meaning only within an imaginative structure: some emotionally charged order of symbols made vividly present to the mind's inner eye (Carroll, 2012, 2018; Dissanayake, 2000; Wilson, 1998, ch. 10). That is why the arts penetrate so deeply into religions and ideologies.

The second section of this chapter describes the evolution of modern brain shape and suggests the role imagination has played in producing the complex of behaviors that characterize neurologically modern *Homo sapiens.* The third section describes the current neuroscientific understanding of the brain's default mode network—the neurological locus of imagination. The fourth section describes three core processes of imagination used in constructing imaginative verbal artifacts: simulation, mental time travel, and perspective taking (also known as "Theory of Mind" and "mentalizing"). The three processes are illustrated with reference to a modern American novel, Wallace Stegner's *Angle of Repose.* The fifth section describes four specialized forms of imagination that deploy the core processes: dreaming, mind-wandering, autobiographical narratives, and counterfactual thinking. That section explains how these forms are involved in writing or reading literature and identifies a few literary works that illustrate them. The final section sums up the argument for the adaptive functions of literature.

2 Globularization, Imagination, and Behavioral Modernity

Humans became anatomically modern between about 200,000 and 150,000 years ago. But they did not consistently display the full array of behaviorally modern traits until roughly 50,000 years ago, approximately the same time at which they began to leave Africa and colonize the rest of the world (Klein, 2008). The evidence for behavioral modernity ranges from "worked bone, ornaments, pigments, and complex multicomponent lithic technologies to material indicators of manipulations of symbols and abstract thought such as unequivocal art" (Neubauer, Hublin, & Gunz, 2018, p. 1). Paleontologist Richard Klein argues that the various traits that characterize behavioral modernity are "related outcomes of the innovative burst behind the Out of Africa expansion" (2008, p. 270). At around the time of the exit from Africa, humans begin consistently to display "substantial growth in the diversity and standardization of artifact types," a "rapid increase in the rate of artifactual change through time," and "an increase in the degree of artifact diversity through space" (Klein, 2008, p. 270).

Why the time lag between anatomical modernity and full behavioral modernity? Scientific debate on this question has been divided between those who postulate some neurological change and those who emphasize the gradual accumulation of behaviorally modern activities through demographic, ecological, and cultural factors (Carroll, 2006; Hatfield & Pittman, 2013; McBrearty & Brooks, 2000; Mellars, 2007; Mellars & Stringer, 1989; Mithen, 1996, 2001; Powell, Shennan, & Thomas, 2009). Klein, a chief proponent for the hypothesis of neural change, acknowledges

that neural change is difficult to pinpoint "because the putative change was in brain organization, not size, and fossil skulls provide little or no secure evidence for brain structure" (Klein, 2008, p. 272). In 2018, a team of paleontologists analyzing endocranial casts of 20 fossil *Homo sapiens* skulls found new evidence for neural change (Neubauer et al., 2018). Their analysis indicates that while brain size for humans has remained relatively stable for the past 300,000 years, the shape of the brain has gradually evolved. This change in brain shape culminated between 100,000 and 35,000 years ago, thus running parallel with the emergence of fully modern behavior.

As modern *Homo sapiens* evolved, the brain assumed a more globular shape. "From geologically older to younger *H. sapiens*, the frontal area becomes taller, the parietal areas bulge, the side walls become parallel, and the occipital area becomes rounder and less overhanging" (Neubauer et al., 2018, p. 2). There are also changes in the cerebellum. The parietal areas are involved in imagery, social awareness, working memory, and long-term memory. Parietal bulging did not increase outer parietal surface, so the bulging implies an increase in the size of inner parietal regions. One such region is the precuneus, which is "a central node of the default-mode network and an important hub of brain organization" (Neubauer et al., 2018, p. 5). The precuneus is involved in mental imagery concerning the self, episodic memory, and modeling other people's views—all of which are main components of the DMN. Benedek and Jauk, psychologists specializing in research on creativity, note that "higher creativity is consistently associated with higher gray matter density in DMN regions, especially the precuneus" (Benedek & Jauk, 2018, p. 290; also see Chen et al., 2015). The cerebellum, which is involved in working memory, social cognition, and affective processing, is also functionally connected with the DMN (Alves et al., 2019).

The evolution of modern brain shape suggests that enhanced imagination is a defining feature of *Homo sapiens*. As archaic humans were evolving into *Homo sapiens*, and as *Homo sapiens* were becoming behaviorally modern, they were becoming more imaginative. Yet further, the evolution of modern brain shape suggests that becoming more imaginative was a crucial precondition for behavioral modernity. The causal logic seems clear. The modern human imagination enables the uniquely human powers of cognitive and behavioral flexibility (Buckner et al., 2008; Margulies et al., 2016; Schacter, 2018; Schacter, Carpenter, Devitt, Roberts, & Addis, 2018; Suddendorf, 2013; Suddendorf & Corballis, 2007). Flexibility is closely allied with creativity, and both flexibility and creativity are preconditions for the power of innovation that characterizes behaviorally modern humans.

3 The Brain's Default Mode Network

When the brain is not engaged in specific tasks requiring exteroceptive perception and directed action, it is not merely resting. It defaults to activity in a well-defined neural network—hence the term "default mode network." That network uses a substantial proportion of the total energy consumed by the brain. Studies suggest that

nearly half our waking thoughts are directed towards topics other than the task at hand, but the proportion could be larger, since task-related thoughts can recruit the DMN (Andrews-Hanna, Smallwood, & Spreng, 2014; Christoff, Irving, Fox, Spreng, & Andrews-Hanna, 2016; Killingsworth & Gilbert, 2010; Smallwood, Margulies, Bernhardt, & Jefferies, 2018; Smallwood & Schooler, 2015). Studies of the brain when it is not responding to external stimuli began about 40 years ago, but in the past two decades, as neuroimaging techniques have become increasingly sophisticated, research on the DMN has increased many times over, and its general functions are now well understood. By constructing autobiographical memory as an emotionally modulated narrative, projecting the self into future scenarios, considering multiple alternative scenarios valenced by emotion and moral value, and simulating the mental lives of other people, the DMN creates subjectively meaningful models of the self and its relations with the world (Alves et al., 2019; Andrews-Hanna, Reidler, Sepulcre, Poulin, & Buckner, 2010; Andrews-Hanna, Saxe, & Yarkoni, 2014, Andrews-Hanna, Smallwood, et al., 2014; Buckner, 2012; Buckner et al., 2008; Buckner & DiNicola, 2019; Immordino-Yang, Christodoulou, & Singh, 2012; O'Callaghan & Irish, 2018; Raichle, 2015; Stan & Christoff, 2018).

The parts of the brain making up the DMN are spread wide in cortical and subcortical regions. The main cortical regions of the DMN are the medial prefrontal cortex, the posterior cingulate cortex, the lateral parietal and temporal association cortices, and the medial temporal lobes (Andrews-Hanna et al., 2010; Buckner & DiNicola, 2019; Molnar-Szakacs & Uddin, 2013). The cortical regions of the network interact with subcortical regions, in particular the amygdala, which modulates emotion and detects salience, and the hippocampus, which is involved in associative thinking, novelty detection, semantic memory (general factual memory), and episodic memory (personal, chronologically sequential memory) (Alves et al., 2019; Christoff et al., 2016; Kernbach et al., 2018; Margulies et al., 2016; Raichle, 2015). The various neural regions of the DMN are differentially involved in activities such as episodic memory, registering emotional tone, reflecting on moral relationships, and peering into other minds. Neuroimaging at the higher levels of resolution available in intraindividual studies suggests that the DMN "comprises multiple distinct but interwoven networks" (Buckner & DiNicola, 2019, p. 597). Nonetheless, the regions within the DMN often coactivate both during periods of rest (Binder et al., 1999; Raichle et al., 2001) and also while performing complex tasks such as perspective taking and constructing self-narratives (Andrews-Hanna, Saxe, et al., 2014; Buckner & DiNicola, 2019).

Neuroscientists are still debating how many neural networks exist, what their boundaries are, and what functions they serve (Mineroff, Blank, Mahowald, & Fedorenko, 2018; Power et al., 2011). Even so, many researchers agree that a large proportion of cognitive labor is performed by three main networks: the frontoparietal control network (FPCN), the DMN, and the dorsal attention network (DAN). The control network flexibly coordinates with other brain networks depending on the nature of the task demands. If the task involves effortful and coordinated internal thought, the control and default networks are coordinated. If the task involves effortful and coordinated external attention, the control and attention networks are

coordinated and are decoupled from the default network (Andrews-Hanna, Saxe, et al., 2014, Andrews-Hanna, Smallwood, et al., 2014; Beaty, Benedek, Silvia, & Schacter, 2016; Buckner & DiNicola, 2019; Spreng, Stevens, Chamberlain, Gilmore, & Schacter, 2010; Zabelina & Andrews-Hanna, 2016). The mind perpetually oscillates between attending to the world outside and attending to the inner world of imagination.

Several researchers in creativity argue that creativity depends on the cooperative interaction between the DMN and the control network (Beaty et al., 2018; Beaty & Jung, 2018; Benedek & Fink, 2019; Jauk, 2019; Jung & Vartanian, 2018; Kaufman & Gregoire, 2015; Zabelina & Andrews-Hanna, 2016). One team of researchers characterizes the activity of the DMN as "spontaneous" thought and the activity of the control network as "deliberate" thought (Andrews-Hanna, Irving, Fox, Spreng, & Christoff, 2018; Christoff et al., 2016). They distinguish among three levels of spontaneity—dreaming, mind-wandering, and creativity—that are differentiated by degrees of interaction between the two networks. When a person is dreaming, the control network shuts down, and the imagination runs riot, unimpeded by external stimuli or the need to complete a task (Hartmann, 2007). The term "mind-wandering" is synonymous with "daydreaming." When one daydreams, the world is still there, on the horizon of conscious awareness, but attention is withdrawn from it and turned inward; the mind wanders as it will, without effort, prompted by memory, anticipation, and association (Andrews-Hanna et al., 2018; Corballis, 2014). Creative thought, in this three-point scale of spontaneity, involves both spontaneous and deliberate mental activity. Deliberate attention to a topic can provide information and analysis—materials for imaginative reflection. If deliberate thought is intense and sustained, it can also make the subject of deliberation "salient and personally relevant," thus placing it within the province of the DMN (Benedek & Jauk, 2018, p. 293). Spontaneous thought, working on the products of deliberate attention, generates new ideas by making connections and inferential leaps among existing ideas. In turn, deliberate, goal-directed thought selects among those new ideas, organizes them, and executes the skill-based actions necessary to put them into practice—in the laboratory, in engineering or business, or on paper, canvas, film, or other media.

Scientific views about the role the DMN plays in brain dynamics have changed dramatically within the past two decades. The change in the status of the DMN parallels a plot trajectory displayed by many fairy tales: the protagonist begins life poor and obscure but then is revealed to be of royal blood and eventually gains the crown. The DMN was discovered by accident and was for several years largely ignored (Buckner, 2012). It was regarded as merely a passive state—what the brain does when it isn't doing anything in particular. As research progressed, the adaptive functions of the DMN gained increasing recognition. The crowning moment for the DMN could be said to have occurred in an innovative study published in 2016. Daniel Margulies and his colleagues combined connectome data and topographic

measurements of distances between brain regions along the cortical surface. (A connectome is a map of neural connections.) The connectome and spatial distance data converged to produce a "gradient" or scale. At one end of the gradient, the components of sensory and motor networks cluster closely together in the brain and are least connected to other networks. At the other end, the DMN is the most spread out and the most widely connected. In yet a third dimension, that same gradient characterizes a range from specialized informational content to widely divergent content—"a spectrum from unimodal to heteromodal activity" (Margulies et al., 2016, p. 12574). "Mode" refers to the kind of informational content processed by a neural network—for example, visual perception or bodily movement. "Unimodal" means that sensory and motor networks are the most focused on single kinds of informational content. The DMN, in contrast, synthesizes the most diverse kinds of information. Moreover, in concordance with its "heteromodal" character, the central nodes of the DMN are equidistant from the centers of the sensory and motor networks, thus ideally positioned to integrate information from diverse sources. In sum, then, four kinds of data converge in this gradient: connectivity, internal spatial distance of components, informational mode, and spatial location relative to other networks. "These results suggest that the default-mode network consists of regions at the top of a representational hierarchy that describe the current cognitive landscape in the most abstract terms" (p. 12574). The top of a representational hierarchy—the crown of cognition. To put that designation in less romantic terms, the DMN is the brain's most comprehensive network for the integration of information (Buckner & DiNicola, 2019; Kernbach et al., 2018; Raichle, 2015).

The adaptively functional significance of the DMN is inversely reflected in the pathologies that characterize disturbances in the network. Such disturbances have been implicated in "depression, anxiety, schizophrenia, obsessive compulsive disorder, psychopathy, substance abuse, attention deficit hyperactivity disorder (ADHD), autism, Tourette's syndrome, Alzheimer's disease, semantic dementia, and chronic pain (among others)" (Andrews-Hanna, Saxe, et al., 2014, Andrews-Hanna, Smallwood, et al., 2014, p. 15). In autism, failures of perspective taking ("Theory of Mind") reflect damage in the DMN or dysfunction in mechanisms in controlling systems that regulate it. In schizophrenia, the kind of spontaneous thought manifested in dreams breaches the space of exteroceptive perception, producing hallucinations and delusions. The main regions of the brain damaged in Alzheimer's disease are part of the DMN. Alzheimer's results in large-scale mental deterioration that includes a loss of episodic memory, impaired future thinking, and a severely diminished sense of personal identity (Addis, Sacchetti, Ally, Budson, & Schacter, 2009; Alves et al., 2019; Andrews-Hanna, Saxe, et al., 2014, Andrews-Hanna, Smallwood, et al., 2014; Broyd et al., 2009; Buckner, 2012, 2013; Buckner et al., 2008; O'Callaghan & Irish, 2018). A healthy brain has a DMN that is working efficiently to integrate information, interact in adaptively functional ways with other neural networks, understand other minds, and maintain a sense of personal identity.

4 Core Processes of Imagination

4.1 Simulation, Mental Time Travel, and Perspective Taking

Three core processes of imagination—simulation, mental time travel, and perspective taking—form the basis for more complex or specialized forms of imagination such as dreaming, mind-wandering, autobiographical narratives, counterfactual thinking, fantasizing, moral reflection, comprehending narratives, and producing intentional fictional constructs. The three core processes can themselves be broken down into parts with distinct features and discrete neurological locations. Simulation can be divided into "embodied simulation"—a process that uses "mirror neurons" to activate sensations like those being observed or read about (Bergen, 2012, 2016; Gallese, 2017)—and the constructive, recombinatory activity of the DMN (Addis, Pan, Vu, Laiser, & Schacter, 2009; Geiger et al., 2019; Molnar-Szakacs & Uddin, 2013). Mental time travel can be divided into episodic memory and future thinking (Schacter, 2018; Suddendorf & Corballis, 2007). Perspective taking can be divided into affective and cognitive processes (Healey & Grossman, 2018; Kanske, 2018; Vogeley, 2017).

Simulation, perspective taking, and mental time travel are not irreducible categories, but they occupy a level of functional organization particularly useful for the analysis of imaginative verbal artifacts. Simulation is the basis of both mental time travel and perspective taking. Mental time travel is the basis for the conscious awareness of personal identity as a continuous stream of experience over time. Perspective taking is the basis for an imaginative awareness of other people as conscious agents moved by desires, fears, thoughts, and beliefs.

"Simulation," understood broadly as "representation" is prerequisite to all imaginative experience (Buckner et al., 2008; Molnar-Szakacs & Uddin, 2013; Oatley, 2016; Roese & Epstude, 2017; Schacter, 2018; Tamir, Bricker, Dodell-Feder, & Mitchell, 2015). To project a future scenario, imagine a past different from the actual past, create an imaginary scene, or envision what some other person is thinking, one must have a mental representation. It can be visual, auditory, tactile, or olfactory. It can involve physical motion, geometrical configurations, or abstract shapes that are either static or dynamic. For a combination of such simulations to construct a scene—a component in a scenario—imagination must specify a "what," "when," and "where" (Hassabis & Maguire, 2007, 2009). The dimensions of space and time determine the basic ontological properties of a scene.

Mental time travel is to simulation as movies are to photographs. All cognitively healthy people inhabit an imaginative temporal continuum. Mental time travel uses episodic memory to make sense of the present and construct scenarios of possible futures. Memory and anticipation channel purposeful action. Researchers have converged in proposing that flexible planning for future contingencies has acted as a selective force driving the expansion of imagination in *Homo sapiens* (Andrews-Hanna, 2012; Buckner, 2012; Schacter, 2018; Suddendorf, Addis, & Corballis, 2009; Suddendorf & Corballis, 2007). An imaginative construction of

interconnected causal events makes for more effective action in the real world. It also provides a model for plot more sophisticated than that in a simple sequence of causally unconnected events—the picaresque mode of narrative (Forster, 1927; Harris, 2000). Satisfaction in the outcome of fictive scenarios depends in some measure on the sense of rightness in a causal sequence. Tragedy, especially, has a feel of an inevitable doom, an inescapable causal process.

Humans are ultra-social. Effectively negotiating the human social environment requires being able to envision the perspective of others: to understand their beliefs and values, anticipate their thoughts, respond to their feelings, and evaluate their motives. That kind of perspective taking is also a precondition of literature as a communicative activity (Carroll, 2018; Mar & Oatley, 2008; Oatley, 2011, 2016; Zunshine, 2006). Authors presuppose readers capable of registering the author's intentional meanings. Successful authors are good intuitive psychologists, capable not only of creating believable characters but also of manipulating the responses of readers—producing excitement, surprise, laughter, or tears. Readers read the minds of depicted characters, making inferences about their sensations, emotions, perceptions, and thoughts. They also read the author's mind, registering not only what the author explicitly says but also what the author feels about the characters and events being depicted. An author's attitude toward his or her imaginary world is an essential part of the meaning of that world (Carroll, 2018, 2019; in this volume see also Clasen; Jonsson; Saunders). That meaning can be conveyed only if readers are capable of reading the author's mind.

Simulation, mental time travel, and perspective taking are closely intertwined. Both mental time travel and perspective taking are forms of simulation. Episodic memory, the basis for mental time travel, provides materials for simulating future scenarios. In mental time travel, one has to bring scenes of the past before the mind's eye or simulate some future scenario. In perspective taking, one must imagine what someone else is thinking; one must simulate the other person's imaginative simulations. Mental time travel often includes simulating other minds in the past or future. A memory or anticipation of a romantic encounter or heated exchange involve seeing the other person in that scenario and imagining what the other person thought or might think. To imagine other minds is also to imagine how those other minds remember the past or envision the future.

We can point to plausible adaptive benefits of simulation, mental time travel, and perspective taking: linking the present to the past, making future plans, and interacting effectively with other people (Buckner et al., 2008; Stan & Christoff, 2018; Suddendorf & Corballis, 2007). But even if we could not identify plausible adaptive benefits, the logic of natural selection would strongly suggest that those processes have adaptive value. Otherwise, their considerable costs would have eliminated them in the course of evolution. Those costs include the substantial amounts of metabolic energy consumed by the DMN. They also include the risks attendant on guiding behavior in light of mistaken models of reality. Simulation uses elements derived from memory and association to create imaginative facsimiles. Those facsimiles can generate both original insights and bizarre distortions—hallucinations and delusions. Mental time travel allows imagination to expand beyond the present

moment and form units of imaginative experience that include the bygone past and futures not yet realized. It can give veridical information about the past, make accurate predictions about the future, and even help determine the course of the future. But both memory and prospection are constructive (Hassabis & Maguire, 2007; Schacter et al., 2018). Like simulation, memory often gives false reports, and predicting the future is a notoriously risky game—in the stock market, in war, and in love. Perspective taking can give authentic impressions of what other people think and feel, but it relies on inferences made from imperfect perceptions and sometimes rickety inferences. We constantly read each other's minds, but often get it wrong, misunderstand, fail to connect.

Imagination is both valuable and vulnerable. Producing and consuming stories, poems, and plays exercise imagination, strengthening it and thus rendering it more valuable and less vulnerable. Humans are a neotenous species—prolonging childhood features into adulthood (Thiessen, 1997; Wrangham, 2019). The young of many species play in order to exercise their adaptively functional powers. Humans continue to play in various ways throughout their lives. One plausible account of literature describes it as a form of imaginative play (Boyd, 2009; Corballis, 2014; and see van Mulukom, this volume). When we take in poems, stories, or dramas, we are refining our own imaginative powers. We learn from literature, in the simplest and most direct way, by assimilating information about the human behavior depicted in literature (see Saunders, this volume), but we also learn indirectly, and perhaps more importantly, by vicariously participating in the imaginative processes in the minds of both characters and authors. To engage in that vicarious experience, we have to deploy our own powers of simulation, mental time travel, and perspective taking.

4.2 Stegner's Angle of Repose: Simulation, Mental Time Travel, Perspective Taking

The three forms of imagination described in subsection 4.1 speak to aspects of literature that are more or less self-evident—literature represents, includes conscious awareness of time, and involves an interaction of perspectives among authors, readers, and characters—but the description of these forms has been abstract, theoretical. An illustrative example should help bridge the gap between abstraction and self-evidence. Wallace Stegner's *Angle of Repose,* published in 1971, won a Pulitzer Prize and is widely regarded as a major work of modern American fiction (a judgment with which I concur). The novel is constructed as a story within a story. The fictional first-person narrator is a retired professor of history poring over his grandmother's letters and writing an account of her marriage with a mining engineer. Part of the story is set in the narrator's present (the end of the 1960s in a California town). The narrator describes his own circumstances and his interactions with his neighbors, his housekeeper, his secretary, and his adult son, a sociology professor at

Berkeley. The narrator is suffering from a bone disease, confined to a wheelchair, partially paralyzed, in physical pain, and emotionally preoccupied with bitter resentment against the wife who has abandoned him. The bulk of the novel, though, consists in the story he is himself writing—the history of the marriage between his grandparents. Stegner based the embedded story about the grandparents' marriage on the letters written by an actual person, Mary Hallock Foote (1847–1938), a writer and magazine illustrator married to the mining engineer Arthur de Wint Foote (1848–1933). Stegner uses many actual passages from the letters and interweaves them with his own fictional passages.

The grandparents' marriage stages a conflict between two major phases of American cultural life: the settled life of the eastern seaboard, and the western expansion. Susan Burling, the grandmother, begins life as a member of the east coast intelligentsia. She is not of patrician origin but is intimately bound up in patrician culture. Her husband, Oliver Ward, begins life in the same milieu but spends his whole adult career in the West—mostly in mining towns in California, Colorado, and South Dakota, but with one period in San Francisco, an excursion to Mexico, and a long stay outside Boise, Idaho. Ward commits himself both professionally and emotionally to the West, despite its cultural rawness and severe privations. As an engineer, he is enthralled with visions of infrastructure development. After multiple failed enterprises, he stakes his family's fortunes on a years-long dam-building and irrigation project in Idaho. His wife, Susan, remains a reluctant Westerner, feeling herself an exile from the refinement, comfort, and cultivated conversation of the East. The tensions between the two are exacerbated by his repeated setbacks. He is a talented engineer and an honest man, but is often thwarted by the greed and corruption of less worthy men. Because of the setbacks in his career, his family's income is heavily dependent on Susan's successful career as a magazine writer and illustrator—a situation that conflicts with their shared belief that the male should be the primary provider for a family. Their story culminates in a crisis: disappointed with her husband's career and exhausted by her own privations, Susan yields emotionally to the romantic entreaty of his assistant and friend. While distracted by the assistant, she neglects to watch her young daughter, who falls into a canal and drowns. The marriage is eventually patched up, but Oliver never forgives his wife, and the deep romantic bond that had characterized their early years is ruined.

The fictional narrator is using his reconstruction of his grandparents' lives to try to make emotional and imaginative sense of his own life. He was raised by his grandparents and regards them more as parents than as grandparents. Reconstructing the story of their marriage helps him think about the failure of his own marriage. Ultimately he comes to no real conclusion about his own marriage. Instead, he lives vicariously in theirs, in its romance, its tragedy, and its stoic renunciations.

This is an unusually complicated setup for a story, but the embedded main story about the grandparents' marriage has so much amplitude and verisimilitude that the framing narrative does not obstruct the force of the historical narrative. The qualities of simulation deployed in this novel make the scenes set in the historical past more vivid than the scenes set in the narrator's present time. The historical scenes set in the East, where the grandparents meet and occasionally visit, are adequate for

ordinary novelistic purposes. The scenes set in the West—Stegner made his career as a writer of the American West—are extraordinarily rich in sensory detail and atmosphere. The many locations in which the family lives are each brought alive to the reader's mind. Stegner captures their sights and sounds, the shape of the land and vegetation, the qualities of light, the characteristic odors, the feel of the air and wind, moisture or dryness, heat or cold. Readers can feel the hot breath of air in the arid grasslands outside Boise, Idaho, and can share the sense of stifling confinement in a log cabin in Leadville, Colorado, during endless winters consumed by tending sick and injured people. All that is "simulation." It is making available for the reader's imagination the sensations that in reflection and retrospect would be in the imagination of the people who experienced it. What is it like to stand on a mountaintop in the Rocky Mountains, on a bright, fresh day, looking out over a cluster of rough, hastily constructed wooden buildings scattered among raw gashes in the earth, piles of mining debris, and huge pieces of smoking, clanking machinery tended by busy, eager, greedy men? Stegner makes it possible for readers to feel what that would be like.

In making his embedded first-person narrator a professional historian, Stegner was choosing to make a complex imaginative awareness of time into a central subject of his novel. The novel is full of particularized, concrete images, but the ultimate imaginative shape the story takes in the narrator's mind is closer to abstract art than to representational painting. The organization of temporal sequences becomes an imaginative abstraction impregnated with aesthetic sensations.

The picture of Leadville is part of a scene, one of many such scenes in multiple, vividly realized settings. All the scenes together, in chronological sequence, create a historical panorama that takes in the settling of the far West and produces an impressionistic portrait of a continental nation undergoing expansion and transformation. In the fictional present time of the story—the few months in which Lyman Ward is reading his grandmother's letters and composing a narrative about her life—he is living in the house in which his grandparents spent their last several decades, and in which he spent his childhood. The house is situated in Grass Valley, California, in the Sierra Nevada foothills northeast of San Francisco. His grandfather became manager of a mine in that town and had the house built. The movement of time in the story—of Lyman Ward's own mental time travel—thus extends over a century, from the 1870s, when his grandparents first met, to the 1960s, but with flashbacks to the grandmother's childhood in the 1850s. This stretch of time forms an imaginative continuum for the narrator. He sums up his grandparents' lives in temporal units, each connected to a place with its own distinctive topography and mood, but all together accumulating the stress that leads to a marital collapse.

In telling the story that leads to this collapse, the narrator must negotiate between his own temporal perspective and that of his characters. At any given point in their story, the historical characters are caught in time. For them, the future with all its hopes and fears is still in doubt. From the narrator's perspective, all doubt is resolved. He knows how the story ends. His characters look to an uncertain future. For him, their whole span of life has the fixity of a sequence that has reached an almost inevitable conclusion. His own future, though, remains suspended,

uncertain. At the very end of the novel, the narrator has a long, realistic dream in which he imagines his wife coming to see him, seeking a forgiveness he does not know whether he can give. In the last line of the novel, he lies in bed, "wondering if I am man enough to be a bigger man than my grandfather."

The narrator devotes little attention to the last several decades of his grandparents' marriage. The dynamic of the marriage has already culminated in the collapse of trust and intimacy. But the quietude and stability of those last several decades form part of the total temporal impression made in Lyman Ward's imagination. The rough years of pioneering in the West settle into comfortable domesticity in Grass Valley, and the passion and anguish of the marriage settle into resignation and endurance. The title of the novel, *Angle of Repose*, is an engineering term designating the angle at which loose debris settles to rest. That image serves as a motif in the narrator's evaluation of the marriage. The novel thus simultaneously produces an impression of long, slow movement through time and of a synchronous, summary impression of a process that has already settled into stability. That stabilized continuum of mental time that spans more than a century is complicated in the narrator's own personal life by flashbacks to his childhood and his marriage. The novel ends on an unresolved tension between a placid but melancholy composure on the scale of historical time and an agitated, unsettled present—a personal agitation complicated by the sociocultural upheavals of late-1960s America.

To convey an imaginatively coherent mental experience spanning more than a century and stretching across the North American continent, Stegner creates multiple levels of "intentionality" (Dennett, 1987)—the reading of one mind by another. For this novel, as for all novels, the author must read his expected readers' minds in order to determine how best to convey the story: where to start, how much to reveal at any given moment, how to keep readers interested and oriented. In this particular novel, the embedded first-person narrator is himself emotionally invested in the story he tells. He knows roughly the final phases of the story—the several decades the grandparents spent in Grass Valley. But he is only gradually bringing the full narrative alive in his own mind as he reads his grandmother's letters and compares their images with his remembered impressions of the older couple. He has a mind closely attuned to but distinct from Stegner's own. He has his own struggles and griefs, his own confusions and uncertainties. As he probes historical documents and personal memories, he is struggling to find his way into the minds of people long dead. While writing their story, he also engages in dialogue about his grandparents with his son the sociology professor and the young woman who is serving as his secretary. To understand his characters, he must shift from his own perspective, and to understand how his characters must look to people with perspectives very different from his own perspective or that of his grandparents, he must shift again. The son is a radical social constructionist who, like Henry Ford, thinks history is bunk. The secretary is a hippy with attitudes toward sexual promiscuity that could be considered, depending on one's own perspective, as either loose or liberated. The contemporary mores evinced by the secretary are set in tension with the attitudes toward monogamous fidelity that governed the grandparents' lives. While negotiating between the attitudes of the past and the present, the narrator also meditates on how

he himself must look to people with very different perspectives. He imagines how his attitudes toward his grandparents influence the way his son and secretary envision his own mind.

Each of the characters in the story—in both the historical narrative and the narrative of the fictional present—is occupied in reading the minds of other characters, and they read those minds in good part by intuiting what they themselves and other people look like in those minds. Each character has a partial, incomplete view of the whole story. The narrator has the most complete view but is himself subsumed in Stegner's own imaginative vision. That vision encompasses the minds of all the characters, including the narrator's, and it also contains Stegner's intuitions about the minds of his readers. Those readers, in turn, take in the whole range of Stegner's simulations of other minds moving through time. Moreover, readers are aware that Stegner has intuitions about their own minds. They can sense that Stegner uses those intuitions to elicit their emotions—suspense, anxiety, affection, fear, relief, or dismay. Stegner's readers have to decide how much to trust him—whether to accept his insights, share his interests and sympathies, and live in the imaginative world he creates.

Many readers of this or any novel consult with other readers—talking about the novel with friends, or reading blurbs, book reviews, and critical essays. Those consultations affirm impressions, clarify them, add to them, or correct them. When reading critical essays or listening to friends, readers of the novel assess the minds of the friends or critics, evaluating how their diverse temperaments and tastes affect their views of Stegner and his novel. If meaning is what happens in minds (Carroll, 2018), the total meaning of Stegner's book includes not only the complicated forms of perspectival interplay he depicts but also the perspectival interplay radiating outward from people who read the novel and discuss it.

5 Literary Forms of Dreaming, Mind-Wandering, Autobiographical Narrative, and Counterfactual Thinking

Literature depicts human behavior and evokes subjective experience. Because imagination is so important a part of human behavior and experience, literature also depicts the imagination at work. Literature and imagination interact in a causal spiral: imagination produces literature, and literature, in turn, depicts the processes of imagination. By depicting those processes, literature alters and enriches the imagination of writers and readers. It thus extends and develops the adaptive functions of imagination.

The previous section describes how simulation, mental time travel, and perspective taking work in just one novel. That novel is particularly complex, but the three core processes at work in it are at work in all imaginative verbal artifacts. This current section offers a few examples of literary works that depict four forms of imagination that use the core processes for more specialized purposes: dreaming,

mind-wandering, autobiographical narrative, and counterfactual thinking. Unlike simulation, mental time travel, and perspective taking, these four forms of imagination do not appear in all imaginative verbal artifacts, but they do appear in many.

Dreaming combines recent memories with remoter memories and with general ("semantic") knowledge. That process contributes to the consolidation of memories, which is vital to creating and sustaining a sense of a personal identity (Hartmann, 2007, 2011; Pace-Schott, 2013; Wamsley, 2018). Literature contains numerous examples of dream narratives such as the medieval poem *Piers Plowman*, Lewis Carroll's Victorian novel *Alice's Adventures in Wonderland* (1865), and Alan Lightman's modern novel *Einstein's Dreams* (1992). It contains even more frequent examples of episodes in which characters have emotionally significant dreams, as in Charles Dicken's "A Christmas Carol" (1843), Emily Brontë's *Wuthering Heights*, Fyodor Dostoevsky's *The Brothers Karamazov* (1880), and Stegner's *Angle of Repose* (1971).

Dreams are important in literature because they are important, adaptively functional, parts of human experience. They are also important because dreams deploy imaginative processes similar to those the imagination uses in symbolic and fantastic literature (Domhoff, 2018; Freud, 1959; Rupprecht, 2007, offers numerous examples of dreams in literature and also quotations from imaginative writers likening stories to dreams). Shakespeare points toward this connection between the modes of dreaming and the modes of symbolic fantasy in the title of his play *A Midsummer Night's Dream*. A large subgenre of literature, both in poetry and prose, consists in surreal, dreamlike narratives. Examples include Nathaniel Hawthorne's "Young Goodman Brown" (1835), George MacDonald's hallucinatory fantasias *Phantastes* (1858) and *Lilith* (1895), Franz Kafka's "A Country Doctor" (1917), Jorge Luis Borges's "The Circular Ruins" (1940), William Burroughs's *Naked Lunch* (1959), and Philip K. Dick's nightmare dystopian fantasies *Do Androids Dream of Electric Sheep?* (1968) and *Ubik* (1969).

Like dreaming, mind-wandering is a form of spontaneous thought that is prompted by emotionally salient concerns and moves associatively (Andrews-Hanna et al., 2018; Christoff et al., 2016; d'Argembeau, 2018). Mind-wandering is translated into literature as "stream of consciousness," a term coined by the psychologist William James (1890), brother of the novelist Henry James. High modernist fiction—literary fiction written between the two world wars—specialized in developing techniques for mimicking stream of consciousness. That method is the single most distinctive common feature in the novels of James Joyce, Virginia Woolf, William Faulkner, and Henry Miller. It is also used in the most famous and influential modernist poem, T. S. Eliot's "The Waste Land" (1922).

Much of daydreaming is dedicated to providing material for autobiographical narratives. We all construct a story of ourselves (Andrews-Hanna, Saxe, et al., 2014, Andrews-Hanna, Smallwood, et al., 2014; Buckner, 2012; Buckner et al., 2008; d'Argembeau, 2018; McAdams, 2016; O'Callaghan & Irish, 2018; and see McAdams & Cowan, this volume). Because creating a coherent sense of self moving through time is so vital a part of human imaginative work, it is not surprising that first-person fictional autobiographies are a pervasive feature of narrative

literature, ranging from what many consider one of the first true novels (Daniel Defoe's *Robinson Crusoe,* 1719), through classic nineteenth-century novels such as Charlotte Brontë's *Jane Eyre* (1847), Dickens's *David Copperfield* (1850), and Mark Twain's *Huckleberry Finn* (1884), to modern novels such as Saul Bellow's *The Adventures of Augie March* (1953), Wallace Stegner's *Angle of Repose* (1971), William Boyd's *The New Confessions* (1987), and Mark Haddon's *The Curious Incident of the Dog in the Night-Time* (2003). First-person speech is even more frequent in the personas of lyric poetry. "I'm so lonesome I could cry" (Hank Williams, 1949). "I walk through the long schoolroom questioning/ … — the children's eyes/In momentary wonder stare upon/A sixty-year-old smiling public man" (W. B. Yeats, "Among School Children," 1928). The English Romantic poet William Wordsworth used autobiographical narrative as the chief form for his longer poetry.

Counterfactual thinking consists in meditating on how things would have turned out if only this had happened rather than that—if only John had stayed home with Margie rather than going out with his friends, he might not have died in a car wreck before finishing his novel; or if Margie had gone with John rather than staying at home, she might not have survived to write the next great American novel (Abraham, 2016; Byrne, 2016, 2017; Roese & Epstude, 2017). Thinking counterfactually traces out alternative causal sequences and is thus closely connected to considering alternative plans for future action. Since humans routinely engage in counterfactual thinking, literature frequently depicts episodes of it. In *Angle of Repose*, Susan Burling Ward looks back constantly to her decision to marry Oliver Ward. In the early years, she can bask in the sense of having made a decision that allowed her fulfillment as a wife and mother. But she yearns toward the life that would have been open to her—travel in Europe and the constant companionship of cultivated people—if only she had not married. At any given point, the conflicting visions of her actual and her counterfactual past influence her decisions about what she will do in the future.

As a large-scale literary technique, counterfactual thinking is the basis for a specialized genre of fantasy: "alternate history." What would have happened if Japan and Germany had won World War Two (Philip K. Dick, *The Man in the High Castle,* 1962)? If Martin Luther had become Pope rather than breaking from the Church of Rome (Kingsley Amis, *The Alteration,* 1976)? Or if the Confederate states had possessed automatic weapons (Harry Turtledove, *The Guns of the South,* 1992)? More broadly, counterfactual thinking—thinking of scenarios different from the actual—is a necessary precondition for all fiction.

6 Conclusion: The Adaptive Functions of Imagination and of Literature

Intentional fictional constructs such as poems, plays, and novels are produced by the imagination and include among their subjects the forms of imagination. Those forms have adaptive functions: creating the self as a values-directed, goal-oriented

agent, understanding other people both for cooperative endeavor and for competitive manipulation, integrating individual identity and social group identity, creating new linkages among ideas, and understanding multiple alternative possible courses of action. Those particular functions add up to one overarching adaptive function: creating an imaginative virtual world, an inner world, that guides our behavior in the actual, physical world. Literature assimilates all the forms of imagination and fulfills their adaptive functions. Works of literature influence readers' imaginative world views, shape their self-images and personal narratives, and inform the values that determine their goals. In all these ways, literature influences behavior. It is a major part of the total adaptive repertory of the human species.

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The Evolution of Imagination and Fiction Through Generativity and Narrative

Valerie van Mulukom

> *First: [imagination] is the Combining Faculty. It brings together things, facts, ideas, conceptions, in new, original, endless, ever-varying, Combinations. It seizes points in common, between subjects having no very apparent connexion, and hence seldom or never brought into Juxtaposition.*
>
> *—Ada Lovelace (Toole, 1992)*

The evolution of the capacity for imagination may at first appear puzzling: humans spend nearly half their waking time engaged in mind-wandering (Killingsworth & Gilbert, 2010), imagining scenarios that have never happened or may never happen, and spend much of their remaining time engaged with fiction, for example, through storytelling, television shows, plays, and so on. Why would evolution by natural selection favor such a time-consuming faculty? Would another species of hominins, one that engages only in the accurate reflection of reality, not out-compete those hominins that engage with fictional representations of their environment? What, in evolutionary terms, is imagination good for?

In this chapter, I will lay out the cognitive science of imagination, in particular episodic imagination and its relation to fiction. *Imagination* will be defined as "the capacity for producing internal perception-like representations in the absence of appropriate sensory input." In this sense, it is a very broad cognitive ability, encompassing a capacity for simulation, symbolic processing, metathought, thinking about different times, places, and minds, among other things. My focus will be on the capacity for imagining events—events that have taken place in the past, that may take place in the future, or that could have been but never were (counterfactuals)—and how this is linked to fiction. *Fiction* will be defined as narratives about

V. van Mulukom (✉)
Coventry University, Coventry, UK
e-mail: ac2492@coventry.ac.uk

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imaginary people, locations, objects, or events, and will be treated as a product of imagination.

As we shall see, this type of "event imagination" crucially relies on *episodic memory*, which is the memory for personally experienced events. Episodic memory exists alongside of *semantic memory*, which is memory for conceptual information such as general knowledge (Tulving, 1972). While there may be some overlap between these two memory systems—episodic information contains some semantic information and vice versa (Gilboa, 2004) and the brain networks supporting these systems may overlap (Burianova, McIntosh, & Grady, 2010)—I will maintain the conceptual distinction in this chapter.

Imagination which relies predominantly on semantic memory supports metathought, symbolic processing and arts, such as painting, sculpture, and music. These creative processes are not limited to the arts, though; semantic memory likely also supports other creative activities, such as creative solutions in business or creative theories in science. However, I am not suggesting there is a taxonomy of types of imaginations; rather, the idea is that imagination is a *general* cognitive capacity that operates on different types of *content*, including, for example, the content of other minds. The imagining of other minds, or *Theory of Mind*, is the ability to think about the minds, perspectives, beliefs, and desires of others (Premack & Woodruff, 1978) and is sometimes also called mentalizing or mind-reading. Thus, I will treat imagination as a general cognitive capacity which relies on both episodic and semantic memory to generate content; content which can take a variety of shapes.

1 Cognition, Memory, and Prediction

Imagination is supported by the *default mode network* in the brain (also called the "imagination network" by Kaufman & Gregoire, 2016; see also Carroll, this volume), which is so called because the network is metabolically active at "rest." The network shows activation when participants in an MRI brain scanner are not engaged in any particular task (Raichle et al., 2001). It is presumed that the participants lying in the scanner, bored and waiting for the next task, are engaged in mind-wandering. Mind-wandering itself is thought to include processes such as thinking about future events, recalling past experiences, and thinking about other people (Buckner & Carroll, 2007). These are reflected in the "subsystems" of the default mode network, which involve brain regions supporting self-referential thought, memory retrieval, and construction (Andrews-Hanna, Reidler, Sepulcre, Poulin, & Buckner, 2010). These processes all have one process in common: mental projection away from the personal here and now.

How may such projection take place? Tulving introduced the concept of "mental time travel" (Tulving, 1985) to denote the ability to displace oneself mentally through time. He proposed that episodic memory (as opposed to semantic memory) is a necessary requirement for mental time travel. This theory was based on neuropathological studies, which showed that patients who had an impaired ability to

remember their past had a parallel deficit in imagining their future (Tulving, 1985). This idea was later supported by functional neuroimaging studies, where it was observed that remembering the past and imagining the future are supported by common regions in the brain (Addis, Wong, & Schacter, 2007; Okuda et al., 2003). The idea is that elements of remembered events (such as persons, locations, and objects) are used as building blocks to construct a plethora of possible future scenarios, a theory called the *constructive episodic simulation theory* (Schacter & Addis, 2007).

This theory was based on Sir Frederic Bartlett's findings from the 1930s. Bartlett (1932) was the first to argue that memories are not literal replays of the past, but rather dynamic representations that can change over time. In his conceptualization, memory is a fundamentally (re)constructive rather than reproductive system. Bartlett found that when participants had to recall complex stories in his experiments, the participants rarely remembered stories literally. Rather, participants remembered the gist of the stories, and often reconstructed stories that would be likely given that gist, even if somewhat inaccurate, incorporating elements they had remembered along the way. Therefore, Bartlett proposed that remembering involves "piecing together" details or fragments of stored information. One might say that human memory does not work like a video camera where experiences are recorded passively for later playback, but rather like an extensive multimedia archive, where various parts are put together in a piecemeal fashion during memory retrieval.

While the (re)constructive nature of memory may seem evolutionarily disadvantageous at first glance—given the increased chance of inaccuracies which would not happen with literal replays (Schacter, 2002)—it is, in fact, enormously advantageous in that it allows for *flexible recombination* (Suddendorf & Corballis, 2007), which in essence comprises imagination (Schacter & Addis, 2007; van Mulukom, 2013). Cognitive neuroscience studies show that the hippocampus, a brain region crucially involved in spatial processing and memory, is more strongly activated for future than for past events (Addis et al., 2007), which likely reflects the creative aspects of having to combine elements from the past in novel, flexible ways (van Mulukom, 2013).

What is more, the brain processes engaged in remembering and imagining are also remarkably similar to those engaged when experiencing. To grasp this concept, it helps to understand what these processes have in common: to visualize and engage with a certain scenario, one needs (visuo)spatial processing, imagery, and a perspective. To be in the present or to remember, or to imagine for the future, one needs a sense of subjective time. In addition, to be present in any mental scenario at all, one needs a sense of self. These processes are supported by the various brain regions that comprise the default mode network and together coordinate the simulation or perception of the event.

Experience is always mediated by the brain, which interprets the signals that come from our sensory organs that perceive the outside world. The word interpretation is crucial here—the world is interpreted, estimated. According to *predictive processing* theories, the brain works as a prediction machine (Hohwy, 2013). It has been suggested that prediction (the process) in the brain consists of three major components: associations, analogies, and predictions (the outcome) (Bar, 2007,

2009). *Associations* are formed through extracting statistical regularities or patterns from our environment throughout our lives, and these are then stored in memory (sometimes called 'prior models'). Upon encountering sensory input from the outside world, the brain seeks a correspondence between these existing associations or prior models and the current experience through *analogies* (based on so-called "pattern completion"). These analogies in turn output a prediction of what we may expect in the world (based on analogies based on associations). Neurocognitively, this process is supported by a brain region also involved in the default mode network called the *hippocampus*. This medial temporal lobe region is crucially involved in navigation and spatial processing (Maguire, Nannery, & Spiers, 2006), but also memory (Eichenbaum, 2001). The hippocampus' pattern completion ability makes it a prime candidate to support prediction processes (Bar, 2007, 2009; Buckner, 2010).

Thus, the brain analyzes what is happening (or is experienced) right now and predicts what is likely to happen (or be experienced) next and whether a match or mismatch is encountered between prediction and experience. This means that we essentially have an imaginary experience of reality: our experience is always based on a "best guess." Thus, remembering, imagining, and experiencing all involve "filling in the gaps" constantly; in a way, we may be considered *Homo Confabulens*.

2 Narrative, Identity, and Worldview

Given the constant predictions and the constant adjustments (in the case of mismatches) in which the brain automatically engages, it comes as no surprise that the desire for perceived consistency is an incredibly strong human motivation (Abelson et al., 1968): it appears that functioning as a human is all about matching predictions and experiences. This promiscuous matching may even happen at the cost of accuracy. Conway and colleagues have suggested that, in order to be able to respond appropriately to current situations, the memory system functions by two main mechanisms: coherence and correspondence (Conway, Singer, & Tagini, 2004). Correspondence is the drive to represent past events accurately, while coherence is the drive to recall events that are coherent or consistent with one's sense of self. While correspondence is of course important for our survival—with overly fictional accounts of reality you will soon run into problems—I argue that the drive for coherence is likely a stronger force in human cognition. While this helps us make sense of the world, it also induces problems, such as biases like the *cognitive dissonance bias*. Biases are errors that are the consequence of the brain relying on its evolved heuristics in order to be able to make sense of the world in a fast and automatic way. The cognitive dissonance bias is a bias of human brains to look out for information that confirms our prior beliefs and to ignore information that contradicts it. In other words, we try and maintain consistency with our prior beliefs and ideas.

This idea is in line with Conway's theory, which proposes that over time, coherence influences memory more than correspondence. That is, we tend to sacrifice

accuracy—often unknowingly—in favor of maintaining the views of the world and ourselves which we want. In other words, we create a narrative worldview and identity that we continuously adapt (McAdams, 1993, 2001), which the flexibility, or reconstructive nature, of memory allows for. This means that memories can be used to create a connection (either in terms of change, or a continuous flow) between one's past and present, to serve the narrative that is currently maintained (Singer & Blagov, 2004). The continuity of life stories, and strength of (consistent) worldviews, in turn, has been shown to contribute to psychological health and well-being (Galen & Kloet, 2011; Lilgendahl & McAdams, 2011).

How do we create a continuous life story and worldview? Bruner (1986) has suggested that there may be two complementary modes of thought: the paradigmatic mode of thought and the narrative mode of thought. The paradigmatic mode of thought is an analytic and semantic mode of thought focused on abstract categories and principles, whereas the narrative mode of thought (or "storied thought") relies on story devices such as theme, plot, character, intention, and outcome. While the paradigmatic mode of thought is the type of thought that is typically tested in memory research, as it is one in which there are true and false retrievals of memories, it is the narrative mode of thought that brings together an individual's remembered past, experienced present, and anticipated future into a unified whole (McAdams, 2001). We define ourselves by constructing our identity through narratives (McAdams, 1993); indeed, some consider the autobiographical memory system as synonymous with our narrative identity (Singer & Blagov, 2004).

3 Belief, Reality Monitoring, and Absorption

If there are such strong similarities between imagining and remembering or even experiencing—since our minds readily confabulate and narrate rather than leaving holes in our stories (Boyd, 2018)—how can we ever know what to believe, what to trust to be real? In episodic memory and imagination research, so-called *reality monitoring* theories have been proposed to explain how we can distinguish between real and imagined in our minds. Johnson and colleagues proposed in the 1980s that "real" events (i.e., memories rather than imagined events) are richer in sensory and perceptual details than imagined ones, thus reflecting their origin in perception or imagination, respectively (Johnson, Foley, Suengas, & Raye, 1988; Johnson & Raye, 1981). This theory has been corroborated by several neuroimaging studies, which indeed found that imagined events had fewer details than remembered events (e.g., Addis, Pan, Vu, Laiser, & Schacter, 2009; D'Argembeau & Van der Linden, 2004). However, previous psychological research showed that level of imagined detail only had a marginal effect on the participants' plausibility ratings of imagined events (which is used as an indicator of how "real" the event felt; Levi & Pryor, 1987).

The fluency with which an event is imagined seems to more substantially influence plausibility judgments, as explained by the *availability heuristic theory* (Bernstein, Godfrey, & Loftus, 2009; Tversky & Kahneman, 1973; Whittlesea &

Leboe, 2003). The idea is that, when an event is unexpectedly imagined rather fluently, this fluency of imagining is interpreted as familiarity with the event (Bernstein et al., 2009). When events are associated with a strong feeling of familiarity, this is typically an indicator that the event is present in episodic memory and is therefore likely to have actually happened in the past. Such feelings of familiarity have a considerable overlap with what has been called the "feeling-of-rightness": This is the feeling that occurs when the individual feels that the relevant memory has been retrieved (Moscovitch & Winocur, 2002).

This process—reality monitoring and the feeling-of-rightness—is supported by the ventromedial prefrontal cortex (Gilboa, 2004). Damage to this region is associated with confabulation (Gilboa, 2004), whereby patients are not able to distinguish feeling-of-rightness for true and for imagined memories (so-called false memories), resulting in a failure in their reality monitoring. Aside from these more obvious differences in brain function between individuals, are there also individual differences in how imagined events are perceived? In other words, are there individual differences in reality monitoring? One candidate for such a difference may be in the capacity for *absorption*. Absorption is a psychological construct reflecting a type of attentional processing, which was first identified as a personality trait associated with hypnotizability by Tellegen and Atkinson (1974). It includes many different subprocesses, such as hyper-focus, attentional commitment, and, importantly, imaginative involvement. Individuals who score high on absorption have a strong willingness and ability to become deeply engrossed in activities such as reading novels and watching films, but also watching sunsets or being fully engaged in routine activities such as dishwashing. Individuals who easily become absorbed perceive themselves to be more creative (in a correlation that was stronger even than with hypnotizability; Manmiller, Kumar, & Pekala, 2005) and are found to be more imaginative (in terms of imagery ability), empathetic (Wickramasekera, 2007), and spiritual (Lifshitz, van Elk, & Luhrmann, 2019; Luhrmann, Nusbaum, & Thisted, 2010). There may be a direct link between absorption and reality monitoring: if those who score high on absorption are more imaginative, then they are likely to imagine events fluently, and possibly with more detail, than those who score lower on absorption. This in turn may influence the "felt realness" of the imagined events. Preliminary results from a recent study on individual differences in imagination and absorption that I ran support this idea.

Reality-monitoring theories explain how we monitor the reality status of our own mental representations to avoid ascribing reality status to imagined representations. However, even when something is imaginary, we can become so fully engrossed or absorbed in it that we temporarily "believe" it. We can be so immersed in a film that for some time, we feel so strongly for the protagonist that we feel that the struggles they must overcome really are taking place. This process has been called the *suspension of disbelief* by Samuel Taylor Coleridge (1817). While there is some argument to be made for the opposite process taking place—we believe any narrative until we realize it is fictional (Raymond A. Mar, personal communication)—the

main idea of the suspension of disbelief is the same: while we *know rationally* that a story is not real, we *temporarily believe* that it is real. Tamar Gendler (2008), a philosophical psychologist, coined this type of belief in fiction "alief," to differentiate it from factual belief. Alief is an automatic, gut-level, belief-like attitude that may contradict an explicitly held belief and refers to the fact that sometimes we believe something while we know it is not really true. In other words, we (factually) believe that fiction is fictional (the struggles the protagonist has to overcome are made up), but we "alieve" that it is real (we feel like the struggles are really taking place).

The theory of "alief"—having a different type of belief-attitude rather than simply suspending our main belief-attitude—finds more credence also in the fact that one's own imagination contributes greatly to any read or heard or seen story (Gottschall, 2012). One can read descriptions about "tall, handsome men," but will inevitably create a fairly idiosyncratic representation based on one's own experiences and ideas. Fiction is not simply passively consumed; it is created anew by the consumer. Therefore, we are not passively suspending our belief when engaging with fiction; rather, we are *actively* using a different belief attitude and engaged with the matter at hand.

4 Motivation, Culture, and Niche Construction

We are now in a position to add another piece to the evolutionary puzzle of why a love of fiction has evolved in humans: we know that fiction is not real, but we do not disbelieve it—we *alieve* it. We entertain its scenarios imaginatively and respond to them emotionally. Our ability to *alieve* fiction may have strong evolutionary advantages. David Sloan Wilson (2002) has explained this distinction in beliefs in terms of *factual realism* versus *practical realism*. He suggests that beliefs have two major functions: either beliefs allow us to function better in the world by knowing how it really is (factual realism) or beliefs help us function better in the world by motivating us (practical realism). That is, he posits that certain beliefs, such as non-factual beliefs (including the belief in fiction), can cause the believer to participate in certain actions that factual beliefs do not have the motivational power to bring about. We might consider religion an example of such "fictions": there is no factual correspondence in the world to supernatural beliefs, yet many are willing to engage in time-consuming actions (such as weekly rituals) in line with their beliefs (see also, van Mulukom, 2019), or even more powerful actions such as suicide in the name of one's beliefs. Thus, the belief motivates the action even if the beliefs do not necessarily tell us empirical facts about the world around us.

This idea is in line with the theory of "status-function assignment," a human imaginative ability that allows us to endow entities in the physical world (objects, persons, but also relationships) with culture-specific properties, such as certain roles

or functions, with associated rights, duties, and activities (Searle, 1995). For example, there is nothing physically different about kings or queens compared to the general public; it is our cultural, symbolic assignments that make them so. And as a result, we expect them to behave or even *be* in a certain way. Thus, stories create culture, at least as much as cultures create stories. Without stories, there would be no way to have kings and queens, or to understand what it means to be a certain culture (e.g., tribe, country) or even a certain individual. An individual might be a terrorist to a nation of individuals, but a freedom fighter to others (e.g., Ernesto "Che" Guevara). Interacting with individuals on the level of factual realism has also been called *transactional interaction*: These are interactions where an individual is approached as they are empirically perceived (e.g., a village elder is perceived to be old and somewhat weak). Interacting with individuals on the level of practical realism has been called *transcendental interaction*; this is when certain roles are assumed within the interaction (e.g., a village elder is perceived as the leader and therefore not weak; Bloch, 2008).

Status-function assignment and transcendental interaction are processes on the level of practical realism that form culture. Thus, imaginative ability crucially supports culture; human culture cannot exist without imagination (Fivush, 2019). Narratives, such as in stories, myths, retellings of the past, but also rituals, songs, and images, articulate cultural norms that regulate human behavior (Carroll, 2012). Joseph Carroll adds: "Humans live in the imagination; they create imaginative virtual worlds that contain past and future and that contain also their sense of relations with people and forces outside their immediate kin. Humans are the only species that can die for an idea. That is because they are the only species that lives by ideas, or more precisely, by emotionally charged imaginative constructs like religions and ideologies" (Carroll, 2012, p. 132). In other words, because imaginative constructs can have a huge influence on human behavior, such constructs have adaptive significance despite their potential nonexistence in the empirical world.

Since imagination has evolutionary benefits, it can be considered its own *niche* (Shantz, 2018). A niche is an environmental context which a species has specifically adapted for its own use and benefit. Imagination fulfills the following criteria for niche construction, a concept developed in evolutionary biology: (1) An organism (i.e., candidate niche constructor) must significantly modify environmental conditions; (2) the organism-mediated environmental modifications must influence selection pressures on a recipient of niche construction; and (3) there must be a detectable evolutionary response in a recipient of the niche construction. Shantz (2018) uses examples of smallpox and measles epidemics in Christian countries (165 CE and 251 CE, respectively) to point out that so-called religious imaginings have led to modified environmental conditions, which then influenced selection pressures and induced an evolutionary response (benefit): Christians survived the epidemics more often because they helped each other, on the basis of a shared belief or "imagining" (see also, Stark, 2007). Thus, Shantz concludes that imagination may be considered an evolutionary niche.

5 Evolutionary Functions of Fiction

The imagination was evidently selected for, but what about the imaginative stories that the imagination produces? Do such stories—fiction—serve any adaptive function? Several such functions have been proposed (Gottschall, 2012): (1) sexual selection, (2) cognitive play, (3) low-cost source of information, and (4) social glue.

Sexual selection theories of fiction suggest that, like other forms of art, fiction is a means through which one can show off their skill, intelligence, and creativity (e.g., Dutton, 2009; Miller, 2011). In other words, one can show off their formidability of mind through telling stories creatively and in an engaging way, like a peacock showing off its feathers. The more witty, convincing, funny or engaging the story, the more attractive the speaker, as the listener learns about the impressive features and quality of the speaker's mind.

Cognitive play theories of fiction (e.g., Boyd, 2009) suggest that works of art act like a "playground for the mind." Brian Boyd (2018) writes: "Like play, in which animals throw themselves off balance in order to learn how to extend their range of control, stories traditionally plunge audiences into turmoil and suspense in order to bring them to a resolution that tames uncertainty and reasserts control" (p. 11). Thus, fiction is a safe way of engaging with problems and threats, just as mental time travel is. The difference between fiction and mental time travel is simply the presence of oneself in the story; the processes underlying both (i.e., event simulation) are presumed the same.

Low-cost information theories of fiction are similar to the cognitive play theories: They suggest that fiction exists to simulate events and experiences without us having to go through them. In this theory, the emphasis lies on learning—not just about the world but also about human culture and psychology. One could never learn about the contents of another person's mind without some kind of transmission between you and the other person. In other words, shared narratives are a compelling pathway to detailed vicarious experiences. Sharing one's individual-specific experiences exponentially increases the pool of experiences a group of humans can learn from, which in turn should increase survival.

Social glue theories of fiction suggest that fiction crucially brings people together; in a physical way, when people gather around the campfire to hear stories, but also in a figurative way, when people tell stories to convey and reinforce common values. To be able to share one's memories of oneself but also of others and the tribe as a whole would have crucially contributed to the bonding of a group and its identity. Likewise, some say that narratives may have been required for religions and religious beliefs to gain a foothold (Sterelny, 2018).

Here, I will not make an attempt to arbitrate between these theories, which all have merit. The sexual selection theory is, to my mind, incomplete, as it appears to discount the inherent value of the stories themselves. As we have seen, stories are far from "functionless." Unlike a peacock's tail, stories do not hinder everyday activities, showing off evolutionary fitness by being cumbersome. As such, I would suggest that while this theory might hold to some extent—many artists (writers,

painters, actors) are held in wide esteem and are world-famous—I believe it does not account for the whole picture. As for the other theories, I think there is something to be said for each of them. Indeed, these theories are not mutually exclusive. Rather, each hones in on the different aspects of imagination, or the default mode network which supports it: imagination involves mental time travel or episodic simulation (cognitive play theory), Theory of Mind (low-cost information source theory), and (episodic) memory (social glue theory). We will investigate these different aspects of imagination and their evolutionary functions now.

6 Mental Time Travel, Theory of Mind, and Language

So far, we have seen the evolutionary benefits of imagination as a general capacity, but imagination involves a variety of different processes and brain regions. In this chapter, I have taken imagination to mean the ability to simulate representations beyond the here and now. These simulations may take the form of events (in the past, future, could-have-been past, etc.) or simply part of these events (people, locations, objects). Event simulation supports mental time travel, whereas the simulation of other minds supports Theory of Mind. In this section, we will examine the evolutionary benefits of these two cognitive processes, before returning to the common feature underlying both of them—boundless generativity—and a short discussion of its underlying evolutionary feature, recursion.

Mental time travel has a number of obvious adaptive advantages, most predominantly that it can help us plan for the future (Ingvar, 1985). Through mental time travel, one can "play out" future scenarios and plans without having to endure the costs of actually experiencing them—that is, one can simulate both potentially successful and unsuccessful actions (Suddendorf & Corballis, 2007). This means that those who have mental time travel have a head start: they can think of appropriate action plans even before a scenario arises. For a Pleistocene human, this would come in very handy for all kinds of everyday problems: for example, imagining and planning to hunt a dangerous animal is a lot less risky than actually having to go out in the world and try and attempt this through trial and error (Suddendorf & Corballis, 2007).

For a modern day human, simulations are equally helpful, in terms of preparation and emotion regulation; for example, it has been shown that college students who simulate an upcoming exam in detail subsequently report more effective coping strategies than students in a control group who did not do this (see for an overview, Taylor, Pham, Rivkin, & Armor, 1998). The idea that creatures able to simulate have a clear evolutionary advantage over those that cannot applies in particular to dealing with problems and threats. It comes as no surprise, then, that fiction—shared imaginings—often, if not always, deals with problems and threats.

Theory of Mind, or the ability to think about other minds, may be equally important, though, since it supports our abilities to cooperate and communicate with others. Theory of Mind is, like event simulation, supported by brain regions within the

default mode network (Buckner & Carroll, 2007). Being able to imagine what another person thinks, feels, or wants is incredibly important for a complex social group to function well. The many adaptive functions of Theory of Mind include the ability to coordinate goals and plans, to intentionally communicate with others, persuade others, teach others, even deceive others or to pretend (Baron-Cohen, 1999). All of these actions are fundamental to a complex society and require an ability to think about what someone else might know; you need to be able to imagine yourself in their shoes.

Moreover, the capacity to *share* imaginings with others has been suggested to be as critical as the capacity to simulate in itself (Corballis, 2013). Once these event simulations can be shared with others, the breadth of knowledge increases exponentially—a wide variety of people with different brains and experiences can share their simulations with one another. That is not to say that *language* had to evolve before experiences were shared; it is often thought that stories were shared before the advent of language (Donald, 1991). Though language is of course immensely helpful for creating and transmitting a narrative, such fictions could also be transmitted through, e.g., mime, dance, shadow puppets, and drawings (Boyd, 2009). These ideas are supported by Michael Corballis' theory (2002) that language originated from gestures. It may be argued that human language requires Theory of Mind to be in place first, rather than the other way round (Corballis, 2013): Human language is notoriously ambiguous, and knowledge of a *common ground* is required for conversations to function (Clark & Brennan, 1991). Having a common ground involves sharing knowledge, beliefs, and assumptions, but also the knowledge that you know what I know—knowledge which is crucially supported by Theory of Mind.

The capacity for flexible recombination underlies event simulation, Theory of Mind, and language. That capacity, in turn, allows for generativity, that is, limitless, creative production. In the case of language, Chomsky (2007) has called this possibility "discrete infinity", or the capacity for the construction of potentially unlimited meanings from finite elements. Due to the generative nature of language, we can construct and understand sentences that we have never spoken or heard before. It is moreover thought that the crucial feature of this generativity is *recursion* (Corballis, 2014). Recursion is a type of generativity with extra complexity: It is a type of generativity with additional levels that refer to each other, such as may not exist in other animals (Hauser, Chomsky, & Fitch, 2002). Recursion occurs in mental time travel or event simulation: I can imagine a future event where I am thinking about an event where you are thinking about the past; Theory of Mind: I know that you know what Mary believes, etc.; and language: we can construct sentences such as, 'I think that John believed that Mary said that the painting was finished'. While Chomsky and colleagues argue that recursion evolved first for language (Hauser et al., 2002), Corballis (2013, 2014) has suggested that complex generativity supported by the capacity for recursion was used first for mental time travel (thus, imagination), and later for language.

Of particular importance to generativity is the hippocampus, previously mentioned for its involvement in predictive processing. The hippocampus is also

involved in associative processing, where connections are made between different concepts (Preston, Shrager, Dudukovic, & Gabrieli, 2004) as well as the encoding and retrieving of personal memories in the brain (Moscovitch et al., 2005). Moreover, damage to this region does bring about deficits not only in the past recall but also in the imagination of future events (Hassabis, Kumaran, Vann, & Maguire, 2007). Most interestingly, however, parts of the hippocampus are activated more strongly for the imagination of future events as compared to the recall of past events (Addis et al., 2007). It has been suggested that this may be due to the novelty of future events, requiring a more creative or constructive rather than reconstructive act (van Mulukom, 2013). Together, these findings suggest that the hippocampus may be crucially involved in flexible recombination in imagination.

7 Creativity

So far we have discussed imagination mainly in the sense of episodic imagination: imagining events, whether those that might occur in the world or those that can only take place in myths and fictional stories. However, imagination does not need to rely solely on episodic memory; in the case of arts such as painting or sculpture, it is likely that imagination predominantly relies on semantic memory, instead. Such creative processes involve more abstract ideas and concepts than episodic imagination, which relies on personally experienced memory details. As with episodic imagination, though, the process underlying the creation of art involves the recombining of older ideas or concepts into novel sets.

Creativity is typically defined as the ability to come up with new ideas or concepts or new associations between the existing ideas or concepts, which are considered both original or novel and meaningful or useful (e.g., Stein, 1953). It is crucial to not just understand creativity as the ability to come up with unusual, new ideas. Rather, these ideas need to be meaningful or useful in some way too. Creative drive without restraint is akin to mania or psychosis: low levels of inhibition allow for the creation of a mishmash of ideas, but these are not necessarily meaningful (Flaherty, 2005). Take for example a brainstorming session at a company, to come up with a solution to a problem; generating many extremely innovative ideas is not going to cut it when none of these ideas are truly useful and cannot be implemented. True creativity must always reflect a balance between innovativeness and usefulness.

Thus, creativity can be seen as consisting of two processes: divergent or associative thinking on the one hand and convergent or executive thinking on the other. Divergent thinking is when the brain "brainstorms," steadily generating new ideas, including all kinds of novel and unforeseen associations. Convergent thinking is when the brain narrows the ideas back down, through evaluation and selection, to a handful or even one useful, meaningful, creative idea. These two subprocesses have been shown to be supported by three distinct brain networks; the default mode network supports the creative process throughout, with the salience network supporting the elicitation of ideas in particular (i.e., divergent or associative thinking) and

the executive network supporting convergent or executive thinking (Beaty, Benedek, Kaufman, & Silvia, 2015). Thus, when producing creative ideas, these distinct networks get coupled and work together.

In terms of evolutionary benefits, it is clear that creativity is an effective response to environmental changes. Being creative means to be flexible, to deal with problem-solving and changes, but also to see opportunities and make advances (Runco, 2004). That is, one has to be able to innovate, in order to overcome new problems or changes, and this means to be flexible in order to come up with new solutions, but also to be able to evaluate and judge which of the generated ideas or solutions works best in order to deal with the problem or change.

8 Conclusions

The chapter started with the evolutionary puzzle of imagination: given that the content of imagination does not always correspond directly with empirical reality, how can its use be evolutionarily advantageous to humans? We have seen that even our regular assessment of the empirical world—prediction, perception, matching, and interpretation—relies on overlapping faculties and brain regions as imagination, through the mental representation of events (e.g., events in the present, past, future, or imagined times) in the default mode network. Indeed, recalling an event, experiencing it, and imagining it are all very similar. This follows partially from the predictive processing in which the brain engages and partially from the fact that memory is not a literal replay of past events but consists of the reconstruction of memory elements. This means that there is space for inaccuracies upon each recall and that some interpretation occurs to bring the elements together. The constructive nature of memory also means that memory elements can be combined into novel sets, thus laying the foundation of imagination beyond the here and now.

Indeed, the evolutionary puzzle of imagination assumes too strong a dichotomy between "imaginary" and "real," while in reality, very similar processes of making sense of the world are engaged. Moreover, the puzzle does not take into account that even ideas in imagination with no counterpart in the empirical world hold evolutionary value: ideological ideas such as supernatural beings can load events and ideas with emotion, often with the support of enthralling narratives, thus creating human cultures and powerful motivations for behavior, which in turn may carry evolutionary benefits.

Thus, there is a dichotomy as to how humans interpret the world, whether we are talking about paradigmatic mode of thought versus narrative mode of thought, factual realism versus practical realism, correspondence versus coherence, belief versus alief, or transactional interaction versus transcendental interaction. The dichotomy is essentially the same: humans are (possibly uniquely) capable of perceiving the world empirically, but also of imbuing it with imaginative meaning (supported by narrative), which lays the foundation for human cultures. It should be recognized that we are able to jump between these two sides of coin, that both are

supported by a similar brain network, and that both are highly important for our evolutionary trajectory.

In summary, generativity and narrative are the two driving forces of imagination: Generativity through flexible recombination allows for unbounded creativity and preparation for a wide variety of events, while narrative allows for efficient communication and gives empirical events meaning and, in doing so, can transform experiences and ideas into powerful motivators, driving their carriers into action. This means that humans can prepare for a vast variety of scenarios, including potentially catastrophic scenarios such as an apocalypse after climate change has destroyed the world. It is exactly this ability to deal with novelty or change—instead of having to rely on fixed instincts, which may become outdated in the face of major changes, such as climate change—which sets humankind apart. It is also this ability that has allowed it to survive for thousands of years and that may save it again in the near future—in particular when combined with emotionally charged, compelling narratives (e.g., Milkoreit, 2016).

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Imagination, Symbolic Cognition, and Human Evolution: The Early Arts Facilitated Group Survival

Dahlia W. Zaidel

The imagination is commonly associated with the positive attributes of creativity, innovation, and discoveries, but it is also linked to topographical orientation, spatial cognition, memories of the past, plans for the future, personality traits, art expressions, and more (Beaty et al., 2018; Spreng, Mar, & Kim, 2009). Art, in particular, has come to be regarded as the stereotypical concept of imagination because its various expressions appear to transcend veridical reality, stretching the possibilities in ways that reflect a wide leeway in tapping acquired knowledge, experiences, thoughts, concepts, and emotions, more so than other human endeavors. The arts constitute a human cultural communicative system whose signals are interpreted through functional activation of symbolic cognition in the brain (Zaidel, 2017). With the cognition, a variety of arbitrary signals gain meaning understood by members of the society in which they arose (Deacon, 1998, 2011), whether they communicate the sounds of language or cultural behaviors such as the arts. Presence of symbolic cognition is thus widely regarded in philosophy (Langer, 1948), archaeology (Tattersall, 2019; Wadley, 2013), cultural evolution (Richerson, Boyd, & Bettinger, 2009), and cognitive psychology (Deacon, 2011; Heyes, 2012) to underlie the capacity for art expression. Its presence would have been critical in the percolation of the arts into early culture in the distant past, which—as will be argued here—benefitted group survival. It was evolutionarily adaptive.

The imagination interacts with symbolic cognition in forming the expressions of the arts. Indeed, the arts have become inextricably woven into human cultural practices, ubiquitously, so much so that the distinction between art and reality has been blurred at times. The current universal presence of the basic forms, dance, music, ornament, visual representation, storytelling, and so on, suggests that they are products of evolutionary pressures and social adaptation (Zaidel, 2019). However, it is

D. W. Zaidel (✉)
Department of Psychology, University of California, Los Angeles, Los Angeles, CA, USA
e-mail: dahliaz@ucla.edu

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unreasonable to assume that today's arts appeared all at once "one bright day." Rather, it is parsimonious to assume that their appearance was staggered, with the sequence of emergence being a reflection of evolutionary pressures, demographic, environmental, and social group conditions.

The argument here is that some arts were practiced quite early in human evolution, and the focus is on the earliest ones and how imagination could have played a role in their emergence. These issues are explored with cross-disciplinary discussion of brain research findings on components of the imagination, archaeological findings, comparative animal and human communication, human physiological traits, and evolutionary pressures on group survival.

1 Imagination and Its Components: Localized and Interconnected Neural Networks in the Brain

A major component of the imagination studied in the laboratory is visual mental imagery, the "mind's eye," mentally "seeing," which is distinct from contemporaneous sensory or perceptual stimulation. Mental visual imagery is distinguished from the imagination itself, the former can be reduced to laboratory measurements while the latter is associated with creativity and innovation, properties that are difficult to quantify in artificial laboratory settings since the timing of eureka moments cannot easily be predicted nor monitored. Research studies have focused on the visual imagery components mainly through functional neuroimaging of the brain (fMRI) in healthy volunteers, albeit largely through non-art domains. For this reason, the neural specifics of how the imagination interacts with art production in the brain are not known. Typically, the imagination process itself taps into widely distributed functional representations of experience, memory, attention, cognition, thoughts, and emotions.

Mental visual imagery is commonly experienced by highly creative and inventive individuals, in general (Gardner, 2011), and many mathematicians and physicists depend on the ability for problem-solving (Miller, 1986; Rocke, 2010). However, not all scientists rely heavily on mental visualization to innovate and discover (reviewed in Watkins, 2018). Whether or not all Nobel Prize science or humanities winners, for example, are capable of such mental visualization is not known. Clearly, then, individual differences in extent and degree define the functionality of the imagination.

Several findings about visual mental imagery have recently been uncovered: The ability to form visual mental images is not universal, and long-term eye blindness does not abolish mental imagery capacity (Boucard et al., 2016). The ability has been compromised in cases of aphantasia, a term that refers to the absence of form-

ing mental images and that can occur congenitally without any obvious injury to the brain (Keogh & Pearson, 2018; Watkins, 2018; Zeman, Dewar, & Della Sala, 2015, 2016). There is a continuum across individuals in forming vivid versus less vivid mental images. In one study, those with vivid imagery were found to have maximal activation in the medial prefrontal cortex and the insula, in both cerebral hemispheres, while those with low vividness had maximal activation in the left fusiform gyrus, posterior cingulate gyrus, and the parahippocampal gyrus (Fulford et al., 2018). Such findings suggest that multiple brain regions are involved in mental visual imagery.

Furthermore, the hippocampus, a brain structure critical for memory consolidation and retrieval, has been found to be essential for conjuring up mental images of personal episodes from the past (Palombo, Alain, Söderlund, Khuu, & Levine, 2015; Zeidman & Maguire, 2016) as well as for imagining the future (Kwan, Carson, Addis, & Rosenbaum, 2010; Maguire, Vargha-Khadem, & Hassabis, 2010). Constructing mental visual scenes in the mind's eye is supported by a neural network connecting the hippocampus to the ventromedial prefrontal cortex, a brain region with a central role in making future plans (Barry, Barnes, Clark, & Maguire, 2019; Maguire, Intraub, & Mullally, 2016). At the same time, the inability to mentally visualize or engage in past–future time travel does not mean there is inability to remember events, solve problems, think, or construct three-dimensional structures (Maguire et al., 2016; Watkins, 2018). Mental visualization, then, is a separate, possibly modular function represented in the brain.

The right hemisphere specialization in spatial cognition has long been documented for neurological cases with brain injury (Boccia et al., 2015). The role of the posterior regions of the right hemisphere in recalling autobiographical memory is known from a posterior cortical atrophy case (Gardini et al., 2011). Within the right hemisphere, the maximal involvement of the parietal lobe in visuospatial mental imagery has been similarly confirmed with fMRI (Formisano et al., 2002). The asymmetrical contributions of the cerebral hemispheres to mental imagery generation has also been studied with fMRI (Bien & Sack, 2014) and revealed a selective specialization in the right cerebral hemisphere for navigating and orienting in geographical topography, remembering to-and-fro routes (mental maps), reading maps, spatial orientation, and spatial cognition when constructing three-dimensional models from two-dimensional diagrams. Spatial perception studied with fMRI has revealed maximal activation of the posterior right parietal lobe, occipital lobe, hippocampus, and parahippocampal gyrus (Boccia et al., 2015, 2017; Maguire, Woollett, & Spiers, 2006; Winlove et al., 2018). Clearly, multiple brain regions are active in spatial perception, a function critical for stone tool making, and thus are assumed to have been functional in tool-producing hominins in the distant past in Africa.

2 Evolution of *Homo sapiens* in Africa: The Dependence on the Imagination

Fossil evidence and archaeological findings suggest that mental visual imagery capacity would have been functional in the early *Homo sapiens* (HS). Several survival-related behaviors depend on this capacity: Fashioning fine tools from raw stones depends on imagining the final product in the mind's eye or for enabling duplication of new tools from viewing existing models (copying), innovating hunting techniques, remembering routes back to home camp after the hunt, re-tracing routes to previous food locations, and networking distantly located social groups, material-laden mines, rocks, or soils. Such activities benefit from mental visualization. "Visual mental imagery is a process that draws on different cognitive abilities and is affected by the contents of mental images" (Boccia et al., 2014, p. 52). Although brain tissue itself does not survive the ravages of time, based on the shape and size of fossilized skulls together with unearthed physical evidence, the neural circuitry underlying these cognitive abilities is thus assumed to have been functional in the brain of early HS.

Furthermore, HS survival would have depended on spatial orientation in order to remember multiple locations of various food sources within forests or in open savannahs. This ability was recently investigated with modern Mbendjele BaYaka people living in the dense forests of the Republic of the Congo and found to be highly effective even in young children and grown adults, independently of their sex (Jang, Boesch, Mundry, Kandza, & Janmaat, 2019).

Africa is the principal geographical area for the rise of the hominins after the evolutionary split from chimps, around 5–6 million years ago, and where HS eventually emerged. The oldest fossil evidence is dated to ~315,000 years ago for archaic HS (Callaway, 2017; Hublin et al., 2017; Richter & Ostovar, 2016; Stringer & Galway-Witham, 2017) while anatomically modern HS is dated to ~195,000 years ago (Stringer, 2016). These dates are embedded in a period known as the Middle Pleistocene in Africa (MPA), ~750,000–130,000 years ago. It was a period in which there was increase in the brain volume of the hominins and the use of fire hearths for cooking and other purposes (Gowlett, 2013; Wiessner, 2014). Archaeologists have noted escalation in extent and kind of innovations in the African Middle Stone Age (MSA), starting around 320,000 years ago and steadily progressing innovation-wise to 45,000 years ago (McBrearty, 2007; McBrearty & Brooks, 2000): Unearthed artifacts in archaeological sites indicate that HS increased the variability and refinement of their stone tools, and further implemented efficient foraging and hunting techniques (Wadley, 2013; Wurz, 2013), including the innovative use of spears for hunting. In Olorgesailie Basin, Kenya, archaeologists found finely shaped black obsidian, possibly used in spears or for other purposes, material that was ferried from a substantial geographical distance away (Brooks et al., 2018). In all, the MSA is considered by archaeologists a significant stretch of time in which HS implemented useful changes in tool manufacture, altered their social organization, applied multiple pigments of ochre clay (for utilitarian and presumably symbolic purposes),

and engaged in inter-group networking (Brooks et al., 2018; d'Errico et al., 2017; McBrearty & Brooks, 2000; McBrearty & Stringer, 2007). The functionality of symbolic cognition is assumed to have contributed to the emergence of the earliest proposed art forms (Zaidel, 2017, 2018).

3 Ochre Clay, Color Pigments, and Symbolic Cognition: An Early Art Expression

The currently prevalent view identifies symbolic capacity with archaeologically unearthed artifacts, dated to 100,000–75,000 years ago. It is based on co-finding physical artifacts considered to be art objects with those deduced to reflect symbolic cognition in a site known as Blombos Cave in South Africa (d'Errico et al., 2017; Henshilwood, 2007; Henshilwood et al., 2011).

The finds consist of purposefully holed seashell beads that might have been strung as ornaments, as well as non-art objects in the form of geometrical line engravings on red ochre rock lumps, red-pigmented drawn lines on a rock fragment, and non-figural engraving on bone tools, which are also assumed to have a symbolic nature. However, these estimated dates occurred much later than those calculated for emergence of archaic and anatomically modern HS and, by themselves, could imply either that symbolic cognition or art, or both, were absent up until the Blombos Cave dates. This view may not be reasonable given archaeological evidence for steady progression by way of expansion and innovation in stone tool technology and other MSA finds, starting around ~320,000 years ago (and some suggest possibly ~500,000 years ago, Brooks et al., 2018).

An early practice is the application of color pigments made from ochre clay, which was extensively mined and processed during the MSA. Evidence for purposeful extraction from soil and rocks predating the Blombos Cave seashell beads artifacts is wide-spread in archaeological sites in Africa. Significantly, it would appear that early HS went to great lengths to mine and procure the clay. It was used both for color pigments and for leather hide tanning, glue adhesives, and skin sun protection (Rifkin, 2012; Rifkin et al., 2015). Judging from the multiple technological processes of modifying its consistency, which archaeologists deduce are over and above its utilitarian purpose, extension into symbolic displays is presumed.

Ochre is recovered from rocks, soil, and clay having high concentrations of iron oxides (hematites), which produce a range of red pigments, or goethite, the range of yellow pigments (Rifkin, 2012; Watts, 2010). Several minerals and other substances such as quartz, clays, and gypsum mica are also embedded in those rocks and soil. An assortment of reddish saturated shades can be extracted and mixed to yield the desired shade. "Ethnographically, red ochre is the most widely used earth pigment, applied to human bodies and cultural artefacts in the course of symbolic practice, especially rituals" (Watts, 2002, p. 1). Artifacts dated to around 160,000 years ago found in Pinnacle Point, a cave in South Africa inhabited by HS, yielded evidence

for extracted ochre pigments, with an abundance of the darkest red ochre lumps (Marean et al., 2007). The physical archaeological evidence itself pertains to pigment stains on multiple stone tools, individual small rocks, and bone artifacts. Some were used to produce powders, which can vary in coarseness as function of grinding, or scraping, or pounding. Pencil-like "crayons" were also unearthed, suggesting applications on surfaces such as the body and face (Barham, 2002; Wadley, 2005). The deliberate effortful investment is thought to be related to symbolic purpose, including body paintings (Brooks et al., 2018; Duarte, 2014; Hodgskiss, 2014; Marean et al., 2007; McBrearty & Stringer, 2007; Rosso, Pitarch Martí, & d'Errico, 2016; Wadley, 2005; Watts, 2002, 2010). Such body paintings would not leave behind physical traces.

The nearly consistent presence of processed ochre in archaeological sites from the MPA (de la Peña et al., 2018; McBrearty & Stringer, 2007) has beginnings proposed to go further back, to around 400,000 years ago (Barham, 1998) and to be associated with the hominin predecessor of HS in Africa, *Homo heidelbergensis* (Barham, 2002), or else to reflect the behavior of archaic HS. The wide variety of ochre types does not always originate from clay sources immediately adjacent to the home base, but rather from miles away: "Middle Pleistocene hominids possessed an acute awareness of the physical properties of minerals available in the landscape, including color. A range of colors is represented in the Twin Rivers [South Africa] mineral sample, including yellow, brown, red, purple, pink, and blue-black. Specularite crystals also yield a purple powder that sparkles" (Barham, 2002, p. 188). Given the lengths to which early humans went to secure ochre consisting of just the right kind of chemical composition, it is unlikely that the laborious grounding into powders, flaking, blending, or heating of it ended merely serving as adhesives or as leather tanning material. Indeed, recent experimental study of ochre's adhesive binding strengths has revealed that the consistency of the powders does not determine the eventual strength (Zipkin, Wagner, McGrath, Brooks, & Lucas, 2014). Considering their spatial knowledge of the landscape topography, their survival strategies for hunting, food gathering, and manufacturing of skillful tools, it is reasonable to conceive that with imagination they applied a form of art expression with symbolic underpinning, namely body painting, and added it to the cultural repertoire. Again, as previously proposed (Zaidel, 2019), its application would have contributed to the evolutionary strategy of social group survival.

4 Evolutionary Pressures: Sealing Social Cracks with Imagination and Art

Published reports by archaeologists and paleo-ecologists describe serious survival challenges to early HS posed by unstable climatic conditions in Africa, with presumed detrimental effects on animals, vegetations, and geographical landscapes (Potts, 1996, 1998, 2013). Conditions in east Africa consisted of rapid shifts in

dry-moist weather, around 615,000–300,000 years ago. Indeed, it has been proposed that advancement in tool technology, symbolic behavior, and brain volume growth reflects capability for adaptive adjustment strategies to such unstable weather conditions (Potts et al., 2018; Shultz & Maslin, 2013; Tryon & Faith, 2016).

One would expect that under conditions affecting food resources and protection from predators, social stresses would arise, simultaneously contributing to fractures in group cohesion and triggering evolutionary drivers of unity (Zaidel, 2019). Inevitable competition for resources together with group size and membership composition factors would have intersected to affect the stability of personal relationships, regardless of extent of kinship (Bergman & Beehner, 2015). In human groups, kin and non-kin coexist, and group survival depends heavily on their cooperation (Hill, Barton, & Hurtado, 2009; Hill et al., 2011; Hill, Wood, Baggio, Hurtado, & Boyd, 2014; Walker & Hill, 2014). Social networks through contacts between human groups (in spread-out locales) have been suggested in recent archaeological reports citing evidence for materials acquired in distantly located geographical regions (Brooks et al., 2018; McBrearty & Brooks, 2000; Potts et al., 2018; Powell, Shennan, & Thomas, 2009), which further suggests non-kin additions to the home-group, and with them, the transmission of cultural knowledge across groups (Grove, 2016; Henrich, 2018). Seen in totality, it is argued here that the rising survival need for stable within-group relationships has led to evolutionary drivers behind imaginative symbolic displays consisting of all-member-inclusive hand linking and moving rhythmically in unison, as in dance. Such displays of cohesion and unity would have enhanced group survival because symbolic cognition capacity would have allowed transmitting and attaining the intended meaning.

5 The Arts Did Not Emerge All at Once: Symbolic Communication and Stages in Art Practices

Imagination's effectiveness is inextricably tied to previous experience and knowledge; the more experiences, the farther the imagination can lead to new applications. The scaffold upon which new discoveries are made expands slowly and gradually as a function of previous knowledge. To use examples from technology, hundreds of thousands of years separated the manufacture of stone tools and those fashioned from bronze, which were followed substantially much later by iron tools; the transitions depended on knowledge of mining the right ores, understanding the whole process of metalworking through melting, oxygenating, molding, cooling, and so on (Powell et al., 2017). Similar well-known analogies can be made in medicine and science. Generalizing to art, it is reasonable to assume that "art" emergence in human culture was a staggered series of endeavors that the eventual emergence of material objects identified as art and the artistic virtuosity characterized in paintings, drawings, sculpting, musical composing, acting, writing, and so on were features of the staggered practice, reflecting, at each phase, social and survival

challenges faced by human groups. The circumstances of the early HS (and hominin predecessors), their existing knowledge at that very distant time, and their cultural norms would have led to the expression of some arts and not others. In the behavioral sequence, then, immediate utilitarian applications promoting survival needs are argued to have expanded with the aid of the imagination into another tier of survival mode, namely symbolically purposed art displays aimed at facilitating the evolutionary trajectory of social group existence.

5.1 Painting the Body: Color-Related

Most archaeologists link ochre to symbolic use. Here, five major reasons are proposed to support the present argument that the initial arts were linked to color and could have been initiated at least ~400,000 years ago (the earliest dated ochre clay pieces): (1) the consistent effort, including long-distance mining, into procuring and processing ochre, (2) use of ochre in adhesives and leather tanning, (3) use of color shades for body camouflage to maximize hunting success and deceive enemies, (4) the use of ochre for health-related reasons (Horváth, Pereszlényi, Åkesson, & Kriska, 2019; Matike, Ekosse, & Ngole, 2010), and (5) generalization to imaginative body painting for symbolic purposes embedded in the evolutionary trajectory of social group survival. The first four are conjectured to have originated with immediate utilitarian and socially asymbolic needs.

The application of this mineral-rich clay on the body would have been recognized for its survival benefits early on. Current indigenous ochre-use by South Africa people informs of possible ancient discoveries and practices.

> Southern Africa, especially South Africa has a record of the traditional usage of clays for cosmetic purposes. In Pondoland, Eastern Cape Province of South Africa, clay was widely used traditionally for cleansing, skin lightening, and beauty purposes. … Among the Xhosas of Eastern Cape Province, South Africa, clays were mainly used for skin protection. Crawling children were smeared with *ingceke* whenever they went out to play. This was an endeavor to protect their skin from dirt, insect bites and adverse effects of the sun. (Matike et al., 2010, p. 142)

As mentioned, *Homo heidelbergensis*, the common ancestor of HS and the Neanderthals, evolved in Africa, with the Neanderthals evolving in Europe. Speculations regarding symbolic behavior by the Neanderthals has been attributed to their encounters with HS in Europe, where they migrated after dispersing from Africa, but based on archaeological evidence the consensus has shifted toward the behavior emerging before the encounters, ochre knowledge possibly carried over from Africa by *Homo heidelbergensis* (Bahn, 1998; Caron, d'Errico, Del Moral, Santos, & Zilhão, 2011). The oldest use of ochre by the Neanderthals is dated to ~115,000 years ago and speculated to have been used for symbolic purposes (Hoffmann et al., 2018). Physical artifacts considered to be ornaments support their symbolic cognition capacity (Hublin, 2017; Radovčić, Sršen, Radovčić, & Frayer, 2015; Zilhão, 2012), but the estimated dates for the hypothesized symbolic use

occur much later than the dates described for early HS in Africa. A few cave wall paintings and hand prints applied with ochre by the Neanderthals in Spain were dated to be ~64,800 years old (Hoffmann et al., 2018). The early HS in Africa did not leave behind marks or figurative drawings on cave walls; it is worth noting. This practice appeared much later in their evolution, namely in Europe, in a period known as the Upper Paleolithic (Zaidel, 2013).

5.2 Symbolic Message of Unity: Group Kinetic Synchronization

Visual signs of social identity, with the group as a whole or sublevels within the group have been repeatedly emphasized by archaeologists to signal the initiation of symbolic cognition and the arts (Lewis-Williams, 2002). However, the identity factor could have been tapped by cultural behavior much earlier than physical artifacts alone would suggest: The factor could have arisen from the natural observation of walking gait, its individual subtleties distinguishing men from women, young from old, friend from foe, and so on. It can be recognized from greater distance than bead necklaces or body paints. Walking pattern, gait, pace, rhythm, and co-timing movements have been found to be culturally stylized (Edensor, 2010; Gell, 1985; James, 2000). Given the presence of symbolic cognition and the imagination, the motoric rhythm of gait would have eased naturally into group dance and its conveyed meaning of unity. In other words, body ornaments in the form of seashell beads need not have served as the initial markers for identity recognition.

More socially relevant than individual identity is the expression of teamwork and cohesion through art (Zaidel, 2017, 2018). Demonstration of affiliation displayed in simultaneously moving in unison, touching others, and rocking together rhythmically provides a powerful symbolic message of unity, the group as a whole being more significant for survival than the individual. Harnessing biologically based physiological traits would have facilitated such expressions. Recruited under evolutionary pressures during prolonged unstable environmental and other demographic conditions to express symbolic social affiliation are argued here to have served as the principal triggers for social art expression, in general, and dance activity, in particular (Zaidel, 2019). The neurobiological foundation for this kinetic art form recruits rhythm synchronization ability passed on to humans from nonhuman primates. Entrainment, co-timing, is a biologically based motoric response found in young babies and other animals (Cirelli, Spinelli, Nozaradan, & Trainor, 2016). Already from the start, young infants respond with motoric synchrony to the rhythms of spoken language and musical beats. They come into the world equipped to positively react to melodious lullabies consisting of harmonious, high-pitched sounds. This and the fact that animal species incorporate entrainment into their behavior (Large & Gray, 2015; Rouse, Cook, Large, & Reichmuth, 2016; Wilson & Cook, 2016) and that adults share co-timing and motoric coupling (Montagu, 2017;

Ravignani & Madison, 2017) demonstrate the biological foundation for group formations, moving together rhythmically. Solidarity, cohesion, and cooperation is the conveyed meaning in such dance formations in which children, young, and the old can participate.

5.3 Music-Related Symbols of Unity: Sound Rhythms and Musical Chorality

A chorus of voices produces rhythmical musical beats to accompany group dance formations or executed independently of any dance. Chorality is almost by definition the quintessential vocal teamwork through which the symbolic message of one-and-the-same is communicated. Innate sound synchrony is a universal human trait (Patel, Iversen, Bregman, & Schulz, 2009; Repp & Su, 2013), passed on from non-human primates. It is reported for group-coordinated, rhythmic vocally produced choruses in chimpanzees (Fedurek, Machanda, Schel, & Slocombe, 2013), lemurs (Gamba et al., 2016), and gibbons (Geissmann & Orgeldinger, 2000). A musical chorus of human voices producing synchronous rhythmical beats expressing social symbolic purposes would have been within the capability of early HS and the immediate hominin ancestors. With the intersection of imagination and symbolic cognition, the unifying power of communal voices in unison would represent an early art form.

Hominins and early HS were surrounded by ambient rhythms of natural sounds as well as by the beats of stone tool making. Their imitation and mimicry are highly likely as part of deceptive strategies in hunting or protection from enemies. Another value involves long distance sound communication, as in whistling, which carries the sound further than the human voice (Belyk, Pfordresher, Liotti, & Brown, 2016; Meyer, 2015). With the imagination, the skill can further be applied and incorporated into purposefully produced rhythmical musical tones.

Recent research has revealed that endogenous neural brain rhythms respond to external musical beats (Tal et al., 2017) and that endorphins, the feel-good brain opiates originating in the hypothalamus, are secreted in response to rhythmical motoric movements (Tarr, Launay, & Dunbar, 2014). The vestibular system (ears and balance control), limbic system (emotional control), and the cerebellum (coordination of motoric movements) are maximally active under such conditions (Todd & Lee, 2015). Rhythm and time perception activate audio-motor pathways in the brain (Zatorre, Chen, & Penhune, 2007); beat prediction activates neural circuitry connecting the supplementary motor area and the basal ganglia (Grahn & Rowe, 2013). Given the primate biological ancestry and brain volume of early HS, and their immediate *Homo* line ancestors, it is reasonable to speculate that they possessed the capacity to produce, respond, and gravitate to musical rhythms.

Singing, whistling, creating rhythms, and mimicking animal sounds for practical, life-saving deception could all have been practiced by the Neanderthals as well

given their throat and ear anatomy (Mithen, 2007). The Neanderthals had a large brain and an ear anatomy functionally capable of transmitting sounds not unlike HS; it is presumed to have been inherited from *Homo heidelbergensis* (Stoessel et al., 2016). The production of singing and response to it, then, could well have predated archaic HS.

5.4 *Unity of Thoughts and Actions: Storytelling and Theater-Like Acting*

Storytelling is one of the art forms practiced universally throughout human societies (Carroll, 2015). Its themes combine real and imaginative events, describing the past and predicting the future, teaching acceptable behavior and warning of breaking rules (Boyd, 2018; Smith et al., 2017; Sugiyama, 1996). Storytelling's early origins may not lie with the use of language per se but rather in the need of humans to rehash experiences, clarify thoughts, explain the past, and make future plans, all in a communal setting such as space around the fire hearth; in other words, with re-enactment of experiences. With current humans, the neural underpinning of mental rehashing of experience involves the hippocampus and the prefrontal cortex (Schuck & Niv, 2019), neuroanatomical brain structures inferred to be present from fossilized skulls of early humans; the hippocampus is critical for the functionality of memory and the frontal lobes are critical for planning ahead.

The juxtaposition of sitting around the fire and the re-enactment of experiences may have been critical in human evolution. Archaeological evidence for purposefully created fire hearths in Africa is dated to ~400,000 years ago, and evidence for controlled fire use is older than that, going back to 1.5 million years ago (Gowlett, 2013). The fire provided cooked food for sharing, means for re-shaping materials through heating, deterrence from predators, warmth, and additional light (Dunbar, 2014; Esteban et al., 2018; Gowlett, 2013; Wiessner, 2014). The evolutionary adaptive use of the hearth is reflected in its consistent presence throughout Africa and other parts of the world. Evidence of fire hearths dated to around 300,000 years ago has been uncovered in Qesem Cave, Israel (Barkai, Rosell, Blasco, & Gopher, 2017; Blasco, Rosell, Sañudo, Gopher, & Barkai, 2016), and in Sibudu, South Africa, dated to 77,000–65,000 years ago (Lennox & Wadley, 2019), as well as in multiple other sites inhabited by HS, or by the Neanderthals (Koller, Baumer, & Mania, 2017; Sorensen, Claud, & Soressi, 2018). Taken together, in addition to its immediate utilitarian survival value, the central hearth would have served a natural social focal platform, a gathering stage for not only sharing food but also for sharing knowledge, teaching others, rehashing daily events, planning survival tactics, and with the imagination as a conduit, for storytelling and theater-like acting.

In those proposed initial stages of the arts, storytelling might have consisted of combined manual and whole body pantomime, mimicked animal sounds, and vocal language. From early utilitarian purpose of rehearsing tactics for food procurement

and animal hunting, say, the percolation of storytelling and theater-like acting into cultural practice is highly plausible. They would be embraced for their value in satisfying survival needs through unity of thematic group thoughts.

Demonstration, performance, and teaching constitute highly effective communal displays of advancing knowledge. The Yoruba people in Africa, for example, solve conflicts in traditional ways (Graham-White, 1970): "Although the legal traditions of the Yoruba were largely unwritten, their preservation and survival were done through performance to make them lively and easily understood" (Ajayi & Buhari, 2014, p. 143). Explaining through demonstration, *sans* language, has antecedence in our biological ancestry: Wild female chimps teach their young how to use twigs, sticks, or plant stems to probe and extract termites for food, to choose just the right materials, and to fashion them into tools (Musgrave, Morgan, Lonsdorf, Mundry, & Sanz, 2016). The precursors of symbolic enactments, theater acting, are likely embedded in teaching survival-related knowledge through demonstration. As with other immediate utilitarian applications, the imagination in early HS would have aided in extending the initial utilitarian purpose to satisfying another tier in evolutionary survival strategy, namely that of social cohesion through art forms.

6 Summary and Conclusions

In the distant past of early humans in Africa, the initial arts, it is proposed, emerged earlier than the predominant view in archaeology would suggest. The proposed triggers for their emergence are linked to the confluence of brain growth, symbolic cognition capacity, functional imagination, and evolutionary pressures on cementing fractures in social group cohesion; unstable environmental and other group-challenging conditions are the presumed causes of the social fractures. The arts' percolation into cultural practice was staggered, possibly emerging first with archaic HS, some 315,000 years ago or earlier with *Homo heidelbergensis*, the common ancestor of HS and the Neanderthals, more than ~500,000 years ago (or even earlier, with *Homo erectus*). Some features of the proposed early arts have deep neurobiological roots. The discussed initial forms are body paintings, group dance formations, group musical chorusing, storytelling, and theater acting around the fire hearth, none of which would have left physical archaeological imprints.

With the imagination serving as a functional conduit, expansion from immediate utilitarian applications into art forms representing symbolic meaning embedded in evolutionary survival goals would have been possible. The current approach to brain research focuses principally on a component of the imagination, visual mental imagery (the "mind's eye"). Neuroimaging studies with fMRI have revealed that mental imagery activates multiple brain regions, including those critical for memory consolidation (hippocampus), planning future events (prefrontal lobe), and motoric movements. Inferring from unearthed stone tools, advancements in survival strategies, geographical distance travel from the home base, and various other archaeological finds, particularly from the MSA period, mental imagery was within

the capacity of the early humans. It would have facilitated early symbolic expressions through art displays.

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Part II
Myth and Religion

Mimesis and Myth: Evolutionary Roots of Psychological Self-Understanding

Dan P. McAdams and Henry R. Cowan

In contemporary social life, we are often asked to elaborate on the kind of person we believe ourselves to be. A prospective employer asks: "Why do you think you are the right person for the job?" On a first meeting with a potential romantic partner—or a new friend we meet online, or a therapist, or even the first haircut with a new stylist—the familiar request comes our way: "So, tell me about yourself." Our different interlocutors want to know something about our *identity*. As such, they are all posing some variation on the fundamental identity question: *Who are you?* There are many different ways to answer the question. We might, for example, describe the neighborhood where we live, our family background, our occupational status, the last vacation we took, the books we like, and our opinions regarding certain Hollywood celebrities. These kinds of demographic and normative responses will probably work well with the hair stylist, but they may prove insufficient for the job interview, the first date, and the therapy session. In these and many other contexts (strongly influenced by cultural expectations), the identity question seems to call for a *psychological* answer. The interlocutor is asking that we share something of our psychological selves. How might we respond?

Two options present themselves. We may (1) *describe features* and/or (2) *tell stories*. In the descriptive mode, we may talk about the specific kind of person we are by invoking our characteristic traits, skills, proclivities, roles, and other consistent features of our psychological makeup, as we recognize them in ourselves: "I am a very sociable person"; "I am a hard worker"; "I have very strong analytic skills"; "I am a devoted mother"; "I always vote"; "people can count on me"; "I tend to be

D. P. McAdams (✉)
Northwestern University, Evanston, IL, USA
e-mail: dmca@northwestern.edu

H. R. Cowan
Department of Psychology, Northwestern University, Evanston, IL, USA
e-mail: raffles.cowan@u.northwestern.edu

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fun-loving". By contrast, in the narrative mode, we convey important aspects of our psychological selfhood by relating concrete events and scenarios: "Yesterday, when I was walking across campus…"; "Ever since I was a kid…"; "An important thing that happened to me was…"; "I have never been the same since…."

In describing abstract features of the self, we draw upon *semantic* memory, or the storehouse of general information we have about the self. In telling self-related stories, by contrast, we draw upon *episodic* memory, or specific scenes from our lives as we remember them, told in story form (Tulving, 1985). The two templates for self-understanding—trait-based (semantic) and story-based (episodic)—turn out to be remarkably distinct (McAdams, 2013a). On time scales of weeks or longer, we tend to define general characteristics about ourselves, even for basic emotional judgements such as "I am a happy person," based on semantic knowledge about the self (Robinson & Clore, 2002). Moreover, as documented in cognitive science experiments, these general characteristics are functionally independent of and often bear little resemblance to the particular stories we tell about our lives (Addis & Tippett, 2008; Klein & Loftus, 1993).

The most dramatic illustrations of the separation between the two different forms of self-understanding come from case studies of patients suffering from retrograde amnesia (e.g., Klein & Lax, 2010; Klein, Loftus, & Kihlstrom, 1996). For example, a 79-year-old man named D. B., who became profoundly amnesic after cardiac arrest, produced reliable and consistent trait ratings for himself, ratings highly correlated with those made by his daughter, even though he was "unable to recollect a single thing he had ever done or experienced from any period in his life" (Klein & Lax, 2010, p. 927). In principle, then, a person may know that he or she is a highly "extraverted" (or "conscientious," or "humble") human being (semantic, trait-based knowledge) without having access to the memory of any single autobiographical event (episodic, story-based knowledge) that might be used as evidence to support the (truthful) claim. Our self-attributed traits are one thing; our self-defining life narratives may be quite another.

Where do these two modes of self-knowledge originate? Developmental and personality psychologists have paid significant research attention to how trait judgements and narrative identity emerge and develop over the human life course (e.g., Harter, 2006; McLean, Pasupathi, & Pals, 2007; Robins, Tracy, & Trzesniewski, 2008). Yet a key piece of this puzzle remains relatively unexplored: *How did trait judgements and narrative identity emerge and develop during the evolutionary course of the human species*? Self-attributed traits and stories are complex, self-reflective, socially, and culturally bound aspects of human experience with no obvious analogues in other species. How can we explain their appearance in the human species? When did they appear in the human evolutionary past? And why?

In this essay, we consider the possible evolutionary origins of psychological self-conceptions, basing our informed speculations on research in personality and developmental psychology, sociology, cognitive science, and linguistics. We begin by linking self-attributed traits to the evolutionary challenge of formulating a viable *social reputation* in groups (Boehm, 1999; Mesoudi & Jensen, 2012). We suggest that this salient challenge was first differentially negotiated in the pre-linguistic,

mimetic culture developed by *Homo erectus*, nearly 2 million years ago (Donald, 1991). The subsequent emergence of language made for greater articulation and precision in the attribution of traits to the self. Importantly, language was also the evolutionary midwife for the emergence and proliferation of storytelling among *Homo sapiens*, and the creation of myth (Donald, 1991; Dor, 2015). Language thus paved the way for the attribution of personal myths, or self-defining life stories, to the self.

In a nutshell, pre-linguistic humans first saw themselves as others saw them, in their performances as social actors. Their selves thus came into existence *from the outside in*. With the transition from mimetic to mythic culture (Donald, 1991), human subjectivity was radically augmented and transformed. Individuals now came to see themselves as carrying stories in their minds, stories about the personal past that might be connected to the anticipated future, stories that could be told, again and again, in words, to both the self as audience and to others. A new narrative dimension was added to the self, developing within a mythic context *from the inside out*. Eventually, human beings began to see themselves as the protagonists of their own ongoing life stories, formulating *narrative identities* (McAdams & McLean, 2013) in their storytelling minds to provide life with some semblance of temporal continuity and long-term purpose.

1 Social Reputation and the Attribution of Traits

When Shakespeare wrote that all the world's a stage and all the men and women merely actors upon it, he was expressing a profound social–psychological truth. In the twentieth century, sociologists like Erving Goffman (1959) and psychologists like Robert Hogan (1982) formulated *dramaturgical* theories of society and the self, describing how human beings play roles, enact scripts, and manage impressions in everyday social interaction. As *social actors*, human beings aim to attain *acceptance* in the group and to achieve some form of *status* in order to obtain the resources needed to survive and flourish (Hogan, 1982; McAdams, 2016). Social actors strive to *get along* (acceptance) and to *get ahead* (status) in the groups wherein their performances are enacted, seen, and evaluated.

As if it were occurring on the theatrical stage, human behavior plays out in the presence of other actors, who observe one another's performances. From one scene to the next, actors develop reputations within their groups. As they improvise on their social roles, they display distinctive styles of emotional and behavioral expression, styles that are assiduously noted and remembered by their fellow actors. Over time, actors come to understand how others see them; they learn what their social reputations are (Bem, 1972; Mead, 1934). By observing themselves and by observing how other actors relate to them, self-conscious human actors begin to formulate semantic understandings of themselves, like these: "I must be an *aggressive* person because other people seem to be afraid of me." "Watching others, I think I am more

emotionally calm than they are." "I must be *smart* because other people come to me for advice."

Initial trait attributions come into the self, as it were, from the outside, as a result of being observed by others. Long before they consciously know that they are social actors whose every performance is being observed, human infants are the objects of rapturous scrutiny and relentless surveillance on the part of caregivers, relatives, friends, and others who watch and comment upon them. By the time self-consciousness begins to dawn (in the third and fourth years of life), human children have already (and unwittingly) garnered social reputations. They eventually come to learn what those reputations are, even as those reputations continue to develop, by taking a third-person perspective on the self—by treating themselves as objects. In the reflexive terminology immortalized by William James (1892/1963), the "I" (the self as subject) begins to formulate an understanding of the "Me" (the self as object) by monitoring how others see "Me." The developing social actor, as I, begins to attribute simple psychological traits to the Me. As the child matures and perspective-taking skills increase, those trait attributions become more complex and differentiated (Harter, 2006). Early on, I may see myself as "nice" or "mean" or "always happy," but eventually I fashion more detailed and informative self-attributions, describing myself (to myself and certain others) as "warm and caring," "depressive," "conscientious," "humble," "socially dominant," "the perennial life of the party," "fearful in the presence of strangers," or "nervously excited when my father is with me."

The number of semantic psychological descriptors that a social actor might attribute to the self would seem, on first blush, to be nearly infinite. In a first effort to narrow these down, Allport and Odbert (1936) identified over 18,000 words in an English unabridged dictionary that refer to psychological traits, states, and evaluations. Working with their list and others, personality psychologists eventually developed hundreds of rating scales and questionnaires designed to assess individual differences in broad self-attributions, administering these scales and tabulating the results in countless studies, conducted in many different societies and with different language traditions, over 70 years. The statistical results of this work have consistently suggested that broad trait attributions may be loosely grouped into five superordinate categories, often called The Big Five (Goldberg, 1993; McCrae & Costa Jr., 2008). In the most commonly used terminology, the five big categories encompass extraversion (e.g., gregariousness, social dominance, positive emotionality), neuroticism (anxiety, depressiveness, negative emotionality), conscientiousness (dutifulness, discipline, industriousness), agreeableness (warmth, altruism, humility), and openness to experience (curiosity, imaginativeness, open-mindedness).

The five categories have repeatedly arisen in statistical studies of *self-report* questionnaires, as well as in ratings of others. At the most basic level, they measure the content of semantic attributions that social actors typically make about the self and others (McAdams, 2013a). Importantly, self-assessments on the Big Five are consistently and significantly correlated with peer ratings (Funder, 1995; Vazire & Mehl, 2008). In other words, if one particular social actor tends to see herself as a

highly extraverted (or highly agreeable, or not especially conscientious) person, others who know her are likely to agree, though discrepancies typically also arise.

It would appear that human beings have evolved to take careful note of the differences captured in the Big Five (Buss, 1996; McAdams, 2016). In order to get along and get ahead in groups, it is essential that social actors keenly evaluate just how "conscientious" a potential ally might be, or how "agreeable" and "emotionally stable" (that is, non-neurotic) a potential romantic mate might be. There are countless behavioral differences that human beings manifest as social actors, but some are much more important for adaptation than are others. Social reputations capture the most important differences, which themselves become incorporated into different social actors' conceptions of themselves. Social actors jockey for reputational position in the groups wherein their performances take place, aiming to improve their overall standing in the group (Mesoudi & Jensen, 2012). As such, the attribution of traits to the self and to others has existential consequences for positioning within the group, with ultimate ramifications for a social actor's survival and reproductive success.

2 Mimesis

The decades-long program of research that led ultimately to the Big Five taxonomy for trait descriptors began with a survey of lexicons (Allport & Odbert, 1936). The assumption was that traits are *in the language*.

But is language in the traits? To be clear, the actual behavioral differences conveyed by the traits are out there already, even if nobody takes note of them. These differences between community members are the end results of environmental inputs and genetic variation, which exist regardless of any attempts to describe them. The question is this: *Is language necessary for encoding those differences into selves?* Does the I need language to know that the Me has traits? And is language necessary for disseminating information about the trait-based social reputations of different actors in the community?

These questions have some bearing on understanding human evolution. Many scholars believe that language emerged relatively recently, perhaps even within the last 100,000 years (e.g., Pinker & Bloom, 1990). Others argue that its origins go back further, but even they suggest that language use followed the advent of relatively complex group life among our evolutionary ancestors (Dor, 2017; Everett, 2017). Either way, there must have been a time when our group-living forerunners managed to adapt to the challenges of group life without the benefits conferred by language. In a pre-linguistic group context, how were social reputations achieved and transmitted? How did social actors understand themselves?

The interdisciplinary literature on pre-linguistic human societies suggests that these ancient groups achieved a remarkable level of social, technological, and communicative sophistication without the benefits of language (Dor, 2017; Wilson, 2012). From approximately 2 million years ago to about half a million years ago,

Homo erectus evolved in the direction of larger brains and greater social intelligence, which promoted greater size and complexity of human groups, which led to even larger brains and so on, in a kind of evolutionary virtuous cycle (Dunbar & Sutcliffe, 2012). Throughout the process, human survival came to rely less and less on individual actions and more on the intricate cooperation of human groups.

Among the most important innovations introduced by *Homo erectus* were collaborative hunting, cooking, and community child-rearing. Each likely contributed to the evolutionary growth of human brains and human groups.

In order to hunt big game, individuals needed to work together to design and forge effective weapons, to develop elaborate plans to achieve their goals, and to distribute the different tasks to different social actors who were capable of working together to achieve them (Sterelny, 2012). Protocols needed to be developed for distributing and storing the meat, making for greater division of labor and more differentiation in group roles. *Homo erectus* learned how to tame fire in order to cook the meat, a development that Wrangham (2009) views to be a game-changer in human evolution. Cooked meat is more tender and easier to digest than raw meat. Cooking thus afforded the shrinking of the human digestive system over evolutionary time while providing energy for the greater growth of the brain. Cooking also changed social life by introducing fireside campsites, where group members came together to cook and to eat. The ancient prototype of the human home may have been the campsite to which hunters and foragers returned every evening and where children were nurtured and raised (Wilson, 2012). Parenting practices became more collaborative through *alloparenting*, in which group members shared resources and responsibilities to protect children, feed them, and socialize them within the group culture (Hrdy, 2009). These social practices required significant skills in perspective taking and empathy, demanding more brainpower and introducing greater practical and emotional interdependencies within the group.

It has been proposed that our pre-linguistic ancestors achieved all of this, and much more, by relying largely upon the communication mode of *mimesis* (Donald, 1991; Dor, 2015, 2017). Mimesis aims to convey meanings through mimicry, imitation, facial expressions, eye movements, manual signs and gestures, postural attitudes, and non-linguistic vocalizations, such as screams, sighs, screeches, and hoots. Mimetic acts imitate and represent human experience without language. They are akin to playing the game of charades. Mimesis is the basis of ritual, dance, artistic expression, and religious and spiritual experiences. Mimesis is fundamental to human emotional experience, as in the nonverbal bond of attachment that forms between human infants and their caregivers and between lovers of all ages, as well as the endlessly varied feelings of both positive and negative emotions—raw and refined—that human beings display in the presence of others.

Mimetic communication enables social actors to share immediate experience with each other. In a nonverbal manner, an actor can readily depict what he or she is feeling, thinking, or wanting. The actor can also teach through mimesis. Indeed, many forms of instruction today rely on mimesis rather than on language per se. From hitting a baseball to typing a manuscript to playing a musical instrument, people often learn skills through modeling what other people do, rather than hearing

or reading what they say. Not only skills, but also group norms are often learned through imitation and modeling (Bandura, 1977). Many skills and norms are passed from one generation to the next largely through the practice of mimesis.

By enabling pedagogy and the accumulation of knowledge over time and generations, mimesis creates cumulative human culture (Henrich, 2016; Tomasello, 1999). Indeed, Donald (1991) has argued that the first human culture was a mimesis culture: "The mimetic system is thus a seminal hominid cognitive innovation, a mode of cognition that remains dissociable from language even in modern humans, and is the logical basis of the first truly human culture" (p. 193). Both Donald (1991) and Dor (2017) identify *Homo erectus* as the progenitors of that first culture. They argue that *Homo erectus* exhibited the first system of communication to afford "the capacity of experiential mutual identification" (Dor, 2017, p. 114) or the group's ability to identify and elaborate upon a shared experience, a shared reality.

Within a mimesis culture, social actors' socio-emotional performances are observed and remembered without the assistance of language (and without the recording technologies, such as writing, that ultimately followed the emergence of language). Even without words to provide the precision and clarity that modern lexicons give us, the behaviors and the emotions associated with traits were expressed in the environment of *Homo erectus*, observable in social actors' repeated and memorable performances, as we might encounter them today in a ballet, a sporting event, or a religious rite. Unlike today, members of a mimesis culture did not enjoy the luxury of talking about the performance they had just observed once the curtain came down. They were less able than modern humans to transport the experience over time. They could not, for example, say: "Remember what a jerk that guy was yesterday!" They could not *gossip*. And gossip is the lingua franca of trait transmission in a linguistic culture, allowing social reputations to be rapidly disseminated throughout a group (Dunbar, 2004; Feinberg, Willer, Stellar, & Keltner, 2012).

Nonetheless, they could still remember. They could continue to update their episodic memory files, which contained a storehouse of remembered mimetic scenes, and they could continue to derive semantic conclusions about different social actors based on those files, including semantic conclusions about themselves. They could arrive at linguistically unmediated conclusions regarding the kind of person a given social actor is, based on repeated observations of socio-emotional performance. Moreover, mimesis would allow them to transmit these trait-based conclusions, in a limited way, to others in their immediate vicinity and experiential context.

Go back a million years and imagine that you want to convey trait information about Social Actor A (who is a jerk—or, we might say, he scores low on the trait of agreeableness) to a fellow Social Actor B (who happens to be a friend). If you are in the presence of both the social actors, you might attract B's attention and then gesture (subtly) in the direction of A, signaling to B that you are about to convey a meaning regarding A. Then you contort your face in such a way as to express a combination of fear and revulsion, to signal the essence of A's social reputation, as you have observed it, based on your experience in the group. B understands you, nodding approval, or else B does not understand, or perhaps B disagrees, and B

gives you a quizzical look. The "conversation" might continue, as in a game of charades. In Dor's (2017) characterization, you and B would be able to share and compare your individual experiences (of A) in order to achieve "experiential mutual identification" regarding A. Like social actors who dish out the gossip today, you would likely be highly motivated to achieve mutual identification, comparing and contrasting your respective impressions mimetically, seeking common reputational ground.

It seems clear that a great deal of emotional and social experience can indeed be conveyed without language. Moreover, we know that social actors living in complex groups need to be able to predict what other actors will do, based on social reputations, in order to get along and get ahead in the group. Therefore, it seems eminently logical to assume that some degree of trait information could be readily garnered, revised, and transmitted in mimetic culture based on social observation. With increasing social complexity, members of *Homo erectus* may have felt more and more pressure to understand each other, and to understand how others understand them. Using the mimetic interactive tools at hand, *Homo erectus* would have developed a host of ingenious strategies for attributing relatively simple behavioral and emotional traits, updating their attributions, and transmitting trait information from one social actor to the next. Of course, language would have made it all easier and more efficient, as language ultimately did. But language would not have been necessary for apprehending and remembering the dispositional traits of other social actors. Mimesis would have been sufficient. Similarly, mimesis would be sufficient for attributing simple, non-linguistic traits to the self as well as others. Without words, early *Homo erectus* would still be able to formulate a semantic, trait-based understanding of the self, based on self-observation and information exchange in a mimetic context.

3 Language, Story, and Myth

Because spoken language leaves no physical evidence behind, scientists have not been able to trace its evolutionary origins with any degree of certitude. Instead, they have had to draw deductions from material artifacts, imagining what qualities of mind and social interaction were necessary to produce the artifacts. Conservatively speaking, then, evidence suggests that language emerged no later than about 70,000 years ago (Wilson, 2012). Many scholars suggest, however, that it emerged much earlier. They note that the anatomy of *Homo sapiens* appears to be conducive for the production of speech and that growing complexity of human groups ultimately required the development of a more versatile communication system, forcing evolution's hand (Everett, 2017). Dor (2015) suggests that language "began to emerge before *Homo sapiens* came onstage, in communities of *Homo erectus* and *Homo heidelbergensis*. But they did not take it very far" (p. 204). According to Dor, *Homo erectus* may have ultimately supplemented mimesis with primitive language, but they never lost their affinity for and dependence upon the former. It was left to

Homo sapiens, "biologically adapted to language" and with "bodies more adapted to speech" (Dor, 2015, p. 204), to exploit the full potential of language over the past 200,000 years.

Dor (2015, 2017) conceives of language as a communication technology invented by humans for the instruction of imagination. Whereas mimesis depends upon mutual identification of experience in real time, language enables speakers to find common experiential ground at any time, constrained only by the limits of what can be imagined. The elements of language convey mutually agreed upon meanings that need not be linked to immediate experience.

In the realm of social reputation, language enables actors to catalogue their observations of others with syntactic forms that are precise, malleable, and infinitely transportable. Rather than gesture in A's direction in order to alert B that I am about to share an impression of A, I can now simply use a word that B and I agree refers to A. I can call A "A" or "John." B and I can now gossip about John when John is not present in our immediate experience. B and I can now recollect him and set him up in a mental space for further elaboration. Moreover, we can employ words to describe our impressions of him, like "jerk," or "disagreeable," or "tends to brag about himself and never cares about the feelings of other people." We can discuss his social reputation at length, elaborating our mutual understanding of John, correcting and updating it over time as we gather new observations and share them with each other, and with yet others in the group. Feeling especially emboldened one day, we can even report back to John with our assessment. We can use that assessment to our advantage in our never-ending efforts to get along and get ahead in the group.

Monitoring our own respective positions in the group, moreover, B and I can use language to update and elaborate upon our own understandings of *ourselves*. We can now attribute traits to the self through words. Language affords so much more elaboration, precision, and flexibility than mimesis that this process will ultimately result in a complexified and differentiated understanding of the self and others. New traits will emerge, in the community and in the minds of social actors themselves, more articulated and subtler forms of self-understanding than could ever be expressed through gesture and mime. In other words, language enables social actors to achieve more complex social reputations, and these reputations can be disseminated within groups more widely, quickly, and efficiently through linguistic gossip. Accordingly, language makes for more complex and sophisticated trait-based self-conceptions, and these become subject to the multiple influences and determinants that arise within a culture wherein people talk about people.

Importantly, language also serves to enrich social and psychological understanding by enabling *storytelling*. Both Dor (2017) and Donald (1991) suggest that telling stories about people, and about the world more generally, may be language's most important function. Donald (1991) asserts that constructing narratives is the original and "natural product of language itself" (p. 257). He writes: "Language, in a preliterate society lacking the apparatus of the modern information-state, is basically for telling stories" (p. 257).

Stories track human *intentionality* across a landscape of time, space, and consciousness (Bruner, 1990). At their core, stories are fundamentally about what happens when a human agent, equipped with wishes and plans, sets out to achieve a goal. For humans, goal-directed action is guided and motivated by the wants, desires, beliefs, and values that reside in the minds of human agents. Understanding goal-directed behavior in this way is indeed the basic insight of *theory of mind*—an insight about motivation that human children apprehend by the time they are 4 or 5 years of age (Apperly, 2012). But these internal motivating states, unlike behavior and emotional display, cannot be directly observed. As such, it is very difficult to convey the dynamics of motivation solely through mimesis. Language provides the first technology for characterizing that goal-directed process as it plays out in human minds and groups. By opening a window into intentionality, the language of stories provides a technology to interrogate the goal-directed human mind.

With the introduction of stories, social reputations and self-understanding move beyond the traits of the social actor to encompass the internalized desires, goals, fears, plans, values, and beliefs inside the minds of *motivated agents* (McAdams, 2013a, 2016). The ability to understand other humans (as well as the self) as intentional agents who act upon internal motivational agendas is an invaluable asset for social life, both within a group and with respect to intergroup competition. Wilson (2012) writes: "A group with members who could read intentions and cooperate among themselves, while predicting the actions of competing groups, would have an enormous advantage over others less gifted" (p. 224). The ability to read intentions and thereby understand motivational agendas in others is a feature of social intelligence that is tied up with a general inclination toward narrative sense-making (Boyd, 2009). Stories function to simulate social experience (Mar & Oatley, 2008), helping human beings to solve social problems (Sugiyama, 2005). Human beings construct scenarios in their minds about what motivated agents might do, or might have done, moving forward and backward in time. After playing the story out in an imagined space, the narrator can decide how to respond to a difficult social problem based on the results of the simulation.

The broad significance of storytelling in human evolution becomes even more apparent in considering the function of story *for the group*. Shared stories model values that are prized by group members, such as courage, resilience, and compassion, serving as important agents of socialization for children in the group. They build group identification and allegiance (Kesebir, 2012). Shared cultural narratives may help to orchestrate large-scale cooperation among group members and to motivate social cohesion (Dautenhahn, 2002), effects that are especially apparent when stories take on the imprimatur of sacred *myth*. Foregrounding the power of language to create integrative stories for human groups, Donald (1991) argues that the introduction of language marked the transition in human evolution from mimetic to *mythic* culture. Reflecting perspectives to be found also in Campbell (1949), Bruner (1990), Harari (2015), and throughout the cultural anthropology literature, Donald (1991) underscores the *integrative* power of myth—its function to synthesize disparate observations, facts, and snippets of human experience within a broader framework that confers broad meanings that are shared within the group:

> The myth is the prototypical, fundamental, integrative mind tool. It tries to integrate a variety of events in a temporal and causal framework.
>
> It is inherently a modeling device, whose primary level of representation is thematic. The pre-eminence of myth in early human society is testimony that humans were using language for a totally new kind of integrative thought. Therefore, the possibility must be entertained that the primary human adaptation was not language qua language but rather integrative, initially mythical, thought. Modern humans developed language in response to pressure to improve their conceptual apparatus, not vice versa (Donald, 1991, p. 215).

In all societies, humans have created myths to make sense of the imagined historical past and the anticipated future, to answer questions about the origins of life and the ultimate reasons for human existence. Employing the power of language to instruct imagination, humans have endeavored to understand themselves—collectively and individually—by crafting stories and telling them to each other. The narrative understandings they have formulated are more integrative than those that rely solely on the identification of salient features, dimensions, and traits. They resemble personal myths—integrative self-narratives that aim to convey broad and abiding conceptions regarding who a person is and what his or her life may mean.

4 Narrating the Self

In the beginning, a social actor behaves and emotes in the presence of others, who observe and take note. The social actor formulates a trait-based self-understanding, which develops initially from the outside in.

Stories help us turn the process around. By capturing and conveying human intentionality, stories show how human beings are not *just* social actors—they are motivated agents, too. Little Red Riding Hood may be a nice girl, or perhaps she is mean and vindictive. She may be extraverted, or not. What gets her story going is not so much her traits but rather her intentionality: Little Red Riding Hood *wants* to get to Grandma's house. That is her goal. The story's plot begins as she sets out on her goal-directed journey. Along the way, she meets a character whose motivational agenda directly opposes hers. He is the Big Bad Wolf, and what he wants is dinner. We understand the protagonist and the antagonist in this simple story through their own subjective perspectives. We know what they want. We know their goals and their values. We get inside their heads. As such, we come to know them from the inside out.

And so, too, do we come to understand ourselves, as motivated agents. Each of us has privileged access to our own minds, filled as they are with wishes, fears, plans, schemes, and other features of our own motivational agendas. Outside observers do not have direct access to these motivational agendas. They cannot know what we know. They must instead try to infer what is in our minds, imagining us as characters in an ongoing narrative of one kind or another. And we must do the same vis-à-vis them if we are to apprehend them as motivated agents. In sharp contrast to the developmental scenario for the social actor, this second form of self-understanding

begins with first-person knowledge of what I want as a motivated agent. It begins from the inside, and then develops outward. Like a character in a story, I harbor a wish in my heart (or mind), and I pursue it. (Or else I don't pursue it, but I still want it.) I am motivated to pursue it. I have a plan. Episodes in my life can play out in the way a story plays out, as if I were Little Red Riding Hood.

We begin to understand ourselves as goal-directed, motivated agents in the early elementary school years (McAdams, 2013a). In so doing, we begin to locate daily events within a temporal stream of experience that evokes a sense of plot and character (Schechtman, 1996). Vaguely at first, we sense that our lives themselves seem to unfold in the way that a story does, with a beginning located in the remembered or confabulated past and an ending projected far off in a distant imagined future. In adolescence and young adulthood, we begin to string together discrete personal events into extended sequences that elaborate on thematic lines running through our lives over time. We begin to draw dynamic conclusions about our lives, about how we have changed and grown over time, as illustrated in these sequences (Habermas & Bluck, 2000). In so doing, we begin to assume some degree of ownership of that ongoing story. Not only are we pursuing our goals as characters in a story, but that ongoing story is *our story*. Not only are we actors who perform roles and agents who strive for goals, but we are also authors of the story wherein our acting and our striving take place.

By adulthood, we typically apprehend ourselves as *autobiographical authors* whose psycho-literary projects come to comprise our respective narrative identities. Our internalized and evolving stories of the self reconstruct the past and imagine the future in such a way as to provide our lives with some degree of coherence, purpose, and moral grounding (McAdams & McLean, 2013). Functioning as personal myths, narrative identities integrate disparate features of ourselves to explain how we have come to be the persons we believe we are becoming. In the same way, then, that groups employ language to construct societal myths which organize group members' understanding of the world (Donald, 1991), so too do autobiographical authors employ language and a storytelling sensibility to construct narrative identity for the self.

Autobiographical authors construct self-defining life stories within a cultural context that prescribes what kinds of stories are indeed worth constructing (McLean & Syed, 2015). Master narratives of culture are stories that prevail within a given society regarding how to live a good life. They prescribe guidelines for narrative identity by translating societal values and norms into idealized life plots, themes, images, and characters (Hammack, 2008). In the United States, for example, narratives of *personal redemption* wield significant cultural power (McAdams, 2013b). Stories of overcoming adversity and rising from rags to riches are enshrined in myths of the American Dream. They are captured in historical accounts of the American pilgrims who sought redemption in their City on a Hill, in the emancipation of African American slaves, in nineteenth-century Horatio Alger stories charting upward social mobility for young immigrant men, and in the Sunday sermons and graduation speeches that exhort Americans to transform sin into salvation, or to transcend the limitations imposed upon them in order to discover their own unique

gifts, so that they can use those gifts to make the world a better place. Within a given culture, a circumscribed collection of master cultural myths compete with each other to win the storytelling hearts of individual narrators, whose personal experiences sometimes line up nicely with what cultural myths prescribe, and sometimes do not.

By providing a voice for the expression of first-person intentionality, then, the emergence of language provided *Homo sapiens* with the indispensable technology (Dor, 2015) for understanding the self first as a motivated agent and later as an autobiographical author. With language, human beings began to assign words to their internal wishes and desires. They eventually converted their understanding of goal-directed sequences into stories that could be shared with others through language's unparalleled power to foster mutual identification. They began to construct the self from the inside out.

But at what point did humans begin to use language to formulate broad stories *of their lives in full*? When did telling stories about discrete goal-directed events of the day bleed into conceiving of one's ongoing life as an integrative, self-authored narrative? In writing the *Confessions*, St. Augustine (354–430 C.E.) is often credited with producing the first truly self-reflective autobiography. But the urge to do so surely predated him. Homer and the Old Testament authors told third-person stories about the lives of gods and men. In some of those stories, the protagonists were themselves motivated agents, as in *The Odyssey*. In others (*The Iliad*, the book of Genesis), supernatural forces and voices sometimes dictated the actions of human protagonists. Still, even the tale of hapless Adam and Eve featured the kind of motivated agency that coherent stories require—on God's part, mostly, but also in Eve's acting upon her own desire to bite into the forbidden fruit.

We assume that long before stories were transcribed into the written word, authors invented stories about motivated agents, and shared those stories with the group. It seems reasonable to assume that they possessed the ability and the desire to tell stories about themselves, too, stories that connected one life event to the next in an ongoing sequence that could potentially convey something substantial and important about "my life." It would seem likely that authors would relate those personal stories to the myths that the group formulated to make sense of the known world more generally (Donald, 1991). Those personal stories would surely have been simpler and less introspective than what St. Augustine accomplished, or what might be told in a job interview or therapy session today. But they would be stories of the self nonetheless, proto-narrative identities, as it were, the fledgling products of an emerging autobiographical author.

5 Conclusion

In their evolutionary study of nineteenth-century British novels, Carroll, Gottschall, Johnson, and Kruger (2016) argue that the dynamics of *cooperation* and *dominance* contour these stories more strongly than do any other thematic concerns. Within the

agonistic plot structure, characters strive to get along (cooperation) and get ahead (dominance). The social reputations of protagonists and antagonists largely consist of the traits that readers ascribe to them in so far as those traits promote or impede the characters' efforts to get along and get ahead. In this essay, we contend that prelinguistic humans, like *Homo erectus*, first ascribed simple versions of these reputational traits to each other, and to themselves, through mimesis. Language per se would not have been necessary for the articulation of trait-based self-understanding, developed from the outside in through the internalization of social reputation.

Language would appear to be a prerequisite, however, for narrative understandings of the self, through which identity develops from the inside out. As the primal technology for storytelling, language provided *Homo sapiens* with a means whereby motivated agents could articulate their goals through stories, while imagining how the minds of others might do the same. The culmination of self-storytelling is the development of narrative identity (McAdams, 2019). As autobiographical authors, human beings derive meaning and purpose in their lives through reconstructing the personal past and imagining the future to create an ongoing, self-defining story. Whereas my traits capture the basic dimensions of my social reputation, my story explains how I have become the unique person I am and where I believe my life may be going.

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Imagining the Gods

E. Thomas Lawson

Religion has long been a prominent subject of study by scholars in both humanities and social sciences. It is only recently, however, that religious phenomena have exercised scholars employing the theoretical perspectives and analytical tools of the cognitive and evolutionary sciences. Within the cognitive science of religion, two competing concepts of religion have emerged: (1) religion as a homogeneous phenomenon and (2) religion as an aggregate phenomenon.

The former concept implies a set of beliefs about supernatural agents and a set of corresponding doctrines. These beliefs and doctrines naturally lead to behaviors such as the performance of prescribed rituals, visionary experiences, and organizational arrangements that invariably lead to in-group/out-group requirements. The second concept regards religion as a set of discrete and independent concepts and behaviors such as (1) an intuitive response to potential danger including contagion, pollution, loss of status, loss of resources, concepts of contagion and pollution, fears about loss of status, intimations of misfortune; (2) ideas about agents with counter-intuitive qualities; (3) social coalitions; and (4) ritualized behavior. Each tendency requires a separate description and explanation. The overall idea governing the second concept is that these individual adaptations have led to survival and reproductive success. Some scholars who have adopted this perspective argue that the religious form of such behaviors is adaptive; others suggest that religious notions are parasitic on other behaviors that are themselves adaptive. Such scholars argue that religious notions should be considered by-products of quite ordinary cognitive processes. I am more sympathetic to the second theoretical perspective, and it will largely inform my approach to imagining the gods.

E. T. Lawson (✉)
Queen's University Belfast, Belfast, UK

Western Michigan University, Kalamazoo, MI, USA
e-mail: t.lawson@qub.ac.uk

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To imagine is to activate the mental capacity to construct a possible world. Such an imagined world might be very similar to the one you inhabit; it might also be radically different. To imagine a world very similar to your own is not a difficult task. In fact, it comes quite easily because you are activating your intuitive ontological capacities that serve you well in the everyday world and that have an evolutionary history. Imagining a world that is strikingly different is more difficult because you are attempting to override those capacities or to employ them in new ways. Studies in experimental cognitive psychology that focus on the creativity required to imagine a radically different world show that constraints on creativity are difficult to overcome (Ward, 1994). For example, when people are asked to imagine the appearance of beings on another planet, they tend to employ the principle of symmetry. Eyes are imagined as being located symmetrically on the face, the same number of limbs are depicted on each side of the body and so on. Ward has called this cognitive process "the path of least resistance." His point is that it is all too easy, when we imagine possible worlds, to simply follow our cognitive biases and think up beings, situations, and contexts very similar to the one with which we are acquainted. If you have any doubts about Ward's claim, examine the images of alien beings on the covers of science fiction novels. The beings that populate those covers are often all too easily recognizable. Their eyes, limbs, and bodies are as symmetrical as ours are. And if they are alien animals, they often appear little more than subtle transformations of animals found on earth. Often the transformation is nothing more than size. King Kong was just big!

Whereas the great writers and artists successfully recognize and overcome such biases and show us worlds that make sense, but differ in significant ways from our own, the less imaginative artists tend to simply transform images from ordinary knowledge with a few twists here and there (Lawson, 2007). For example, Nancy Kress in her *Probability Trilogy* (*Probability Moon, Probability Sun* and *Probability Space*) among many inventions creates a planet that is discovered by humankind and that is populated by sentient creatures who operate according to the principles of "shared reality." Shared reality means living according to a set of norms for the conduct of life that, if flouted, cause significant head pain. Such a physiological condition provides a powerful means for ensuring a stable and productive society but also creates problems for the humans who encounter them (Lawson, 2007). Imagining a world that differs in significant ways from our own has value because it highlights the principles that human beings share and encourages us to consider what principles we employ to maintain a stable and productive society. Ethnographic encounters have already introduced us to actual worlds different from our own. How much more challenging it is to imagine worlds radically different from the ones we populate.

To understand the significance of imagining alternative worlds, we should start by asking how the imagination arises. Evolutionary biologists, social scientists, and scholars in humanities who have studied the processes of natural selection focus on the role that evolution has played in the construction of the mind and its products, they ask: "In that construction of the mind, from an evolutionary standpoint, what is

the imagination for?" Two key elements of the imagination would seem to play a role: episodic memory and planning for the future.

In the case of episodic memory, recovering past information almost certainly involves some imaginative reconstruction. Given an event in the past, we ask: Was it really like that? Or maybe it was like this? Do I remember the situation correctly? Where did we find food yesterday? Will there be more there today? Was it easy, difficult, plentiful? Did we run into any problems? Was it dangerous? Will it be risky to return to the same place? Or is it better to go ahead over the mountain? Is it possible that there is more and better food and less danger there? If we take the chance, will it be worth it? These are all computational processes in the working of the imagination. These computations attempt to establish the information that is important for survival and reproduction. Their accuracy and reliability would provide a significant selective advantage.

Planning or thinking ahead to possible situations yet to come would also seem to require imaginative construction (Hayes-Roth & Hayes-Roth, 1979). It could be this way, or it might be that way. I imagine a place with plentiful food or available mates that might be worth the risk. Perhaps the benefits will be greater than the costs. I therefore set about planning to visit a new place that I have not yet seen, I find its attractions compelling even if I am only imagining it at this moment, but I recognize that there are risks. In fact, these risks worry me, they make me anxious. In order to give me some confidence I have a set of behaviors I have ready in such a situation (a ritual!) that suppresses my anxiety and helps me to move on to the new adventure. This is not a situation where there is actual, visible, danger. Rather, I am built to be responsive to potential danger (Boyer & Liénard, 2006). The possibility of attaining additional resources is worth the risk. However, I recognize that I need protection. It might be worth performing my ritual which helps me overcome my habitual behavior, which is to go back to the old place. Instead, I will seek the place that I imagined. Studies in OCD provide important clues about the role that ritualization plays in repetitive behavior as well as its functional consequences. For example, repetitive washing of hands that are already clean in OCD is echoed in the ritualized washing of hands in religious ceremonies. In the case of OCD, a patient cannot proceed to engage in further activities until this compulsive behavior has been enacted. In the case of religious ritual, people are unconsciously responding to feelings that such behavior is important even if they are not performing the act compulsively and could not explain why they feel compelled to do it, or at least feel satisfied when they do perform the activity. From an evolutionary perspective, such behavior is the consequence of an inherited awareness that dirt can be dangerous. It is safer to be clean than dirty. We constantly attempt to anticipate situations, partly to find opportunities and partly to avoid danger.

Precautionary psychology—the scientific study of responses to potential danger (Boyer & Szechtman, 2011)—also provides us with some very important clues about the evolutionary significance of such mental states. Here I will focus on what is involved in imagining the gods, because imagine them we do, across cultures and through time. Nothing seems capable of getting rid of this tendency to imagine

worlds filled with imaginary promise as well as imagined threats. From an evolutionary perspective, possessing such a capacity constitutes an advantage.

We not only imagine worlds with new resources, new mates, and new experiences, we also imagine worlds populated by beings that differ in important ways from the ones we know. They might provide new opportunities or constitute new threats.

Our libraries are full of stories from many countries and from earlier periods of time about agents with some special qualities, those we label as counter-intuitive. Oral traditions in non-literate societies hand down such stories from generation to generation. Images of such beings can be found on the walls of caves, or patiently carved on rocks in many countries (Lewis-Williams, 2002). Cognitive and evolutionary scientists would like to know why such imaginative content persists despite attempts to establish an enlightened, demythologized world. Even scientists who are committed to teaching young children to think in evolutionary terms employ imaginative animals to accomplish their purposes. The discipline focusing most directly on the role that the mind plays in imagining the gods is the cognitive and evolutionary science of religion (CSR).

CSR is a relatively new discipline (Bering, 2011; Boyer, 2001; Lawson & McCauley, 1990; Martin & Wiebe, 2017). It deploys two basic ideas about religion: the idea that religion is a by-product and the idea that it is adaptive. The by-product approach proposes that religious thought and the behavior associated with it (for example, ritual behavior) are non-adaptive or adaptively neutral manifestations of cognitive mechanisms that also have adaptive functions. Religion, in this conception, gives those mechanisms gentle tweaks that satisfy cognitive impulses but have no adaptive function. Agents with some counter-intuitive qualities are still conceived of as agents. The counter-intuitive aspects are what make them memorable and therefore transmissible. But the capacity to distinguish between agents and everything else is what provides the evolutionary advantage, not the tweaked qualities that some agents are imagined as having (Boyer & Ramble, 2001). What makes them imaginable lies in our capacity to mentally construct them as agents. What makes them memorable and transmissible emerges from their ability to grab our attention.

Adaptationists concede the power of this approach but are not satisfied with its claims. They think that religious thought and behavior are so persistent and pervasive that there has to be more to the story. They argue that at least some behaviors and some modes of thought have persisted through time and across cultures because they are adaptive. They do real work. Some authors, for example, have focused on the widespread notion of beliefs in an afterlife (Bering, McLeod, & Shackelford, 2005; White, Marin, & Fessler, 2017). They argue that while biological death is readily understood even by the very young, psychological death is another matter. In experimental studies, children reveal that they know that the animal is really dead. It cannot move or eat or breathe. Children even participate in the burial of a pet. Nevertheless, they quite easily think that the animal can still think about them. In other words, they refuse or find it difficult to abandon the notion that the dead

animal can still think about them. Psychological death, the cessation of the capacity to think or to perceive, is very difficult to accept.

Both the by-product and the adaptationist approaches have found empirical support. Neither of them argues for the truth of the imaginative contents—just their relevance for providing an advantage. Both also argue for the persuasiveness of such contents. Both views also explain why, despite the development and success of scientific rationality, such ideas and the behaviors that accompany them persist. More empirical work is needed to bring more light to this debate within CSR. It is quite possible that these views might be synthesized by arguing that what was once a by-product has become adaptive over evolutionary time via the notion of exaptation.

We should not jump too quickly to ultimate explanations about why we imagine the gods. First, we should think about what cognitive processes are involved in such imagining. A distinction should be drawn between highly reflective ideas about imagined agents and the intuitive notions that most people readily and easily entertain about the gods—notions entertained by people who follow the path of least cognitive resistance. Scholars working in the area, especially critics of religion, often fail to distinguish between these rather different conceptions about the gods. "Theological correctness" involves imagining a god who is omniscient, omnipotent, and omnipresent, and it also involves developing a systematic theology to develop, analyze, and transmit such notions. That sort of complex and sophisticated cognitive process is quite different from imagining a god who occasionally pays attention to you, but might be too busy to answer your prayers, and who might even be fooled if you wear your lucky charm and display the right amount of piety (Barrett & Keil, 1996; Slone, 2004).

In their early work on "theological correctness," Barrett and Keil (1996) performed an experiment in which people were first asked to imagine what their god was like. Their replies typically described their god as one who knew everything, was everywhere, and could do anything, in other words, the god was omniscient, omnipresent, and omnipotent, notions that clearly result from reflection and can be found in standard theological treatises. Then the subjects were told stories about the god which involved the god doing something, for example, answering a prayer from one person, and also saving someone else from drowning. When participants were quizzed about the events in the presented narrative they had read or heard, they *systematically misremembered* the events by anthropomorphizing (that is, limiting) the god's cognitive and behavioral capacities. They reported these acts as sequential temporally rather than as simultaneous. Their intuitions about the limitations of ordinary agents' knowledge and behavior won out over their reflective capacity to imagine properties such as omniscience, omnipresence, and omnipotence and won out also over their capacity to develop systematic theologies to structure such concepts. In order to test the results cross-culturally, Barrett also performed a similar experiment in India with similar results (Barrett, 1998).

What Barrett has shown is that there are two types of data that should be taken into consideration when we theorize about religious data: the intuitive and the reflective. The former is largely unconscious and the latter conscious. Natural selection has played an important role in building such intuitive capacities in us. They are

very efficient even though at times prone to error (Kahnemann, 2011). I presume that natural selection also built in our capacity for reflection. What kind of advantage it provides remains for now an open question. Science, of course, would not exist without it.

The distinction between intuitive and reflective thinking has been widely discussed with respect to folk physics, folk biology, and folk psychology (Hirschfeld & Gelman, 1994). Reflective capacities often have a disadvantage from an evolutionary perspective. We know from the study of precautionary psychology that the capacity to immediately respond to a threat by recognizing, for example, the direction of the eye-gaze of a predator, is clearly more beneficial than standing around analyzing the situation while the predator is rapidly approaching. The speed of response is what counts. This is a point that Kahnemann (2011) has emphasized in his discussion of thinking fast and slow.

The products of intuition and reflection consist of different data sets. A great deal of work in comparative religion focusses on doctrinal similarities and differences that are attributable to the result of reflection rather than on the forms of behavior driven by deeply intuitive responses. The critique of "religion" by the new atheism often focusses on the content of doctrine and thus misses the real story about how religious representations and behavior emerge (Dawkins, 2006). Doctrines are the result of centuries of reflection by religious specialists. Ordinary people are often completely ignorant about the results of this reflection. In contrast to Dawkins, Dennett (2006) recognizes that religion is a natural phenomenon and credits scholars working in the cognitive science of religion with making important scientific discoveries, but he still seems to think that it is relatively easy to abandon such a deeply held tendency, that the spell of the religious imagination can be broken.

The experimental study of religious ritual provides us with interesting clues about the persistence of religious intuitions. McCauley and I have argued that noncultural regularities in how actions are represented or conceptualized constrain participants' judgments about significant properties of religious rituals (Lawson & McCauley, 1990). We called this the theory of ritual competence. Barrett and Lawson (2001) devised a study that could provide empirical support for ritual competence theory by testing three predictions: (a) people with little or no knowledge of any given ritual system will have intuitions about the potential effectiveness of a ritual given minimal information about the structure of the ritual; (b) the representation of superhuman agency in the action structure will be considered the most important factor contributing to effectiveness; and (c) having an appropriate intentional agent initiate the action will be considered relatively more important than any specific action to be performed. These predictions would provide a significant test about the constraints of the imagination.

We employed a between-subjects manipulation by asking subjects to complete a task rating the likelihood of success of various actions. The experimenter presented two groups with a set of eight fictitious action sequences. There were two conditions, "religious" and "other world." Each of eight successful sequences' description was followed by seven variations of the sequence that participants rated for likelihood of success. Of the seven variations, two changed just the agent in the

original sequence, two changed just the action, two changed just the instrument used in the original, and one was a restatement of the original. For example, one item from the "religious" condition read:

Given that a special person cleans a trumpet with a special cloth, and the village is protected from an epidemic, how likely is each of the following actions to protect the village from an epidemic? Please rate each action 1 = extremely likely the action will work, 7 = extremely unlikely that the action will work.

1. A special person cleans a trumpet with a special plant.
2. A special beetle cleans a trumpet with a special cloth.
3. A special person cleans a trumpet with a special paper.
4. A special dog cleans a trumpet with a special cloth.
5. A special person covers a trumpet with a special cloth.
6. A special person stuffs a trumpet with a special cloth.
7. A special person cleans a trumpet with a special cloth.

The order of presentation of each type of variation was randomized for each item. In the religious condition, the ratings included an explanation of the term special. "For the following ratings 'special' means someone or something that has been given special properties or authority by the gods." In the "other world" condition, the word special was dropped from all parts of the description, and the participants were presented with a different explanation. "All of the following are proposed actions on a world very much like ours. Try to use as much of the rating scales as reasonable."

In the "religious" condition, participants rated the action with changed agents as significantly less likely to be successful than sequences in which the action was changed, supporting the prediction that having a proper agent is more important than the particular action. However, when subjects rated the same action sequences in the "other-world" condition, the agent was no longer considered most important for the success of the action. Indeed, agent changes were rated as significantly more likely to succeed.

This study demonstrated that people have strong intuitions about the structure of rituals and also that, when they are called to imagine novel situations, their judgments will be constrained by cognitive biases about agents, actions, and instruments.

There is still a problem, however, about cultural differences. If these mechanisms are in place across the board, why are the contents produced by the biases or dispositions so different in different places and at different times? In order to provide a satisfactory answer to this question, we need to look at two different cognitive processes: cultural transmission and evoked culture. An explanation of cultural transmission would identify how a particular concept or representation is successfully transmitted from generation to generation. An explanation of evoked culture would identify the various mechanisms that are ready to be evoked and the domain-specific conditions that elicit specific kinds of behaviors. Evoked culture, in other words, focuses on cultural differences such as human languages which develop in different environments but, because of underlying universal mechanisms, activate similar responses.

Transmission requires memorability. The most memorable and transmittable notion is the one most attention-grabbing. We could say that the most attention-grabbing notion is the one that captures the imagination most fully. Building on empirical tests, theorists have concluded that—given an intuitive response to a stimulus—the minimally counter-intuitive quality of an intuitive representation provides a transmission advantage. Sperber (1985) has employed the notion of epidemiology to describe how transmission of representations proceed. Given multiple versions of a cultural representation, there is a tendency for such versions to converge on an attractor (Sperber, 1985). An attractor is a state toward which a dynamic system evolves. If the attractor is a cultural entity such as a folk tale, for example "Red Riding Hood," that has multiple versions, there will be a tendency for these various versions in their retelling to evolve toward a common form. This epidemiological theory does a good job of explaining how any particular idea in any particular cultural stream achieves transmission success despite consisting of various versions.

For those who have been persuaded by the scientific significance of the Darwinian revolution, especially as this is expressed in the modern synthesis, it is never sufficient to focus simply on the role that "culture" plays in explaining certain forms of behavior and especially not the kind of behavior that appears to cost more than its benefits. Religious ritual is an example of the kind of behavior that appears to cost more than its benefits. "Evoked culture" presupposes that the human mind consists of a set of biologically bequeathed mechanisms, capacities, or dispositions that respond to external stimuli in domain-specific ways depending upon the context in which the stimuli are presented. For example, while we possess adaptive mechanisms designed to distinguish between intentional actions and nonintentional events, the contents of the action might vary between individuals or groups. Different environmental conditions will *evoke* different responses by the same mechanism, for example, the language acquisition mechanism responds phonologically to spoken sounds in different ways as the developing child acquires a vocabulary. Zulu children easily acquire the various clicks that play a significant role in the Zulu language. Any child could learn to use the clicks, but if a child is not exposed to such sounds early in linguistic development, they become very difficult to acquire later in life. This observation has a bearing on the role that the imagination plays in many contexts. For example, one would expect different ways of imagining what superhuman beings are like in different environmental conditions and social situations. In small groups of humans such as bands of hunters and gatherers, one would expect ancestors to play a significant ritual role because in small groups anyone gone is easily missed. In small groups, intimacy plays a fundamental role and the recently departed play an import mnemonic role. In hierarchically organized societies in which guilds play a significant role, so-called Big Gods would be center stage (Norenzayan, 2015). In the former case, narratives would play a significant role in daily life. In the latter case, doctrinal niceties that fit with the inevitable distinctions present in hierarchical organization would likely be evoked (Liénard & Lawson, 2008). Reading a history of doctrinal development in any of the world religions will quickly disclose such niceties. In Christian doctrine, there was extensive discussion and argument over the filioque clause, namely whether "and the son" was to be

added to the Nicene Creed. Disagreement on that nicety ultimately led to the division between the Catholic and the Orthodox Church.

Much about the role that the human mind plays in imagining the gods remains to be discovered. Scholars in both humanities and social sciences are presently engaged in doing just that by continuing to pursue theoretical development as well as empirical and experimental studies. In their edited volume, Martin and Wiebe (2017) have collected together 15 essays which detail both the theoretical development and the empirical studies in the cognitive science of religion over the last 25 years. For example, philosopher of science Robert McCauley discusses explanatory pluralism, the opportunistic approaches employed in the sciences to explain cognitive processes by whatever means are presently available, the inadequacy of interpretive exclusivism to deal with causal processes, theological correctness, the tendency to make abstract doctrines definitive of religious systems while ignoring the great variety of practices in a particular religious system, and promiscuous teleology, the tendency to attribute purposes to the features of objects when such features are not intentional at all.

Despite the Enlightenment and the prestige of scientific knowledge across cultures, the religious imagination refuses to be stilled. A naturalistic explanation in the form of evolutionary theory has begun to show us why. It has enabled us to discover the forms of knowledge or capacities that natural selection has designed that equip us to deal with a fascinating but dangerous world.

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Part III
Aesthetic Theory

Key Stimuli and Power Objects: Aesthetics and Our Innate Sensibilities

Henrik Høgh-Olesen

Homo sapiens is one animal living among many others in the world; but it is also a very special animal: an *aesthetic* animal. It is a creature that adorns itself and its surroundings according to an internal aesthetic idea. A creature that creates art, music, dance, and fiction, and which spends enormous amounts of time and resources on these aesthetic activities, as if it had nothing better to do. In short, the *aesthetic impulse* is a species trait in humans and is thus as natural a disposition for humans as language and toolmaking.

An impulse is a natural, internal behavioral incentive which does not need any external reward to exist, and a number of observations indicate that the aesthetic impulse is exactly such an inherent part of human nature and therefore a primary impulse in its own right:

- The aesthetic impulse is present in all known present and past human cultures regardless of time, place, and material level.
- It occurs in our infants as an innate, pleasurable activity, which (like playing) does not need to be learned or rewarded in order to exist.
- The brain's reward circuit is activated when we are presented with aesthetic experiences and objects.
- We voluntarily spend, as individuals and as a society, enormous amounts of time, effort, and resources on satisfying this impulse.
- Useless behavior without value, taking costly resources away from other useful activities, is ruthlessly weeded out by selection during the evolutionary history of a species (Brown, Gao, Tisdelle, Eickhoff, & Liotti, 2011; Dissanayake, 2007, 2013; Høgh-Olesen, 2019; Lacey et al., 2011; Morris, 2013).

H. Høgh-Olesen (✉)
Department of Psychology and Behavioural Sciences, Aarhus University, Aarhus, Denmark
e-mail: h2o@psy.au.dk

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In addition, the aesthetic sense appears to have several important functions:

- It may guide us towards what is biologically good for us and help us choose the right fitness-enhancing items in our surroundings.
- Aesthetic behavior may serve as a valid individual fitness indicator as well as a unifying social group marker.
- Aesthetically skilled individuals get more mating possibilities, higher status, and more collaborative offers (Dissanayake, 1999; Høgh-Olesen, 2019; Miller, 1999, 2001; Nettle & Clegg, 2006; Thornhill, 2003).

I have previously (Høgh-Olesen, 2019) done extensive work on the ultimate "why's" of our aesthetic motivations, but this chapter will primarily focus on the world of key stimuli, innate sensibilities, and species-typical preferences on which our aesthetic sense is based. In short, we will be looking into the neurological microprocesses behind the aesthetic impulse in order to understand why we are fascinated by and drawn to certain things.

1 Key Stimuli and Inborn Sensibilities

Animals scan their surroundings and rate the impressions on a broad desire/detest, attraction/aversion, and approach/avoidance scale (Heinrich, 2013; Li & Liberles, 2015; Voland & Grammer, 2003). Figuring in this spontaneous appreciation is clear sensory preferences (based on input from the basic external senses and the internal sensory system regulating bodily homeostasis) that decide which species in the surrounding flora and fauna, which food items, colors, shapes, smells, sounds, environments, and landscapes it is attracted to or repulsed by, as well as which partners within its own species it chooses to engage with, sexually, socially, and cooperatively. To aid in these central identifications, every species is, by nature, hardwired to be especially aware of certain signals and markers in its surroundings that through evolution have been associated with an expectation of functionality, fitness, and an increased quality of life: the so-called *key stimuli* (Eibl-Eibesfeldt, 1989; Lorenz, 1981; Orians, 2001; Tinbergen, 1951).

Key stimuli are particularly powerful stimuli to which we have been programmed to pay extra attention because they have guided us towards making the right (i.e. fitness-enhancing) choices. The key stimulus fits like a key to the lock of an inborn stimulus filter: *The Innate Releasing Mechanism* (IRM) in the central nervous system, which releases instinct-like behavior in the form of *Fixed Action Patterns* (FAPs) when the right key stimulus is perceived (Tinbergen, 1951). In that way, the key stimulus becomes a kind of *alpha stimulus*, which automatically dominates other input in the human hierarchy of attention and which makes all other stimuli seem like insignificant background noise when they occur together. A topic or an object that contains important key stimuli therefore automatically gets our attention and becomes a *power object* or a *fetish,* if you like (Høgh-Olesen, 2018, 2019).

Like other animals, humans are predisposed to reacting to certain key stimuli that have become associated, through evolution, with an expectation of functionality, fitness, and increased well-being. The aesthetic sense—which allows us to distinguish the beautiful from the ugly and the wonderful from the horrible—is thus, like our feelings of desire and disgust, a factor which heightens our attention around everything that is adaptively significant to us, for our survival and reproduction. Thus, the aesthetic sense contributes to our general survival and reproductive *fitness*. The perception of beauty is a powerful internal indicator, and acting on it has proven beneficial. It is the expectation that this will be good for the organism. Or, as Thornhill (2003) puts it: "Beauty experiences are unconsciously realized avenues to high fitness in human evolutionary history. Ugliness defines just the reverse" (p. 9).

2 Human Beauty

My old high school teacher used to say: "To each their own. That is why all girls get married and all sausages get eaten." It was a funny saying, but research actually challenges these "words of wisdom." Throughout the world, across sexes, culture, and ethnicity, people largely agree on what a beautiful face looks like (Cunningham, Roberts, Barbee, Druen, & Wu, 1995). Thus, it is not so much taste that varies as it is the ability to get what or who you want, and so sometimes you have to resign yourself.

A woman who has a heart-shaped, symmetrical face with big eyes, high cheekbones, and full lips is considered attractive throughout the world. At the same time, these key stimuli are a testament to organismic health (the absence of parasites, mutations, and pathogens) as well as a high level of estrogen. All key information seen from a reproductive standpoint (Buss & Schmitt, 2019; Høgh-Olesen, 2019).

The physiognomy of the masculine face also has its own key stimuli. Once again, symmetry is valued highly. So are facial features that indicate a high level of testosterone such as distinct eyebrows and a strong jaw. In addition, the attraction towards these facial features increases significantly when a woman is ovulating (Grammer, Fink, Møller, & Thornhill, 2003; Penton-Voak et al., 1999), and men who bear these masculine features also tend to have more sex and more relationships than their less masculine peers (Mueller & Mazur, 1997). Masculine facial features indicate strength and domination, and men bearing these features also do better in competitions for status and career, according to research (Chatterjee, 2014; Keating, Mazur, & Segall, 1981). You need a strong immune system in order to release enough testosterone during puberty to achieve masculine facial features, which is also why these features are reliable indicators of a strong and healthy organism.

Beautiful people of both sexes have an easier time in life. They receive milder punishments and better treatment, in the school system as well as in the legal system. They get higher grades and are preferred from others in a group of applicants. Furthermore, we tend to consider them more intelligent, honest, sensitive, and agreeable and as having leadership skills superior to their less attractive peers

(Chatterjee, 2014; Hatfield & Sprecher, 1986; Voland & Grammer, 2003). We thus not only equate beauty with biologically good—we also equate beauty with morally good, and this apparently happens completely automatically, if we are not conscious of it. And while the first bias may make sense in a biological light and can guide us in the direction of a good choice of mate, the second bias is much more problematic, because beautiful people are not necessarily morally superior.

"But are all these ideal beauty standards not just the result of a globalized world in which we have all for years been affected by the same stereotypical Hollywood beauty standards?" some might ask.

As tempting as that explanation is, the science does not support it. Newborn babies who have only been in the world for 14–151 h have no doubts when it comes to beauty, and they make the same choices as their adult peers (Slater et al., 1998). When presented with two female faces, in pairs where one is attractive and the other is not, the babies gaze on the attractive face for longer, which suggests that the child has an innate drive for paying special attention to certain visual key stimuli, just as it is naturally hardwired to tune into a higher-pitched voice, as it is likely in this direction that the milk can be found.

3 Inverted Triangles and Hourglass Figures: The Key Stimuli of the Body

The body also has its own key stimuli, and for both sexes, symmetry is an important factor. Women even prefer the scent of symmetrical men, when they smell the T-shirts of unknown men, and men with symmetrical proportions have earlier sexual debuts and two to three times more sexual partners than their more asymmetrical peers (Buss & Schmitt, 2019; Gangestad, Bennett, & Thornhill, 2001; Thornhill & Gangestad, 1999).

Moreover, women prefer tall men with broad shoulders and narrow hips, so that the man achieves the characteristic inverted triangle shape. Once again, these are features which are heavily affected by testosterone and which have a proven positive correlation with important social and biological markers such as status, fertility, health, and a reduced risk of prostate and testicular cancer compared to men with narrower shoulders and curvier hips (Buss, 2003; Chatterjee, 2014).

Men, on the other hand, prefer women who have an hourglass figure with a waist-to-hip ratio of 0.7, where the circumference of the waist is approximately 70% of that of the hips (Fig. 1). Even men who are congenitally blind prefer a lower waist-to-hip ratio (Karremans, Frankenhuis, & Arons, 2010), and once again, there seem to be sound biological reasons for why these exact key stimuli are preferred. Women with a waist-to-hip ratio of around 0.7 have a 30% higher chance of getting pregnant than women with a less distinct waist, and they have a more optimal level of estrogen in their bodies. Furthermore, they are more resistant to diabetes, heart problems, and ovarian cancer. Women with a more masculine waist-to-hip ratio of

Fig. 1 Venus from Willendorf, Germany (approximately 28,000 BCE). (Image credit Henrik Høgh-Olesen)

0.8 or more, on the other hand, are more prone to serious illnesses such as diabetes, gallbladder issues, strokes, and high blood pressure (Buss, 2003; Marlowe, Apicella, & Reed, 2005; Singh, 1993, 1995). Consequently, we consider men in the shape of an inverted triangle and women in the shape of an hourglass sexually attractive. At the same time, humans are also fascinating biocultural animals who use culture to stage their own nature; animals who brilliantly manage to orchestrate the inborn sensibilities of the species, and who can consciously stage the key stimuli that titillate and stimulate them.

The world of fetish provides an interesting insight into this ability. Throughout the world, tight corsets are a widespread fetish because they enhance and exaggerate the key stimulus of the classic hourglass shape. You may not naturally be equipped with the optimal body measurements, but with a corset, you can kid and cultivate nature and hence treat yourself and your partner to a heightened sexual arousal by consciously engineering the key stimuli that excite and stimulate you.

The cognitive mechanisms are simple: The perceptual system reacts more strongly to an exaggeration of the original characteristics than to the original stimuli themselves (Costa & Corazza, 2006; Staddon, 1975). Within the field of ethology, these are known as *super stimuli* (Tinbergen, 1951). A super stimulus is an exaggerated and enlarged key stimulus. For example, if an oystercatcher is presented with a grotesquely enlarged version of its normal egg, it will be drawn towards this giant

egg and will attempt to hatch it, even though the egg is so large that the bird cannot sit on it. This object simply signals *egg* to such a large degree that the oystercatcher has no choice but to surrender to the stimulus. Similarly, tight corsets are an irresistible stimulus to some, because they enhance the sexual key stimulus of the female hourglass figure by producing an exaggerated wasp's waist.

Others have a fetish for grotesquely big breasts or backsides, and to them the artificially enlarged body parts of Dolly Parton, Nicki Minaj, and Kim Kardashian are fetishised objects of sexual desire. Perhaps the voluptuous Venus figurines of the past—such as the Venus of Willendorf or the Venus of Lespugue—were made to be titillating super stimuli of the female figure. These figurines—with no face, hands, or feet, but with enormous breasts and buttocks, and with a hip-to-waist ratio of 0.65 on average—are certainly curvier than most women (Guthrie, 2005). What we see here is a representation of a woman reduced to feminine geometry (Fig. 2).

Modern cartoon characters also super-size these endocrine biological markers. A study of 3752 Marvel comic characters found that the male figures were almost as wide at the shoulders as they were tall, resembling the triangular Dorito corn chip. Female cartoon bodies were uniformly hyper feminine, with average waist-to-hip ratios of 0.60, well below the average woman (Burch & Johnsen, 2019).

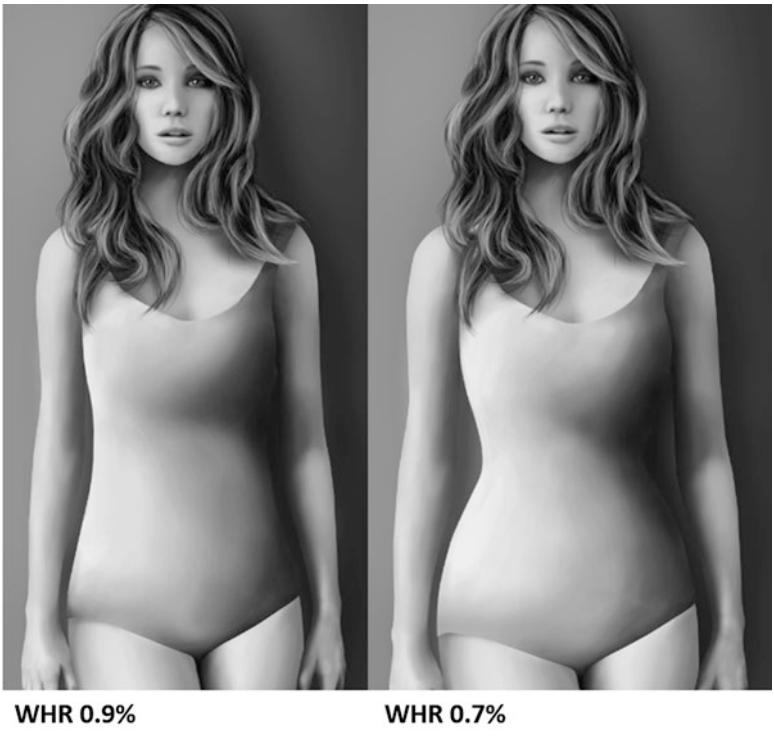

Fig. 2 Waist-to-hip ratios (WHR). The ideal waist-to-hip ratio is 0.7, i.e. the waist is 70% of the size of the hips. (Image credit Henrik Høgh-Olesen)

Uniforms are another widespread fetish that stage human power and dominance relationships. A uniform depersonalizes someone and elevates the wearer to a symbol of power and that is tempting for a social-hierarchic species that forms pecking orders and is engaged in power, status, and dominance displays. Furthermore, a uniform exaggerates the dominant male's broad shoulders with shoulder pads and epaulettes and hereby transforms the masculine inverted triangle shape into a super stimulus and the wearer into a power object with alpha status.

A smooth and flawless skin is also a biological fitness indicator that denotes health and youth. We are all attracted to this type of skin, but, unfortunately, we are not all blessed with it. Consequently, tightfitting latex suits that cling to the body like an extra layer of skin are very popular in the world of fetishism. This is probably because the artificial skin functions as a super stimulus that exaggerates the normal healthy human skin and thus forms the perfect skin: young, smooth, pure, flawless, elastic, and protective. I have described the world of fetishes in great detail elsewhere and refer interested readers to Høgh-Olesen (2018, 2019).

4 Colors as Key Stimuli

Humans are very fond of colors, and they adorn themselves, their possessions, and their surroundings with an entire rainbow of them. *Homo erectus*, one of our more recent ancestors, left traces of color pigment behind as early as 800,000 years ago (Høgh-Olesen, 2019).

Humans are primarily sensitive to the red, green, and blue areas of the color spectrum, while bees, for example, are sensitive to the yellow, blue, and ultraviolet areas. The latter is completely invisible to humans. Bees, on the other hand, cannot see the color red, as we know it. Dogs and cats seem to see blue and yellow colors best, while they have difficulty seeing the difference between red and green, and thus, each species sees the world in its own colors, depending on which wavelengths the species is able to process. Furthermore, the wavelengths available to our eyes (from 400 to 700 nm in the electromagnetic spectrum) seem to have a great deal of influence on our lives: our health, our sexual preferences, consumer habits, psychological moods, and our general quality of life (Fehrman & Fehrman, 2004).

To a great number of species, the color red is a strong signal indicator. In humans, the color red causes increased heart rate and blood pressure as well as a momentary increase in organismic *arousal* and thus also in activity and attention level (as opposed to, e.g., blue and green colors, which lower our arousal level), and this impacts our interaction with others.

If, for instance, you are the owner of a red car, you should be prepared for quicker and angrier responses from other drivers (flashing their lights, honking, gesticulating) when you make a mistake or get in their way in traffic, compared to if you had the same car in green, blue, black, or white. In this case, the red color has the same effect as a red cloth waved in front of a bull (Guéguen, Jacob, Lourel, & Pascual, 2012).

However, if you are a woman and you wear a red dress or blouse, men are more likely to think that you are beautiful and sexually attractive than if you were wearing blue, grey, or green. Among other things, this can mean that they will sit closer to you when trying to make contact and that they will ask more intimate questions in conversation (Elliot & Niesta, 2008; Kayser, Elliot, & Feltman, 2010). At the same time, men are not aware of this effect, and their opinion of whether or not you are sympathetic, kind, or intelligent is not affected by whether or not you are wearing red. Finally, the effect only happens in men, not in women watching other women wearing red. Red linen and lingerie are also a treasured fetish for many men.

This is probably a remnant of the mating rituals of the higher primates. In our closest relatives among the great apes (chimpanzees, bonobos, gorillas, and gibbons), the backsides and genitals of the females swell and become very red when they are ovulating and ready to mate. Similarly, the color red is an *aphrodisiac* associated with sex and romance for humans. Throughout the world—from the tribal societies of Africa and South America to modern industrial societies—young women paint themselves with colors of red to symbolize fertility and the transition from child to sexually mature woman.

Human females may not have visible signs of ovulation, like the great apes; but the skin blushes on the chest, neck, and face, and the labia minora swell and become red during sexual arousal. Furthermore, Beall and Tracy (2013) found that women at peak fertility were more likely to wear red or pink clothing than women who were not close to ovulating. On dating sites, women who indicated that they were interested in casual sex were also more likely to display red on their profile picture than women not indicating this (Elliot & Pazda, 2012). In a similar way, women's use of makeup such as blusher, lipstick, and nail varnish simulate these erotic colorings, and men are programmed to respond to this biological code language. Red makeup, red lingerie, Red Light District, and red monkey bottom: a pattern is starting to form.

On a more general level, red is cognitively associated with warmth (sun and fire) all over the world, whereas blue is associated with something cool and fresh (water and ice). People generally feel warmer in red and orange rooms and cooler in blue and green rooms, and if you increase the temperature of a room, people will start to prefer blue-toned colors, while the reverse will happen when the temperature drops. As mentioned above, the color red momentarily increases the arousal level; but the effect is short-lived, as we quickly habituate to most sensory stimulations, and there is thus no indication that working in a room with permanently red walls will make people more active, productive, or erotically charged (Fehrman & Fehrman, 2004).

However, background colors have a huge impact on us in buying situations, and buyers in online auctions make higher and more aggressive bids when the item they want is presented on a red background than when the same item is presented on a blue background (Bagchi & Cheema, 2013). The increased organismic arousal triggered by the color, combined with the association of something desirable, is likely what gives rise to this effect.

The field of color psychology is still in its infancy. Some effects, like the effect of red on attractiveness and sexual receptivity are well-documented, however, not

all studies find this effect (Peperkoorn, Roberts, & Pollet, 2016), but the field is buzzing with activity, and we will soon be able to present more precise data for how the colors of the world affect us psychologically.

5 Shapes, Materials, and Textures

The stimulation of a symmetric pattern also has an effect outside the sexual area. For example, we value symmetry in art, architecture, design, interior design, gardening, outdoor areas, flower arrangements, and when choosing our pets. The first hand axes made by our ancestors *Homo habilis* or *Homo erectus* according to a set internal idea around 1.4 million years ago are similarly beautiful with their symmetric drop shape. Why did they give them this shape, when other less symmetrical shapes would have been much lighter and less time-consuming to produce—and at least as functional?

The best explanation is that, to our ancestors, the symmetrical shape was a positively charged key stimulus: A perceptual and cognitive bias in the brain that spreads to a range of different areas (Ryan, 2017). Either as random spillover or because this shape, like the symmetrical face and body, is generally associated with good quality. This shape has guided our choice of mate, and we are thus also attracted to it when we create tools or select useful objects in the world of things. Furthermore, the beautiful symmetrical hand axe also worked as a possible fitness indicator of the person who had managed to create such a harmonious object. The skills, effort, and care needed to produce these objects are valuable signals that can be translated into sexual and social advantages (Mithen, 2003).

Throughout the world, people also show a special awareness of sharp, pointed, serrated, and prickly shapes, and these were central stimuli during our evolution, as sharp and prickly shapes can also be found on the claws and teeth of predators and conspecifics, on weapons such as knives, arrows, and spears, and on sharp rocks and thorns that you might step on. To this day, we therefore exhibit a pupil dilation reflex (a fear response) when presented with sharp rather than round shapes in experiments (Coss, 1968, 2003).

Both the entertainment industry and the art and design world have realised the potential of this innate tool, and edgy zig-zag patterns are popular in both the ritual masks, shields, and artefacts of primitive tribal people and in modern textile design made to capture our attention. We perceive sharp shapes as more dangerous than round shapes in questionnaire tests, and if we analyse the characters of cartoons and video games, it becomes clear that within these universes, the villains and dangerous characters of a high status have sharp, pointed shapes significantly more often than the more peaceful, less dominant, and more round characters (Coss, 2003; Høgh-Olesen, 2019).

When it comes to materials and textures, people all over the world are strongly attracted to shiny and glistening shapes and surfaces. Anything with a BLING effect that shines, sparkles, and glitters gets our full attention. Gold, silver, pearl,

diamonds, crystal, gems—all inedible objects that other animals would simply pass by—as well as cars with a high-mirror finish and chrome rims, glittery paper, and fireworks in the night sky are all very popular—to young and old, men and women, religious and rappers alike (Meert, Pandelaere, & Patrick, 2014).

Today, these items are valued so highly that they can be converted into all manners of satisfaction and work as status markers and door openers for those who know how to flash them properly. But originally, the shiny objects, which cannot even serve as food, simply seduced us through their perceived beauty because they stood out and enticed our aesthetic sense. There must be a reason for that.

If we are to dig deeper into this particular fascination, we must begin by asking: What else shines and glitters like gold, silver, and diamonds? The answer is water, dew, and juicy fruits when the light is reflected in the water droplets. As mentioned above, we are coded to keep an eye out for and to feel attracted to certain central stimuli. Habitats with water have been vital during our evolution, and this special attention towards shiny, glistening stimuli, indicating clear, clean water, juicy fruits, and fertile surroundings could very well be the reason behind our fascination with all things BLING. Infants are much more likely to put shiny objects in their mouths and suck on them than matte objects. Moreover, adult research participants' current level of thirst significantly affects their preference for glossy images. More thirst leads to a higher preference for glossy, which is once again testimony of the association between shiny and wet (Coss, 2003; Coss & Moore, 1990; Coss, Ruff, & Simms, 2003; Meert et al., 2014).

6 The Beautiful Landscape: The Good Habitat

Humans now populate all climate zones of the earth. We are neophile creatures, and very good at adapting to many different environmental conditions. That being said, the birthplace of our species is the African savannah, and it appears that we still have a natural urge for savannah-like landscapes with water, an open view, and shade trees with wide crowns that are easy to climb, because this kind of environment provides us with all we need to survive.

When Balling and Falk (1982) showed 8-year-old children images from five different biotopes (tropical rainforest, African savannah, deciduous forest, coniferous forest, and desert), they preferred the savannah landscape, even if they had grown up in deciduous or coniferous forest areas. In other studies, Orians and Heerwagen (1992) showed that people—regardless of the flora of their home environment—prefer images of savannah acacias with wide crowns and many layers that provide shade and protection. And when Lohr and Pearson-Mims (2006) let their test subjects choose between images of trees with round crowns, trees with a cone shape (such as coniferous trees), and trees with wide crowns (such as the acacia tree), they preferred trees with wide crowns.

Even though most of us are now city dwellers living in densely populated urban spaces, scenes of nature are still very important to our well-being. When asked what

they would prefer to have in an open area in their city, most people will say that they would prefer something green and natural, such as a tree and some plants, rather than different man-made or dead objects (Lohr and Pearson-Mims 2006). Video game designers are well aware of this, and if you have ever played *Sim City*, you will know that you can significantly increase the value of a neighbourhood if you add some green to the area.

Scenes of nature simply have a relaxing effect on us humans. Hospital patients who have a view of trees, nature, and vegetation from their beds get well sooner, have fewer complications, use less pain relief, have lower blood pressure, and experience less anxiety than those who have no such view. Obviously, not all hospital beds can have such a view; but pictures, wallpapers, and photostats of nature scenes also work, and they work better than pictures of geometric shapes or abstract color compositions (Orians, 2001; Ulrich, 1995).

This knowledge of "functional aesthetics" is also used when we design working settings in space and other remote environments. Pictures depicting spacious views of nature make confined technical environments more bearable to the humans living and working there and enhance their subjective well-being (Clearwater & Coss, 1991). Architects have increasingly begun exploiting this knowledge when designing spaces, and "healing architecture" is an area experiencing rapid growth.

7 Disgust and Aversion

Disgust and the ugly part of the scans we make of our surroundings, and thus the items which we naturally perceive as disgusting, repulsive, and ugly, are key stimuli—just as essential to our survival and well-being as the attractive ones. We are thus also equipped with an innate preparedness and sensibility towards them. The physiological security system of the brain uses our automatic responses of disgust and repulsion towards certain sensory input as a starting point. These reactions are hardwired reflexes that happen without any significant reflection. In humans, the ethogram (i.e., inventory of behaviors) of disgust has the following appearance: the nostrils flare and tremble. The face gets pale and is turned away. The heart rate decreases. The blood pressure rises, the skin sweats, and lastly, the stomach turns and empties itself.

This disgust response is located deep within the *Insula* of the brain, which is also the area that can malfunction in patients suffering from OCD, which makes them initiate an endless series of cleansing rituals (Miller, 1997; Smith, 2007). Most animals exhibit this kind of aversion programming in which they avoid, turn away, wrinkle their noses, or shake their paws. But only a few species exhibit the radical reactions of spitting and vomiting as seen in humans.

All species are equipped with a *Precaution System* specific to their species, which is a repertoire of clues for potential dangers that works together with a repertoire of species-specific precautions (Boyer & Lienard, 2006). Part of the Precaution System is based on innate predispositions to react with more or less fixed action

patterns (FAP's) on certain key stimuli related to pollution, purification, protection, precaution, danger, and central fitness tasks.

Blood, meat that has gone bad, and feces contain a large number of harmful bacteria and microbes that can multiply swiftly and thus become life threatening to us. Consequently, throughout the world, the sight and smell of blood, rotten meat, and feces elicit a powerful disgust response in humans that is strong enough to provoke a spontaneous gag reflex (Curtis & Biran, 2001); while these same stimuli simply elicit an eating impulse in other species such as sharks, crocodiles, vultures, hyenas, and rats.

So also, it is significantly easier to acquire a fear and avoidance response to snakes, spiders, insects, loud noises, closed spaces, large open areas, and blood than it is to acquire an aversion and caution towards modern cultural threats such as cigarettes, drugs, weapons, cars, and electricity, as these items are not part of our species' natural precautions (Öhman, Flykt, & Esteves, 2001).

The dangers and imaginary creatures of myths, fairy tales, stories, and films are also based on our natural preparedness. Witches, trolls, ghosts, werewolves, vampires, and zombies all reside in dark, scary places. They come from deep woods, underground caves, or big empty mansions where we are alone and unprotected, and thus from locations that have been dangerous for us to enter from an evolutionary perspective (McAndrew, in press). Furthermore, these creatures bear all the hallmarks of a predator: sharp teeth, claws, fur. Or they show signs of an infectious, degenerated, ill, or unhealthy body: pale, sallow skin, warts, deformities, oozing wounds, or rotting flesh, which makes everything in our natural precaution system scream: danger. Avoid, stay away! (Clasen, 2012).

Sometimes the modern art world utilizes our evolutionary precaution system when it wants to capture our attention. In 1917, Marcel Duchamp displayed an ordinary urinal, which he signed. In the 1960s, Italian artist Piero Manzoni put his own feces in tins. And in 2007, one of these tins was sold for EUR 124,000 at a Sotheby's auction. In 1994, German-Danish artist Christian Lemmerz stitched together rotting pig carcasses and exhibited them in an art museum. In 1998, English artist Tracey Emin displayed her own unmade bed, complete with used condoms, blood-stained underwear, and bodily fluids, and this piece was sold for over GBP 2.5 million when it was sold at the Christie's auction house in 2014.

"Is that really art?" some might ask, but judging by the current state of the art world, the answer is "Yes." I will not deny that there may be conceptual art that falls completely outside the category of aesthetics; but there is not much of it, and this does not apply to the above-mentioned works which are both sensory and thought provoking. These works are strong *power objects*, and with their references to basic negative key stimuli such as urine, feces, sweat, blood, semen, dirt, and bad meat, they are guaranteed to capture our attention. They are fascinating and revolting at the same time. They are "disgusting" and "unaesthetic"; but this is exactly why they belong to the aesthetic category. All that is beautiful is aesthetic; but not everything that is aesthetic is beautiful, and, as demonstrated above, the disgust and aversion part of the scans we make of our surroundings are key stimuli and just as important as the aesthetically pleasing ones. Thus, they also present us with innate preparedness and sensibilities that the art world can utilize.

8 Key Narratives and Universal Alpha Themes in Fiction

Key stimuli normally come to us via the external senses, but as everyone who has read a hair-raising thriller or an erotic novella knows, there is nothing stopping our innate releasing mechanisms in the central nervous system from being stimulated and triggered by the *narrative stimuli* and surrogate sensory input we receive when we read stories—fact or fiction—that tickle the senses. In addition, it is important to note that some literary themes resonate more strongly with a wider audience than others, and thus they can be characterized as *key narratives* or universal *alpha themes* that we humans are especially sensitive to and thus more interested in. Consequently, we can find variations of these base stories throughout the world and throughout history. Whether there are 5, 10, or 15 universal plots depends on the level of abstraction and analysis. However, there is no infinite number of stories that will be able to captivate us, just an infinite number of variations to the same basic stories.

Foster-Harris (1959) found three universal plots underpinning all stories: *happy ending, unhappy ending, tragedy*. Langdon Elsbree (1982) found five perennial basic stories: *the establishment of home, fighting a battle, going on a journey, enduring suffering, seeking fulfilment.* And finally, Christopher Booker (2004) distilled seven universal plots: *overcoming the monster, rags to riches, voyage and return, the quest, comedy, tragedy, rebirth.*

All the researchers mentioned above are literary scholars who have conducted wide-ranging scans of the different stories of this world, but what happens if we present a group of mathematicians and computer scientists with the same task?

Researchers from the University of Vermont's Computational Story Lab fed 1737 English books of fiction, freely available from the Project Gutenberg data set, through a computer program and analyzed their language for emotional content, using principal component analysis (Reagan, Mitchell, Kiley, Danforth, & Dodds, 2016). Six core trajectories that form the building blocks of complex narratives appeared:

Rags to riches (a story that follows a *rise* in happiness)
Tragedy/Riches to rags (*fall* in happiness)
Man in a hole (somebody gets in trouble and gets out of it again: *fall–rise*)
Icarus (*rise–fall*)
Cinderella (*rise–fall–rise*)
Oedipus (*fall–rise–fall*)

As mentioned, this study only covers English language literature, whereas the literary scholars also included myths and oral tales from cultures with no written language. Nevertheless, the similarities are astounding. Whether you describe it as rise–fall movements or more specifically as fighting a battle, reaching a goal or losing, or going on a journey or a quest, is not that important. What is important is the human force field that these recurring themes maintain and the fascination that these existential zones produce.

From a psychological perspective, each of these alpha themes can thus be considered a special, central, and powerful stimulus configuration that forms a force field of fictionalized existential essence, and thus they close in on the natural key stimuli of the external world when it comes to the power of fascination.

These themes focus on the essence of human existence. They put something very human, central, and eternally true into form, and when the uniquely human is thus concentrated, people give it their full attention throughout the world. This is what it is like to fight, win, and lose. This is what it is like to long, to lose something, and to gain something. This is what it is like to need, to yearn, and to endure. This is what it is like to break apart, tear down, and build. We already know this; but as these alpha themes are made topical time and again in our own lives, we also want to hear new variations of these basic forms, so please tell us one more time. These are the forces that work in society and in the human mind, brought into meaningful connection. And through these simulations, our ability to understand and regulate ourselves improves, and so does our ability to understand and assess other people's behavior, goals, and motives (Black & Barnes, 2015; Carroll, 2005; Kidd & Castano, 2013; Mar & Oatley, 2008).

9 Simulation Seeking and Habituation: The Evolution and Variation of Artistic Expression

Basic stimulus factors also have an impact on our understanding of the evolution of aesthetic expression over time.

As a species, we belong to the category of neophile animals. We are curious, explorative creatures with a nervous system wired for activity and stimulation seeking, and even when we are relaxing, and all our basic needs are fulfilled, we seek stimulation and amusement (Wilson et al., 2014).

The human need for stimulation thus also has an effect on the evolution of artistic expression itself. The brain is wired to primarily respond to new and unexpected stimuli and to ignore familiar, repeated stimuli. We simply become habituated and bored when stimuli are repeated, and the habituation mechanism therefore forces artistic expression to constantly reinvent itself. The first time a culture or individual hears experimental jazz or listens to the sonic experiments of Jimi Hendrix with distortion and feedback, they might find this eminent virtuosity so strange that it sounds mostly like noise. However, with repeated exposure, the structure becomes more apparent, until you end up following, understanding, and enjoying these complex improvisations.

At the same time, when we have reached that point, we are ready to move on to new things. And when enough people reach that point, art will once again change direction and expression. But that is not to say that the expression of art will continue to be more and more inexplicable, experimental, and transgressional. That will only happen within a limited time frame, as there is a limit to how much novelty we can meaningfully integrate at once.

When a culture has favoured complex prog or fusion rock with many advanced chord changes and complex compositions for some time, soon after there will be a longing for a more direct, simple, and "primitive" punk rock. And when we have worshipped abstract paintings and modernist experiments with language and form for a while, it suddenly once again becomes interesting when someone goes back to a classic style of painting or writes whole poems with lines that rhyme. Thus, the psychologist Colin Martindale (1990) has shown, with reference to examples from architecture, painting, and literature, how the changing styles of art are rooted in predictable stimulation dynamics.

10 Making Special: Concluding Remarks

According to American researcher Ellen Dissanayake (1999), human aesthetic and artistic behavior is essentially a *making special process*. Through special techniques and by using certain sensory effects, things are made *special* and given greater aesthetic value because the person who created them did so with special care, sensitivity, and effort.

In this chapter, I have attempted to bring readers closer to an understanding of this process by turning their attention to key stimuli and innate sensibilities that naturally guide our perception of our surroundings. And if the cup, bowl, or shield is given some of the colors and shapes—such as the powerful zig-zag pattern—that we are already wired to respond to, then we are well on the way to making this everyday item into an especially attractive power object.

When we look at key stimuli, natural preparedness, innate sensibilities, and species-typical preferences, we are entering the microprocesses that trigger and power the aesthetic impulse. An artwork or a decoration that manages to incorporate these elements in its expression will be guaranteed our full attention and have an easier time being perceived as beautiful, fascinating, provocative, or existentially essential than works with few or none of these elements.

That being said, it is, of course, important that we do not become reductionists with an eye only for our innate sensibilities. Our senses and our aesthetic tastes are also calibrated by culture and change continuously throughout our lives. For example, I now appreciate complex and inharmonious music such as experimental jazz and trash metal, or the taste of smoked single-malt whiskey, which I did not 30 years ago. The aesthetic sense cannot be reduced to only key stimuli, species-typical predisposition, and innate programming. Cultural influence, social pressure, authority structures, tradition, habituation, education, and learning process must also be factored in.

But aesthetics and art are also *behaviors*. It is something that our species *does*, and if we want to understand our unique desire to adorn ourselves and our surroundings, we must consider the nature and evolutionary history of the human species. Here we will not only find some of the answers to the big "why does art and embellishment even exist"; we will also find the key to some of the aesthetic

microprocesses of art: the themes and key stimuli, the colors, shapes, sounds, patterns, motifs, and textures that have a special fascination power and appeal to us as humans.

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The Role of Aesthetic Style in Alleviating Anxiety About the Future

James Carney

Style is a form of concrete metaphysics. It is metaphysical to the extent that every given style implies that all of reality has a particular character; it is concrete because it structures the materials from which representations of actual or possible states of affairs are made. Moreover, style is a cultural universal: every culture on record has stylistic traditions, and even the refusal of style in favor of (purported) direct representation is itself a stylistic choice (Barthes, 2000; Dutton, 2009). For these reasons, style and its associated phenomena are crucially important to the understanding of human culture. And yet, while there is no shortage of historical expositions on particular styles of representation, the origin of style itself is far less frequently theoriszd. Even where worthwhile expositions do exist (e.g., Meyer, 1987; Schapiro, 1997), they tend to focus on specific types of style, such as musical or pictorial, at the expense of a more general appreciation of the features common to all styles.

In the present chapter, I shall present a new account of style that attends to the wider principles underwriting it. My goal will be to show that the purpose of style is to establish a cognitive orientation towards the future—that is, it represents the world as being inherently more predictable. In doing this, I argue that style succeeds in reducing anxiety with respect to the future by framing certain aspects of the future as probable and framing other aspects as less probable. I shall pursue this idea by way of concepts from information theory, which provide a powerful framework for dealing with symbolic systems from a quantitative perspective. Specifically, I shall show that style results from an agent's desire to establish an optimum balance between the simplicity of a model of the environment (technically, its entropy) and the model's accuracy. I hypothesize that the agent preserves low model entropy by

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J. Carney (✉)
Brunel University London, London, UK
e-mail: James.Carney@brunel.ac.uk

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actively saturating the environment with model evidence, and thus preserves model integrity for longer by reducing prediction errors. This reduces anxiety by creating plausible expectations about future perceptual and cognitive experiences. Given that the accuracy of environmental models is subject to direct and indirect selection processes, my account of style will in the final account be evolutionary. However, I shall also show that the process of stylistic creation and elaboration is historically conditioned, and it is only when evolutionary processes are considered in conjunction with historical ones that any new knowledge about a particular style emerges.

I shall begin my account by summarizing our intuitions about style and how it has previously been theorized. As I do not aim to present a historical survey of thinking about style, this summary will not be exhaustive; nevertheless, it should map some general contours of the phenomenon. The next step will come with an introduction to some information-theoretic concepts, and how they relate to perception. This will be followed by the central part of my exposition, which connects perception, prediction, and style. I shall finish by showing how some of the features of style outlined in the first section can be explained and making some further predictions that invite testing.

1 What Is Style?

To begin, it is a useful exercise to summarize our intuitions about style. Though this may lack empirical rigor, it will at least provide a starting point for the formalization of the general principles at work in stylistic representation. Equally, it will allow for engagement to be made with some of the existing literature on the nature of style. For the record, I shall mostly use pictorial art for the purposes of example throughout the discussion: this should not be taken to imply that my conclusions only apply to the visual arts—in principle they have relevance for any medium, including language.

The most basic understanding of the concept of style identifies it as a principle of organization based on normative rather than practical precepts. Significantly, this principle is not co-extensive with the habits or heuristics of an individual agent. Though individuals certainly have stylistic signatures (‘Kafkaesque’), their stylistic practices can vary over their lifetime (‘Picasso’s late style’); moreover, stylistic similarity is used to demarcate both collective aesthetic movements (‘Russian suprematism’) and longer periods of artistic or decorative production (‘the medieval aesthetic’). Even more reductively, style can sometimes be used to capture the aesthetic and decorative norms associated with a cultural group, whether based on national origin (‘French chic’), economic class (‘bourgeois art’), or religious denomination (‘Catholic expressiveness’). What this serves to show is that style has no obvious subject; it is a practice that can be implemented across multiple agents who are often distributed in time and space. Moreover, these agents need not even be compositionally human: deep learning algorithms have already produced visual and linguistic artefacts that are indistinguishable from human productions (Gatys,

Ecker, & Bethge, 2015; Gwern, 2019), and there is ample evidence of stylistic variation in animal communication (Botero, Pen, Komdeur, & Weissing, 2010).

Clearly, then, any appreciation of style cannot begin with its cognitive implementation in humans; instead, it needs to identify the underlying structure that is common to its implementation (psychological or otherwise) across all subjects. In this regard, Meyer (1987) offers a useful starting point when he defines style as 'a replication of patterning … that results from a series of choices made within some set of constraints' (p. 21)—with 'choice' to be understood in the weak sense as merely meaning that alternative patterns are possible. The value of this formulation is that it captures two components—contingency and necessity—that are visible in any coherent manifestation of style. The necessity derives from the fact that, at any point, a style will prohibit certain aesthetic choices being made; the contingency lies in the liberty of the subject to choose freely once these prohibitions are respected. Inevitably, matters are not so simple in reality, as styles typically evolve by permitting and incorporating small deviations relative to established norms (Adorno, 2004; Eco, 1985); equally, there is always the *degree* to which an artefact evinces a particular style (Munro, 1946). But even allowing these caveats, it remains the case that an aesthetic style—whether lodged in an individual, a genre, a movement, or a historical period—defines a set of normative standards that both positively and negatively select for aesthetic choices.

This issue of normativity brings to the fore another core feature of style—its polemical character. Friedrich Nietzsche (1927) captures one aspect of this in his discussion of the dichotomy, in Greek art, between the integrative, rationalist 'Apollonian' aesthetic and the disintegrative, hedonic 'Dionysian' aesthetic. One need not subscribe to Nietzsche's categories to appreciate the wider point: styles are defined by what they are *not* as much by what they *are*, so no style can exist without at least implicitly defining itself against a counter-style. Moreover, given that the subjects of a style are often (but not always) social collectives, this means that stylistic oppositions can be coordinated with political ones. This can be seen readily enough in the culture of the manifesto and the radical break, which often attends the emergence of a new style (Danchev, 2011). Equally, the stylistic innovations associated with marginal subcultures can be interpreted as implicit refusals of a dominant or received pattern of meanings. In Dick Hebidge's words (1979), these innovations 'carry "secret" meanings which express, in code, a form of resistance to the order which guarantees their continued subordination' (p. 18). It takes no great conceptual leap from here to identify a style as an expression of a worldview—a claim we shall return to; for now, the idea to retain is that styles are typically (though not necessarily always) antagonistic with respect to each other.

A third feature that is visible in our intuitions about style is that individual styles are transitory. Depending on context, the degree to which this is so can vary. More strictly decorative expressions of style (such as found in fashion) have their value defined, at least in part, by novelty, and thus evince the transitory nature of style with particular effect. Equally, fast-moving milieux like the twentieth-century avant-garde, where unprecedented social and technological change was matched by equivalent innovation on the aesthetic sphere, are characterized by quick

successions of different stylistic practices. (Indeed, some authors go so far as to claim that this drive for novelty will ultimately result in incoherent artforms [Martindale, 1990; Martindale & Locher, 2009].) However, no human society is without history, and even relatively static societies—such as, presumably, those found in the Palaeolithic—still see stylistic variation in time and space (Pigeaud, 2007). By the same token, even where styles persist over long durations, it remains the case that sub-styles and local variations proliferate, sometimes to the point of becoming distinct styles in their own right—a pattern most visible in the evolution of popular genres like science fiction and fantasy. All of this suggests that whatever function style may serve, it can only do so for a limited time: whether in the long or the short term, styles will eventually become exhausted, superannuated, or otherwise obsolete.

These, then, are some of the core intuitions that any theory of style should be able to reproduce. Before advancing to such a theory, however, it is important to address some possible objections to the wider project I am proposing. The most important of these centers on the viability of style itself as an analytical category. Such objections generally maintain that style has no objective reality and exists only as a denotative shorthand for historical particulars that cannot be meaningfully discussed outside of the material and contextual details of these particulars (Alpers, 1987; Smith, 1980). In practice, this results in a rejection of any general theory of style: 'it is because style is a historical phenomenon that an absolute science of style is impossible' (Jameson, 1972, p. 335). As such claims are so visibly the product of a politically aggressive historicism, it is tempting to just not bother engaging with them at all. However, a rebuttal is easily formulated. If the idea of style is to be rejected because it is abstracted from contingent material phenomena, then so too must concepts like species, gene, function, adaptation and many others that make up the lexicon of scientific biology. Biological forms, no less than cultural ones, are contingent, with the only difference being that the contingency lies in the operations of natural selection over any purported historical dialectic. While there is no shortage of theorists—past and present—who remain willing to intrude their political convictions into the natural order (Kolchinsky, Kutschera, Hossfeld, & Levit, 2017), the utter failure of such approaches to create new knowledge presents its own verdict on their viability. For a concept like style, which is vastly simpler than even the most rudimentary biological system, it therefore follows that formalism is not only allowed, but mandated.

2 Perception and Information

Translating the features of style into a model requires formalizing them in an appropriate way. In this regard, the first step comes with taking a step back and making some observations concerning human perceptual experience and how it informs models of the environment. Once this has been done, it will become possible to mathematically model style as an attempt to reduce the information-processing

demands of psycho-perceptual interaction with the world. Though this will lead the discussion into some mathematical formalism, I submit that this formalism will repay its presence by sharpening our understanding of how style works, and where it sits in relation to the wider repertoire of human activities.

Though perception is one of the largest research areas in psychology, it is also one of the most mature, with a core discovery being that human perception is *not* experienced as a continuous set of gradations; instead, continuous sensory inputs are discretized (often recursively) into perceptual elements (Marr, 1982, 2010; Nakayama, Motoyoshi, & Sato, 2018; Sims, 2016). Moreover, these elements are not experienced in a neutral fashion. As explored in the enactivist literature, perceptual elements are at once registrations of the state of the world and invitations to act on it (Bach-y-Rita & Kercel, 2003; Georgeon, Marshall, & Manzotti, 2013). In the simplest case, these perceptual experiences center on spatial location and physical manipulation; more complex experiences—like those supported by cultural objects and experiences—are freighted with the sophisticated meanings and affordances that inform human intersubjective existence (Durt, 2017; Gallagher, 2008).

Putting this on a probabilistic footing, what emerges is that a human perceptual environment can be modelled as a set of n discrete elements, S, such that each $s_i \in S$ for $1 \leq i \leq n$ picks out one of these elements. Necessarily, the full repertoire of these elements must be purely theoretical, as no analysis can ever enumerate them in advance.

$$S = \{s_1, s_2, \ldots, s_n\} \tag{1}$$

The value of this formalism is that a given perceptual environment, S_j can then be defined by a probability distribution, P_j, where p_{ji} denotes the probability of a randomly selected perceptual element in that environment being the element s_{ji}. In this scenario, each p_{ji} for $1 \leq i \leq n$ can theoretically take a value between 0 and 1 inclusive, and the entire distribution sums to 1—even if in practice there will always be some non-zero probability assigned to every element, though it might be vanishingly small.

$$P_j = \left(p_{j1}, p_{j2}, \ldots, p_{jn}\right) \tag{2}$$

More generally, what each P_j here represents is a model of an environment. By defining a set of expectations, this model has an obvious role in guiding the allocation of resources (including attention) for an organism or process embedded in the given environment (Clark, 2016). As the environment varies, so too will the model, with both the duration (a moment, a day, a lifetime) and the scope (an organ, a body, a landscape, a cosmos) of the model being parameters of variation. For this model to be *useful*, a necessary (but not sufficient) condition is that it has low entropy. As the logic behind this constraint may not be familiar to some readers, I will now briefly outline the concept of entropy (technically, Shannon entropy) as it functions in information theory, given that this is crucial to the discussion that follows.

On one definition, entropy is 'a measure of the information contained in a message as opposed to the part of the message that is strictly determined (hence predictable) by inherent structures' (Kuzemsky, 2017, p. 275). That is to say, entropy measures how unpredictable a message is, with messages high in entropy being unpredictable and those low in entropy being predictable (Cover & Thomas, 2005; Shannon, 1948). As the core concept of information theory, entropy allows for symbolic complexity to be quantified. This is done by way of the probability distribution of symbols in a message, such that the entropy, H, of a distribution, X, is defined as the product of the probability of a symbol occurring and the logarithm of this probability, summed across all symbols $x_i \in \{x_1, x_2, \ldots, x_n\}$. When the base of the logarithm is 2, the outcome is measured in bits.

$$H(X) = -\sum_i p(x_i) \log_2 p(x_i) \tag{3}$$

The mathematical details here are less important than the intuition behind them, which is that entropy is highest for systems with several equiprobable outcomes. Take the entropy for a coin toss with a coin that has an equal chance of heads or tails coming up (i.e. $p(H) = ½$; $p(T) = ½$). The entropy of this system can be calculated as follows:

$$-1 \times \left[\left(\frac{1}{2} \times -1 \right) + \left(\frac{1}{2} \times -1 \right) \right] = 1 \tag{4}$$

This shows that only one bit of information is needed to encode the states of this system. Very different results emerge when the coin is biased. Figure 1 shows the effect of shifting the bias from one extreme (H always comes up, or $p(H) = 1$) to the other (T always comes up, or $p(T) = 1$). As can be seen, entropy is zero for the extreme scenarios as the system is perfectly predictable and there is no uncertainty; as calculated above, the maximum entropy occurs when H and T occur with equal probability.

Bringing this back to the discussion of perceptual models, it should now be clearer why the model P_j should have low entropy if it is to be effective. A model that defines a uniform probability distribution cannot be used to create a differentiated set of expectations, because all outcomes are expected equally. Far more useful is a model that accurately identifies specific outcomes as being more likely than others in a given perceptual environment; better yet is a suite of models that recalibrate expectations across different scenarios. If this so, then it is likely that there should be an evolutionary selection pressure for accurate, low entropy models—and this, indeed, is what we see in the literature linking anxiety to uncertainty. Here, the suggestion is that the experience of anxiety can be understood as a penalty function for cognitive models of the environment that fail to offer identifiable predictions (Craske, 2003; Craske et al., 2009; Ellsberg, 1961; Hirsh, Mar, & Peterson, 2012; Lake & LaBar, 2011; Sullivan, 2016). Though such evidence is only phenomenologically accessible with respect to humans (through self-report), there is evidence

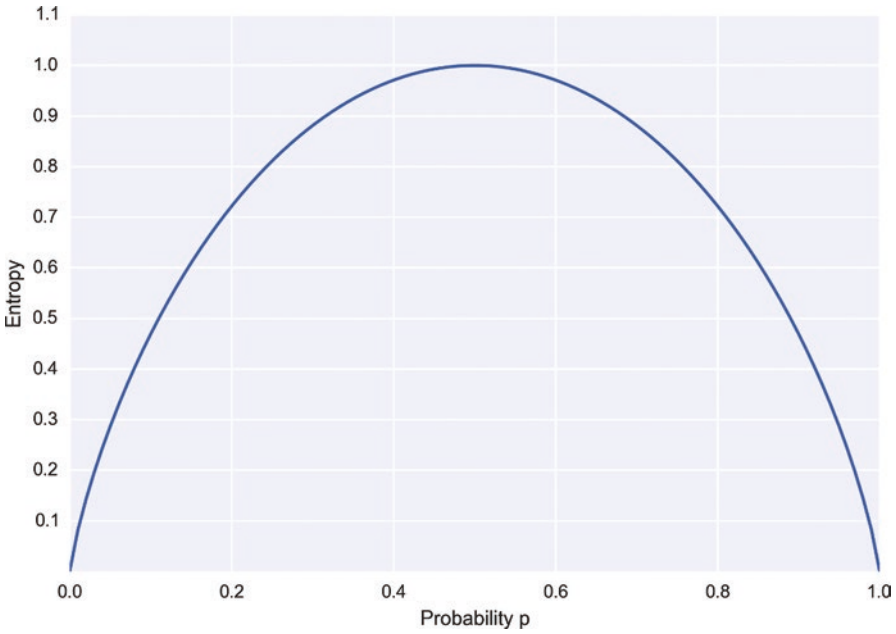

Fig. 1 Entropy of a coin toss for $p(H) = p$ and $p(T) = 1 - p$ as p takes values in the [0,1] interval. Note that entropy is at a maximum for an unbiased coin toss, when both $p(H)$ and $p(T) = 0.5$

from neuroscience that it is present in animals, too (e.g., Grillon, Baas, Lissek, Smith, & Milstein, 2004; Herry et al., 2007). Thus, one of the central aversive sensations for an organic agent is linked directly to the entropy of its model of the environment. In such a scenario, the clear incentive that emerges is for the agent to reduce anxiety by optimizing for low-entropy models.

And it is here that the problem emerges. Building a predictive model of the environment is extremely difficult, largely because discrete perceptual elements admit being combined into composites that are themselves experienced discretely. The result of this combinatorial facility is the quick supervening of distributions that are intractable with respect to computing probabilities. To see this, imagine a highly parsimonious ontology of 100 colors; at the same time, allow that a discrete experience can consist of combinations of up to four colors together. The approximately four million potential perceptual items that emerge from this is already too large for any on-the-fly cognitive system to easily deal with—a situation that becomes entirely unworkable for systems with anything approaching real-world complexity. Necessarily, this latter scenario will expose an organism to all the existential threats that attend a poor environmental model, which will ultimately result in those organisms with more effective models being genetically selected for. The result is to trap the agent between two competing imperatives: the desire to avoid anxiety by optimizing for simple, low-entropy models of the world, and the difficulty of satisfying

model accuracy due to a combinatorial explosion in the number of possible elements of experience.

A useful way to quantify this situation is by way of what are known as Bregman divergences (Bregman, 1967). These divergences measure the difference between a 'true' distribution, P, and an estimating distribution, Q. As such, they provide a good metric of how well a model fits the environment. For the purposes of illustration, the most useful of these is the Kullback–Leibler divergence—also known as the relative entropy—between two distributions (Kullback & Leibler, 1951). This measures how much extra information, in bits, is needed to model a distribution $P(X)$ when an approximating distribution $Q(X)$ is already known.

$$D_{\mathrm{KL}}\left(P \,\|\, Q\right) = \sum_{x \in X} P\left(x\right) \log_2 \frac{P\left(x\right)}{Q\left(x\right)} \tag{5}$$

When the distributions are identical, the divergence is zero, and no extra information is needed to represent P in terms of Q; as D_{KL} increases, the approximating distribution becomes less and less accurate as a model of the target distribution. In the context under discussion, this means that the need for accuracy will drive organisms to create models of the world that drive D_{KL} down; however, the impossibility of doing so will—through the mechanism of anxiety—push organisms towards low-entropy approximations that can often drive D_{KL} up. How can this dilemma be resolved?

It is here, after our information-theoretic detour, that it becomes possible to return to the topic of style. As we shall now see, style can be theorized as an attempt to inject maximum predictability into the environment, subject to constraints of model accuracy. What this should show is that style is a local example of a general tendency on the part of organisms to optimize their behavior by minimizing prediction error while maximizing model simplicity.

3 Style and Prediction

Every style is encountered as an arrangement of the material world—whether that be in the form of paint on a canvas, patterns of sound in the air, or the movement of limbs on the human body. As such, each style exists as part of a perceptual repertoire. Given this, the perceptual considerations outlined in the previous section also apply to style. In fact, their application is even more appropriate. For the perceptual elements circumscribed by a particular style are always exaggerated—one of the functions of a style is to draw attention to itself (Shklovsky, 1965). This is a logical prerequisite, to the extent that a style cannot be individuated from a background unless it is perceptually salient; however, neuroscientific research also shows that aesthetic phenomena have distinctive, measurable impacts on neural processing (Ishizu & Zeki, 2013; Seeley, 2013). In this sense, style offers a condensed form of

perception, such that a stylized element is freighted with greater salience than a non-stylized element.

Paralleling this exaggeration of perceptual salience, most styles are enacted across a smaller number of perceptual elements than are likely to comprise the world of phenomenal experience. Take *De Stijl*, the aesthetic style associated with Piet Mondrian and other Dutch artists of the inter-war period. In Mondrian's words, this aesthetic ignores 'the particulars of appearance, that is to say, natural form and color. On the contrary it should find its expression in the abstraction of form and color, that is to say, in the straight line and the clearly defined primary colour' (qtd. in Huntsman, 2016, p. 141). Thus, in this aesthetic, there are essentially two elements: the straight line and the set of primary colors. This is a generative system, so there are certainly more than two perceptual experiences available through it; nevertheless, the probability distribution, P, defined across the set of possible perceptual elements, S, will, in this instance, consist mostly of zeroes, with those elements that are not zero having a high value. Naturally, a more mimetically oriented style than *De Stijl* will emphasize a greater number of elements, but any style that falls short of a one-one reproduction of reality—which is to say, every style—will still perform this reductive operation.

What all of this points to is the functional role of style in making an environment more predictable. Because each style is associated with a set of perceptual expectations, any environment that is saturated with that style lends itself to being predicted with greater facility than an environment which is not. Thus, if an agent wishes to reduce the uncertainty in the environment, it can do so by actively shaping the environment in accordance with the precepts of a given style. In this way, 'action then ensures that prior expectations are met and desired states are frequented' (Friston, 2009, p. 299). If this perspective is allowed, style becomes much more than mere decoration; it is instead the efferent arm of a process of uncertainty reduction, where the environment is actively manipulated so as to render it consistent with a set of model expectations. Intuitive support for this idea comes from the observation that a core impulse of a style is to percolate outwards. What began as niche aesthetic in Dutch abstract art now defines the perceptual experience of the London underground (Lloyd, 2017), just as the discordant aesthetic of punk music projected itself into the jarring sartorial choices of its performers and followers (Hebidge, 1979). The examples could be multiplied, but the point remains the same: styles colonize environments, thereby making them more predictable.

The first impact of this colonization will be to reduce anxiety. If high-entropy scenarios are intrinsically more anxiety-provoking, the saturation of the environment with predictable stylistic features will attenuate the baseline uncertainty that attends perception and action. While this claim is difficult to test empirically, the evidence that does exist supports it. For instance, there is a robust literature on the therapeutic effects of artistic creation on the experience of anxiety (Curry & Kasser, 2005; Jang, Kang, Lee, & Lee, 2016; Sandmire, Gorham, Rankin, & Grimm, 2012; Slaytohn, D'Archer, & Kaplan, 2010; van der Vennet & Serice, 2012). So also, conditions like autism spectrum disorder that may derive from impaired predictive abilities are often attended by repetitive 'stimming' (self-stimulation) and

pattern-matching behaviors that regularize the environment by actively making it more predictable (Lawson, Rees, & Friston, 2014; Sinha et al., 2014). While it would be unwise to generalize these observations across the entire cultural record, the fact remains that they provide a compelling explanation for the excess that characterizes style. As has been observed by several commentators, aesthetic stylization is something of an evolutionary mystery: though consuming of resources, aesthetic phenomena seem to offer no functional advantages (Dutton, 2009; Pinker, 2007; Tooby & Cosmides, 2001). On the view offered here, the impulse to stylization is to be found in the manipulation of the environment so as to reduce the likelihood of encountering surprising states; the seeming superfluity of stylization derives from the requirement that this must be done at scale if it is to be effective.

But if this satisfies one of the constraints identified of model building—the reduction of entropy—it leaves to one side the other constraint, which centers on model accuracy. This, it will be remembered, concerns the combinatorial explosion in the possible forms of perceptual experience on the back of linear increases in the elements that compose these experiences. If the model of style offered here has any value, then this pressure should be in some way visible in how style manifests itself in the cultural record. And this, in fact, is the case, to the extent that the duration of a style is intrinsically related to the accuracy of the model of the environment it represents.

To see how this is so, we need to look at the items from which a style is composed. Though these items can, in principle, be anything, it is notable that the duration of a style is to an important degree determined by the psychological, cultural, and historical significance of the items that compose it. 'Significance' can, of course, mean anything, so it is as well to be clear and indicate that its meaning here centers on what might be thought of as the explanatory salience of an item. In lived experience, there will always be some class of forms that seem expressive of a deeper or hidden principle of structure or value. Sometimes, these will coincide with biological cues, which evolution has conferred with a suggestive or stimulating power (Dawkins & Krebs, 1979; Thom, 1990)—such forms are visible, for example, in the big-breasted Venus figurines of the Palaeolithic (Schebesch, 2013). Other times, it may be that the frequency with which a specific form is encountered increases, due to material changes in the environment—in the way, for instance, that the new technologies of the early Bronze Age served to make perceptual forms associated with metal smelting more culturally salient (Brück, 2006; Sørensen & Rebay, 2008). In both cases, the relevant forms point to a set of hidden variables or propositions, Z, that stand behind the flux of phenomenal experience (e.g. 'the world is/is not the creation of a benign mother'; 'fire is/is not the underlying nature of reality'). Necessarily, these purported hidden variables will enter into cosmological and philosophical speculation on the nature of reality (or some part of it), in that they will define a probability distribution, $P(Z)$, that functions as an interpretive prior in the assessment of new sense data. To greater and lesser degrees, the encounter with real-world evidence, X, will change the estimation of the prior probabilities assigned to the items of the $P(Z)$ distribution in accordance with Bayes' formula.

$$P(Z \mid X) = \frac{P(X \mid Z)P(Z)}{P(X)} \tag{6}$$

That is, corroborating or disconfirming evidence will be used to update the probabilities assigned to the items that comprise Z ('given evidence X, it is more/less likely that the world is/is not the creation of a benign mother'). If model accuracy is a criterion of interest, then these hidden variables—if actually present—will therefore allow for low entropy to be coordinated with high accuracy. The question is, are they present?

It is here that the issue of stylistic duration comes into view. As part of the perceptual environment, the elements of a given style will act as evidence for the likelihood of an associated set of hidden variables—whether through causal implication, symbolic association, or subjective conviction (Peirce, 1958). However, when a style is the *only* evidence for these variables that are encountered, the reduction in anxiety is offset by the loss of accuracy. In this scenario, an agent can either increase evidence by further saturating the environment with stylistic elements or else abandon the style entirely. Conversely, when a style aligns with other aspects of the environment, it adds further evidence for a posited set of hidden variables; here, the style is likely to persist due to satisfying both the low entropy and high accuracy constraints. Thus, the duration of a style is directly informed by the set of hidden variables that motivate it.

This hypothesis predicts several known categories of style. At one extreme, there is the *fad,* where the hidden variables offer some contingent or facile model of the world that cannot be sustained; at the other extreme, a style becomes a *tradition*, where the hidden variables correspond to cosmological or metaphysical principles that cannot easily be disproved. The only other possibility—the hidden variables exist and perform genuine explanatory work—is almost never encountered in stylistic elaboration, as it is epistemologically equivalent to scientific theorizing. The one exception (to the author's knowledge) is the set of action roles found in narrative, to the extent that these provide folk-psychological ways of understanding social behavior that actually reflects the structure of human motivations (Gallagher, 2011; Hutto, 2009). For reasons we explore in Carney, Robertson, and Dávid-Barrett (2019), this produces a situation in which the hidden variables come to be taken as an approximation of reality without needing to be supported by conditioning evidence. (That is, they make up the estimating distribution in a process of variational Bayesian inference, where the estimated distribution of motives is intractable due to the combinatorial explosion, as groups get bigger, in representations of the form 'I believe that *A* thinks that *B* is certain that *D* knows … that *X* is the case'.) But leaving aside the special case of narrative, what emerges is that model accuracy is the key variable that impacts on the duration of a style. When the hidden values that inform a style perform no explanatory work, the style is evanescent (if potentially intense); when the style evokes variables that are less easily dismissed, it will be compelling for much longer. In situations where there is perfect predictive knowledge, I suggest there will be no style at all. However, I caveat this by suggesting that

even a perfect model can only predict accurately with exhaustive data, and for most situations, we do not have (and probably never will have) exhaustive data. We can aspire to successful knowledge about physical processes, and to the extent that we do, we no longer stylize these processes because our uncertainty is reduced. Against this, there is no scientific theory that usefully accounts for dealing with social situations and uncertainties at the level they are experienced, because there are no non-trivial scientific laws predicting the exact form my dinner party, night on the town, and first encounter with my in-laws will take.

As these considerations are somewhat abstract, it is useful to close this section with an example—once again, *De Stijl*. When *De Stijl* emerged, the Netherlands was undergoing a wave of industrialization that consolidated its position as 'part of the advanced economic core of North-West Europe' (Wintle, 2000, p. 245). At the same time, massive and unprecedented infrastructural projects like the reclamation of land from the Zuidersee were being initiated (Van Lier & Steiner, 1982). When combined with international developments in physics and mathematics, it is easy to see how such a milieu would incubate a model of the world as intrinsically ordered and rational. At a perceptual level, this would be experienced by way of increased encounters with manufactured items and landscapes, where the idiosyncrasies of natural and artisanal forms are replaced by a geometrical schematism composed of straight lines, right angles, and formal equivalences between objects. Though familiarity makes these forms unexceptionable to present-day eyes, at the time they would have been salient as indicators of a rationalist, collective—and, in the USSR of the same period, revolutionary—re-ordering of the human lifeworld. This in turn would have facilitated a world-model that has, as its animating claim, the rejection of subjectivity as a generative principle and the embracing of impersonal processes. It is not surprising, therefore, to see this given expression in the first manifesto of *De Stijl*, which juxtaposes the subjectivist impulse of earlier art—'traditions, dogmas, and the predominance of the individual'—against the 'relationship of equality between the universal and the individual' that attends the new style (Conrads, 1970, p. 39). Thus, the *De Stijl* aesthetic—and indeed the modernist aesthetic more generally—can be understood as an attempt to infuse the environment with perceptual evidence for a low-entropy model of the world that retains a high accuracy value due to the historical salience of the perceptual elements that compose it.

4 Conclusion: Some Predictions

Style reduces anxiety about the future by making the environment more predictable, subject to the constraints of model accuracy—with environment corresponding to both the specific field of aesthetic creation and the more general world of *all* fabricated objects and processes. That, at least, is the claim I am making here. If correct, this model of style should both account for our existing intuitions and—ideally—allow for new insights. We have already seen how the transitory nature of style is explained by the model accuracy parameter. Stylistic forms that do not evince

hidden explanatory variables (or do so implausibly) are evanescent; styles that point to hidden variables less easy to disprove tend to last longer. Explanations are also available for the normative and polemical character of style. Specifically, styles are normative and polemical for the same reason: each one defines a model of the world, and models of the world are exclusive (mathematically, the probability distribution across the elements of the model sums to one). This means that no style can accommodate the prescriptions of another without radically changing its own forms and becoming a new style. At the same time, the political function of a worldview that is encoded in a set of stylistic forms cannot admit another style without conceding legitimacy. While this latter point does not mean that syncretic styles are impossible, it does suggest that they will be most common (like religious syncretism) in times when a secure collective identity is available. Compare, for instance, the openness of the later Roman Empire to regional aesthetics with the competitive elaboration of highly individual styles by small tribal societies that exist in close proximity to each other (e.g. in Papua and West Papua).

But the question remains: What are the new insights provided by the information-theoretic model? We have already seen how varying the accuracy parameter generates predictions; it is perhaps worth finishing by cataloguing the predictions that follow from varying the simplicity parameter. In practice, this means varying the entropy of the model associated with the style. Doing this at once introduces considerations of cognitive load. All styles are simplifications, but some styles simplify to a far greater degree than others—and because these styles are predictable, they impose lower demands on working memory and attention (Carney, 2019; Hunter & Pisoni, 2018). This contrasts with more elaborate or ornate styles, which impose high demands by approximating more and more to the degree of complexity that attends real-world phenomena. From this, two predictions emerge. The first is that stable, unchanging contexts will support high-entropy styles, whereas unstable contexts will support low-entropy ones. The second is that the greater the psychological distance associated with a topic of aesthetic representation, the lower the entropy of the associated style is likely to be. ('Distance', in this instance, picks out displacement with respect to space, time, familiarity, and likelihood—see below.)

With respect to the first prediction, unstable environments place obvious demands on cognitive budgets with respect to time, energy, memory, and attention (Dunbar, Lehmann, Korstjens, & Gowlett, 2014; Mithen, 1995; Stout, Hecht, Khreisheh, Bradley, & Chaminade, 2015). Any activity that competes for the same resources will, therefore, negatively impact on the processing of threats and opportunities by reducing these resources, and thereby raise anxiety. Conversely, environments that are highly predictable can free up cognitive resources for activities that are not directly adaptive without compromising agent survival. Thus, the simplicity parameter—the model entropy—associated with anxiety reduction in style will have a much tighter bound in challenging environments. In practice, this means we should expect to see more schematic, geometrical, and repetitive styles when societies and individuals are exposed to ongoing stress. At the same time, there is likely to be an ameliorative value in the identification of simple hidden variables standing behind otherwise chaotic experiences, given that these can provide a focus for ritual or

therapeutic behaviors. Against this, more ornate, baroque, or organic styles should become visible when the producers of style exist in a stable, predictable milieu. In this regard, it has already been hypothesized that the impulse towards abstraction comes from 'the immense spiritual dread of space,' which leaves humanity 'tormented by the entangled inter-relationship and flux of the phenomena of the outer world' (Worringer, 1997, pp. 15–16). This is most obvious with respect to the linear, schematic exercises in artistic creation from the earliest parts of human history (Henshilwood et al., 2002), but it is no less true that the sensory richness of French impressionism and Victorian realism in the latter half of the nineteenth century could not contrast more with the revolutionary formalism of Russian art in the early twentieth century. And tellingly enough, the consolidation of the USSR and the regularization of daily life brought with it a migration to a less abstract, more realistic aesthetic. Nevertheless, I readily acknowledge that these claims—which take in the entirety of the cultural record—will need more evidence than I am able to supply here if they are to be compelling.

The second prediction is no less speculative, but hopefully equally provocative. This is the hypothesis that lower entropy styles should attend subject matter that is distant or cognitively remote. Here, the reasoning is that remote subject matter will, all things being equal, offer fewer familiar perceptual elements, and therefore make bigger claims on cognitive budget by requiring such elements to be explicitly memorized or inferred. What this means in practice is that any associated style is likely to make do with fewer, more schematic elements that are often repeated, as opposed to reproducing a familiar reality with a more expressive style. Once more, evidence for such a hypothesis requires a survey of the cultural record that I cannot offer, except to note that the fantastical cultural forms like myth, folktale, and the epic consistently make use of formulaic patterns, stock phrases, and predictable characters (Gray, 1971), just as genres like contemporary science fiction and fantasy are well-known for complementing far-reaching speculation with prosaic (i.e. predictable) delivery (Stockwell, 2014). However, a useful independent body of evidence in support of my view comes from construal level theory (CLT), a branch of social psychology that deals with the interaction between abstraction and psychological distance. The core discovery of CLT is that abstract representations cue expectations of psychological distance in the dimensions of space, time, likelihood, and social familiarity, just as the experience of psychological distance cues expectations of abstraction, with a similar relationship holding true for concreteness and nearness (Liberman & Trope, 2009; Trope & Liberman, 2010). In other words, CLT shows that cognition centering on far away, temporally distant, socially alien, or implausible themes is biased towards abstract modes of representation, with the reverse being true for representations that are near in those dimensions. I have explored this claim already with respect to science fiction in Carney (2017), where I show that four of its core topics—space travel, time travel, non-human agency, and counterfactual history—pair extremes of psychological distance with various forms of linguistic and cognitive abstraction. Extending this claim to other stylistic modes and cultural genres is certainly possible; doing so would both supply CLT with an

explanatory mechanism for its claims and allow for these claims (and the associated prediction I am offering here) to be tested against rich cultural data.

The information-theoretical model of style therefore presents two clear further lines of development for future work. Here, my purpose will have been achieved if I have made clearer the precise ways in which anxiety about the future is alleviated by the injection of stylistic elements into the environment. Style, on this view, is less a cultural incidental or a hedonic decoration than it is the material implementation of perhaps the signature psycho-perceptual strategy of all forms of organic life (Friston, 2012; Friston et al., 2012). This is an ambitious claim, and even if true, a peremptory one. Nevertheless, the increasingly necessary intellectual project of reconciling our models of biological, cognitive, and cultural processes is an argument for at least pursuing it. If successful, the present chapter will have made one step—even if only a negative one—towards doing so.

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Part IV
Music

Music and the Evolution of Embodied Cognition

Stephen Asma

When I was in my 20s, a series of lucky breaks resulted in my becoming a hired guitar-slinger in the Chicago music scene. I played in an opening band for blues legend B.B. King, and then found myself playing with other great blues musicians—Koko Taylor, Buddy Guy, and Bo Diddley, to name a few. For a time, Bo Diddley hired me whenever he played in Chicago.

Before my first gig with Bo, I spent a full week of intense preparation, learning and rehearsing his songs. I had hoped to rehearse with him before the gig, or at least discuss the songs I had practiced. I was young. But he only arrived at the venue minutes before the performance, and I met him as he walked on stage in front of a screaming audience. He scarcely noticed me and the other band members, and just plugged into his amp, launching into a loud, rhythmic riff on his trademark rectangular guitar. He never bothered to tell me what song we were playing, what chord changes were coming, what key we were in, or anything. But, as every blues and jazz musician knows, that is how it goes. Bo and the other greats I played with often worked this way. It was a hair-raising on-the-job education. These musicians never told me what was coming next, partly because they did not know themselves. They were masters of the art of improvisation.

To play music in the oral tradition—the oldest system of music learning—I had to fumble to find the chord we were playing. That usually told me the key. Sometimes I could assume a certain chord progression and scale, but not always. Then I had to watch the bandleader like a hawk, for subtle cues—this tilt of the guitar means I solo, that slight bend of the knees means bring the dynamic down, this sudden jerk of the upper body means break, or stop. All forms of folk music performance are like this (e.g., Celtic, Polka, Cueca, Cajun, Klezmer). My friends who play classical Indian music and classical Arabic music also learn the melodies, rhythms, and

S. Asma (✉)
Columbia College Chicago, Chicago, IL, USA

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emotional aspects by this apprentice method. The term "oral tradition" is shorthand for aural/oral/visual/kinesthetic tradition. We emulate and simulate masters, until very slowly we become masterful music practitioners ourselves. This is the ancient tradition of musical learning, and it is a sophisticated form of embodied cognition.

Of course, specializing in music is a relatively modern phenomenon, common in larger hierarchical societies. If a subset of a cooperative community can dedicate large parts of their day to practicing and performing music, then it might reveal something about the prosperity of the group. When Plato is building his utopia in *The Republic*, he argues that artists arise (with warriors) only after luxury and leisure have been introduced into the previously austere community. Contrary to this notion of music as the product of leisure, there is plenty of empirical evidence that music thrives in economically challenged communities—indeed some of the best music is part of the therapeutic response to hardship. Moreover, small-scale societies may not have a "professionalization" of music per se, but everyone hums, sings, dances, drums, and so on. Some songs are memorized age-old badges of community membership, but most spontaneous music is improvised.

Improvising, in music, is the act of composing and performing simultaneously. It is easy to experiment and play (especially vocally), and difficult to master (especially instrumentally). But it is also universal, and despite the powerful human impulse to plan and program, improvisation is integral to nearly every aspect of our lives. Improvising is a style of thinking generally. It investigates and helps us come to know the world not by theory but by a method of simulation—observing, listening, acting. I would argue, in fact, that it is the most fundamental form of human cognition, one that must have evolved long before deductive and inductive logic, when the first humans began developing the skills needed for their survival in an untamed environment.

In this essay, I want to explore the cognitive roots of music generally, from multiple perspectives, like performance, composing, and audience listening. I want to do this through the explanatory lenses of development and evolution (ontogenetic and phylogenetic approaches). I will try to give a broad review of the available approaches to music, but this chapter is not a review of the literature per se. I have a somewhat didactic agenda, because I think music making and music consuming represent primordial forms of enactive cognition that are still alive and well within the modern mind.

Music, especially when considered as "beautifully useless," has posed certain challenges to evolutionary explanation. Traditional aesthetics did not imagine music along the lines of utility, but focused on its intrinsic rather than extrinsic value. Arthur Schopenhauer, for example, argued that music and art generally was to be exalted because it was one of the few human projects that did not serve the will, or human craving (appetitive urges). To our contemporary ears this may sound overly romantic or idealist, but there is something true here too. Ultimately, the challenges of reconciling music and evolution are being met, and a rich melodious explanation is slowly emerging. It seems increasingly clear, for example, that our species probably sang before we spoke (Dunbar, 2002; Mithen, 2007; Schulkin & Raglan, 2014). But the origins, functions, and even the semantics of music do not submit to simple

adaptationist just-so stories. Even Steven Pinker (1997) seemed flummoxed by the adaptive value of music and suggested that it may just be a happy accident or byproduct ("auditory cheesecake") of more general cognitive adaptations (like language).

Darwin (1872) speculated that music originates in the vocalizations of male *Homo sapiens* trying to attract and woo females. Just as song birds, Passeriformes, advertise fitness and initiate reproductive opportunities, human males—according to Darwin—adjusted vocalizations in order to appeal to females who would in turn choose the musical man over his competitors (sexual selection). From this function of sexual selection, all musical variations eventually emerged, including the songs of joy, sadness, anger, and the complex forms of virtuosity.

Herbert Spencer (1890) respected Darwin's acumen generally, but thought him overly reductionistic on the topic of music. How, Spencer wonders, could romantic cooing generate the full range of musical expression? And bird song itself cannot be reduced to sexual selection either, since it seems equally implicated in territory defense. Spencer argues instead that music originates in the spontaneous overflow of energy that we feel under certain peak psychological experiences. I will call this the "blurt theory" of musical genesis. When we are overwhelmed with sexual attraction, or grief, or rage, we have a "tendency to superfluous expenditure in various forms of action—unusual vivacity of every kind, including vocal vivacity" (Spencer, 1890, p. 4). Music starts as a purposeless byproduct of extreme emotion. But as we evolve, we give higher cognitive flavor to the essential emotional elements. Mozart, Beethoven, and others become musical geniuses, according to Spencer, when they achieve decorative sophistication (through harmony and counterpoint, for example) but retain the primordial emotional meanings. In the end, citing the deep immersion of indigenous musicians who do not experience the disinterested detachment of sheet music notation (which divides the literate musician's attention), Spencer claims that music is the language of the emotions. More recent work in affective neuroscience, which I discuss below, appears to confirm some of Spencer's general views (Asma & Gabriel, 2019; Damasio, 2000; Panksepp, 1998). But first, let us consider the dim evidence from deep time.

1 Archaeology

Obviously, music—especially vocal music—does not fossilize, and it does not leave physical traces. Ancient images of musical instruments and performances are helpful for understanding the social context and even playing techniques of instruments (Both, 2009), but unlike stone tool technology, it is very hard to get a clear picture of music before pictorial representation and written forms. The oldest written music notation may be the ancient Mesopotamian "Hurrian Hymn," which is a cuniform tablature for lyre, dating around 1400 BCE. Chinese drums made of animal skins date back as far as 5000 BCE. And Upper Paleolithic bone flutes are around 40,000 years old. Vocal music and drumming on natural objects could be much

older, possibly even pre-sapiens, or even pre-Homo. There is no reason to think that music emerged suddenly in the Upper Paleolithic along with flutes and pictorial representation.

Small group, family-level *Homo sapiens* of the prehistoric age satisfied the necessities of life with simple technology based on hunting, gathering, and plowless agriculture. Their social and economic structure was likewise relatively simple and depended on the immediate task at hand rather than on status hierarchy. Yet we find evidence of aesthetic behavior far back in prehistory. Over 160,000 years ago (kya), we observe the construction of grindstones and pigments in the material culture of *Homo sapiens*. Around 70 kya we find remnants of ornamental beads, presumably for social purposes. In the Aurignacian cultural period (35–25 kya) of the Upper Paleolithic (40–11 kya) we find the famous instances of cave images (McBrearty & Brooks, 2000). Approximately 300 sites of Paleolithic parietal art of this period reveal representation in painting, engraving, sculpture, jewelry, as well as fragments of bone, antler, and ivory with patterned markings, and notably, flutes made of vulture bones (Clottes, 1996, 2016; Vialou, 1996). While prehistoric art served many purposes, including mythic and aesthetic functions, the relation between art and experience in the evolution of social technologies seems to indicate the engendering and memorializing of spiritual emotions (Asma & Gabriel, 2019).

In southern Germany, at Hohle Fels cave, flute fragments were discovered that date back 42,000–43,000 years ago. There is debate as to whether Neanderthals had flute technology, or whether it is a strictly *Homo sapiens* instrument. A cave in Slovenia contained a "flute" made from a cave bear femur, dubbed the Divje Babe flute. It was thought to be played by the Neanderthals who lived in that region, but in 2015 some archaeologists argued that the "diatonic scale" holes were merely accidents of hyenas chewing on the bones, punching serial hole patterns that we misinterpreted (Diedrich, 2015).

Ambiguity is very common in trying to assess prehistoric music technology. In England, three decorated cylinders made of local chalk, called the Folkton Drums, were found buried in a child's grave from around 3000 BCE. Archaeologists cannot even agree if these are musical drums, or just drum-shaped decorative objects (Longworth, 1999).

An alternative approach to understanding prehistoric music is fraught with challenges and arguable assumptions—namely cross-cultural comparative study of modern human tribes, indigenous or small-scale social groups. How, we might ask, are modern Sioux tribes, African pygmy groups, Australian Aboriginals, Yupik tribes, and so on, making and using music? The subsistence lifestyles of such modern indigenous peoples replicate the hunter–gatherer conditions of the Upper Paleolithic period and the early agricultural conditions of the Holocene, but there is no guarantee that current practices recapitulate ancient ones. Still, good work has been done in this area (Killin, 2018; Morley, 2013), and some of the functional generalizations below rely in part on some of this comparative research. At the very least, such research provides us reliable insight into the possible uses of music.

The ephemeral nature of oral-tradition music is especially frustrating for historians and evolutionists because storytelling songs in particular act as the "cloud

storage" for the wisdom and the adventures of a culture (Gioia, 2019). If you wanted to know about a people or even a specific person within a culture, you consulted the singer—who was also a kind of shaman. In the Old English epic poem *Beowulf*, for example, we learn that one of the greatest honors that can grace a hero (and one of his principal motivations) is to have songs sung about him—songs that will go on after he is long dead. The tradition of singing your tribe's cultural achievements can also be seen, for example, in the African griot. The griot is a West African poet, singer, musician, who acts as a repository of local knowledge, an entertainer, and an adviser to power. Their function was reconfigured in American music history, in the form of the Blues and Gospel singers of the Jim Crow era.

Songs do not just contain information and historical legends, they also transmit values. They explicitly or implicitly teach norms and social mores, having to do with sexuality, filial duty, war, and so on. From time immemorial, for example, songs have been about sex (Carpentier, 2014). Fertility festivals and seasons would have been driven in large part by songs, and even a recent study of *Billboard* top-ten chart songs revealed that 92% of the songs refer repeatedly to sex (reproductive phrases) (Gioia, 2019). When I toured with bluesman Buddy Guy, he used to shout encouragement to the band, "Let's make it so funky they can smell it!" When asked to explain what funk music is, James Brown once said, it's music that smells like sex.

I will not spend much time discussing song lyrics, even though they are obviously of paramount importance. This is because lyrics are a subset of storytelling behavior, and excellent scholarship has been done and is being done on the evolution of storytelling (Carroll, 2011; Gottschall, 2013). Instead I will tend to emphasize the uniquely sonic, melodic, harmonic, aspects of music, as they relate to experiences and functions.

2 Adaptation

If music is not auditory cheesecake, then it has been selected for because it gave some advantage to music producers and consumers. The mechanisms of evolution have broadened recently, since the decline of strict Neo-Darwinism in the twentieth century. Most importantly, many evolutionary researchers (Henrich, 2017; Richerson & Boyd, 2005) have argued persuasively for gene-culture coevolution. Cultural inheritance is profoundly important for human survival and cultural traits can be selected and sustained over thousands of generations, but may not be genetically significant. Behavioral changes (e.g., fire-starting, hunting technique) and even anatomical changes (e.g., training offspring for large leg-muscle mass, cultural dietary traditions) can be taught and passed down culturally to offspring, giving them significant survival advantages, when there is no specific dedicated genetic circuitry for those specific traits.

We are certainly pre-adapted for music, as I will discuss below, because we have the cognitive and biological architecture for making it, but music is also a clear case of cultural inheritance. And it can be advantageous for the individual organism, as

well as the group, so levels of selection are varied. The means by which music replicates is also varied. It has horizontal spread across contemporaries in a community, as a prehistoric campfire song and a pop-music radio hit can catch fire and spread to many people sharing the same real-time lifespans. But it also has vertical transmission, since elders teach youngsters songs, styles, and techniques, carrying on musical traditions for centuries. Rather than "genes for music" it is probably the case that music learning is downstream from our cognitive capacities for social learning (Heyes, 2018).

So, what are the selectable uses and benefits of music? Music is a form of psychological catharsis and emotional management, a form of communication, a form of recreation, a form of social bonding, and a form of spiritual cultivation and communion.

There is increasing evidence that musical training improves our powers of attention (Medina & Barraza, 2019). The more musical training you have, the more you are able to shut out distracting irrelevant information while performing a demanding task. Musical training at a young age has also been shown to prevent speech hearing reductions common to people as they grow older (Bidelman & Alain, 2015). The musical activities of youth constitute a kind of brain training that contributes to greater neural plasticity, and this remains advantageous much later in life. Children who play music also show greater abilities of emotional control, and diminished anxiety (Hudziak et al., 2014). People who can play a musical instrument also show greater connectivity between the hearing and motor control areas of their brains. Additionally, instruments that require two hands, like piano or guitar, create greater motor autonomy between the two hands generally (Palomar-García, Zatorre, Ventura-Campos, Bueichekú, & Ávila, 2017). Some studies have shown that people with musical training are better at hearing and identifying plaintive cries buried within noisy environments (e.g., a baby crying), suggesting adaptive social uses for musical sensitivity. Music has also been shown to provide powerful analgesic effects, reducing the need for post-operative painkillers (Bernatzky, Presch, Anderson, & Panksepp, 2011). There are many more empirical studies showing that music helps humans hear better, move better, think better, and feel better.

A recent cross cultural study (Mehr et al., 2019) performed a big-data analysis of two massive data sets (NHS Ethnography and NHS Discography), and found that music is not only universally present, but has clear ties to specific behaviors like religious rituals. Moreover, robust evidence reveals that all cultures employ music in healing behaviors, dance, and infant care.

Music is also a powerful way to bond independent individuals into a common collective. Music makes people into a "team" or "tribe." Think about losing yourself in the undulating audience of a rock concert, feeling like you are one with everyone. Or consider the strange sense of allegiance one feels at the beginning of a sporting event, when everyone rises and sings the national anthem together. In part, music evolved to glue us together in social cooperative groups, because we are a highly dependent species and need each other for survival (Schulkin & Raglan, 2014). Such bonding starts in the intimate musicality between mother and baby (motherese

or baby-talk), but then it is broadened by coordinated social rituals—creating opportunities of shared intentionality across larger groups.

Musical taste is both a way to distinguish ourselves from others—asserting our individuality, and a way of melting into a crowd and being a part of something bigger (e.g., fan cultures). These functions seem even more pronounced in our large-scale urban societies where individuality and group membership are always being tested, challenged, and reasserted. The counter-culture movement of the 1960s and the early Rock and Roll era before it were self-conscious music cultures that employed music to signal rebellion, autonomy, group membership, and so on. After 9/11, music was part of many healing processes (e.g., composer John Adams composed a choral work entitled "On the Transmigration of Souls"), but also mainstream music grew more patriotic (e.g., Country-pop music), and countercultures and subcultures also expressed their dissatisfaction with dominant narratives through music (e.g., a resurgence of punk music).

These are contemporary imaginative cultures that recreate age-old social uses of music. Long before higher cognition turns our emotions into principled philosophies, it is the work of simpler social and cultural "institutions" to shape and sculpt our feelings into adaptive resources. Anthropologist Polly Wiessner studies how informal institutions, like speech patterns, behavioral traditions, and rituals, shape emotion and cognition (2014). Songs, for example, are important mechanisms in cultivating and directing adaptive emotions. The Enge peoples of New Guinea, for instance, solve ecological and political challenges in part by musical group manipulation. When a group of friends split into two hostile factions, as sometimes happens during competition for resources, the newly opposing groups will rile-up violence by singing songs that demonize their new enemies—songs that describe the opponent families as practicing incest, or describe the opponent women as having thorns in their vaginas, and other dehumanizing narratives. But after several months of warfare and a few casualties, the enemies grow weary and begin to sing peacemaking songs, and songs of consolation. The new songs down-tune the anger and shift the emotional state to one of reconciliation. This leads to expressions of care, and then meals are shared together between the groups. The songs and the meals pacify the rage, and foster prosocial emotions and behaviors (University of California Television (UCTV), 2014).

Music also marks territory. Sometimes we are using music to say, "we are the people who sing these songs, not those other people." Hagen and Bryant (2003) proposed that the evolution of human music and dance was rooted in coordinated auditory and visual territorial advertisements, like the sonic signals produced by other mammal carnivores. Hominid proto-music, in essence, might have been functionally analogous to the howling of wolves (Hagen & Hammerstein, 2009).

Ecological psychology and social psychology are helpful ways of reframing the adaptive aspects of music and art generally. Music is an embodied and enactive form of knowing—coming to understand the environment (physical and social) as well as the self. Given the universal demands of social life (e.g., procreation, affiliation, dominance, cooperation), we can consider music and dance (which are

almost inseparable) as ways of problem solving. I want to suggest that music and dance are ways of adapting and even *thinking with your body* (Asma, 2017; Tversky, 2019).

Like other animals, as Darwin suggested, we use dance and song to demonstrate our fitness to potential mates. Ritualized body movement and song is both a show of health in real-time, and a symbolic promise of health for future genetic investment (offspring) and nurturing. Music composition as a signal of potential fitness has been empirically tested on contemporary women, and attraction to complexity of composition changes in step with estrus (Charlton, 2014).

Moving the body and voice in sequential patterns can also communicate rich environmental information to members of your group. Even bees perform a waggle dance that informs other bees where to fly in order to find nectar, pollen, water, and other resources. The body can create a map, and even *be* a map, for other hive or tribe members that need to navigate space. And musical communication can indicate where allies and enemies are located, creating an adaptive sonic map before language.

In addition to these uses of music and dance, body movement and singing that is synchronized is especially pleasurable. Like other forms of social grooming, the body produces internal opioids (like endorphins) during ritualized rhythmic song and dance. In fact, music and dancing form a tour de force of neurochemical pleasures: serotonin, epinephrine, endorphins, and dopamine. Pain is blocked and euphoria is increased in the musical experience. Unsurprisingly, a team of researchers recently found that group dancing raises endorphins considerably and contributes to social bonding (Tarr, Launay, Cohen, & Dunbar, 2015).

Researchers Hagen and Bryant (2003) suggest that synchronized dance or ritualized body movement would have sent a very strong signal to competing groups: do not mess with us, because we are a unified and formidable group. Coordinated dance and song is a strong form of coalition signaling. Imagine two competing tribes facing down each other over some resource or territory. If one of them jumps, stamps, sings, and generally grooves together like a giant single organism, it signals to the other group that these guys are going to stick together in a fight. A small but coordinated group of warriors can do much more damage than a large but loose coalition. And the performance signal is high fidelity, because it cannot be faked. Groups can pretend or fake strength with bravado and unorganized shouts, but synchronized dance and vocalization actually demonstrates strength directly. Ritualized performance *shows*, instead of merely *says*, the group is highly cooperative and has significant history together. Contemporary Samburu and Maasai of Kenya, along with many other tribal peoples around the world, still perform a synchronized warrior dance that is remarkably coordinated and intimidating for any potential enemy to witness. Indeed, modern militaries around the world still use forms of synchronization or entrainment as intimidation.

3 Structures

The component parts of music, or the structural elements, are worth considering when we think about the evolution of music. We can reverse engineer or anatomize any song, and find the distinct markings of earlier songs, traditions, and elements. Muddy Waters said: "The blues had a baby, and they named it rock and roll." Inside most pop music we find the structures of blues—12-bar chord progressions, pentatonic scales, call-and-response, and so on.

Of course, genres have clear structures—jazz relies heavily on AABA American songbook structure, classical rondos might be ABA, and songs can be dissected into common structural elements like verse, chorus, and bridge. But what are the cognitive structures underlying music as an evolved human activity?

Pitch-bending, for example, is a physiological and cognitive aspect of human singing that is hard to find among other animals. Some scholars think it is a crucial structural aspect of human music because it can be used for social coordination and emotional unification in a group of singers and listeners (Brown, 2000).

Alternatively, consider the phenomenon of rhythmic synchronization. Ethnomusicologist Ingrid Monson, interviewing Jazz player Cecil McBee, describes the aesthetics of rhythm as a wave, and "you understand that particular pulse, where emphasis is placed on two and four … The moment you pick up the instrument and put it into motion you're supposed to *feel* that, and then the other things kind of ride the wave" (Monson, 1996, p. 27). An emphasis on the off-beats has a well-known ability to inspire listeners into rhythmic participation. "An entire room of people clapping on 2 and 4 in a gospel service, for example, has the power to motivate all but the most resistant to clap along" (Monson, 1996, p. 27). This ability to sync to a beat and subdivide time inside a beat is called *entrainment*. Without entrainment animals cannot synchronize tightly. Dancing is out of the question, as is most synchronized singing.

Rhythm is infectious for humans. If one person bangs a drum rhythmically, another person can move their feet, bob their head, or bow their trunk in time to the beat. Next, another person or group of people can start to synchronize the same motions to the same beat. Before you know it, you have a whole tribe in a groove together. This seems relatively simple to us because it is so universal in humans and requires little or no training. But other animals, even our closest cousins, fail miserably to get a decent groove going (Cook, Large, Hattori, Merchant, & Patel, 2014). There are rare exceptions—like Snowball the dancing cockatoo, and some chimps—but most animals seem incapable of synchronizing their own bodies to a beat, and coordinating multiple bodies to a pulse is nigh impossible (Honing, 2019).

Recursion is another deep structural component of music. Language is recursive in the sense that we can keep embedding one clause inside another and adding preposition onto preposition, and there is no upper boundary (syntactically) on this ability. One of the major arguments in the evolution and philosophy of language is how humans arrive at our grammar recursion and embedding ability. It is hard to see how social learning dispositions can give humans this syntactical ability—which is

why Noam Chomsky postulated a hypothetical "language acquisition device" in the brain. My own view is that recursion is evidenced in other human cognitive abilities, like motor task grammar for complex behavioral sequences (Asma, 2017), and also in music.

Music has similar syntactical properties as language. Did the properties derive from language or did they precede it? "Blue Moon" by Rogers and Hart, or "Yesterday" by Lennon and McCartney, have AABA structure, which is the classic American song form; 8 bars of the same chord pattern (A1), followed by a slightly modified repeat pattern for 8 bars (A2), then 8 bars of the bridge pattern of chords (B), and finally a return to the original 8 bars (A3). Music is built on such repetition, and it is reasonable to suppose that even stone-age flute music had "parts" in repeated sequence, and parts embedded within other melodic passages (like dropping a "B" sequence or "clause" in-between the recursive A patterning). As Steven Mithen (2007) puts it, "recursion is one of the most critical features of music" (p. 17).

Recursion, as a power of the human mind, probably owes as much to music and dance, as to language and math. Dance is a foundational example of simulation and sequencing. The dancing body is another example of pre-linguistic "grammar" because it has infinite recursion and "step" embedding. A good dancer can subsume many subroutines inside a larger frame of movement repetitions. The basic Tango is a 5-step pattern (slow, slow, quick, quick, slow), using 8 musical counts. I cannot see cave-men doing the Tango, but they may have been doing something equally complicated. There may be something special and uniquely human about recursion and embedding, but we would be wrong to think this is only a feature of language.

I agree with anthropologist Steven Mithen that a crucial feature of *Homo sapiens*' mind is "cognitive fluidity" (Mithen, 2007). This fluidity breaks down the dedicated brain circuitry that ties one action-response to one stimulus. Our minds become less machine-like because we can entertain counterfactual images and enlist alternative responses. Most evolutionary psychologists and philosophers have assumed that the cause of this cognitive fluidity was the development of language (in the late Pleistocene), because language provides an obvious syntactical/grammatical system for manipulating representations. This system seemed to be the perfect girder network for expanding the inner headspace of flexible cognition. But more recently, Mithen has argued that another system, namely music, coevolved in parallel with language and gave pre-*sapiens* similar ways of projecting possible futures. I would push this insight one step further, suggesting that, more than just music per se, a suite of embodied creative abilities—dance, image, music, gesture, etc.—built up an inner space and behavioral space of options that freed *Homo* from the more deterministic patterns of other hominids. These creative improvisation skills emerged from earlier mammalian habits that manage resource exploitation and social cohesion, and they were emotionally (affectively) driven (i.e., habits like grooming and play fighting). Play, for example, would be selected for because it allows mammals to take threats (and dominance) off-line and rehearse for them in safe environments. And such proto-imagination play is done largely through the body, without much cognitive motivation or even understanding. Music has the

ability to represent things and feelings, when the original stimuli are no longer present. Sad and mournful songs, for example, can put an otherwise happy audience, sitting around a campfire or concert hall, into a virtual reality of grief and loss (Taylor & Friedman, 2015). And like any good communication system, refined over eons, music can do this reliably.

While we are considering the "virtual reality" aspect of music—wherein representations are taken offline or decoupled from perception—we need to acknowledge that memory is a crucial deep structure beneath music. A mother sings directly to a child or a cantor chants a hymn in real time, but music also plays in our heads later. Music in real-time can be taken off-line so to speak, and play occasionally or continuously (sometimes irritatingly so) inside our minds. Memory sophistication is requisite when I hum a melody in my head. And eventually a more complete explanation of the origin of music will need to understand the relationship to semantic, episodic, and procedural memory (Groussard et al., 2010). Along with navigational mapping abilities and flint knapping sequences, it is probable that social pressure on musical facility may have helped improve procedural memory, as our ancestors strove to remember and reproduce melodies and beats.

4 Neural Systems

Any discussion of the underlying structures of musical cognition needs to consider the neuroscience and brain imaging data. Mirror neurons, for example, may be the cognitive architecture of imitation that connects our sensory representations of another agent or action to a motor representation of the same action. So, I see a hand grasping, and this matches with an inner motor sense or feeling of my own hand grasping—these are "matching vertical associations" (Heyes, 2018). Observational learning requires a conversion of visual or auditory patterns to bodily patterns (action and affect), and mirror neurons act as the requisite converters. When I hear these sounds (e.g., lullabies), I feel these soothing experiences (e.g., mother's touch and a flood of oxytocin), and an adaptive association is forged that can be drawn upon for emotional regulation ever after. Mother–infant interaction, with its strong physiological, emotional, and even sonic synchronizing, may have helped create proto-music as early as *H. heidelbergensis* (Dissanayake, 2000, 2015).

Recently, there has been some fMRI data to confirm that music and speech are processed in different parts of the brain (Angulo-Perkins & Concha, 2019). Musically sensitive areas of the brain were found in the anterior and posterior temporal gyrus (planum polare and temporale), the right supplementary premotor areas, and the inferior frontal gyrus. Speech-sensitive areas, by contrast, were found on the left pars opercularis and the anterior portion of the medial temporal gyrus. It is not entirely clear what this means in terms of evolution, but it lends some corroboration to the theory of pre-linguistic or paralinguistic music communication among pre-sapiens.

Since the development of EEG technology, in the 1920s, we have seen evidence that the brain has a Default Mode Network or DMN. This is the brain phase that we slip into once we stop attending to specific things or tasks in the external world. It consists of medial or middle brain regions, like the medial prefrontal cortex (mPFC), the posterior cingulate cortex (PCC), the hippocampus (in the medial temporal lobe), and the amygdala (in the medial temporal lobe). This brain system is active when we are in wakeful rest, like mind-wandering or daydreaming, introspection, and other non-directional or low attention states of mind. As a default system it characterizes our *goal-irrelevant* frame of mind. And it contrasts strongly with the Task Positive Network or TPN, which consists of more peripheral brain regions (lateral prefrontal cortex (lPFC), the anterior cingulate cortex (ACC), the insula, and the somatosensory cortex). The TPN underscores our focused attention and goal-directed activities—everything from concentrating on a chess game, or analyzing a mechanical problem, to baiting a fish-hook or solving a math problem.

Some new fMRI evidence suggests that the DMN becomes more active during musical composition, suggesting that it is an important system in creativity. The DMN is in strong communication with the anterior cingulate cortex (ACC) during composition. The ACC (usually more active in the task positive network) acts as an interface between the more rational deliberator functions of the frontal brain and the emotive aspects of the limbic brain. The strong communication between these two areas during creative composition leads some researchers to speculate that the ACC might be providing the otherwise goal-less DMN with some measure of focused intentionality. This may be the brain communication underlying the artist's active manipulation of daydreaming imagery and impressions, rather than just passive mind wandering. Using a rich flow of potential images, sounds, impressions, memories (dominant in DMN), the creator harnesses them into organized narratives or compositions by attending to some rather than others, by discerning implications, by framing context, and embedding subsections (i.e., activities more dominant in the TPN). On this view, imaginative activity is a *toggle* between decentered associational mind (i.e., L-state and DMN) and goal-directed intentionality (i.e., F-state and TPN). Even this complicated story is still too simple to capture what is happening in the brain.

Fascinating recent research on the improvising brain reveals some of the neural architecture that underlies the toggle. Cognitive ethnomusicologist Aaron Berkowitz (2010) found that improvising musicians in an fMRI machine enlist the anterior cingulate cortex, ACC, to a significant extent. The ACC is one of the filters or switching stations wherein competing cognitive options and affective values become preferred or chosen. But Berkowitz worked primarily with classical musicians who branched out slightly from established compositions, in improvisational cadenzas. A complementary study by Charles Limb and Allen Braun (2008) opened up the experiment to include different kinds of improvisers, notably jazz musicians and freestyle hip-hop rappers. Limb and others like G. F. Donnay, Rankin, Lopez-Gonzalez, Jiradejvong, and Limb (2014) have continued these experiments and begun a new wave of research into spontaneous creativity. The studies reveal that

the lateral prefrontal cortex (lPFC) deactivates during improvisation, while the medial prefrontal activity increases. What does this mean?

It suggests that improvisation succeeds when we shut off our higher order consciousness, particularly self-monitoring awareness, and we let the default mode network (DMN) do its thing. The lPFC is one of the "brakes" or censors in the brain, and the adept improviser is able to disengage the brake so to speak, allowing the usually filtered associations and behaviors to flow more freely. This state of decreased control is sometimes called "transient hypofrontality"—meaning, temporarily reduced frontality. Removing the brake is the last step in the improviser's series of preparatory behaviors and habits that help her access the note patterns, or rhymes, or free associations that characterize spontaneous creativity.

5 Emotion

Why do we like sad songs? Why do we become aggressive when listening to certain Eminem or Black Sabbath records? Why do we feel amorous when certain Marvin Gaye or Beyonce songs play? Are there chords, melodies, and beats that similarly trigger universal human emotional systems?

Playing a tritone pattern like F and B, or A and Eb, is dissonant and disturbing for most people, while the Ionian major scale is universally heard as happy (Azib, 2017). The Beatles' song *She Said She Said* and the Rolling Stones' song *Satisfaction* are primarily in Mixolydian mode (i.e., note scale intervals of whole, whole, half, whole, whole, half, whole). The Miles Davis piece *So What* and the Lady Gaga song *Telephone* are largely in Dorian mode (i.e., note scale intervals of whole, half, whole, whole, whole, half, whole). These have distinctly different emotional qualities, but it is unclear if they are heard universally with similar feeling-states.

No discussion about the meaning of music would be complete without special consideration of the emotional aspects of musical communication. On the one hand, the relationship between music and emotion is obvious, phenomenologically speaking, but strangely opaque from the scientific perspective (Koelsch, 2015). This is largely because debate still rages around the question: What are emotions? Recent work by constructionists like Lisa Feldman Barrett (2017) has galvanized a cadre of skeptics who think there are no biological emotional systems that we inherit from our ancestors, or share with our mammal cousins. My own view harmonizes with the opposing tradition, which argues that we have inherited a small number of primary emotions from our phylogenetic history (affective systems). We share these affective systems with other mammals, and our neocortical conceptual sophistication transforms these into additional uniquely human emotions.

Following Panksepp, I contend that all mammals share seven foundational affective systems: FEAR, LUST, CARE, PLAY, RAGE, SEEKING, and PANIC/GRIEF. Each of these has specific neural electrochemical pathways, with accompanying feeling states and behavior patterns. Human beings are not just an assembly of mental modules or even emotional circuits. The affective systems are

hierarchically structured in three layers of interpenetrating brain activities: primary, secondary, and tertiary functions. Mindbrain processing is stacked like a layer-cake. At the very bottom or at the "core" are the instinctual drives, like fight or flight, and the raw motivations of intentional seeking. This primary-process layer is housed largely in subcortical areas of the brain.

Primary-process emotions are (1) sensory affects (sensorially triggered pleasant-unpleasant feelings), (2) homeostatic affects (hunger, thirst, etc. tracked via brain-body interoceptors), and (3) emotional affects (emotion action tendencies) (Panksepp, 2011).We share these primordial affective systems with all other vertebrates. This layer heavily influences the layer above it, secondary-process emotion, which is more developed in mammals.

Secondary processing includes social emotions, like GRIEF, PLAY, and CARE. It is distinguished from the primary level because it can be sculpted by learning and conditioning. It is the layer of soft-wiring (part native instinct and part learned association), as compared to the hard-wiring of primary level emotion. Panksepp describes secondary-process mind in terms of (1) classical-conditioning, (2) operant conditioning, and (3) emotional habits. Emotions in primary and secondary layers are largely unconscious, and even when we are regulating them, we do not have clear introspective conscious access to their functioning (Winkielman & Berridge, 2004).

Lastly is the top layer of the mindbrain: tertiary-process emotion. This is the layer of mind that most philosophers and psychologists tend to focus on exclusively. Here the emotions are still connected to the primary and secondary processes, but they are intertwined in the cognitive powers of the neocortex. Ruminations and thoughts, underwritten by language, symbols, executive control, and future planning constitute the tertiary-level, though they are energized by the lower level emotion. These ruminations and thoughts also serve as top-down regulators and directors of emotion. At this third level, we arrive at uniquely human emotions, like those elaborate and ephemeral feelings so beautifully articulated by introspective artistic savants like Dostoyevsky, Lennon and McCartney, and Gershwin. Tertiary affects and neocortical awareness function as (1) cognitive executive functions, (2) emotional ruminations and regulations (generally located in the medial frontal neocortex), (3) free will, or reflective intention to act (frontal cortical executive functions).

The biological and psychological sciences have historically isolated or focused on one layer of mind to the exclusion of others, and thereby presented partial and sometimes conflicting pictures of mind and behavior. Many computationally oriented cognitive scientists tend to focus on tertiary-level processing, while behaviorists focus on secondary-level processing. Rami Gabriel and I have argued (2019) that the seeming hostility between the emotional constructivists and the emotional naturalists is also more a matter of selective attention on the top or the middle, or the bottom of the emotion layer-cake.

Some music-based emotion studies seem to confirm this view of the emotions, shedding light on the question of musical universalism. A fascinating study in 2015 exposed 40 Canadians and 40 Congolese Pygmies to musical pieces (approximately equal number of Western and Pygmy songs) (Egermann, Fernando, Chuen, &

McAdams, 2015). The participants were continuously measured for emotional responses, including subjective feeling reports, facial expressions, and physiological arousal. The physiological responses to music were measured by using a respiration belt, a blood volume pulse monitor, an electrodermal monitor, and facial muscle detectors. Generally speaking, the subjective reports about the meaning of the music, and even the emotional feelings were quite diverse and varied, as Canadians and Pygmies evaluated the same musical pieces. This suggests, to my mind, considerable flexibility and even idiosyncrasies at the cultural/cognitive level (secondary and tertiary emotions). However, physiological readings were very consistent across cultures as they measured arousal states. Faster tempos aroused both cultural groups in very similar ways, and certain pitches elicited similar physiological responses, suggesting that acoustical characteristics of music like tempo, pitch, or timbre are activating pre-cultural affective systems.

Another study (Fritz et al., 2009) showed that native African Mafa people listening to Western music for the first time successfully identified three basic emotions in respective songs (happy, sad, and fearful). Investigators interpreted this to mean that expression of basic emotions in Western music can be recognized universally.

The means by which emotional systems may be triggered universally is unclear. Some sonic ingredients (e.g., beat tempo, volume) may be universally impacting perceptual/motor systems in a way that activates subcortical responses—analogous to universal startle effects. But emotional contagion is also clearly implicated, and such contagion is probably underwritten by the same mimetic simulation systems that spark empathy in social scenarios.

The view from the stage, so to speak, reveals musicians actively engaged in embodied cognition, but the view from the audience (and the dance floor, and the mosh pit, etc.) also reveals social unifying practices via altered states of consciousness. Often these are spiritual experiences. In high school I followed the *Grateful Dead* around for a summer. With the other 20,000 audience members, I would drop some psychotropic substance in the afternoon, and be high as a kite by the time Jerry Garcia started noodling guitar riffs in the evening. The Woodstock music festival of 1969 formed the template for this kind of collective, consciousness-altering concert tradition, but Woodstock was really just a safe bourgeois version of the ancient Dionysian and Bacchanalian revels of Greek and Roman culture. Music has always played a part in cultural traditions of ecstasy. Ecstatic festivals use repetitive rhythms and melodies to break down individual egos and merge them together into social super-organisms. Electronic dance music mosh-pits are almost akin to participating in a Sufi whirling dervish ritual, as individual egos are blown-away in search of collective transcendence (Redfield & Thouin-Savard, 2017; Vroegh, 2019). The transcendence, however, is not Cartesian separation from the body, but communal identification with other bodies.

6 Aesthetics

None of what I have discussed here is designed to reduce or eliminate the important work of traditional aesthetics. Music is useful, and adaptive, and therapeutic, but also it is (and will always be) "beautiful," and "sublime," and "inspiring," and even "sacred." Figuring out why Mozart is beautiful and Stravinsky seems sublime, or why music makes life meaningful, will not be captured entirely in the net of scientific explanation. We also need humanities and philosophical reflection on music that explores the rich connotative, even personal idiosyncrasies of music. Reflecting on emotional resonance and music, my colleague Madeline Cole tells a relatable story about their idiosyncratic connections:

> Something as cheesy as *Africa* by Toto, or *Copacabana* by Barry Manilow, and even the musical *Joseph and the Amazing Technicolor Dreamcoat* have a powerful emotional effect on me, personally. I listened to classic rock in high school because it was the only radio station in my car that worked. Therefore, when I listen to it now, I feel emotions linked to the feelings I had as a teenager driving my own car for the first time. Something like *Joseph*, though very bizarre, is something my grandmother constantly had on. It's debatable what I took away from it as a religious/moral lesson, but the songs still make me feel a level of comfort, like anyone would with their grandmother. Even songs that are, on a technical level, bad can invoke these positive feelings in us because of the conditioned associations.

Instrumental music in particular is a unique realm of non-representation or pre-representational meaning. The difficulty in expressing its meaning through propositional discourse is a necessary result of its origins in pre-linguistic embodiment. The meaning in music, I submit, is deeper and older than language.

As an evolutionary naturalist I am not inclined to think that a Bach mass, an Arabic Salah, a Rastafarian song, or a gospel hymn are literally *representing* or *presenting* God per se. But such music is indeed the stuff of life, however you relate it to metaphysics. In his *Twilight of the Idols*, Nietzsche famously said: "Without music, life would be a mistake." Even an evolutionist like myself cannot disagree.

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Part V
Visual and Plastic Arts

The Influence of Image Salience on the Artistic Renditions of Cave Lions in the Early Upper Paleolithic

Richard G. Coss

The heuristic aim in this chapter is evaluating the neurobiological and behavioral evidence suggesting that humans retain ecologically relevant elements of felid-predator recognition shaped by natural selection that could influence the portrayals of large-bodied cats in prehistoric art. Emphasis will be given to identifying the salient visual properties of extinct cave lions (*Panthera spelaea*) that likely influenced the anatomical accuracy of their renditions in cave drawings and mobiliary figurines in the early Upper Paleolithic of Europe.

Visual-image salience emerges primarily from the ecological context in which it is perceived. Such distinctiveness requires the perception of difference between the target of visual fixation and the surrounding features (cf. Nothdurft, 2007; Simons, 2000). This figure–background contrast applies to both the lowest level of neural organization and the highest level of perceptual organization that shapes the interaction of the organism with its environment. However, perceptual contrast alone does not account for why some images "pop out" from background settings. When viewed from the perspective of perceivers, image salience can be magnified by its meaningfulness in a particular setting that can reflect innate perceptual properties coupled with a history of prior exposure of its predictive properties in ecologically relevant circumstances. I will explore this conceptual framework of perceived context as I develop my argument for how salient visual features of dangerous felids influenced visual imagery, working memory, and artistic expression.

R. G. Coss (✉)
University of California, Davis, Davis, CA, USA
e-mail: rgcoss@ucdavis.edu

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1 The Implications of Innate Face Recognition and Contextual Assessment

Human neonates exhibit the innate ability to recognize schematic faces at close viewing distances shortly after birth (Goren, Sarty, & Wu, 1975; Jirari, 1970), indicating a "predetermined epigenesis" (see Gottlieb, 1973, p. 9) of functioning subcortical neural pathways directing visual attention. Subcortical face perception was inferred initially because the infant's visual cortex is undeveloped at birth (Johnson, 2005; Johnson, Senju, & Tomalski, 2015). Human infants do exhibit a sparse pattern of synapses in visual cortex at 8 months of age, followed by synaptic overproduction by 500 days of age with slow pruning until age 11 years (Huttenlocher & Dabholkar, 1997, p. 170). Even with low synaptic density in visual cortex, infants are still capable of discriminating fearful faces at 7 months of age, an ability suggestive of subcortical facilitation (Peltola, Leppänen, Palokangas, & Hietanen, 2008). While the sparsely connected visual and temporal cortices might play a role in recognition processes, the most likely neurological source for face perception by newborn infants is visual input via the retinotectal pathway to the superficial layer of the superior colliculus (SC) (Rafal et al., 2015). Electrophysiological recordings have found that SC neurons in Japanese macaques (*Macaca fuscata*) respond to high-contrast face-like patterns including two-facing eyes (see Fig. 6A in Nguyen et al., 2014).

Visual-image stability is critical for pattern recognition. As recorded electrophysiologically in rhesus macaques (*M. mulatta*), stable visual images are perceived because the SC alerts the cortical frontal eye field that saccadic eye movements are about to occur, a process guided by the SC's intermediate layer projecting to the cortical frontal eye field via the mediodorsal thalamus (Sommer & Wurtz, 2004, 2006). Functional maturation of this subcortical visual pathway for face recognition occurs prior to birth several weeks after fetal eye opening. During clinical evaluations, preterm infants have exhibited distress when looking at a human face (discussed in Coss & Goldthwaite, 1995). More specifically, research using upright and inverted triangular arrays of three light-emitting diodes placed on the mother's abdomen recorded reliably greater fetal head orientation toward the upright face-like array of lights (Reid et al., 2017).

The superior colliculus is considered an essential neural structure for innate object recognition in early development (Sewards & Sewards, 2002). In fish, birds, and reptiles, the evolutionary homologue of the superior colliculus is the optic tectum, a phylogenetically ancient structure for regulating visual attention and action (Tamietto & de Gelder, 2010). Research on tectally dominant species, such as fish and birds, has shown that face-like patterns with two conspicuous eyes can be provocative and engender caution or rapid defensive behavior (reviewed by Coss & Goldthwaite, 1995).

While the superior colliculus plays a role in low-frequency (softly blurred) face perception, the higher level of cortical visual-pattern integration occurs within the occipitotemporal network. Electrophysiological recordings and functional magnetic

resonance imaging of the anterior portion (TE) of the inferotemporal cortex (IT) of macaques have revealed a mosaic of nonadjacent "face patches" that contribute to distinguishing faces with different orientations and non-face objects (Freiwald & Tsao, 2010; Moeller, Freiwald, & Tsao, 2008). Freiwald and Tsao (2010) suggest that the face-processing system "interdigitates with representations for other objects implementing the same three view stages" (p. 6). Rather than identifying specific faces, single neurons within face patches appear to use a coordinate system to measure facial structure for feature integration, a process likely applicable to non-face objects throughout the IT (Chang & Tsao, 2017). Similar to patches at a much smaller anatomical scale, clusters of axon terminals are evident in macaque IT in which pyramidal cells in layers 2 and 3 radiate collateral axons horizontally that terminate on layer 5 cells in nonadjacent neural columns (Fujita & Fujita, 1996). Humans also exhibit face patches in the fusiform gyrus that is anatomically equivalent to the macaque TE (Tsao, Moeller, & Freiwald, 2008).

While single-unit recordings of neurons in macaque TE face areas show broad tuning to schematic face-like patterns (Minami, Tamura, Fujita, & Tanaka, 1995; Tanaka, 1996), they also respond to photographs of unique macaque and human faces (Perrett, Rolls, & Caan, 1982). The human fusiform face area also responds similarly to faces in a manner that appears to be "genetically specified" (Kanwisher, 2010, p. 11165). Nevertheless, this ability to generalize to a variety of faces provides the neurological scaffold for observational learning of specific faces, and other familiar objects with face-like properties, such as automobile headlights and grills (Gauthier, Skudlarski, Gore, & Anderson, 2000; Gauthier, Tarr, Anderson, Skudlarski, & Gore, 1999). Two examples relevant to my ensuing discussion of felid salience were the maximum responses of a macaque TE neuron to a drawing of a striped cat and horizontal and vertical gratings and another neuron's responses to a cat's striped hind leg and a stripe-like vertical grating (Tanaka, Saito, Fukada, & Moriya, 1991; Tanaka, 2003, p. 91).

While the aforementioned processes of face perception by nonhuman primates would be essential for detecting the faces of partially concealed predators predominantly from the salient aspects of two-facing eyes (cf. Coss & Goldthwaite, 1995; Coss, Ramakrishnan, & Schank, 2005), there are complementary neurological processes that integrate the features of non-face patterns into recognizable gestalts. TE neurons can fire selectively to presentations of two-dimensional contours; but, more importantly, large numbers will fire to texture characteristics engendering three-dimensional selectivity for curved surfaces (Janssen, Vogels, Liu, & Orban, 2001). For example, texture-sensitive cells in macaque TE can respond to a single bar, multiple stripes, and dot patterns that could define a three-dimensional surface feature. Furthermore, cohesive bar-like contours can emerge from moving dot patterns, a process originating in early visual areas V1, V2, and V3 (Peterhans, Heider, & Baumann, 2005). In intermediate visual cortex, V4 cells respond to illusory figure-ground borders produced by groups of dots moving slowly in opposite directions (Roe et al., 2012) and arrays of dots moving unidirectionally that might reflect gradients of vertical shading of surface textures (Hanazawa & Komatsu, 2001).

2 Contextual Figure-Ground Segmentation

The response specificity of downstream TE neurons to specific shapes and their response generalization to similar-appearing shapes is important for understanding how objects embedded in larger, complex background images are recognized. One technique for examining this phenomenon in humans involves rapid presentations of natural scenes with embedded target images and the recording of event-related potentials with task-specific behavioral measures. Rousselet, Fabre-Thorpe, and Thorpe (2002) reported that one to two objects (animal/non-animal) presented to human subjects briefly (20 ms) in complex photographs of natural images could be identified without the need for focal attention.

In humans, natural-scene perception includes participation of the parahippocampal gyrus that evaluates peripheral spatial areas (Kravitz, Saleem, Baker, Ungerleider, & Mishkin, 2013) in a manner that could evaluate the contextual assessment of danger, notably the position of the body relative to immediately perceived and previously known refuge. For ancestral humans in natural settings, covert (non-foveal) attention would be very useful for the rapid detection of a single dangerous target in the peripheral field of view, such as a lurking felid predator. Evaluation of the spatial layout of the microhabitat by the parahippocampal place area, a subregion of the parahippocampal gyrus, is crucial for integrating the properties of objects and faces processed by the fusiform face area (Kanwisher, 2010).

From the perspective of neural-circuitry operations in the fusiform gyrus integrating contours, textures, and colors, a recognizable shape without a background pattern has limited meaningfulness to the perceiver until the meaningfulness of its background pattern is evaluated as a top-down process. For example, Bar et al. (2006) presented familiar objects followed briefly by an intermixture with other objects. To record rapid brain activity, magnetoencephalography (MEG) and behavioral tasks were employed, the results of which identified a downstream prefrontal site in the orbitofrontal cortex that facilitated top-down object recognition via contextual associations. In complex images with embedded targets, pattern recognition within the fusiform gyrus is integrated with scene-selective processing by the adjacent parahippocampal gyrus in the medial temporal lobe (Nasr et al., 2011). Related research into the contextual associations of objects and their spatial properties revealed a major contribution of the posterior region of the parahippocampal cortex (Bar, 2009; Mullally & Maguire, 2011), the retrosplenial complex, and the medial prefrontal cortex (Kveraga et al., 2011; Panichello, Cheung, & Bar, 2013). In particular, neural activity measured by MEG showed that the visual cortex, parahippocampal cortex, and retrosplenial complex was phase locked early during contextual processing of pictures of objects with later phase locking of the retrosplenial complex and the medial prefrontal cortex. Early phase locking was also evident for the visual cortex and orbitofrontal cortex followed by phase locking of the fusiform cortex and orbitofrontal cortex (Kveraga et al., 2011). Together, these findings support the argument that contextual information about object meaningfulness is extracted early during object recognition. In natural settings, the visual

salience of a recognized object juxtaposed with background images emerges as a contextual relationship, both of which are subject to the effects of natural selection on perception and action. The next section focuses on the sources of natural selection shaping the visual salience of felids and the significance of contextual association with appropriate defensive action patterns by prey.

3 Sources of Natural Selection Promoting Felid Recognition

For innate predator recognition to emerge in the evolutionary time frame, prey species need to have experienced a long history in which predators and the microhabitats in which they were encountered were perceived and acted upon consistently. As emphasized above, the neural underpinnings of face recognition can generalize face-processing operations to encompass similar visual schemata. Such face-generalization ability can thus be coopted by natural selection to share some of the same facets of neural organization, thus facilitating how selection from predation filters out failure to recognize predators in specific contexts. In shared perceptual processing, the ancient schema of two-facing eyes can metaphorically anchor surrounding facial structure for heterospecific face recognition. Like primates that rely on stereoscopy for distance estimation, felid predators have forward-facing eyes permitting three-dimensional judgments of prey distances for launching attacks. When monitoring prey from cover, their two eyes are generally exposed to view. Because of the long history of prey detecting predators based on this facing eye schema, a number of ambushing and coursing carnivores have evolved obliterative camouflage, such as vertical eye bars, horizontal masks, and facial patches that reduce the distinctiveness of two-facing eyes. Felids in particular have evolved short vertical bars above the eyes coupled with dark eyelids and white patches below the eyes (Ortolani, 1999, p. 454), and some felids have dark vertical stripes on their cheeks aligned with the upper eye bars that, as subjective contours, transect the inner elliptical edges of the two eyes. In other felids, the numerous flecks and spots near the eyes probably act as blending camouflage reducing eye-schema detection (see Mottram, 1915, 1916). At the larger scale of body coat patterns, such blending camouflage consists of spots, rosettes, and stripes (Allen, Cuthill, Scott-Samuel, & Baddeley, 2011) that interrupt the continuity of felid-body outline, a process also complemented by obliterative shading in which a darker back and lighter ventral pelage optically flatten felid cylindrical appearance generated by sunlight and shadow (Cott, 1941; Jarŏs, 2012).

The oldest fossil record of leopards (*P. pardus*) migrating from Africa to Europe is dated at circa 900 ka (1000 years ago) (Sala, 1990) whereas genetic-distance analyses suggest that leopards migrated further into southern and eastern Asia more recently, between 300–170 ka (Uphyrkina et al., 2001). Nonetheless, leopard-like rosettes appear to be the ancestral condition shared phylogenetically with lions and jaguars (Werdelin & Olsson, 1997) and were likely displayed by the primitive jaguar (*P. aff. gombaszoegensis*) that inhabited South Asia ~2 Ma (million years ago)

(Hemmer, 1976). As such, it is reasonable to argue that South Asian primates and ungulates had a much longer history of exposure to the rosette coat-pattern of this felid predator before the arrival of leopards.

Because of their consistent daytime appearance to prey engendering successful evasive behavior, the rosettes on the coats of leopards that putatively evolved as blending camouflage in dappled light now appear to be a salient predator-recognition cue for several species of primate and ungulate prey, such as muntjac deer (*Muntiacus reevesi*), sambar deer (*Cervus unicolor*), and chital deer (*Axis axis*) in South Asia (Ramakrishnan & Coss, 2000; Yahner, 1980). In addition, the yellowish background color for the rosette coat-pattern enhances leopard detection by macaques because their neurons in early vision are sensitive to yellowish hues (see Yoshioka & Dow, 1996; Yoshioka, Dow, & Vautin, 1996). To reduce detection, leopards have adopted the strategy of stealthy daytime and nighttime hunting (Isbell, Bidner, Van Cleave, Matsumoto-Oda, & Crofoot, 2018; Zuberbühler & Jenny, 2002).

For wild bonnet macaques (*M. radiata*) foraging on the ground in southern India, the sudden appearance of a leopard model can elicit fast (200–300 ms) flight-reaction times and similar reaction times for leopard-naïve monkeys on a park-like university campus in Bangalore city (Coss & Ramakrishnan, 2000). Moreover, the exposed forequarters and facing head of this leopard model partially concealed by vegetation engendered a much greater flight to trees than exposure of this model's hindquarters. These monkeys responded even less to presentations of the forequarters and facing head of a dark-leopard model without rosettes representing the dark melanic morph, and were totally unresponsive to its dark hindquarters (Coss et al., 2005).

In a related study, Schel and Zuberbühler (2009) also found that leopard-naïve Guereza monkeys (*Colobus guereza*) in Uganda reacted promptly when they detected the back of a leopard-like model with conspicuous rosettes moving below them. Similarly in captivity, leopard-naïve sooty mangabeys (*Cercocebus atys*), pig-tail macaques (*M. nemestrina*), and rhesus macaques exhibited vigorous alarm calling to a leopard model derived from the model presented to wild bonnet macaques (Davis, Parr, & Gouzoules, 2006). Together, these studies of monkeys from field sites in Africa and India where leopards are absent along with inexperienced captive monkeys suggest that leopard recognition is mediated by innate perceptual processes.

Outside of heterospecific face-generalization that might promote leopard recognition, what is the likelihood that human ancestors experienced historical felid predation with the intensity of Old World monkeys that engendered leopard recognition? This question is relevant to the central premise of whether evolved perceptual processes for recognizing felid predators influence their artistic renditions. A review of the temporal coincidence of felid and hominin fossils in the same and nearby fossil assemblages clearly suggests the potential for predator–prey interactions.

During the Early Miocene epoch, widely distributed African barbourofelid cats (Morales & Pickford, 2018) would have been capable of taking large-bodied hominoids. The advent of bipedality in the Late Miocene of Africa would have permitted early hominins to forage well beyond the immediate refuge of trees (Richmond,

Begun, & Strait, 2001, p. 98). The earliest occurrence, circa 7 Ma, of the dirk-toothed cat, *Megantereon*, co-occurs with a larger *Machairodus* sp. in a fossil assemblage in Chad (Peigné et al., 2005; de Bonis et al., 2010, p. 225) not far from the fossil site of the oldest putative member of the hominid clade, and possible biped, *Sahelanthropus tchadensis* (Brunet et al., 2005; Zollikofer et al., 2005). With a jaguar-like morphology and presumed prey immobilization ability, *Megantereon* is thought to have been an ambush hunter that engaged in carcass dragging (Arribas & Palmqvist, 1999); albeit its short tail (Christiansen, 2013) is not indicative of arboreal hunting. Nevertheless, such felid agility might have posed considerable danger to early hominins not unlike that of ambushing leopards that hunt vervets, baboons, macaques, and larger langurs and chimpanzees (Boesch, 1991; Busse, 1980; Cowlishaw, 1994; Isbell et al., 2018; Ramakrishnan, Coss, & Pelkey, 1999). Emergency bipedal flight behavior with rapid assessment of potential refuge has arguably provided the most consistent context for selection to act on successful predator avoidance. It is reasonable to suggest that *Megantereon* provided one of the longest time frames of felid predation on hominins (Lee-Thorp, Thackery, & van der Merwe, 2000) prior to its extinction during the Early Pleistocene (Treves & Palmqvist, 2007; Turner & Antón, 1998; Werdelin & Lewis, 2005).

Although tooth marks (punctures and pitting) on fossil bones are suggestive of predation, they also characterize scavenging activity, so interpretations of hominin predation by felids that are flesh specialists should be viewed cautiously. In the approximately 6 Ma fossil beds in the Rift Valley, Kenya, the femora of *Orrorin tugenensis*, another basal member of the hominin clade considered to be an habitual biped (Pickford, Senut, Gommery, & Treil, 2002; Richmond & Jungers, 2008), exhibits gnawing damage and tooth marks suggestive of possible predation by a leopard-sized felid that appears in the same fossil assemblage (Gommery, Pickford, & Senut, 2007; Pickford & Senut, 2001). About 2 Ma later, another habitually bipedal hominin, *Australopithecus anamensis*, is evident in northern Kenya (Haile-Selassie, Melillo, Vazzana, Benazzi, & Ryan, 2019; Ward, Leakey, & Walker, 1999) with a small percentage of the bone assemblage showing carnivore damage (Drapeau et al., 2014). Clearly, the shift from being a facultative biped and tree climber to a highly derived obligate biped by 3.6 Ma (Raichlen, Gordon, Harcourt-Smith, Foster, & Haas Jr., 2010) followed by a long period of stasis (Haile-Selassie et al., 2010) would have enhanced successful running to arboreal refuge from large-bodied felids.

The earliest felid (*P*. aff. *Gombaszoegensis* or *P. palaeosinensis*) resembling modern lions (*P. leo*) and a smaller, more definitive leopard (cf. *P. pardus*) appear in Laetoli, Kenya, about 3.6 Ma (Barry, 1987). True lions first appear in East Africa 1.8–1.9 Ma (Werdelin & Lewis, 2005) consistent with the appearance of *Homo erectus* whose highly mobile groups would have probably procured meat from partly consumed carcasses (Lewis, 1997). Successful competition with lions for scavenging kills would possibly include harassment with stone throwing and counteractive lion actions where *H. erectus* would be endangered and need to engage in evasive antipredator behavior (Willems & van Schaik, 2017). In South Africa, leopards would pose significant threats to hominins, especially at night (de Ruiter & Berger, 2000). Moreover, the accumulation of hominin fossil deposits in caves is

strongly suggestive of leopard predation (Brain, 1970, 1981). Leopards can drag large carcasses to caves so they are the most likely predator for the collection of hominin bones rather than alternative felid predators, such as *Megantereon* or the false saber-tooth felid, *Dinofelis* (de Ruiter & Berger, 2000).

During the Plio-Pleistocene, there is suggestive evidence that early *Homo* was already equipped with sufficient technology for ambush hunting 1.8 Ma (Bunn & Gurtov, 2014), thereby potentially changing the dynamics of competitive interactions with lions. Nevertheless, lions and leopards would have likely constituted the greatest predatory threat to hominins until the Middle Pleistocene when *H. erectus* would have employed both effective defensive and harassing tactics to dissuade lions and hyenas during confrontational scavenging at kill sites. With the advent of hand-delivered spears ~500 ka with hafted stone points (cf. Johnson & McBrearty, 2010; Shea & Sisk, 2010; Wilkins & Chazan, 2012; Wilkins, Schoville, Brown, & Chazan, 2012), competitive scavenging by late *H. erectus* and archaic humans would become exceedingly dangerous for lions. This technological development would begin to change the context of natural selection on this predator–prey interaction when humans as competitors changed into dangerous adversaries (see O'Connell, Hawkes, & Jones, 1988, p. 357). As a result, one can envision that daytime predation on human ancestors by leopards and lions slowly transformed into nocturnal situations where, most recently, predation occurs in small groups and while sleeping (cf. Corbett, 1947; Packer et al., 2019; Packer, Swanson, Ikanda, & Kushnir, 2011).

Lion predation on hominins led to lion infection by *Helicobacter pylori*, an old Gram-negative stomach bacterium in the human lineage. This bacterial jump from early humans to lions is estimated, based on a synonymous genetic distance, to have occurred maximally within the past 400k years (Eppinger et al., 2006). Despite occasional predation currently, the long period of dangerous interactions with humans has engendered considerable caution of humans on foot by African lions evidenced by lions fleeing from Maasai pedestrians (Packer & Clottes, 2000) and when Bushmen hunter–gatherers and herders chased away lions easily with commanding voices (Bauer & de Iongh, 2005; Thompson, 2003, p. 73).

4 Effects of Prolonged Relaxed Selection on Felid Salience

The proposed daytime shift in lion-predation threat to nighttime circumstances would initiate the onset of prolonged relaxed natural selection on the lion component of felid-predator recognition. Since the aforementioned neurological properties of pattern recognition affect rapid and meaningfully defensive behavior, relaxed selection might uncouple some facets of felid recognition and defensive behavior; that is, relaxed selection engendering genetic drift might weaken interneural connectivity between recognition processes and action coordination. For example in laboratory recreations of the historical context of snake–predator encounters, California ground squirrels (*Otospermophilus beecheyi*) living in snake-absent and

snake-rare habitats maintain innate recognition of their former rattlesnake and gopher snake predators for an estimated time frame of 300k years of relaxed selection; albeit, their defensive behavior is less coordinated (Coss, 1991a; Coss, 1999; Coss & Biardi, 1997). Neural systems are generally protected from disintegration under relaxed selection if they have multiple functions still under selection or their pattern of organization involves shared developmental pathways (Coss, 1999, p. 200; Lahti et al., 2009; Lehmann, Strauß, & Lakes-Harlan, 2007, p. 542; Moczek et al., 2011, p. 2710).

Outside of generalized face recognition processes still under selection in humans, if felid shape and coat patterns are also recognized innately, as documented in some monkeys, then the time frame for their complete disintegration under prolonged relaxed selection would likely span several million years. Such evolutionary persistence would reflect the much slower mutation rate in humans based on their estimated generation time of 29 years compared with 1–2 years in ground squirrels (cf. Coss & Goldthwaite, 1995; Langergraber et al., 2012, p. 15717). The persistence of defensive behavioral relicts under prolonged relaxed selection from felid predation, which includes higher-order cognition about habitat refuge (Coss & Moore, 2002), is also indicative of the historical consistency of successful evasive action in specific situations. Retention of rapid refuge assessment as a behavioral relict under relaxed selection does not appear to be costly and the neural processes for its expression might, like some aspects of predator recognition, be buffered from rapid disintegration due to their shared functionality in related situations (Blumstein, 2006; Coss, 1999; Lahti et al., 2009).

In modern humans, running from an attacking lion (see Patterson, 1907) powered by the uniquely large gluteus maximus muscles (Bartlett, Sumner, Ellis, & Kram, 2014, p. 130) is still adaptive. Similarly adaptive, emergency tree climbing is also reported when lions are encountered unexpectedly and there are several anecdotal cases on the web of incidences of tree climbing under predatory threat. Simulated climbing by preschool children of tree silhouettes using their fingers showed that young children without tree-climbing experience continued to recognize the historical utility of low weight-bearing branches by choosing refuge closer to the crown edges to feel safe from a lion (Coss & Moore, 2002). Follow-up research on preschool children using realistic leopard and deer models in a playground simulation of antipredator behavior provided further evidence of a sophisticated understanding of how a predatory threat could be monitored safely from a distance or from cover (Coss & Penkunas, 2016). Although conducted in truly safe contexts, these studies of preschool children are consistent with evidence observed in other species that innate antipredator behavior like that of face recognition can appear early in the developing brain (Coss, 1991a, 1991b).

The summarizing point of this discussion relevant to artistic behavior is that, unlike natural encounters with felids, representations of large-bodied felids in paintings and sculptures can be considered as simulations viewed in safe situations. Nevertheless, the viewing of dangerous felids in movies, photographs, and illustrative art works might still evoke preconscious echoes of ancient patterns of evasive behavior. Similarly, the earliest artistic depictions of felids by Upper Paleolithic

artists might have engendered mnemonic reminders of their threatening capabilities. The next section evaluates experimental evidence for the perceptual aspects of felid salience presented in safe laboratory settings.

5 Experimental Studies of Human Responses to Lion Images

Inspired by a Darwinian perspective of threat assessment, there is a growing literature on human responses to viewing dangerous animals, mostly using photographs of snakes and spiders known to engender phobic responses (see LoBue, Matthews, Harvey, & Stark, 2014). The experimental protocols used in these studies resemble those employed for face perception and typically evaluate subjective attitudes, viewer reaction times, and physiological measures (e.g., Berdica, Gerdes, Pittig, & Alpers, 2014). Controlled presentations of animal images in laboratory settings can provide information on the specific perceptual properties of these animals that attract attention and influence rapid decision making, including aesthetic preferences (cf. Blanchette, 2006; Landova et al., 2018).

Our initial research on children and adults employed multiple presentations of natural scenes to examine their ability to detect standing and reclining lion targets in arrays of eight randomly arranged antelope as distractors and vice versa using a visual-search protocol and touch-screen computer display (Penkunas & Coss, 2013a). We were particularly interested in determining whether the patterns of lion detection during childhood were also present in adulthood. Both American children and adults detected target lions in arrays of antelope distractors more quickly than target antelope in arrays of lion distractors, the results of which might reflect an evolutionary influence on threat assessment (Penkunas & Coss, 2013a). However, there were numerous opportunities for children to learn about lion dangerousness in books, movies, and on television, so a second study compared children living in a forested area of southern India inhabited by tigers and leopards with children from the nearby predator-free city of Bangalore. We found similarly faster reaction times for lion-target detection in arrays of antelope in both urban and rural children (Penkunas & Coss, 2013b) consistent with our initial study of American children. A follow-up study of adults employed eye tracking to measure the speed of detecting standing lions and impala (*Aepyceros melampus*) in natural scenes and found similarly higher attention-catching properties for lions (Yorzinski, Penkunas, Platt, & Coss, 2014).

While these studies of children and adults suggest that lions pop out from visual arrays of antelope, they did not reveal what features of lions were salient. Eye tracking was employed again using the same visual-array methodology, comparing standing lion targets with lion distractors and impala targets with impala distractors that were either facing or facing away. Both facing lion and impala targets were detected faster than when these target animals were facing away, although the latency to detect facing lion targets was faster than that of facing impala targets (Yorzinski, Tovar, & Coss, 2018). The standing posture of lions might be one

critical cue for assessing lion dangerousness so eye tracking was employed again to compare standing lions with reclining lions and standing impala with reclining impala. Counter to our predictions, we found that the standing postures of both species facilitated target detection (Yorzinski & Coss, 2019). Together, these studies of visual search for lions in natural scenes revealed that lions are relatively salient when they are compared directly with other nonthreatening species that are less relevant ecologically to perceivers. Not surprisingly, differences in body configurations, such as head orientation and body posture, are less distinguishable during visual search for targets in visual arrays of the same species; that is, the efficiency of visual search is hampered when these defining features are part of the visual schemata engendering species recognition and participants have adopted a "feature search mode" (see Folk & Remington, 2006, p. 463). Target-image salience, however, still depends on the contextual relationship of these targets and distractors; for example, target snakes and spiders presented with threat-irrelevant distractors are not necessarily detected faster than technological threats, such as guns, knives, and syringes presented in arrays of threat-irrelevant distractors (cf. Blanchette, 2006; Fox, Griggs, & Mouchlianitis, 2007). It appears from these picture studies of biological and technological threats that the relevance of the image to perceivers is more important for guiding target detection than its historical importance from an evolutionary perspective.

Another approach to studying felid salience is to consider that some innate behaviors with cognitive components are expressed early in human development prior to their obvious adaptive utility. Precocity of innate behavior results from the early installment of specific patterns of interneural connectivity on newly formed neurons with only initial dendritic branch outgrowth that resist the remodeling that occurs during "experience-dependent" dendritic growth and connectivity later in development (see Black & Greenough, 1986). Such innate precocity is quite apparent for California ground squirrel pups that can visually recognize their gopher snake predator and engage in adult-like antisnake behavior the first day they use vision for guiding locomotion (Coss, 1991a). Similar behavioral precocity is evident in nursing age infants that, on their hands and knees, mouth shiny plates as if drinking from a water hole at a much older age (Coss, Ruff, & Simms, 2003).

The important aspect of studying the precocious expression of recognition systems in young children is that it can reveal the adaptive defensive behavior of adult ancestors (Coss & Goldthwaite, 1995, p. 126) and might provide insight on the visual cues used to recognize ancestral predators or other dangerous species (for snake perception by infants, see Bertels, Bayard, Floccia, & Destrebecqz, 2018). For example, 7–15 month-old infants and toddlers in day-care playroom settings engaged in more exploratory poking of yellowish plastic jars displaying python scales and leopard rosettes compared with yellowish plaid and plain jars prior to picking them up (see Coss, 2003, p. 113). The salience of leopard rosettes outside the context of observing leopards was examined further in adults using eye tracking (Shabbir, Zon, & Thuppil, 2018). These researchers found that small images of target people wearing clothing with leopard, floral, and camouflage prints were detected reliably faster in photographs of a crowded airport terminal than targets wearing nonpatterned shiny and plain clothing.

6 Cave Lion Portrayals in the Early Upper Paleolithic

This final section evaluates how image salience influences artistic expression. One method of measuring how salient images promote long-term memory and the generation of visual imagery is to evaluate the realism of human artifacts. I will emphasize the degree of morphological accuracy of early Upper Paleolithic drawings and figurines of European cave lions by Aurignacian artists.

The study of visual-image salience on the ability to recall various items from memory is an important area of memory research and highly imageable items are thought to be recalled most easily (e.g., Fletcher et al., 1995), especially if they are rated highly as pleasant or unpleasant (Bywater, Andrade, & Turpin, 2004). Based on brain-imaging studies, the parietal and frontal cortices appear to play an important role in the production of mental images (Ishai, Ungerleider, & Haxby, 2000), with the underlying long-term memory for its expression organized spatially by the topographical properties of area V1 in early vision (Pearson, Naselaris, Holmes, & Kosslyn, 2015). When the eyes are closed, the formation of mental images can activate the cortical frontal eye field regulating eye movement (Winlove et al., 2018) as if the mental images are being scanned overtly. Along with activation of the precuneus in the posterior-medial parietal region, the subjective vividness of mental imagery is also correlated positively with increased activation of the fusiform gyrus, posterior cingulate gyrus, parahippocampal gyrus and the retrosplenial cortex (Fulford et al., 2018). Both the parahippocampal gyrus, and retrospinal cortex respond to landmark features relevant to mental-image vividness and contextual assessment (see Auger, Mullally, & Maguire, 2012; Mullally & Maguire, 2011). It thus appears from this brain-imaging research that mental images are evaluated by attentional processes almost as if they were real visual images (Amedi, Malach, & Pascual-Leone, 2005).

There are several aspects of artistic creation that need to be addressed in my discussion of the relationship of mental imagery and artistic production. I have argued previously (Coss, 2017, p. 26) that European Neanderthals (*H. neanderthalensis*) were not deficient in generating mental imagery useful for hunting, but they lacked the neurological ability of anatomically modern *H. sapiens* (AMH) to translate this imagery from working memory into drawing recognizable images. Neanderthals were capable of generating nonfigurative geometric images as evident from the red scalariform (ladder-like) image on the wall of La Pasiega cave, Spain, dated at ~65 ka (Hoffmann et al., 2018; Hoffmann et al., 2018; but see dating critique by Aubert, Brumm, & Huntley, 2018) and the multilined crisscross engraved on the floor of Gorham's Cave, Gibraltar, dated ~39 ka (Rodríguez-Vidal et al., 2014). Currently, the closest approximation to figural art by Neanderthals is relevant to my discussion of felid salience. A natural flint block roughly resembling a feline face caught the attention of Neanderthals at La Roche-Cotard, France ~76 ka (Marquet, Lorblanchet, Oberlin, Thamo-Bozso, & Aubry, 2016). Its coincidental cat-like appearance was enhanced further by deliberately removing flakes to flatten

Fig. 1 Left: Natural flint stone reworked by Neanderthals to enhance its face-like appearance. Dimensions: 98–93 mm height, 105 mm width, with a 74 mm long bone sliver, dated at circa 76 ka. Photograph by Jean-Claude Marquet. Right: Female African lion, Kenya (Photograph by Richard Coss, 2013)

the head and define the nose and by inserting a bone splinter through a hole joining its illusory eye sockets (Fig. 1).

Unlike Neanderthals, AMH engaged in both abstract and realistic parietal depictions of animals and therianthropic representations (recognizable admixtures of humans and other species useful for shamanistic purposes, cf. Jolly, 2002; Leihitu & Permana, 2019). Abstract figural art in the Upper Paleolithic can reflect an undeveloped drawing ability that results in child-like renditions (Coss, 1968, p. 282). Distortion can also be deliberate "socio-sexual signalism" (Sütterlin, 2003, p. 153) as seems evident for the ~35 ka female figurine excavated at Hohle Fels Cave in southwestern Germany (Conard, 2009). For Southeast Asian rock art, a mildly distorted painting of a babirusa "deer-pig" (*Babyrousa* sp.) on Sulawesi, Indonesia, dated ~35 ka is among the earliest AMH recognizable animal depictions (Aubert et al., 2014). More relevant to the issue of felid salience, an African example of a Late Stone Age therianthrope was discovered in the Apollo 11 rockshelter in southern Namibia consisting of a painted stone slab depicting the silhouette of a feline head and body adorned with oryx-like horns, ungulate forelegs, and human hind legs (Vogelsang et al., 2010, p. 195). These early examples of AMH art complement other realistic examples in which mental-image vividness likely played a role in artistic expression.

There are different situations in which Aurignacian hunter–gatherers would have acquired vivid episodic memories of cave lions behaving in nature as well as close-up inspections of cave-lion carcasses that were exploited systematically. Osteological evidence of cave-lion exploitation from the Aurignacian and Gravettian periods of

the Swabian Jura in southwestern Germany spanning around 40–27 ka indicates that Aurignacians focused on acquiring meat, possibly skins, and canines as hand-tool retouchers of blades (Kitagawa, Krönneck, Conard, & Münzel, 2012).

Prior to the arrival of the Aurignacians to Central Europe ~40 ka using the Danube corridor (Conard & Bolus, 2008, p. 894; Conard, 2011; Higham et al., 2012), it is unlikely that Neanderthals who favored thrusting spears for close-range hunting (Schmitt, Churchill, & Hylander, 2003) engaged in intense carcass competition with cave lions. Cave lions were formidable predators and their prey preferences varied among individuals as inferred from isotopic signatures of bone collagen that differed from cave hyenas, suggesting some competitive exclusion of prey species (Bocherens et al., 2011; Camarós, Münzel, Cueto, Rivals, & Conard, 2016). In the aforementioned context of African-lion timidity to humans on foot, cave lions might have been much less intimidated by human presence, and thus posed a great danger to unwary hunters. Habituation to human activity is known to embolden some large-bodied felids, such as pumas (*Puma concolor*) exposed initially to humans during the very late Pleistocene of North America (Coss, Fitzhugh, Schmid-Holmes, Kenyon, & Etling, 2009). The ancestors of cave lions diverged from African lions prior to 600 ka (cf. Argant & Brugal, 2017; Burger et al., 2004), precluding their experiencing the increased dangerousness of carcass competition with archaic and modern humans in Africa.

Perhaps due to the visually provocative qualities of cave lions, the Aurignacians in the Swabian Jura created multiple ivory figurines of them as mobiliary art discarded in domestic spaces (Mendoza Straffon, 2014). A small figurine from Vogelherd cave in the Lone Valley shows a cave lion in a stalking posture with incised lines on its shoulders and outstretched neck (Fig. 2). These repetitive lines might characterize the piloerection of thick, wavy cave-lion hair to illustrate its highly aroused state of attention directed at prey. In support of this premise of thick hair, a small reddish bundle of wavy cave-lion hair with thick underfur was recovered from frozen Pleistocene sediment in Russia (Chernova et al., 2016; Kirillova et al., 2015). Another less realistic Vogelherd figurine of a stalking cave lion shows a series of crosshatched lines along its back also suggestive of piloerected hair (see Fig. 16-4 in Hussain & Floss, 2015, p. 109). It must be noted in this context, that piloerection of angry African lions is depicted as bristled hair in more contemporary San rock-paintings in South Africa (Hollmann, 2002).

There are several worthwhile speculations about the cultural function of these figurines based on other cultures. Since these figurines would likely attract attention because of their ecological significance to group members, one could envision an apotropaic function in which these figurines were carried about for protection from cave lions, other people, or imaginary agents in the believed spirit world (see Hussain & Floss, 2015). Such an apotropaic function would be analogous to the shiny amulets worn in the Middle East and South Asia to ward off the malignant "evil eye" (see Coss, 1981; Woodburne, 1981). Other plausible functions include using them as props for animated storytelling about cave-lion behavior (Piprani, 2011; Porr, 2010) and other forms of cultural transmission perhaps assisted by

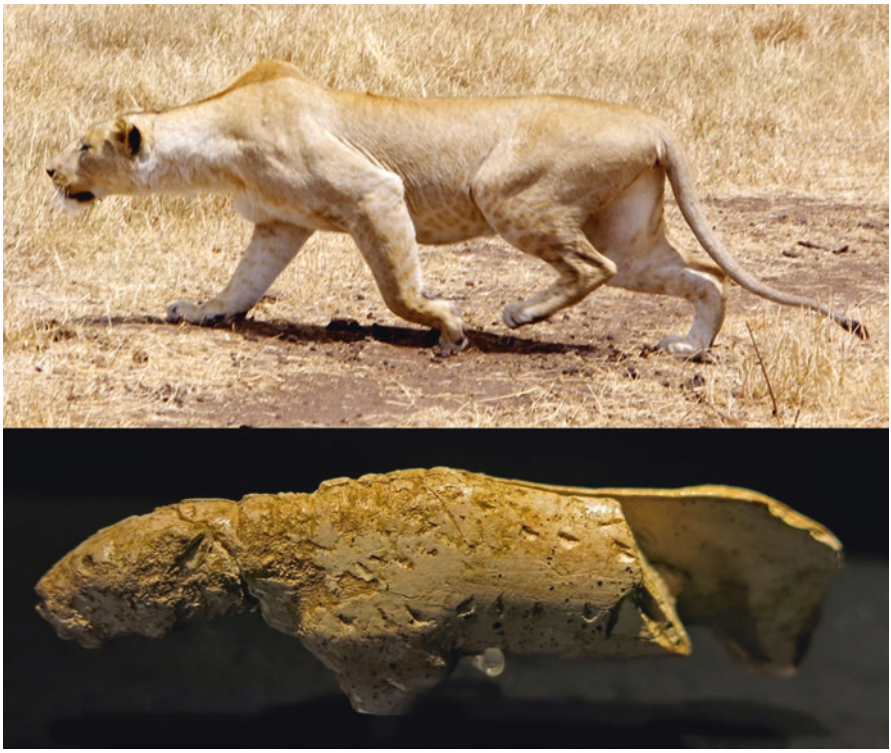

Fig. 2 Top: Young female lion stalking zebras in the Ngorongoro Crater, Tanzania. Photograph by Richard Coss, 2013. Bottom: Aurignacian ivory figurine of a cave lion from Vogelherd cave, Swabian Jura. Dimensions: Length 68 mm, height 24 mm, breadth 14.5 mm, dated at circa 32 ka. Museum der Universität Tübingen (Photograph by Don Hitchcock, 2015). Note the stalking posture with outstretched neck and incised lines on the neck and shoulder blades that could represent piloerection of thick hair. The engraved pits likely portray a coat pattern of rosettes

rituals conducted under altered states of consciousness (Lewis-Williams & Clottes, 1998).

Mammoth ivory is a medium-hard material that makes detailed carving and engraving difficult with the prismatic blade technology common in Aurignacian sites. Achrati (2012) proposes that mammoth ivory was softened prior to carving by possibly soaking it in water, urine, or digestive rumen fluids from the stomach contents of herbivorous game. With this ivory softening technique in mind, an example of a finely detailed cave-lion head from Vogelherd (Fig. 3) shows the prominent cheetah-like cheek stripe that caught the attention of Aurignacian artists and cross-hatching that, again, might represent thickly matted hair. Bristling of hair is not depicted explicitly in the charcoal drawings of the 75 cave lions appearing in Chauvet cave in Vallon-Pont-d'Arc, Ardèche, France that, according to Clottes and Azéma (2005), represent more than 60% of the lions portrayed in European Upper

Fig. 3 Ivory carving of a cave-lion head from Vogelherd cave that was originally part of a complete figurine. The cheek stripe is prominently engraved and the crosshatched pattern could represent thick hair with a wavy down. Dimensions: Length 25 mm, height 18 mm, breadth 6 mm. Copyright: Landesmuseum Württemberg, Hendrik Zwietasch

Paleolithic art. There are marked differences in the quality of these cave-lion drawings (Packer & Clottes, 2000) that could reflect individual differences in autobiographical mental imagery (Bergmann, Genç, Kohler, Singer, & Pearson, 2016; Cui, Jeter, Yang, Montague, & Eagleman, 2007; Greenberg & Knowlton, 2014) and the ability to translate these images into well-delineated drawings (De Pisapia, Bacci, Parrott, & Melcher, 2016; Ellamil, Dobson, Beeman, & Christoff, 2012).

Many of the cave-lion drawings in Chauvet cave are depicted with their heads extended as if inspecting potential prey that are drawn alongside them. The prominent cheek stripe is frequently delineated in these charcoal drawings (Fig. 4) which, considering a possible cultural link between Aurignacians occupying Chauvet cave and those in the Swabian Jura spanning 35–30 ka (Igarashi & Floss, 2019), strongly supports the argument that cheek stripes were a prominent facial feature of cave lions. The facial pattern of short bars above the eyes that merge with the cheek stripes via the inner eyelids (Fig. 4) is indubitably ancient in felids, as inferred from its variable presence in cat-like viverrids and prionodontids whose stem ancestor diverged from felids ~30 Ma based on a mitochondrial phylogeny (see Paijmans et al., 2017, p. 3332). If indeed present on Late Miocene felid predators, such as *Megantereon*, natural selection on hominin assessment of predatory threats might have added these salient facial stripes to the already provocative facing eyes to facilitate detection of partially occluded felids waiting to ambush from cover.

Fig. 4 Top: Asiatic lion (*Panthera leo persica*) from the Gir forest Sanctuary, India. Photograph by Hiren Khambhayata. Bottom: Two charcoal drawings of cave lions in the Gallery of Lions, Chauvet Cave, from the 2011 film *Cave of Forgotten Dreams* (Werner Herzog, director). Note the whitish lower eyelid and short bar above the left eye of this Asiatic lion that extends into the cheek stripe and the similarity of this facial pattern with the cave-lion drawings

7 Conclusion

The salience of cave lion facial markings and stalking body postures is suggested by their depiction in the charcoal drawings of cave lions in Chauvet cave and the small ivory figurines from Vogelherd cave made by Aurignacian hunter–gatherers in the early Upper Paleolithic of Europe. The prominence of these cave-lion features in artistic renditions might reflect their provocative qualities that enhanced mental-image vividness and the anatomical accuracy of these renditions. The evolved ability to recognize face-like schemata is present in human neonates and likely provides the neurological scaffolding for the generalization of human-face perception to other species, including felid predators. During hominin evolution, natural selection acting on successful assessment of felid-predator dangerousness might have capitalized on the adaptive utility of this face-generalization process. On the whole, the renditions of cave lions in Chauvet cave illustrate their prominent cheek stripes,

eye-lid coloration, ear positions, and in some cases, their stalking postures shown by their lowered profiles with extended heads, elevated shoulder blades, and upright ears. Other anatomical details on some of the small cave-lion figurines from the Swabian Jura in southwestern Germany include engraved pitting of the ivory suggestive of a coat pattern of rosettes similar to that of young African lions. Serrated lines and crisscrossing on the backs of these stalking figurines could well connote the piloerection of thick hair of highly aroused lions. Together, these artistic renditions of cave lions recreate the formidable appearance of an extinct adversary of Upper Paleolithic humans with a prominent, but unknowable, social significance.

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Evolutionary Constraints on Creativity in the Visual and Plastic Arts

Aaron Kozbelt

1 Evolutionary Constraints on Creativity in the Visual and Plastic Arts

The visual and plastic arts are paradigms of aesthetics and creativity for laypersons and scholars alike. A ubiquitous and valued outlet of creative expression, art is a human universal (Brown, 1991), appearing in some form in every known culture. Visual artistry has likewise been identified as a basic domain of mind (Feist, 2008; Gardner, 1983; Karmiloff-Smith, 1992). Human art is complex in its manifestations and social significance, and as an object of study, it lies at the intersection of many domains in the sciences and humanities, each with its own agenda.

Art is so vitally human that it cannot simply be ignored, but it cannot easily be pigeonholed either. The visual and plastic arts manifest a seemingly endless variety across cultures, epochs, and individuals. For millennia, they have shown an apparently relentless capacity for stylistic change. Perhaps there are no meaningful limits to human artistic creativity, and we as a species ought to congratulate ourselves for infinite ingenuity in aesthetic expression.

In this chapter I will argue that this mindset is deeply flawed and assert that an "anything-goes" position on human artistry is facile and untenable. Rather, canalized aesthetic biases, building on evolved psychobiological mechanisms, persist to the present day and constrain the nature and scope of our artistry. The strongest basis for proposing inherent constraints on human art is the ruthlessly nonoptimizing logic of evolution. To the extent that art reflects the evolved structure of the

A. Kozbelt (✉)
Department of Psychology, Brooklyn College, Brooklyn, NY, USA

The Graduate School and University Center of the City University of New York, New York, NY, USA
e-mail: AaronK@brooklyn.cuny.edu

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human mind—with all its imperfections, biases, and limitations—it should show systematic built-in constraints in line with what we, for lack of a better term, call human nature (Pinker, 2002; Wilson, 1998). Whether we can overcome biological predispositions in the course of creating our imaginative culture—especially in the visual and plastic arts—is a contentious question. Addressing it is the purpose of the present chapter.

Raising the impossibility of transcending our biological inheritance in the realm of art raises further questions, with some provocative implications. These include the following: What relevance, if any, do our evolutionary origins have for art today? Across cultures and traditions, which is more important, variability or commonalities in human art? To the extent that universals (or at least regularities) exist in art, how can these be understood—in terms of common characteristics of aesthetic products, mental processes underlying artistic cognition and behaviors, or sociocultural functions of art? How flexible versus rigid are aesthetic universals? What are the options for ambitious creators when the pressure for radical aesthetic novelty runs counter to evolutionarily canalized aesthetic biases? Have the high arts already succumbed to this pressure, or are there ways out of this impasse, which might also better characterize human creative artistry in the first place?

This sequence of questions provides the basic structure for the chapter.

2 Evolutionary Origins and their Relevance to Understanding Present-Day Art

The unsurpassed explanatory power of Darwinian principles of evolution continues to inform the most astonishing variety of questions, leaving few domains unscathed (Dennett, 1995). In the study of human creativity, an evolutionary framework details the phylogenetic origins of our creative and aesthetic capacities and has provided rich metaphors to understand how these capacities function (Kozbelt, 2019a). The visual and plastic arts have been a special focus of evolutionary theories, given art's longstanding cultural importance, the array of mental mechanisms that undergird artistic practice and perception, and controversy over whether art represents a genuine evolutionary adaptation.

Nascent elements of artistry ran in tandem with hominin evolution over the last few million years, with several periods of rapid transition between species paralleling saltations in artifact types. The early parts of this narrative are murky; scattered fragments of bones and stones are all that remain to tell the tale. Subsequently, each of our ancestral species—from *Homo habilis* onward—had its characteristic stone tool technology (Kozbelt, 2019a).

Understanding the origins of bona fide human visual artistry involves enormous problems of evidence and inference. Works made of perishable materials do not survive for geologic timespans. Stone tools do endure, but their functional utility is at odds with a modern "aesthetic" view of the purpose(lessness) of artworks. Other

artifacts, not obviously either completely natural or completely fabricated, represent potential early evidence of deliberate artistry. These include troves of ochre and beads apparently used for body decoration (164,000 and 100,000 years ago, respectively) or the Berekhat-Ram or Tan-Tan figurines (each several hundred thousand years old; see Morriss-Kay, 2010). In such cases, we can make only vague suppositions about proto-artists' cognitive capacities or their sociocultural milieus.

Our understanding improves somewhat for art produced in the wake of the so-called creative explosion some 40,000 years ago (Pfeiffer, 1982; see also Klein, 1992; Lewin & Foley, 2004; Lewis-Williams, 2002). Those responsible for this cultural watershed were anatomically and behaviorally modern humans, and they evinced far more creativity in a few thousand years than their ancestors had over the preceding six million years (Mithen, 1996). Some of the most iconic emblems of prehistory were created more than 35,000 years ago (Morriss-Kay, 2010), and they represent humanity's first notable works of visual and plastic art. Among these masterful depictions are the cave paintings of animals at Chauvet (Clottes, 2003) and so-called Venus figurines (Conard, 2009).

Ever since, our species has maintained significant artistic output. Early civilizations developed their own local aesthetic traditions, expanding the scope of techniques and subject matter. In classical antiquity and again in post-medieval Europe, artists mastered visual realism (Gombrich, 1950/1995). In the last century or two, visual artistry has moved beyond traditional depictive media into realms like photography and film. At the leading edge of contemporary art, many artists have abandoned visual principles almost entirely, instead favoring overtly conceptual approaches to art making in a milieu notable for the pluralistic coexistence of styles.

The most fundamental initial question is whether our evolutionary backstory retains *any* relevance for contemporary art. If it does not, then we have essentially transcended our evolutionary origins and are a "blank slate" (Pinker, 2002), utterly malleable by culture and experience and without any appreciable limitations on artistic styles. Support for the "blank slate" model derives mainly from rhetoric rooted in questionable assumptions, downplaying evidence linking established evolutionary principles to modern behavior, and cherry-picking exceptions that seem to violate straw-man universalist claims. This position has been critiqued for its willful disregard of evolutionary and psychological principles (Wilson, 1998), stifles consideration of our main themes, and will not be considered further. It is far more productive to entertain evolution's ongoing relevance for present-day art. Doing so raises fertile and fundamental questions, such as why we as a species enjoy and engage in art (rather than not doing so) and why human art is the way it is (and not some other way).

Understanding why we have art at all is bound up with the biological mechanism(s) through which art emerged in the first place. This rich and contentious issue has been dealt with extensively elsewhere (see Dissanayake, 2007; Kozbelt, 2019a), but the main options can be briefly summarized. One candidate is Darwinian natural selection, whereby art represents a direct adaptation; human aesthetics derive from our sense of safety in responding to visual patterns associated with survival (Bradshaw, 2001; Orians, 2001, 2014). Another alternative is that artistry and

aesthetic preferences arose through Darwinian sexual selection (Dutton, 2009; Miller, 2000), where artistic virtuosity functioned as an honest signal of good genes in a mate selection context. A third option regards human artistry as a by-product of other genuine adaptations. This conception of aesthetics as evolutionary "cheesecake" (Pinker, 1997) or "spandrels" (Gould & Lewontin, 1979) suggests potentially greater cross-cultural flexibility in aesthetics and emphasizes popular artworks. Here, making a definitive choice among these three mechanisms is somewhat beside the point. The important thing is that in each case—and in contrast to the "blank slate" position—people have *some* systematic aesthetic preferences derived from evolution.

3 Variety Versus Commonalities in Human Art

The possibility of systematic, species-wide aesthetic preferences directly concerns why human art is the way it is—or, if you prefer, why human artworks are the ways that they are. One can regard visual and plastic art in their totality as either endlessly varied or as sharing important commonalities. Which better characterizes the condition of human art, and what does that choice imply? If variety trumps similarity, then even if evolution has exerted some detectable effects on art, perhaps these have been overstated. In that case, aesthetic biases might then be greatly modulated by cultural practice and individual experience, even if they cannot be completely overwritten. On the other hand, if similarities predominate, with convergent styles evident across widely dispersed artistic traditions, then this suggests an enduring influence of specific, evolutionarily rooted biases on human art making and art appreciation. Resolving this quandary is no simple matter. In any complex domain, the process of categorization and assessment of similarities versus differences is complex and contentious. Neither position is logically indefensible or incorrect; the choice hinges on one's preference and purpose.

Elsewhere I have summarized how different disciplines prioritize variety versus commonalities in human art (Kozbelt, 2016). Among the camp emphasizing variety are literary theorists in the postmodern vein (e.g., Barthes, 1968/2001) and their counterparts in visual art (e.g., Bryson, 1983) who assert that everyone creates their own inner world by accepting or rejecting endlessly shifting linguistic signs, and that what counts as "art" is merely an arbitrary cultural convention with no external validity. Sociologists (e.g., Bourdieu, 1979/1984) have discussed the importance of factors like socioeconomic class in modulating patterns of taste and cultural consumption. Scholars in domains like cultural studies, art history, and social theory (e.g., Elkins, 2002) have emphasized the importance of understanding how the concept of visual art is understood cross-culturally and trans-historically: witness Shiner's (2001) contention that the concept of "fine art"—as distinct from craft—is a relatively recent innovation, dating only from the eighteenth century. Similarly, anthropologists have long documented variability in many cultural practices, including the conception, function, and practice of art (Boas, 1927/1955; Maduro, 1976);

thus, one cannot assume that works revered in one culture will be accepted in another (Bohannan, 1966). An emphasis on broad cultural differences in cognition, particularly between the Eastern and Western cultures, has also been advocated by some psychologists (Lubart, 1999, 2010; Nisbett, 2003; Niu & Sternberg, 2002).

In contrast, other scholars have emphasized commonalities in style and thematic elements across disparate artistic traditions. In this view, important similarities are present even in early cave art, from around the world. These include representations of abstract visual patterns that have been related to phosphenes and other autogenic visual phenomena (Bednarik, 1984; Hudson, 1998), as well as a superabundance of animals as the main subjects of cave paintings (Bahn, 1998). Indeed, the earliest known figurative painting—a 40,000-year old depiction of wild cattle in Borneo—strongly resembles, in style and subject matter, European Upper Paleolithic cave art produced thousands of miles away and thousands of years later (Aubert et al., 2018).

Researchers in psychology, biology, and neuroscience have marshalled other lines of inquiry that support the idea of species-wide aesthetic preferences. These include direct cross-cultural studies of aesthetic preferences and judgment, which show strong concordance, especially among experts (e.g., Chen et al., 2002; Ford, Prothro, & Child, 1966). Such findings are consistent with anecdotes of works garnering immediate praise in a foreign context—artist Albrecht Dürer's astonishment at Aztec artifacts freshly imported from the New World, for instance. They are also in line with theoretical models (e.g., Berlyne, 1971; Martindale, 2007; Ramachandran & Hirstein, 1999), which parsimoniously explain findings on aesthetic response with reference to a few psychobiological principles. Neuroaesthetics researchers have pursued a parallel program, seeking to understand the neural substrate of aesthetic experience, preference, and judgment, and grounding aesthetic cognition in localized brain areas and distributed brain networks (Chatterjee & Vartanian, 2014; Ishizu & Zeki, 2011; Nadal & Chatterjee, 2018). Other research findings further underscore regularities in human artistry. These include psychological essentialism in art (Newman & Bloom, 2012), cross-cultural commonalities in children's drawings and adults' doodles, both of which employ a very limited graphic repertoire (Gardner, 1980; van Sommers, 1984), and historiometric analyses of creative productivity across different cultures, epochs, and domains (Martindale, 1990; Simonton, 1997).

What to make of this pile of evidence, which simultaneously suggests significant variability as well as strong commonalities in artistic practices and styles across cultures? On balance, I believe claims of cross-cultural artistic similarities enjoy stronger empirical support than those emphasizing differences, and that initially prioritizing variability at the expense of regularities puts the evolutionary cart before the horse. Better to ascribe aesthetic similarities to a common phylogenetic origin, rather than cross-cultural coincidence, and to regard variations as later developments superimposed on those initial regularities.

Let's see where this path leads, by examining the proposition that our evolutionary history has deeply ingrained a systematic set of biases and preferences in how humans experience the world. People everywhere share perceptual and cognitive systems with a common neural architecture, adapted for processing information

from the environment to arrive at an understanding of the structure and content of our surroundings, which in turn promotes reproductive success. There is an essentially universal evolved structure of the human mind, which strongly predisposes us toward certain modes of perception, cognition, experience, and social organization, and which biases us against other possibilities (Pinker, 1997, 2002; Wilson, 1998).

Evolutionary constraints on our mental structure extend to creative and aesthetic realms like the visual and plastic arts. These bias our reception and production of aesthetic artifacts in ways consistent with our evolved psychology. This process of "canalization" (Waddington, 1942) constrains the kinds of aesthetic artifacts that people are likely to find worth spending time, money, and other resources on. The attracting force of canalized biases suggests that, try as we might to generate as much novelty as possible, human artistry ends up being not nearly as varied as it could be in principle. As Stephen Jay Gould (1996) mused, "perhaps we have already explored most of what even a highly sophisticated audience can deem accessible" (p. 228).

4 Candidate Aesthetic Universals: Products, Processes, and Sociocultural Functions

Aesthetic universals can be characterized several ways, some more straightforward and better supported than others. In this section I describe three such categories: common perceptual features of artistic products, underlying mental processes that facilitate aesthetic cognition and the creation of artworks, and sociocultural functions of art.

4.1 Products

Canalized aesthetic biases are most clearly manifested in observable features of artworks. Phosphene-like patterns and the frequent depiction of animals in cave paintings have already been mentioned. Other scholars have attempted to understand specific forms of imagery and sequences of associations in depictive cave paintings via an underlying artistic "grammar" (Ananti, 1994). In addition, basic color preferences—especially for the triad of black, white, and red—appear to have a strong neurophysiological basis (Berlin & Kay, 1969), and some have argued that the common use of these colors in early art reflects a universal aesthetic tendency (Turner, 1966).

Other researchers have identified basic-level visual preferences with strong psychobiological underpinnings. For instance, people like more saturated colors (holding hue and lightness constant) and colors like red and blue, compared to green, orange, and yellow (Eysenck, 1941). Other research has revealed that color

preferences also reflect the statistics of how much people in general like objects that are typically those colors (Palmer, Schloss, & Sammartino, 2012). Additional well-documented visual regularities involve a preference for looking at the edges of objects, rather than areas of uniform lightness, and a preference for closed shapes over the random or irregular placements of their constituent lines (Martindale, 2007). Research on preferences for shapes of varying complexity is another staple of this literature; results often show that liking follows a monotonically increasing or inverted U-shaped function of complexity (but with some caveats: see Nadal, Munar, Marty, & Cela-Conde, 2010). Another oft-touted aesthetic universal is an alleged preference for the so-called Golden Ratio (Φ, equal to approximately 0.618), which is evident as an organizing principle in classical art and architecture and is a venerable subject of aesthetic research (Fechner, 1876; Höge, 1995). Yet another proposed universal derives from research by Smets (1973), who found a sharp peak in brain alpha wave desynchronization when persons viewed abstract designs with 20% repetitiveness of elements—the equivalent amount of order found in simple mazes, pictographs in numerous Asian languages, and Mondrian paintings; Wilson (1998) claimed that "the 20 percent redundancy effect appears to be innate" (p. 230).

Such studies do not involve particularly aesthetic stimuli, but other research has examined features of artworks more directly, sometimes using computing-intensive methods. For instance, the principle of compositional balance in artworks has been examined by computing, for each point on a painting's surface, a color "weight" representing a vector from the center of a three-dimensional red-green-blue color space and then applying physical mechanics formulas (Firstov, Firstov, Voloshinov, & Locher, 2007). The results show a consistent trend for the balancing point of each image to be near its physical center, validating Arnheim's (1988) notion of "the power of the center." Other research, examining the overall distribution of fine versus coarse spatial frequencies in artistic images, has found that this distribution tends to be fractal-like, with a similar spatial structure evident across large and small scales, just as in natural scenes (think of the jaggedness of a coastline, which is maintained irrespective of the degree of magnification). This is true even for artistic depictions of faces, though photographs of faces do *not* show scale-invariance (see Graham & Redies, 2010). More theoretically, Ramachandran and Hirstein (1999) proposed ten universal principles of art, encompassing features of products as well as underlying psychobiological processes. Featural principles include contrast, isolation, symmetry, abhorrence of coincidence or generic viewpoints, repetition, rhythm, orderliness, and balance. Finally, beyond academic research, a famous conceptual art project by Komar and Melamid (Wypijewski, 1998), which surveyed people's preferences to produce the "Most wanted painting" across numerous countries, found a high degree of cross-cultural consistency in basic preferences (see also Dutton, 2009).

In sum, researchers have identified many regularities in our aesthetic preferences of perceptual features, which are relevant to the visual and plastic arts. These regularities need not be literally universal-to-a-person in order to demonstrate that human visual aesthetics are highly structured and constrained in a way that plausibly derives from evolutionary pressures.

4.2 Processes

While the visual features of artworks are largely self-evident, the underlying psychological processes that support them are usually hidden. These can be construed as general mental mechanisms that provide a foundation for art appreciation or as specifically creative processes that give rise to new artifacts. I discuss each in turn.

Wide-ranging mental processes that play a role in aesthetic perception include several of Ramachandran and Hirstein's (1999) principles, such as perceptual grouping and binding, perceptual problem solving, metaphor, and peak shift (the tendency to respond more strongly to a perceptual cue when that cue becomes exaggerated—as when an animal learns to choose a rectangle over a square, and then responds even more strongly to a skinnier rectangle). Martindale (2007) elucidated some additional psychobiological processes undergirding aesthetic cognition. These include behavioral contrast (an offshoot of peak shift), association effects (involving episodic memory as a means to justify aesthetic preferences), mere exposure effects (the more often a nonnegative stimulus is seen, the more it is implicitly liked), and habituation (declining preference for overly familiar, unsurprising stimuli). Other perceptual processes are also critical components of visual artistry, including the enhancement of edges and contrast via lateral inhibition (whereby active neurons suppress the activity of their neighbors), color contrast, shape and size constancies, monocular and binocular depth cues, object recognition mechanisms, and visual imagery (see Kozbelt & Ostrofsky, 2018). Finally, physical mechanisms of the body are also vital: for example, some researchers (e.g., Gallese, 2019; Johnson, 2007) have argued that embodiment is critical to our aesthetic sense, and biomechanical and kinematic factors also constrain how humans produce depictive marks in visual art (van Sommers, 1984).

Creative processes are also important for aesthetic cognition (Martindale, 2007; Tinio, 2013). Psychological models of the creative process vary widely, including chance-intensive Darwinian accounts (Simonton, 1997, 1999, 2011), Lamarckian models (Johnson-Laird, 1993), and expert problem-solving frameworks (Weisberg, 2006). Such models make universalist claims about the nature of creativity.

However, the complexity of the creative process in art muddles the notion of aesthetic universals. Artists engage in cognitive, metacognitive, and evaluative processes while drawing (Fayena-Tawil, Kozbelt, & Sitaras, 2011), often making substantial changes to emerging artworks (Kozbelt, 2006a, 2008). Throughout, artists are guided by constraints on their creative decisions (Stokes, 2005). An artist's consistent approach to art making yields a personal style at the process level, akin to conceptions of style based on finished artworks, but different artists vary enormously in their creative methods (Galenson, 2001).

The distinction between mental processes used in artistic appreciation versus creation cautions against thinking too monolithically about evolutionary constraints in human art. As a heuristic framework, one can make a broadly dichotomous distinction between several facets of human artistry (Kozbelt, 2017a), as follows. On the one hand, there are universal, domain-general mechanisms that are more

relevant to the nonexpert appreciation and reception of artistic products, which are often of a popular nature. (This is the main thrust of most evolutionary aesthetics research that has been conducted to date, as summarized above.) On the other hand, there are potentially idiosyncratic, domain-specific mechanisms that are more relevant to expert artistic production, which are often of a more elite, esoteric nature. (This research terrain is far less explored, and in the preceding discussion only emerged a paragraph or two ago.) However, this latter perspective is critical for addressing high-level artistic achievements and the sociocultural functions that establish aesthetic niches.

4.3 Sociocultural Functions

The sociocultural functions of art may also constrain the fundamental nature of human artistry. In general, how groups of people have socially organized themselves—through kin networks, social hierarchies, and divisions of labor within fairly small bands—has surely impacted many aspects of human cognition, including language, face recognition, reading emotions, theory of mind, sensitivity to justice and social standing, and so on. Indeed, some scholars (e.g., Cupchik, 2016; Dunbar, 1998; Humphrey, 1976) have argued that the intellectual faculties of primates evolved mainly as an adaptation to the demands of social living.

The specific role of art within our ancestors' social dynamics remains unclear. Some researchers have attempted to make inferences about the early sociocultural functions of art. For instance, Dissanayake (2007) proposed that ritualized forms of art can help people cope with uncertainty and promote group cohesiveness and cooperation. In contrast, Miller (2000) argued for the importance of intra-group competition, especially via Darwinian sexual selection, and against any kind of group-level selection. The opposite conclusions reached by two distinguished scholars suffice to reveal the depths of our ignorance on this matter.

In historical times, sociocultural factors have influenced the conception, production, practice, and appreciation of art. Ethnographic studies of indigenous peoples have documented cross-cultural variability in art's sociocultural functions. Such accounts include many cases in which deviations from established stylistic norms are simply not permitted, reflecting art's ritual functions (for a discussion, see Kozbelt, 2016). Similarly, in some high cultures, like ancient Egypt, art was a state monopoly, with the rigid enforcement of a canonical style used to buttress political power and religious observance. In contrast, in the contemporary West, artists enjoy unprecedented freedom of expression and occasionally high social status. Relatedly, class distinctions in the consumption of artistic capital (Bourdieu, 1979/1984) reinforce the varied sociocultural functions of art. These include lowbrow entertainment, education, markers of social class or subculture identity, incitements to social awareness and change, and aesthetic valuation of creative expression for its own sake. Finally, some sociocultural models of creativity (Csikszentmihalyi, 1988; Sawyer, 2006) have emphasized the role of well-positioned gatekeepers (e.g.,

gallery owners, curators, and other influential members of the art world) who select new productions for exposure and canonization, as part of a complex dynamic system by which social judgments of creativity are rendered.

As with creativity, sociocultural functions of art complicate the prospect of aesthetic universals. Some basic patterns may be evident, in how different kinds of art may be used to reinforce or challenge social, political, or religious orders, or how artistic themes factor into interpersonal interactions. However, understanding potential aesthetic universals through the lens of sociocultural factors remains a nascent challenge, with an uncertain outcome.

5 Static Rigidity Versus Dynamic Flexibility in Aesthetic Universals

The preferred features of artworks and domain-general psychobiological processes that support aesthetic cognition can be regarded as evolutionarily canalized biases, which I have argued function as human aesthetic universals. In contrast, the idiosyncrasies of artists' creative processes and the sociocultural functions of art may seem less obviously universal and constrained by evolution (but see Carroll, 2015; Curry, 2016). In fairness, less research has addressed these latter topics, but further considering these issues and levels of analysis should add nuance to the notion of canalized aesthetic biases and their pragmatic role in the visual and plastic arts.

A related and important question about the nature of aesthetic universals is whether they must be thought of as embodying a fixed set of perceptual criteria, which must be met in the final realization of an artwork. While a focus on static perceptual features might seem to imply that putative aesthetic universals must be rigidly defined, this is incorrect. Neural systems have evolved to be highly flexible. Plasticity and variation are more characteristic of functional biological organization than rigidity and invariance (Laland et al., 2015; Nadal & Chatterjee, 2018).

However, neural flexibility does not imply total freedom. Observed regularities in aesthetic preferences are akin to averages summarizing a range of possibilities. While there is meaning in both central tendency and variability, the diagnostic element for a systematic regularity is a piling up of scores at some point, rather than a flat distribution over the entire range of the possible. Flexibility is engendered through the dynamic activity of processes like peak shift and habituation, which rely on comparisons at different temporal points. Over time, a specific aesthetic preference, akin to the peak of a statistical distribution, may change systematically. However, as "canalization" implies, at some point that modified preference or behavior will predictably revert to its "natural" state within the groove of the canal, at least for a time.

Can aesthetic regularities undergo enduring systematic changes, such that they *never* return to an earlier canalized state? Mechanisms like iterated peak shift and iterated habituation (Martindale, 2007) are dynamic, and they can transform

aesthetic sensibilities among both creators and viewers, leading to the growth of new artistic styles. This is a coevolutionary process, whereby performances or artifacts and their evaluations mutually alter each other through their history of interactions. Coevolution is a centerpiece of some provocative accounts of aesthetics that span artistic and biological artworlds, and art itself can be defined along such lines—see, for instance, Prum's (2013) assertion that "art consists of a form of communication that has coevolved with its evaluation" (p. 818). Because co-evolution requires creators and audiences to negotiate this interaction, with plenty of give-and-take, it is a gradual process, which can conceivably trend in many possible directions.

6 Tensions between Radical Novelty and Aesthetic Biases

Although the long-term stylistic evolution of the arts is assumed to be an unpredictable historical process, it turns out that some trans-historical trends in the evolution of artistic style are remarkably systematic. This surprising conclusion is due primarily to Martindale's (1990) model of style change, which is rooted in the same psychobiological mechanisms—like hedonic selection, habituation, and peak shift—that support aesthetic universals in the first place. In his view, artistic creators seek critical attention for their productions, mostly from a relatively small circle of fellow creators, patrons, and gatekeepers. Because of habituation, the appeal of new productions gradually diminishes. Thus, creators must continually create work that is more striking or attention-grabbing—that is, higher in "arousal potential." The arousal potential of a stimulus is determined by its stimulus intensity, meaning, and so-called collative properties (novelty, complexity, surprise). Martindale argued that the most effective way for a creator to garner critical attention is through collative properties—either by producing more unusual combinations of ideas within an artistic style via "primordial cognition" (a mode of thought akin to dreams or daydreams), or by developing a new style altogether.

This dynamic propels the trans-historical evolution of art in predictable ways. For instance, within an artistic tradition, arousal potential always increases over time. In contrast, primordial cognition and stylistic change simultaneously increase overall and oscillate inversely with each other as they ascend—since only one or the other method of introducing novelty is necessary to further increase arousal potential. Abundant empirical data support Martindale's model, drawn from widespread artistic traditions and domains (among them, European painting, music, and poetry, Egyptian sculpture, Greek statuary, Japanese woodblock prints, and New England tombstones) and employing numerous sophisticated methods, including computer-based analyses of poetic texts.

Paradoxically, this trans-historical dynamic relies on psychobiological mechanisms (like habituation and peak shift) that both stimulate an ever-increasing pressure for novelty and provide the basis of aesthetic communication in the form of presumed aesthetic universals. The most ambitious, innovative artists push aesthetic

boundaries, sometimes outstripping audiences' capacities for appreciation. As an artistic tradition evolves, the twin pressures for novelty and communication become progressively strained, and when even elite audiences lose interest, the artistic tradition can be said to have died. Martindale (2009) claimed that this has already happened to most of the high arts of the West. He did not explicitly frame his argument in terms of a tension between creative innovation and evolutionarily canalized aesthetic biases, but the conclusion is the same.

What to make of this provocative argument? Must the very mechanisms undergirding our aesthetic biases, which would innocently seem to inform important aspects of human nature and provide a bulwark against artistic chaos, ultimately spawn an ineluctable aesthetic death spiral?

There are several reasons to suspect the logical necessity of Martindale's conclusion (Kozbelt, 2009a, 2017b). One is that the psychobiological mechanisms for *capturing* attention—so prominent in the accounts of Berlyne (1971) and Martindale (1990)—may have been erroneously extrapolated to the process of *sustaining* critical attention over the generations. Another is that art historical systems do not have a perfect memory, since a single instance of extreme novelty does not preclude works that are less radical from garnering attention later. A corollary involves the false notion that artistic originality is a one-dimensional, more-versus-less phenomenon and, relatedly, that aesthetic innovations can be rank ordered in a linear way that predetermines their historical appearance. (A weaker version of this latter point may be useful for understanding innovations in the history of realistic depiction in visual art, however; see Kozbelt, 2006b.) Instead, aesthetic styles likely inhabit a bushy set of niches, which may coexist and interact in unexpected ways, and which emerge through the personalities of individual creators—who, incidentally, are missing from Martindale's anonymized data sets. Finally, some of Martindale's conclusions rest on questionable claims about the evolutionary process underlying style change in art: for instance, baffling remarks about modern art essentially comprising random marks on canvases (but see Hawley-Dolan & Winner, 2011), thus having no variability, thus not being subject to further evolutionary change.

This last point returns us to questions about the origins and extent of variability in human art and the relation to aesthetic regularities. Consider one integrative discussion of these themes, whereby artistic creativity is rooted in the relaxation of evolutionary selection pressures, illustrated by the avian example of the Bengalese finch (Chatterjee, 2014). Bengalese finches were bred into existence from the wild white rumped munia over several centuries, with the goal of enhancing its colorful plumage. To attract mates, the munia sings a stereotyped song, subject to substantial evolutionary selection pressure. For domesticated Bengalese finches, this pressure disappeared, yet their songs became more complex and unpredictable. This trend is thought to be due to genetic drift away from genes underlying the production of the stereotyped song, accompanied by more widely distributed neural pathways for the finches' songs. In this view, the alternate dynamics of selection and relaxation mean that sometimes art is restricted by selective pressure imposed by a cultural niche and sometimes it is free to change, if those pressures relax.

The idea of relaxed constraints as a stimulus to aesthetic expression is reasonable and appealing. It also seems to reflect the open nature of the contemporary art world in the West, which is largely free of political oppression or stiflingly institutionalized academic standards. Do relaxed sociocultural standards open a path for us to go beyond our biological aesthetic inheritance, along the lines of the Bengalese finch?

I think the answer is still no. What may be most interesting in such situations is that even the total relaxation of external constraints does not lead to a blank-slate artistic free-for-all: regularities inherent in our human nature still emerge. The dynamics of relaxed selection pressures imply that previously unrealized aesthetic regularities may become evident in historical times, under the right sociocultural circumstances—a salutary point, since evolutionary aesthetics are often discussed in largely ahistorical terms (see Kozbelt, 2009b). Consider the invention of writing, for which there was no previous direct evolutionary selection pressure. In principle, the specifics of written language could have taken an almost infinite number of potential directions. But despite impressive cross-cultural variety, orthographic systems show numerous featural commonalities (Gleitman & Rozin, 1977; Treiman & Kessler, 2011) reflecting their relation to spoken language as well as constraints based on species-wide perceptual, memory, and information-processing limitations. A similar argument might be made for the invention of a new artistic domain like film. At its inception, anything might seem possible; however, rather than reflecting an array of mutually incomprehensible aesthetic dialects, a common "language of film" (Bordwell, 2008; Edgar, Marland, & Rawle, 2015; Gallese & Guerra, 2019) emerged, constrained by the need of viewers to follow the narrative and emotional aspects of the movie. Historical instances like writing and film surely derive some of their regularities from initial stylistic contingencies that are later canonized. However, other regularities may reflect nonaccidental, canalized biases—say, in the spatial deployment of marks constituting orthographic symbols or in how aspects of cinematography are used to establish setting or track the physical locations of characters in space. Broader examples, like the functioning of free economic markets that are overtly unregulated—and thus directly analogous to the notion of relaxed constraints—also yield emergent properties, like supply and demand relationships, which give structure to the behavior of the system. Thus, positing relaxed constraints as a means of facilitating creative novelty still does not imply an anything-goes aesthetic: constraints can still emerge as properties of complex systems, embodied as perceptual regularities in the products created within those systems.

A good example of an emergent regularity in visual art in historical times is the principle of compositional balance cited earlier (Arnheim, 1988; Firstov et al., 2007). Recall that the forms and colors in paintings tend to be deployed on the surface such that they create a balancing point near the image's physical center. Prehistoric cave paintings cover entire irregular surfaces and lack any real sense of frame, as do many painted murals and sculpted wall friezes from the art of the ancient Near East, Egypt, classical antiquity, and many Asian traditions. In European art, the use of a discrete frame as a means of enlivening a painted scene was pioneered by Giotto (c. 1267–1337), who treated the painted surface as an arena for dynamic but equipoised visual compositions. Such an innovation, adopted and

developed by generations of later artists and confirmed by empirical aesthetics researchers, can rightly be called a discovery, rather than a mere invention—in line with some accounts of artists as intuitive neuroscientists (Lehrer, 2007; Livingstone, 2002). Latent for thousands of years, our aesthetic sense of compositional balance partakes of venerable embodied psychobiological mechanisms. At the same time, it represents a continual creative challenge for artists testing its nature and limits and, when their efforts are successful, a source of aesthetic satisfaction among viewers.

7 Ways Out of the Impasse

The possibility of new aesthetic regularities arising in historical times returns us to the allegedly moribund condition of contemporary art (Martindale, 2009). Has the recalcitrantly difficult nature of much contemporary art permanently put it beyond the reach of communicating to viewers? Are there any ways out of this impasse? Put another way, what does the future hold for the visual and plastic arts—is the state of contemporary art an endgame, a new state of equilibrium, a temporary departure from tradition and normalcy, or merely another stage in art's ongoing evolution?

Several options seem possible (Kozbelt, 2017b). One extreme possibility is that aesthetic biases are inviolable and that, *à la* Martindale, high art traditions truly have died. This seems unlikely, given the aforementioned caveats about Martindale's conclusions, as well as the flexibility of neural systems (Laland et al., 2015). Another extreme option, in line with a blank-slate aesthetic, is that alleged aesthetic universals are illusory. Perhaps they are historical accidents or simply represent the path of least resistance—the biologically easiest options for structuring aesthetic behavior, but with no inherent constraints on future artistry. This alternative also seems unlikely, given the abundantly documented aesthetic regularities described earlier.

A sensible middle-ground option is the long-term coevolution of aesthetic regularities among creators and audiences (see Prum, 2013). This dynamic is rooted in traditional aesthetic preferences, with room for flexibility and gradual development—which, however, may never fully obviate them, given preferences' tendency toward canalization. This might be cynically regarded as a milquetoast compromise, but it has several useful features. First, while it gives some scope for flexibility, it is ultimately insistent on the pervasiveness of canalized aesthetic preferences—not a trivial theoretical position. Also, regarding aesthetic regularities as potentially flexible and socioculturally situated suggests that alleged universals need not be created equal: some may be more biologically canalized and less amenable to change than others, some may be more potent than others in terms of their aesthetic impact, and some may also be represented more implicitly than others, at least at certain points in history. The empirical accumulation of instances of aesthetic regularities can be used to test such questions.

Moreover, new instances of discovered aesthetic universals—like compositional balance in painting, or any regularity that arises as a response to novel historical or sociocultural circumstances—can be accommodated by this view. These provide

ways of continually promoting artistic variability, while maintaining a foothold in evolutionarily canalized biases. Different innovations may also be subject to processes of higher-order recombination and synthesis—as in a Wagnerian *Gesamtkunstwerk* or modern cinema (Brown & Dissanayake, 2018)—with their own emergent properties providing grist for further development. Such possibilities run counter to Martindale's (1995) assertion that the second law of thermodynamics is the first law of art history—that is, as styles change, increasing aesthetic entropy inexorably exhausts creative traditions from within. In contrast to closed systems, where the laws of thermodynamics apply, the introduction of newly discovered aesthetic universals and organic growth of artistic traditions represent an open system, where thermodynamic principles are not the full story (see also Carroll, 2009).

Open systems, freed from local subservience to entropic decay, are amenable to sustainability. Elsewhere I have discussed the prospects for trans-historical sustainability in creative and aesthetic domains (Kozbelt, 2009b, 2019b). Orienting toward the theme of long-term sustainability reinforces many themes that have been prominent in this chapter. These include empirically tractable, if nascent, research questions such as: how aesthetic constraints are translated into the creative process, how implicit constraints guide the development of artistic styles, how sociocultural and psychological forces establish aesthetic niches, and how the work of some high artists becomes wildly popular even among non-elite consumers of culture.

A focus on sustainability also forces reconsideration of the phenomenon of creativity itself. Of the usual criteria—originality, value, and (sometimes) surprise—the first is almost always prioritized. This is the engine leading to the death of art—or at least a failure to communicate—in Martindale's (1990, 2009) model. A reevaluation of the relative status of these criteria, de-emphasizing novelty as the most important aspect of creativity and placing more stress on value, or adaptive solutions to problems, may fundamentally alter not only how we think about creativity, but how human creativity itself plays out and may itself continue to evolve (see Kozbelt, 2009b).

8 Conclusion

Overall, this chapter may be regarded as an extended gloss of a point distilled by Wilson (1998) in *Consilience*:

> Artistic inspiration common to everyone in varying degrees rises from the artesian wells of human nature. Its creations are meant to be delivered directly to the sensibilities of the beholder without analytic explanation. Creativity is therefore humanistic in the fullest sense. Works of enduring value are those truest to those origins. It follows that even the greatest works of art might be understood fundamentally with knowledge of the biologically evolved epigenetic rules that guided them. (p. 213)

To the extent that the defining biological feature of humanity is the flexible nature of our intelligence, great art reflects this essential quality. In stimulating perception, cognition, emotion, and motivation, the visual and plastic arts provide for many

interpretations and experiences across different sociocultural contexts. Far from exhausting art's potential, phenomena like the invention of new styles, the discovery of new aesthetic regularities, and the establishment of new aesthetic niches all act to increase aesthetic variability—a logical requirement for art, viewed as an ongoing evolutionary phenomenon, to thrive.

Aesthetic productions remain circumscribed by the enduring legacy of our evolutionary history, which has shaped human nature. The most meaningful and powerful artistic innovations reveal deep truths about our humanity. Even when innovations create—and ideally satisfy—an aesthetic need that previously we didn't even know we had, we can understand both the craving and the satisfaction in evolutionary terms.

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Part VI
Video Games and Films

"Unbreakable, Incorruptible, Unyielding": *Doom* as an Agency Simulator

Jens Kjeldgaard-Christiansen

> And in his conquest against the blackened souls of the doomed, his prowess was shown. The seraphim bestowed upon him terrible power and speed, and with his might he crushed the obsidian pillars of the Blood Temples. He set forth without pity upon the beasts of the nine circles. Unbreakable, incorruptible, unyielding, the Doom Slayer sought to end the dominion of the dark realm.

So reads Book III of the Slayer's Testament, which recounts the Doom Slayer's first bloody march on the legions of Hell. This tale is the backdrop of *Doom* (id Software, 2016), the reboot to the classic *Doom* video game series, which popularized the first-person shooter genre. Since the release of the first *Doom* game (id Software, 1993), the series has been mired in controversy for its ultraviolent gameplay (Markey & Ferguson, 2017, pp. 12–14), which pits the player against demonic invaders of all shapes and sizes. The reboot once again calls on players to kill demons as the Doom Slayer, and to take the fight to Hell itself. Many have heeded that call. *Doom* was a million-seller within months of its initial release on the PC, Xbox One, and PlayStation 4 platforms (Mansoor, 2016).

Of course, the Doom Slayer *character* would not revisit Hell for the hell of it. The fate of humanity is his motivation. What could possibly be the player's? Why would anyone want to play a game with a title like *Doom*, and with gameplay befitting that title?

In this chapter, I analyze *Doom*'s violent story world and gameplay from an evolutionary perspective and argue that the game's appeal is that of an agency simulator: a digitized power fantasy. The player assumes the role of the superhuman Doom

J. Kjeldgaard-Christiansen (✉)
Department of English, Aarhus University, Aarhus C, Denmark
e-mail: jkc@cc.au.dk

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Slayer and gets to experience his legendary "prowess," "power," "speed," and "might" first-hand. At the same time, the game removes all ethical and prudential barriers to the player's exercise of agency. In *Doom*, there is no one to care for but yourself, and aggression can never result in anything worse than starting over from a previous checkpoint. The resulting gameplay experience is one of primal and virtually limitless physical empowerment.

I begin the chapter by grounding the concept of agency in evolutionary social theory, before explaining how the video game medium allows the player to simulate desirable forms of agentic experience. I then analyze how *Doom* invites the player to experience the unconstrained agency of the Doom Slayer through the game's simulated story world and gameplay. I conclude the chapter with a short, evolutionarily informed commentary on the moral status of *Doom* and other violent video games.

1 Agency: Real and Virtual

Bakan (1966) introduced the concepts of agency and communion as "two fundamental modalities in the existence of living forms, agency for the existence of an organism as an individual, communion for the participation of the individual in some larger organism of which the individual is part." In contemporary psychology, agency and communion are described as "basic styles of how individuals relate to their social worlds" (Diehl, Owen, & Youngblade, 2004, p. 1)—"styles," because the terms denote clusters of personal characteristics that tend to go together (Abele & Wojciszke, 2007). Agency subsumes individualistic motives, values, and traits. The concept is closely related to a masculine ideal of strength, courage, assertiveness, and independence. Communion subsumes motives, values, and characteristics that benefit the collective in subordinating individual interest to the common good. The concept is closely related to a feminine ideal of sociality, gentleness, and sensitivity. Wiggins (1991), and, more recently, Trapnell and Paulhus (2012) note the concepts' contiguity with other social-perceptive dimensional pairs, including competence/warmth, dominance/submissiveness, and autonomy/trust. These subordinate classifications isolate aspects of agency and communion. For example, agentic individuals are more likely to project dominance in their interactions with others, whereas communal individuals tend to be submissive.

The conceptual duality of agency and communion summarizes the psychological reality of being a social agent in a world of other social agents (Bakan, 1966; Hogan, Jones, & Cheek, 1985; Wiggins, 1991). That reality is nothing if not complex. Humans have needs and wants of their own, but they also have needs and wants that relate to other people, who in turn have needs and wants that relate back to them. Social interconnectedness means that almost every personal decision we make is simultaneously a social decision. I can choose to invest heavily in my personal hobbies, but that would mean leaving less time and energy for family and friends. I can work under the table to secure more resources for myself, but that would mean

Fig. 1 Concept art for *Doom* (2016). The Doom Slayer is fighting demonic creatures atop a mound of fallen foes (Reproduced under fair use)

failing to support the wider communities of which I am a part. These dilemmas manifest to me as personal opportunities and social constraints: opportunities to do what I may desire in the here and now, and constraints that tell me why, all the same, I had better not. A solely agentic individual would wish to be free of all such commitments—to "have no strings," in Pinocchio's memorable conceit. However, the vast majority of people derive value and meaning from at least some such

constraining commitments, including family and friends, morals, and religion. Humans are both agentic and communal creatures, and such a divided social existence could not be without conflict.

The idea that sociality constrains the human will to self-assertion is commonly linked to the emancipatory philosophy of Nietzsche, the speculative psychology of Freud, and the functionalist sociology of Émile Durkheim (the latter of whom *defined* social facts in terms of social constraint). However, the idea finds its deepest source of resonance in evolutionary theory. Evolutionary social theory recognizes the overlapping but distinct interests of any social group and its individual members (Boehm, 1999; Bowles & Gintis, 2011; Boyd & Richerson, 1985; Carroll, 2015; Fehr & Gächter, 2002; Kaplan, Gurven, Hill, & Hurtado, 2005; Nowak, Tarnita, & Antal, 2010). It is in the interest of the group that its members subordinate themselves to the group's communal norms. Darwinian and cultural selection at the level of social groups, including family groups ("kin selection"), has therefore caused humans to care deeply about other people and the norms by which they relate to them (Chudek & Henrich, 2011; Haidt, 2012; Henrich, 2015; Nowak, 2006; Sober & Wilson, 1998). However, individual group members may be genetically advantaged by flouting communal norms when it benefits them in particular, promoting selfish assertion and deception. On the morally negative side, this evolutionary dynamic has produced the human psychology of hypocrisy: of wanting everyone *else* to abide by rule and exhibit restraint (Kurzban, 2010). On the morally positive side, it has produced the human conscience (Boehm, 2012). In no small part, the human moral imagination is about the balance between agentic assertion and communal concern.

To summarize, the concept of agency is all about *me*, the individual. Agentic individuals value personal achievement, competence, and self-assertion. They feel that they have great potential, and they want to see it realized and recognized. They tend to be confident and goal-focused. They wish to be free of the needs and demands of others. Most of us recognize varying degrees of these characteristics in ourselves, auspiciously counterbalanced by communal characteristics that keep us part of the social conversation (Bakan, 1966; Leonard, 1997; McAdams, Ruetzel, & Foley, 1986). Empirically, teenagers and young adults, and in particular male teenagers and young adults, tend to identify with and idealize agentic characteristics such as power, competence, confidence, and status (Carlson, 1971; Eagly, 1987, 2009; Geary, 2010; Kenrick, Griskevicius, Neuberg, & Schaller, 2010; Spence & Helmreich, 1979; Wilson & Daly, 1985), which would have secured mating opportunities and improved the social standing of their ancestral forebears. Young males' preoccupation with agency shows in such areas as their life stories (Thorne & McLean, 2003), interpersonal styles (Rose & Rudolph, 2006), propensity for violence (Wilson & Daly, 1985), and, as is important for my purposes, their relative preference for action-packed, protagonist-driven entertainment such as violent action films (e.g., Goldstein, 1999). It is not so difficult to explain this preference. Powerful, competent, and brash action heroes, such as those portrayed by Arnold Schwarzenegger and Sylvester Stallone, come close to exemplifying the agentic ideal. They become objects of admiration and wishful identification (Hoffner, 1996;

Hoffner & Levine, 2005). First-person shooters such as *Doom* tend also disproportionately to appeal to young males (Greenberg, Sherry, Lachlan, Lucas, & Holmstrom, 2010). An evolutionary perspective suggests that this is no accident, as *Doom* allows its players to experience the thrill of superhuman agency—of *being* the action hero.

The psychological concept of agency ("psychological agency") explored so far is related to video game theory in ways that make its application to that domain a little awkward. Agency in a video game ("technical agency") is commonly used to refer to the player's capacity to act in and on a game's virtual world (e.g., Frasca, 2001). For example, players exercise agency when they press the A button on the Nintendo Entertainment System controller to jump in *Super Mario Bros.* (Nintendo, 1985) or tilt the left analogue stick of the PlayStation 4 controller to move around in *Sekiro: Shadows Die Twice* (FromSoftware, 2019). These are two simple ways in which players may influence the on-screen action. By contrast, players cannot exercise technical agency when the action unfolds the same way regardless of what the player does, such as in the opening cutscene of *Sekiro*, which relates the backstory of that game.

Technical agency is related to psychological agency in that *technical agency allows for the experience of gratifying psychological agency in the virtual world*. This is because the technical agency of the video game allows the player to attain personal goals, such as dominate the competition and take the win in a sports game. A medium can only offer agentic gratifications if it allows its user to exercise strong-willed effort and demonstrate mastery, and video games allow for such agentic pursuits (Grodal, 2000).

The player's ability to control what happens in a video game marks a seminal and distinguishing characteristic of the medium: its egocentric nature. With few exceptions, literature and film are about the experience of people, or at least conscious agents, who are not identical with the reader or viewer. Philosophical and psychological treatments of these media tend to laud their allocentric nature, suggesting that they may produce sociomoral insight into what it is like to be a different person in different circumstances (e.g., Mar & Oatley, 2008; Nussbaum, 1995). A frequently cited example is that of Harriet Beecher Stowe's appositely titled *Uncle Tom's Cabin; or, Life among the Lowly* (1852), which is thought to have deeply affected contemporary white Americans' attitudes toward African Americans and slavery. To be sure, narratively driven and cooperative video games may also inspire empathy. However, by their interactive nature, video games center the player's personal experience and performance (Grodal, 2003). In video games, *you* win or fail. You play well or you play badly. In this sense at least, video games are about the individual player, though cooperative, team-based games make for an important exception.

Video gaming's egocentricity means that the medium bears a deeper affinity to agentic experience than simply enabling it. The fact that victory or defeat depends crucially on the player's own performance lends grave significance to their every move. The digital world literally revolves around the player, as the plot normally unfolds in dutiful lockstep with the player's successes in finishing difficult missions

and defeating powerful bosses. It is therefore not surprising that playing video games often brings a sense of empowerment and personal efficacy (Klimmt & Hartmann, 2006; Ryan, Rigby, & Przybylski, 2006). Ingeniously, games may allow the player to succeed or fail not just as themselves but also as a fictional character in a virtual world with heroes, villains, and a plot of its own. In *Pokémon Snap* (HAL Laboratory & Pax Softnica, 1999) for the Nintendo 64, you play as a photographer attempting to shoot compelling photographs of the imaginative Pokémon creatures that inhabit the virtual world's environments. In *Doom* you also shoot strange creatures, but with a double-barreled Super Shotgun or some other deadly weapon. These very different experiences appeal to different segments of the population. Surveys and sales figures document significant disparities in gaming habits between demographic categories, including gender (Ferguson, Cruz, & Rueda, 2008; Greenberg et al., 2010; Yee, 2017). As already mentioned, shooters tend to appeal mostly to male audiences. Males also show a relative preference for sports games. Females show a relative preference for social, action/adventure, and puzzle games. Some researchers argue that these disparities may have an evolutionary basis (e.g., Mendenhall, Saad, & Nepomuceno, 2010).

Along with most other scholarship on gaming culture, evolutionary investigations have typically assumed a simulative conception of the medium. They have described the themes that define video game genres (e.g., combat, dating) and linked those themes with evolutionarily relevant outcomes (e.g., survival, reproduction) (e.g, Mendenhall et al., 2010). The thematic linkage is then used to explain the genre's appeal: as evolved creatures, we would want to simulate fitness-relevant scenarios. It is fair to say that these analyses have emphasized function over mechanism; little evolutionary work has been done on the psycho-technical interfacing that allows video games to generate fitness-relevant forms of experience (Kjeldgaard-Christiansen, 2019). Brill, Lange, and Schwab (2019) bridge this theoretical gap in conceptualizing video games as a cultural elaboration of our adaptive capacity to think in (moving) images, and thereby to envision the ramifying consequences of our decisions and actions. We use this capacity not just for prudential reasons, but also to daydream of such evolutionary jackpots as food, love, sex, and financial success. Brill and colleagues point out that most popular video games work on a very similar principle. They tend to be about such adaptive concerns as finding love, besting your rival, and mastering some socially desirable skill (the *Guitar Hero* series comes to mind). Modern technology has enabled video games to produce audiovisually compelling scenarios—digitally vivified fantasies—for players to experience. The fact that players tend to respond to these artificial scenarios in ways that recall how they would respond to the real deal, such as by being afraid for themselves when playing *F.E.A.R.* (Monolith Productions, 2005) or cheering to a hard-won goal in *Madden NFL 19* (EA Tiburon, 2018), is evidence for the self-involving, simulative nature of these games (see Robson & Meskin, 2016).

Video games, then, can simulate desirable forms of experience, and the experience of psychological agency is desirable to many. The appeal of *Doom*, as I will now go on to argue, is precisely that it allows the player to experience a sense of superhuman agency.

2 *Doom* as an Agency Simulator

The plot of *Doom* begins in the Union Aerospace Corporation's (UAC) base on Mars in the distant future. At this time, humanity is suffering an energy crisis. The UAC is questing for a solution. Hubristic ambition leads facility director Samuel Hayden and head researcher Olivia Pierce to study the energy reserves of Hell, and Pierce to strike a deal with a demon lord: otherworldly energy in exchange for human technology. Pierce opens a hopeful portal to the dark realm, but the scientists quickly discover that they are in way over their heads. Murderous demonic creatures pour into the UAC base, killing everyone in their path. Hayden and Pierce are forced to retreat. In desperation, Hayden awakens the Doom Slayer from his sealed sarcophagus to crush the invaders and close the portal from within Hell itself.

The game begins with the player rising as the newly awakened Doom Slayer. Hayden contacts the Slayer via a nearby intercom screen and introduces himself as a classical helper character: the Vergil to *Doom*'s Hell-braving Dante. "Welcome. I'm Dr. Samuel Hayden. I'm the head of this facility. I think we can work together and resolve this situation in a way that benefits us both." Trained by genre convention, the player expects a mission briefing telling them what to do and how to do it. But the Slayer's response to Hayden's teaming greeting is to rip the screen from its mounting and hurl it against the wall. He does not need or want any help. As the Slayer is leaving the structure in an elevator, Hayden tries his luck again through the elevator intercom, this time mindful that the protagonist may need a few concessions:

> [Non-diegetic industrial metal music starts playing in the background]. I am willing to take full responsibility for the horrible events of the last 24 hours. But you must understand: Our interest in their world was purely for the betterment of mankind. [The Slayer's first-person perspective tilts down to reveal a blood-spattered human corpse]. Everything has clearly gotten out of hand now, yes. [The Slayer audibly cracks his knuckles.] But it was worth the risk, I assure you.

The Slayer trashes this intercom, too, with a violent backhanded swipe. As the elevator opens to the arid plains outside, the music climaxes in a slew of grueling guitar riffs merged with the roar of a chainsaw. The Slayer pumps his shotgun on beat with the final strokes of the saw-guitar. Now the player is in control, and acutely aware that there is no need to play by the usual rules of the game.

The opening sequence sets the tone of *Doom* as a whole. In a self-conscious breach of convention, the game starts as a run-of-the-mill first-person shooter—completing mission A entails the linear completion of objectives B, C, and D—but then proclaims to the player that it is anything but. *Fuck the mission—kill the demons*. Hayes' final attempt to intervene on the Slayer's will ends predictably with the Slayer repeatedly stomping on the technological equipment he was instructed to remove "carefully." *Doom*'s focus on making the player feel in complete control guides all layers of the game's presentation. Indeed, the developers have described virtual empowerment as a core pillar of the game's design (Loudy & Campbell, 2018). In what follows, I will explain how this pillar supports every aspect of *Doom*'s presentation to stage a simulation of unbridled agency.

3 Gameplay

The player experiences the virtual world of *Doom* from the Slayer's first-person perspective. The first-person shooter has been one of the most popular video game genres since the release of the original *Doom* in 1993 and its sequel, *Doom II*, in 1994. This perspective aligns the player's visual field with that of the player character, or "avatar," to produce a sense of inhabiting the avatar's body in three-dimensional virtual space. Visuospatial alignment also heightens the player's sense of presence by having the virtual world and its inhabitants present themselves to the player's senses in a naturalistic, "egocentric" manner (McMahan, 2003). Surround-sound can simulate the approach of an agent from behind, such as in a chase sequence, and the wide aspect ratios of modern monitors and TVs enable a realistic, rectangular field of view, though it is typically slightly narrower than humans' binocular field of view (about 100° versus 114°). *Doom* further encourages the player's merging with the avatar by never showing the silent protagonist's face, which might as well be the face of the player. This is a departure from *Doom 1* and *2*, though both of these games may have aimed for the same effect in displaying the Slayer's face as that of a nonspecific Caucasian male in a small window toward the bottom of the screen. (The American developers would likely have assumed the typical player of their game to be a Caucasian male.) In addition, the largely text-based exposition of the original *Doom* games addressed the player character in the second person, as "you." This convention has carried over to the reboot's laconic teaser text: "The Union Aerospace Corporation's facility is overrun by demons. Only one person stands between their world and ours. As the Doom Marine, you're here to do one thing—kill them all." The rationale for deemphasizing the identity of the protagonist has been revealed by lead designer of the first two *Doom* games, John Romero: "The less you know about him, the more likely you as the player will feel free to invent your own personality for him" (2002). "There was never a name for the DOOM marine because it's supposed to be YOU" (quoted in Stuart, 2015).

Doom brings the Slayer face-to-face with thousands of demonic enemies over the course of the game's approximately 12-h campaign. Many enemy types, such as the Barons of Hell, are hulking monstrosities with sharp horns, fangs, and claws. The game's final boss is a giant arachnoid. These fearsome creatures are exaggerated versions of worldly predators. They are quite clearly designed to be maximally threatening, and to suggest to the player that they are up against truly formidable foes. Yet the player quickly learns not to fear them, as the world is full of weaponry powerful enough to turn the odds in their favor: chain guns, rocket launchers, and plasma rifles are merely the backbone of the player's impressive arsenal. Note here *Doom*'s fundamental departure from the typical horror video game. Horror games introduce very similar and evolutionarily relevant enemies and inhospitable environments to induce fear and avoidance in the player. However, the flight-response of the horror game is enhanced by the player's perception of confronting hostile agents too powerful to defeat in direct combat (Clasen, 2017, Chapter 13; Kjeldgaard-Christiansen & Clasen, 2019; Lynch & Martins, 2015). By contrast, *Doom* invites a

confident and motivated fight-response. It gives the player the means to fight back, and then some. The most iconic example is the BFG ("Big Fucking Gun"), which can obliterate scores of demons with a single blast.

This fundamental discrepancy between the conventional horror game and an all-out action game, such as *Doom*, can be formalized and understood in the evolutionary language of resource holding (Lynch, 2019). Fear, as the affective promise of the horror game, is an adaptive emotional response provoked by the perception of a genuine threat: something that puts the organism in immediate danger. But the ascription of threat is always relative to some target; something is only threatening to you insofar as you lack the resources to effectively and reliably cope with it. Therefore, equipping the player with powerful weapons and armor can drastically reduce the threat an enemy poses in the virtual world, just as, in the real world, the interposition of armored glass between a human and deadly predator will tend to reduce the fear of the human. *Doom* gives the player ample resources and narratively frames the player as a uniquely skilled warrior. This overflow of concrete and symbolic resources (what would a Slayer do well if not slay?) urges fight rather than flight.

Doom's distinctive brand of "push forward combat" allows players to use their considerable resources to full effect. The nature and significance of this system is best understood against the background of the prevailing alternative. As popular game analyst Mark Brown (2017) has argued, the combat mechanics of many recent shooters trade agency for realism. Take the popular series of *Call of Duty* and *Gears of War*. The player of these games should seek only to engage a single enemy at a time, and to stay behind cover whenever possible. A gung-ho approach will cause the player to take fire from all sides and become overwhelmed. This outcome is realistic, but not exactly empowering. *Doom*'s combat, by contrast, draws inspiration from action-adventure games like *Devil May Cry* (Capcom, 2001) and *Bloodborne* (FromSoftware, 2015) to encourage an offensive, unrestrained playstyle in rewarding so-called glory kills. When an enemy has low health, as signaled by its glowing frame and staggered state, the player has a brief window in which to perform a glory kill. This is accomplished by rushing down the enemy and killing it with strikes and grapples that tear the demon limb from limb. These melee executions reward the player with health and ammunition, thus greatly incentivizing forward momentum and reckless attack. *Doom*'s hands-on approach to combat allows for the assertion of power in the most concrete and primordial sense of that word: the ability physically to *overpower* opponents. The resulting combat is visceral, and intensely stimulating. It has nothing of the abstractness of modern warfare, of pushing a button to launch a missile toward some remote enemy encampment.

Realistic but agentically limiting facets of realistic gunplay are similarly "gamified." Guns never need reloading. Being hit by enemy fire does not result in crippling injuries or failing strength. The Slayer's speed and power are unaffected by enemy fire until his health is brought down to zero, whereupon the game loads the player into a previous checkpoint to resume the fight. There is no reason to hold back. *Doom*'s gameplay maximizes the positive reinforcement of agentic accomplishment while minimizing the punishment for failure. "Push forward" is just as apt of a descriptor for *Doom*'s gameplay overall as for its combat mechanics in isolation.

4 Audio

A typical combat sequence in *Doom* starts with the player entering some large, techno-industrial structure with plenty of space for horizontal and vertical movement. Demons spawn in from every side, and level progression is locked until all of them are dead. The subdued, bass-driven ambient music explodes into ear-pounding industrial metal produced by the game's audio director, Mick Gordon, specifically to complement the brutal combat (Prescott, 2016).

Gordon's soundtrack won many awards in the months following *Doom*'s release. Unofficial uploads of the heaviest tracks, including "BFG Division" and "Rip and Tear," have each generated millions of clicks on YouTube and other online services. Yet the most celebrated aspect of *Doom*'s music is not the tracks as such, but their dynamic integration with the game's combat mechanics. Gordon wanted *Doom*'s music to capture the gameplay's furious lack of restraint, and to underscore the player's power. He translated this vision into the game's deeply dynamic soundtrack, which intensifies during heavy combat and slows down as enemies are cleared. This dynamism is accomplished through the tracks' sectional design, which typically features several intervals of intense progressive metal interspersed with comparatively subdued transitional harmonies. When the player engages in active combat, the track shifts to one of the intense sections, and to transitional intervals when the action subsides. The most powerful music accompanies the player's most grueling fights. The effect is to amplify the player's actions throughout the game's entire soundscape. It is as if the Slayer is fighting to the tune of his own musical theme.

Doom's modal matching between sound and gameplay runs very deep indeed. Gordon gives another example:

> The firing sound of the chaingun is at the same pitch as the music—so when its [sic] firing, it's firing on the D note … and the music there is written in the key of D—so whenever the player pulls that trigger, that gun is playing a note that fits within the music. This is stuff the player's not going to notice, but they notice it if it's wrong. (Haske, 2016).

The crucial gameplay mechanic of the glory kill received a similar treatment. When the player performs a glory kill, the music momentarily vacuums out to accentuate the sound effects of the ripping and the tearing, before roaring back as the animation ends, typically with some sort of killing blow: a jaw-cracking punch, for example, or a skull-crushing head stomp. Where most first-person shooters center the player as first-person auditor of diegetic sound—typically the player's own movements and gunplay (Grimshaw & Schott, 2007)—*Doom* expands the player's role also to audit non-diegetic sound. The game fully subordinates its soundscape to the player's kinediegetic agency.

Grimshaw and Schott (2007) note that this auditory suppleness toward the player's actions in fact does heighten the player's sense of agency. It is more than just a metaphor. The connection ultimately rests on psychophysiology of action and action-perception. Human agents do not just act in a world, whether real or virtual, but also on it. We expect our actions to produce commensurate consequences. When I hit an object as hard as I can, I expect to hear a loud noise and perhaps see some

damage. Sensory feedback confirms or disconfirms these expectations. Confirmation produces in me a normally satisfying sense of self-agency, that is, of self-authorship of the action and its effects (Gallagher, 2000; Synofzik, Vosgerau, & Newen, 2008). *I did this*. Virtual games exploit this mechanism by grounding the player's actions in visual and auditory cues that register the player's impact on the game world (Gregersen & Grodal, 2008). The artificial nature of the video game, however, allows it to go further in replacing true, "mimetic realism" with "perceptual realism," in the terminology of Grimshaw (2008). By this is meant that video games can meaningfully modulate and exaggerate sounds to accent certain actions and suppress others; they can make the sounds feel right, even if they are not actually realistic. Thus, the successful landing of a kick or punch in a fighting game, such as *Street Fighter II: The World Warrior* (Capcom, 1991), is often signaled by a loud crack that gives the impression of forceful impact and crushing effect. The sound effect is unrealistically loud, but feels right in the context of a fighting game that is all about the exchange of physical blows. Such perceptual realism is raised to a level of thematic realism in *Doom*. The Slayer's agency takes center stage and dominates its acoustic environment with solipsistic conviction, as when all musical and ambient sources of sound yield to the crunch of a glory kill. Another example, simultaneously brazen and subtle, plays out as the Slayer is contacted by Hayden via the elevator intercom at the start of the game. The Slayer's threatening knuckle cracking is synchronized, at two different points, with the elevator's violent shaking as it approaches surface level. It feels as if the whole structure is quaking with the rage and power of the protagonist.

5 Narrative

Whereas *Doom* represents a thoroughly agentic experience of dominance and self-sufficiency, communal games, such as those in the popular *The Sims* franchise, channel the social and docile side of human nature. *The Sims* (Maxis, 2000) allows players to cultivate lasting relationships and start families in its virtual world. The challenge of this game is to balance the various needs and wants of the characters, who would become destitute and miserable without the player's help. More than anything, this is a challenge of social constraint, as the player's own agency is instrumentally subordinated to that of the Sims. The player is meant to feel a great deal of responsibility toward the pixelated beings.

The psychology of communal care and compromise does not sit well with *Doom*'s fully agentic vision, wherefore the game aims to bypass it completely. By contrast to thematically communal games like *The Sims*, *Doom*'s game world presents no social constraints or obligations. This is signaled from the start of the game by the Slayer's dismissal of Hayden, who is the world's only nonhostile inhabitant. There is no one to care about but yourself, as the demonic invaders hardly inspire sympathetic concern. These enemies are not members of some "demonized" outgroup or otherwise morally challenging adversaries, but actual demons motivated

by pure malice. They also *do* evil by mercilessly attacking and killing their human hosts. This story setup might initially suggest that *Doom*'s appeal is one of revenge, which would have communal undertones; after all, you avenge others because you care about them. But *Doom* is not a story-*driven* game. The player is free to traverse the world without any real knowledge of its inhabitants and lore, and *Doom* features only very few instances of the modern shooter's preferred method of narrative delivery—gameplay-suspending, pre-rendered cinematic cutscenes. Hugo Martin, the creative director on *Doom*, has grinningly remarked in an interview that the game tells players all they need to know when, in the first level, the intercom screen through which Hayden contacts the player reads "demonic invasion in progress" (2016). He goes on to state that the team had experimented with a narratively and morally more complex setup. Tellingly, all of this complexity was "getting in the way"; it was hindering the player's sense of freedom and control. The tension was resolved by having the Slayer literally throw the exposition, as delivered through the intercom, out of the way.

Other than justifying the player's actions, the narration serves little other purpose than to amplify those actions. The beginning of this chapter quoted the Slayer's Testament, which provides backstory with a singular focus on conveying the Slayer's immense power. The Testament is narrated to the player by the gruff, stentorian voice of a demonic scribe during gameplay. Together, the seven books of the Testament tell the Slayer's story with scriptural gravity. Books I and II are quoted below:

> In the first age, in the first battle, when the shadows first lengthened, one stood. Burned by the embers of Armageddon, his soul blistered by the fires of Hell and tainted beyond ascension, he chose the path of perpetual torment. In his ravenous hatred he found no peace; and with boiling blood he scoured the Umbral Plains seeking vengeance against the dark lords who had wronged him. He wore the crown of the Night Sentinels, and those that tasted the bite of his sword named him … the Doom Slayer.
>
> Tempered by the fires of Hell, his iron will remained steadfast through the passage that preys upon the weak. For he alone was the Hell Walker, the Unchained Predator, who sought retribution in all quarters, dark and light, fire and ice, in the beginning and the end, and he hunted the slaves of Doom with barbarous cruelty; for he passed through the divide as none but demon had before.

The Testament is not alone in observing the Slayer's might. As the player approaches the elevator to exit the structure in which the Slayer awakens, they discover a hologram of Olivia Pierce, who worries that "he [the Slayer] would ruin everything." Pierce is not ready to give up on her ambition to channel the energies of Hell, but she recognizes that the Slayer is powerful enough to stop her, or anyone else for that matter. Another hologram shows three cloaked individuals prostrating themselves before the Slayer's sarcophagus. To them, the Slayer's might has transcendent significance. In discussing the last-minute implementation of these holograms, Martin (2016) cites inspiration from 1980s action films such as *Robocop* (Verhoeven, 1987) and *Rambo: First Blood* (Kotcheff, 1982). These films effectively conveyed their heroes' momentous power through what others said about them, that is, through reputation. Thus, a full two and a half minutes of *Rambo* are devoted to the hero's

former general insisting that the local sheriff, who is pursuing Rambo, is meddling with powers that are utterly beyond him. The general closes his tirade by stating that if the sheriff were to send his full force of 200 men, he should also remember to send "a good supply of body bags." The point of this bombast, of course, is to build anticipation toward the protagonist. The audience should realize that they are in for an impressive show of force. There would be more reason for the audience to be suspicious of such claims if they were uttered by the protagonist about his own person, as he might be tempted to exaggerate or lie outright. Naturally, the report of a third party is less likely to be self-servingly biased.

In *Doom*, the Slayer's Testament is etched into ceremonious tablets wrought by his enemies, who certainly would have no reason to idolize him. The narration builds the player's confidence by telling them just how powerful they are, and are recognized to be. It exploits the evolutionary psychology of reputation and its management, of locating reliable sources of information and respecting their pronouncements (Shackelford, 2005). And it works to position the player as nothing short of Rambo's digital equal. Rather than being a moralistic or epistemic motivator, then, *Doom*'s narrative setup is all about centering the player's agency. It informs the player that they are uniquely capable of fighting the hellish invaders, and that there is no reason at all to hold back.

6 Conclusion

Doom is structured around a single-minded experiential ambition: making the player feel like a demon-slaying badass. As one YouTube commenter stated in response to a video of the game's introduction: "Clicking a mouse alone in a room has never made me feel so manly" (Cholrus69, 2016). The seemingly enormous disconnect between the commentator's lonesome mouse clicking and its empowering psychological effect calls out for an imaginational explanation. My evolutionary analysis suggests that *Doom* transports the player's consciousness into the physical and symbolic armor of the Doom Slayer, thereby granting them the skill, resilience, and sheer strength to dominate an army of hellish invaders. The resulting sense of empowerment—of almost limitless agency—is a crucial factor in explaining the game's appeal.

As also argued, *Doom* builds to this experience in part through ensuring that the player's agency is not stifled by moral choice and social compromise. *Doom* is certainly not alone in this; many violent games treat of violent subject matter without much in the way of critical commentary. Some psychologists believe this should be a cause for concern because a video game's frivolous treatment of violent subject matter might leave players desensitized to actual, real-world violence (e.g., Anderson & Bushman, 2001). However, empirical research on the effects of playing violent video games has failed to establish a causal link between playing violent video games, such as *Doom*, and real-world violence (Elson & Ferguson, 2014). At the most general level, it has been shown that the popularization of violent video

games in the 1990s coincided with well-documented declines of violence in the populations most likely to be playing such games (Ferguson, 2010a; Markey & Ferguson, 2017, Chapter 4). Of course, this finding does not establish that video games caused the declines, or even that their impact was not on the whole negative, but it does strongly suggest that violent video games are not the social scourge that some suppose them to be.

Why would violent video games not ravage the psyches of their massive audiences? Why would there be no discernible causal link from the practice of virtual to the practice of real violence? I will end this chapter by indulging in a little evolutionarily informed, yet speculative reasoning on the topic, as well as on the moral status of *Doom* and other violent video games.

First, a fact-check. Violent games are much more popular among male than among female populations, as already noted. Violent ideation is also more prevalent in males than in females (Kenrick & Sheets, 1993), and so is rough-and-tumble and pseudo-violent play (e.g., DiPietro, 1981). These convergences are almost certainly grounded in genetic evolution and human nature. Violence links up with maleness in the animal kingdom due, ultimately, to dynamics of sexual selection (Darwin, 1871). Males benefit from dominating other males, and, more generally, from being able to demonstrate fighting prowess. In humans, this fact explains associations between a male-typical hormonal profile and male-typical forms of behavior, such as rough-and-tumble play and violence (Hines & Kaufman, 1994; Raine, 2014, pp. 194–198).

When I was a young boy, my friends and I would sometimes spend our afternoons enacting violent scenarios of the imagination. We referred to this kind of play by the innocent phrase of "being someone else." Somehow, this "someone else" always turned out to be a superhumanly powerful hero capable of taking on hordes of malicious foes. And there would always be hordes of malicious foes. We would punch, kick, and shoot imaginary guns into the air, picturing in our mind's eye how our forceful gesticulations would cause our enemies to fly like ragdolls. Often we would provide the sound effects ourselves. We did not feel bad about all of this violence because its targets were the bad guys. They deserved it for having invaded our homes or attacking one of us unprovoked, or something. We enacted these scenarios despite the fact that we were privileged, middle-class children who had no real experience with, or use for, violence. We just felt that it was stimulating. As we grew up and our parents grew less protective of our supposedly endlessly impressionable minds, violent imaginative play gave way to violent action movies and video games. My uncle bought me *Doom II* in 1996.

Though it is a little uncomfortable to admit, there is nothing in *Doom* that was not there in my young (and adult) head in the first place. This does not really worry me. Many perfectly sociable people, especially of the male variety, have benignly violent fantasies and consume benignly violent media products to gratify the same underlying impulse. *Doom* is one such source of gratification. *Doom* simulates precisely the type of violent scenario that my friends and I enacted in our imaginations. It even provides the requisite justificational narrative. The game is much more likely to express the player's existing inclinations than to inculcate violent

tendencies (for a similar argument, see Ferguson, 2010b). To counter this argument, a critic might cite evidence for social imitation in the tradition of social learning theory (Bandura, 1991; Bandura, 1977; DeWall & Anderson, 2011). According to this tradition, people are likely to adopt the behaviors that they see others perform, including violent behavior. However, despite decades of research, there is no real evidence that engagement with violent *virtual* worlds produces violent imitation outside the virtual world (Elson & Ferguson, 2014). The one exception appears to concern socially maladjusted, aggressive children, who may be adversely affected (Huesmann & Taylor, 2006). But such cases are rightly regarded as pathological, and I am not here interested in extreme cases. All of this is not to suggest that violent content in video games is always *A-okay*, and that we are never right to worry about it. Most people, players and nonplayers alike, believe that virtual violence ought generally to be morally justified. I believe so too, and take comfort in the fact that players tend to shun virtual violence when they are invested in a game's story world and deem the violence immoral (for evidence and discussion, see Kjeldgaard-Christiansen, 2019).

Like other violent video games, *Doom* may benignly play off a violent impulse rather than perniciously stoke it. And just as both children and adults need not act out their benignly violent fantasies, so players of *Doom* can recognize the game as a way of scratching the same imaginative itch. Hugo Martin of the *Doom* team makes the same point: "I don't think anyone who would pay 60 bucks for a *Doom* game is looking to avoid a fight." *Doom* makes this fight especially attractive by granting the player enormous power and providing a digital clearing for its use. There is and will continue to be a market for such experiences because they connect with an aspect of who we are, or at least who many of us are. In the end, *Doom*'s digital violence seems to me no better or worse than your average schoolboy's power fantasies, and we are not going to get rid of those, either.

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Cliodynamics and Dramatic Performances

Bruce McConachie

The Seshat project is a global history databank founded in 2011 by social historian Peter Turchin and his colleagues. Among its key accomplishments is the ability to discover causal relations between the primary mode of ritual performance in historical polities and their social complexity and cohesion. In brief, Turchin and his colleagues hypothesize reasons for a polity to adopt more complex modes of organization, build a database that links likely indicators of that change to historical evidence, and then devise mathematical formulas to test their hypotheses. This method has been named "cliodynamics" because it metaphorically marries the Roman muse of historical knowledge to dynamic systems theory. Within Seshat, anthropologist Harvey Whitehouse and his assistants code rituals on a spectrum that ranges between euphoric and dysphoric cognitive and performative elements. Examining historical polities and their rituals from ancient times to around 1900, Whitehouse has found that his ritual indicators for these elements correlate with Turchin's indicators for social complexity and cohesion.

As a historian of drama in several media—from live performance to the Internet—I am interested in Turchin's and Whitehouse's ability to demonstrate empirical relationships linking social cohesion to popular religious rituals. As in most areas of historical scholarship, historians of theater and performance have long struggled to ground their explanations in empirically valid definitions and procedures that restrain their own and others' ability to cherry-pick evidence that "proves" their precooked perspective. The historical patterns uncovered by Seshat can help to produce such restraints. It is evident from performance history that dramatic representations (initially on-stage and later in all media) have been energizing many of the same emotional and empathetic entanglements as religious services for many members of complex societies since around 1800. Because performances of rituals

B. McConachie (✉)
University of Pittsburgh, Pittsburgh, PA, USA
e-mail: bamcco@pitt.edu

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and dramas have much in common, one could expect some revealing continuities connecting ritual to dramatic experiences and the relations of both to the problematics of social cohesion.

In this chapter, I provide an overview of Turchin's and Whitehouse's approach, then deploy key aspects of their explanatory framework in a case study of four Hollywood films produced from the mid-1950s to the early 1970s. During this period, according to a recent study by Turchin, indicators of social cohesion in the United States moved from positive into negative territory. The plunge from what Turchin (2016b) calls the "Era of Good Feelings II" into an "Age of Discord II" in the US invites an assessment of popular US dramas on television and film during this 20-year period (p. 243). Analyzing these four movies through the lens of Whitehouse's understanding of dysphoric rituals, lightly modified to suit Hollywood dramas, will illuminate their relation to the changing dynamics of social cohesion in the US.

1 A Cliodynamic Approach to Ritual Experience

Cliodynamics has been a subfield of historical studies since the 1970s, using Big Data to challenge the empirical reliability of conventional history. Peter Turchin (2016a) describes his work in the introduction to his *Ultrasociety* as combining "the insights from such diverse fields as historical macrosociology, economic history, and cultural evolution to build and test models for historical dynamics" (p. 19). Convinced that cliodynamics can improve historical explanations, he argues that "traditional history has been deficient" because it cannot empirically distinguish "good explanations from bad ones" (p. 19). He gives as an example the consensus among several historians, archaeologists, and political scientists that large-scale, complex societies first evolved primarily because of the invention of agriculture in northern China and the Fertile Crescent of the Middle East. Turchin tests this consensus and concludes that it is wrong. Though acknowledging that agriculture and geography created the necessary conditions for social complexity, he draws from gene-culture coevolution theory to hypothesize a better explanation: social complexity is "only possible when societies compete against each other" (p. 19). Using Big Data to build a model that tests his hypothesis, he demonstrates that warfare provides a better explanation than agriculture for the beginning of our species' long march toward social complexity.

According to Turchin (2016a), the model he built with his colleagues, which was published in the *Proceedings of the National Academy of Sciences* (2013), "did an incredibly good job of predicting when and where large empires arose in Eurasia and Africa" (p. 20). They used what he and others have called "retrospective prediction" to test the two potential explanations. As he explains, "Two rival theories may make different predictions about the behavior of some variable … under certain conditions. We then ask historians to explore the archives, or archaeologists to dig up data, and determine which theory's predictions best fit the data" (Turchin, 2008,

p. 35). He adds that retrospective prediction, or "retrodiction," "is the life-blood of historical disciplines such as astrophysics and evolutionary biology" (Turchin, 2008, p. 35).

Turchin (2016b) applies retrodiction to US history in *Ages of Discord: A Structural-Demographic Analysis of American History*. He begins with a flashback to the surrender of Ft. Sumter in 1861, which signaled the catastrophic failure of the US constitutional system and triggered the Civil War. As he puts it, "What is particularly astounding is how myopic the American political leaders and their supporters were on the eve of the Civil War, especially those from the southern states" (p. 3). Turchin believes that the Civil War should have taught us "that large-scale complex societies are actually fragile, and that a descent into a civil war can be rapid"—a lesson that, "150 years later. .. has been thoroughly forgotten" (p. 4). Writing near the end of the 2016 election season, Turchin states that we now know enough about historical dynamics—even though that knowledge "is by no means complete"—"to be worried, very worried about the direction in which the United States is moving" (p. 4).

Ages of Discord summarizes the structural-demographic theory (SDT) that Turchin deployed with some success to understand sociopolitical instability in pre-industrial polities. The theory identifies long-term cycles of political instability, usually lasting from a 120 to 200 years, in such disparate, agriculturally based polities as the Roman Republic, Bourbon France in the years before the Revolution, and China over the 200 years of its empire. Each cycle consists of integrative and disintegrative phases, roughly equal in length, when the main indicators of political instability and social discord are either decreasing (the integrative phase) or increasing (disintegrative). Turchin sets out to apply this theory—based primarily on synthesized ideas from Marx, Weber, Malthus, and others, modified by masses of historical data—to US history. He acknowledges that he had to modify the theory for the period between 1840 and 2010, due to changes forced by industrialization (and, later, by the dynamics of post-industrialization).

Turchin's indicators demonstrate that the initial disintegrative phase of the first full cycle for the US bottomed out in the early 1900s, and that a second cycle began to track upwards with progressive reforms and the national unification required for entry into the Great War. This integrative phase continued with the reforms of the New Deal, national mobilization to fight WW II, and the post-war economic boom. The cycle shifted toward disintegration in the mid-1960s, with the fragmentation of the Civil Rights struggle, urban riots, and protests against the Vietnam War, and capitalism's attacks on the power of labor unions. Although Reagan's presidency solidified several downward trends, the 20 years from 1960 to 1980 was the key transition period; several indicators of social cohesion peaked in the early 1960s and more began to decline into political discord after that. Did a similar shift occur in the cognitive and performative elements of popular dramatic performances on film and television?

Enter Harvey Whitehouse. Following the publication of his *Modes of Religiosity: A Cognitive Theory of Religious Transmission* (2004) and extensive research investigating the relations among ritual activities, group cohesion, and cultural complexity,

Whitehouse joined Seshat in 2015. A 2014 article, "The Ties That Bind Us: Ritual, Fusion, and Identification," written with cognitive anthropologist Jonathan Lanman for *Current Anthropology*, sums up a significant strand of this research. Their abstract for the essay begins by noting two major problems in the scholarship on ritual:

> Most social scientists endorse some version of the claim that participating in collective rituals promotes social cohesion. The systematic testing and evaluation of this claim, however, has been prevented by a lack of precision regarding the nature of both 'ritual' and 'social cohesion' as well as a lack of integration between the theories and findings of the social and evolutionary sciences. (2014, p. 674).

These same difficulties have also bedeviled scholarly progress in integrating evolutionary, anthropological, and historical work on ritual and social cohesion in performance studies. See, for example, the competing definitions of ritual, society, performance, and related terms in Jeffrey C. Alexander (2011), *Performance and Power*, Marvin Carlson (2004), *Performance: A Critical Introduction*, Peter G. Stromberg (2009), *Caught in Play*: *How Performance Works on You,* and my own *Evolution, Cognition*, *and Performance.*

Whitehouse and Lanman begin by noting the common observation by many social scientists that all cultures promote two primary means of cultural cohesion: identity fusion and group identification. The first occurs "when a social identity becomes an essential component of our personal self-concept" (Whitehouse & Lanman, 2014, p. 677), usually leading to a person's strong identification with a small social group. The second simply notes people's recognition that they share certain prototypical behaviors and norms with other group members that are not essential to their individual, personal identities. The authors add that "social identity researchers have argued that personal and social identities are normally like oil and water—if one is activated, the other is not—and the more one prevails in the individual's social life, the less prominently the other features" (p. 677). As the distinction between fusion and identification suggests, "fused" individuals will tend to perceive affronts to their group as threats to their biological family, while the second orientation, "identification" with the behaviors and norms of a group, "will result in intuitions of shared group membership and trustworthiness via the workings of ethnic psychology" (p. 678). Both lead to social cohesion, but while "fused" individuals may lay down their lives for one of their "band of brothers," mutual trust is more likely to result in bolstering social norms and cooperation among ethnic allies.

According to Whitehouse and Lanman (2014), the processes of identity fusion and group identification are each related to a distinctive type of ritual—dysphoric and euphoric—practiced by our species from the late Pleistocene Epoch to the present (p. 679). Dysphoric rituals have been called rites of terror; intended to cause disorientation and fear, they often involve coercion, physical punishment, and negative emotions. By causing participants to bond together through the memory of that shared ritual experience, dysphoric rituals prepare them to participate together in high-risk activities, such as hunting and warfare. Euphoric rituals, in contrast, "involve frequently repeated, causally opaque conventional actions with low levels

of dysphoric arousal but heavily emphasizing credibility-enhancing displays for beliefs, ideologies, and values" (2014, p. 681). These rituals persuade primarily through the repetition of a common orthodoxy, rather than demanding obedience to fearful practices. As Whitehouse and Lanman conclude:

> Viewed within an evolutionary framework, different societies require higher or lower levels of fusion or identification to fulfill their basic material and economic needs in diverse resource environments. … and the two ritual packages evolved, through a process of cultural group selection, to produce the required levels of fusion or identification. (p. 681).

Whitehouse hypothesizes that our species' shift to agriculture led its more complex social groups to gradually abandon dysphoric fusion rituals for their general population and to feature instead the norm-enhancing values of euphoric identification rituals. A brief 2015 article in *Cliodynamics* written by Whitehouse, Turchin, and a third coauthor, "The Role of Ritual in the Evolution of Social Complexity: Five Predictions and a Drum Roll," predicts how these divergent modes of ritual practice will play out over the centuries when tested by Seshat's algorithms for increasing social complexity. Whitehouse et al. craft five hypotheses, beginning with the statement that after the transition to agriculture "dysphoric rituals correlate with small-scale armed groups, intra-elite conflicts, military revolts, and separatist rebellions" (2015, p. 202). No longer necessary for the survival of the whole culture, dysphoric rituals typically fuel the loyalties, resentments, and actions of small groups of nonconformists. Euphoric rituals of identification, in contrast, thrive in the demand for the new norms of cooperation needed to sustain increasingly complex social orders.

Seshat's preliminary findings noted in the 2015 *Cliodynamics* piece report that Whitehouse's five predictions were confirmed: "We were finally able to see whether ritual statistically clustered as predicted around imagistic [dysphoric] and doctrinal [euphoric] 'attractor' positions. To our immense relief, they did. But this was only the beginning" (p. 206). More work by Seshat in the four years since has confirmed Whitehouse's hypotheses linking euphoric rituals to increasing social complexity.

What are the implications of these results for later modes of performance beyond religious rituals? Like all of our species' coevolutionary predispositions, our predilections for practicing dysphoric and euphoric rituals can be expected to continue past the Pleistocene and into the present. Darwin's general rule about descent applies to coevolutionary cultural traits as well as to bones and neurons; descent nearly always involves modification. Just as many of the political practices of hominids during the Pleistocene will not be expressed the same as they were a million years ago, present-day performative practices will likely have morphed into analogous, but still recognizable modes. Consequently, we can expect to find structural elements and social purposes that remain rooted in dysphoric and euphoric rituals in many of the current dramas—whether on stage, radio, film, television, or the Internet—performed in more complex societies. Following Whitehouse's results, it should not be difficult to discern the elements and purposes of performances that are primarily euphoric in orientation—norm-enhancing dramas with prosocial emotions that have been popular in complex societies over the last 200 years.

But what about the continuing viability of cognitive and performative elements in dramas deriving primarily from dysphoric rituals? Although religious rituals of terror have diminished among citizens living in complex societies, no one would argue that frightening, disorienting, and even painful dramatic performances have disappeared among these populations. The history of two major Hollywood genres that traffic in dysphoric shocks—horror and crime films—suggests that the enjoyment of these genres has continued despite the increasing complexity of modern life. Significantly, both genres flourished in the US before, during, and after Turchin's integrative and disintegrative phases of social cohesion in the modern US polity. For example, *Them!*, a 1954 film featuring giant, radioactive ants that threaten Los Angeles, and a 1962 episode from *The Untouchables* television series, which contrasts the incorruptible virtue of a heroic federal agent with a businessman who has ties to the mob, were popular examples of horror and crime dramas during Turchin's "Era of Good Feelings II" phase of US history. These may be usefully contrasted with two later dysphoric films from the same genres, *Night of the Living Dead* (1968) and *The Godfather* (1972), which gained enormous popularity during the transition to Turchin's disintegrative phase. *Night / Dead*, a seminal example of later zombie movies, features an embattled group of survivors, all of whom eventually die, and the film maintains the fiction that more cannibalistic ghouls lurk in the darkness ready to terrorize and devour us. Likewise, Francis Ford Coppola's *The Godfather* marked a major turning point in the genre of mafia-centered crime dramas, with its evocation of sympathy for a mob family, cascade of ritual killings, and cynical view of governmental law and order.

My case study will demonstrate that dramas deriving from dysphoric rituals have continued to be popular with many citizens living in complex societies, even though the religious rituals that support fusion identification have declined among the general population. These examples suggest that such popular dramatic entertainments may begin to take the place of dysphoric religious performances when the historical cycles discovered by Turchin shift from their integrative to disintegrative phases. In particular, Whitehouse's indicators of social dissensus and distrust in the latter two horror and crime dramas suggest that these dramas helped to undercut the general cohesion of the polity after 1965.

2 Dysphoric Dramatic Performances, 1950–1980

Although rituals and films are different in several ways, most of Whitehouse's categories for coding rituals can be transferred with relative ease to the analysis of Hollywood film dramas. Some require tweaking before they can be applied to dramatic as well as ritual performances. Only a few do not transfer at all. Whitehouse divides the groups involved in rituals into three categories: "specialists," "participants," and "audience." "Priests" and "entertainers" are his primary ritual specialists and his audience, as might be expected, are those watching the performance but not taking an active part in eating, praying, or similar ritual activities (See Seshat/

Methods/Code book/Ritual Variables, n.d., for all coded material). These two kinds of roles correspond closely to the conventional parts played by actors-as-characters and spectators in most dramatic productions. Unlike actor/characters, however, religious priests combine self and character into a single, indivisible whole. Whitehouse's "participants," however, are unique to rituals. These may be initiates and highly engaged congregants, but are usually distinct from his specialists and audiences. While I will be attentive to what I take to be the thoughts and emotions of the audience, I will not assume that spectators for dramatic performances (a term I will use interchangeably with audiences) ever became ritual participants. Whitehouse's method queries the frequency of ritual interactions among his three groups. In terms of the US entertainment industry, this question is relevant for spectators, but a different one needs to be asked about actors. Hollywood used box office sales, Neilson ratings, and similar data to track the popularity of their products, but looked to Oscars, Emmys, and other awards to rate their performers and the other artists who produced their dramatic shows. Regarding the four popular dramas I am examining, all were successful according to the standards of their time and each won some awards.

Whitehouse's category of "inclusiveness" (whether his ritual specialists and audiences came from the whole polity, the elite, or other groups, etc.), however, is more difficult to transfer to Hollywood entertainment. With the exception of *Night of the Living Dead*, the films were cast with professional and star actors, intended for adult audiences, and marketed either in prime time or in first-run movie houses. Although *Night/Dead* began as a low-budget, black-and-white cult film, its innovations made it one of the most popular and profitable horror films in movie history. Answering the larger question about the relative inclusiveness of the audience is more difficult. Hollywood promoters in the 1950s and 1960s understood that horror films generally played well to teenage audiences, but neither *Them!* nor *Night/Dead* was marketed exclusively for those spectators. *The Untouchables* was a successful prime-time series and *The Godfather*, as we'll see, was one of the most popular and celebrated films in Hollywood history. Whether either film drama played especially well to elite spectators or appealed primarily to working-class families or minority groups, however, cannot be known without more research. Whitehouse also enquires about the "costs of participation," which in the case of human ritual sacrifices prevalent in early archaic states could be substantial. For most Americans from the 1950s through the 1970s, of course, the "costs" were relatively easier to bear, although there were some poor families that could not afford televisions or the price of occasional movie tickets.

In addition to the social categories above, Whitehouse asks about dysphoric and euphoric elements in each ritual, checks on orthopraxy and orthodoxy (which ensure a standardized performance [orthopraxy] and a standardized interpretation [orthodoxy] of the ritual), and direct evidence in the ritual's content about social cohesion. Perhaps the best way to discuss the details of these cognitive and performative elements is to use them in the order listed above to analyze the first of our four films, *Them!*

Not surprisingly, the primary dysphoric element in this 1954 horror movie is the fearsome and disgusting image of the giant ants themselves, explained in the film as mutants created by the atomic explosions at Alamogordo, New Mexico. Roughly 6 ft tall and 10 ft long, they crawl out of holes in the ground and lurk in the storm sewers of Los Angeles on hairy, spindly legs with bloated bodies, to threaten humans by stinging them to death with formic acid or crushing their bodies with their lobster-claw-like mandibles. Disgust and fear of mutilation or death—all grounded in evolutionary realities and listed by Whitehouse as dysphoric—provide the emotional highpoints of the action. The climax of the plot occurs when the US Army is brought in to fight the ants in the sewers of L.A. A heroic police sergeant rescues two boys in one of the sewer pipes, but is squeezed to death by an ant before he can escape. Accompanying the army is the hero of the drama, a senior scientist who specializes in ants; he tells us that the new queen ants have just hatched, but luckily have not yet left to start new nests. Army flame throwers provide a fiery inferno that kills the beasts and fries the rest of their eggs. At the end of the film, however, the scientist warns of unknown dangers to come: "When Man entered the Atomic Age, he opened the door to a new world. What we may eventually find in that new world, nobody can predict" (Weisbart & Douglas, 1954).

Despite this somber tone, which pervades the film and accompanied the likely audience response of fear and disgust to many scenes, *Them!* has several euphoric moments that occasionally take the edge off the elements of horror. The scientist is given some quirky, comic lines that raise a few smiles and his good-looking daughter, another scientist, provides what Hollywood in the 1950s understood as "sex appeal," which attracts some appreciative attention from a male FBI agent. Although their mutual attraction never amounts to a romantic subplot, it does provide occasional distraction from the general tone of anxiety. Then there are some short comic episodes with minor characters—a befuddled airplane pilot and a couple of alcoholics who would rather hit the bottle than talk about what they saw. Dysphoric elements predominate over euphoric ones, but that is to be expected in a horror-sci-fi movie.

In this regard, the orthopraxy and orthodoxy checks built into the formal elements of the film ensure that it stays within the conventions of horror films and will be interpreted in that way. Like many horror movies of the period, the first third of the film plays like a detective story, with the police and FBI trying to figure out what is causing the murders and property destruction they uncover in the New Mexico desert. The giant ants are kept off-screen during this suspenseful build-up, although we do hear them occasionally, along with screams from their victims. The first ant the spectators see appears behind the scientist's daughter, when she is alone in a pocket of the desert, oblivious to the danger and looking in the direction of the camera. Innocence-in-danger shots occur often in *Them!* These and similar filmic conventions were the Hollywood equivalent of Whitehouse's ritual orthopraxy and -doxy in the 1950s.

The category of social cohesion covers examples such as oath-taking and actions that reflect the willing assumptions of civic duty. Whitehouse recognizes that strong public norms generally accompany social cohesion in complex societies, while familial ties of altruism and/or honor often bind groups together in less complex

ones. Although set against the background of possible nuclear war between two complex superpowers, *Them!* shines with civic trust and pride! Despite some minor tensions among public authority figures, the local police cooperate with the FBI, the scientist and his daughter work well with both of them, and when the mystery of the giant ants is solved, the federal government responds quickly to the threat, declares martial law in L.A., and sends in the army. In the parlance of the day, the authorities "contain" the threat from the nuclear ants, allowing innocent Americans to go on with their virtuous lives. Yes, the Atomic Age will kick up new threats in the future, but *Them!* assures us that the scientists who brought us these problems, in alliance with other trustworthy public servants, also know how to protect us from "them."

This assumption is starkly at odds with the filmic world brought to life in *Night of the Living Dead*. The nightmarish plot of this thriller also builds on the legacy of "the Atomic Age," in this case the fear that "radioactive contamination" might cause the dead to rise from their graves and seek to eat the living. *Night/Dead* depicts cannibalism and intergenerational family murder and introduced an African American protagonist and racial conflict into its story—taboos that conventional Hollywood horror flicks had avoided before 1968. Lacking nearly any euphoric elements, it shows ravenous ghouls eating the charred remains of human flesh, and features a daughter, reanimated after her death, biting into her father's body and stabbing her mother to death with a masonry trowel. The main plot is simply told. Ben, an energetic, responsible black man in his 20s, tries to help several white adults and teens save themselves from the zombies that are trying to penetrate an old farmhouse where they are temporarily holed up, but his efforts are continually frustrated by their incompetence, fear, and racism. At one point, a frightened father tries to shoot Ben, but he wrestles the rifle from the older man and must kill the father to save himself. At the end of the film, Ben is the only non-ghoul character remaining in the farmhouse. Hearing gunfire in the morning, he emerges from the cellar to see a local sheriff and his vigilante deputies shooting the remaining zombies and signals to them that he is alive. But a deputy takes Ben for another zombie, shoots him in the head (the only way to kill zombies in the film), and throws him on the pile of ghouls to burn.

In his *Why Horror Seduces*, evolutionary cultural scholar Mathias Clasen (2017) argues that *Night/Dead's* zombies trigger defensive adaptation responses in their viewers related to human fears of predation and contagion: "We fear agents that have the will and the capacity to eat us and we have strongly aversive reactions to cues of contagion, such as the odor and sight of decomposing flesh" (p. 98). As Clasen notes, the ghouls of the film—the characters never actually call them "zombies," a term that was applied to them later—are also weirdly uncanny. We all know that dead people should not be able to move around, much less try to eat the living, but these "living dead" do both.

George Romero, the writer and director of *Night/Dead*, borrowed some elements from previous Hollywood horror films, but scrambled them to purposefully confuse his audience and unsettle their conventional ways of interpreting his film. Instead of gradually building an atmosphere of mystery and tension, Romero begins by turning a simple outing involving a brother and sister's visit to a cemetery into an ambigu-

ous situation that could be innocent or dangerous. Only later, when the sister is safe in the farmhouse, do we learn that she was right to flee from the strange man that pursued her. Soon after that, however, the sister sinks into a numbed stupor, and the character who might have provided the conventional innocent female victim of the horror film becomes irrelevant to its plot until Romero decides to reanimate her later in the movie. For these and similar reasons, the usual paths to orthopraxy and orthodoxy cannot be trusted in *Night/Dead*.

Nor, of course, can the conventional sources of morality and justice be relied upon to operate responsibly in the threatening and grotesque world of the film. In contrast to *Them!* families cannot be trusted to protect their own and public authorities—the police, news reporters, hospital officials, and federal government—do not coordinate their efforts. When Ben is finally able to listen to news reports on radio and TV about what is happening and how to deal with the zombies, the coverage is haphazard and partial. The scientists, for example, are not sure why the dead are rising from their graves. Ben hears a report that a nearby hospital is a safe haven and, following that hopeful tip, tries to get enough gas in his truck to take the wounded survivors in the farmhouse there, but a gasoline spill upsets his plans and the torch he was using to protect himself from the ghouls starts a fire that leads to the truck's explosion. With families dysfunctional and public help impossible to reach, *Night/Dead* leads Ben and the audience into isolation and claustrophobia, until he is the only human left alive in the farmhouse. As film historian Joseph Maddrey (2004) remarks, the content and "wartime newsreel style" of Romero's black-and-white film makes it seem much like "a documentary on the loss of social stability" (p. 51).

Romero did not invent zombies—by 1968 such "living dead" characters had already been featured as mindless automatons in films about Haitian voodoo—but he did invent the subgenre of horror films that features the lurching, ravaging, cannibalistic monsters who fear fire but can only be killed by a bullet to the brain. *Night/Dead* continued to play in film houses for a decade after its release and it has been translated into more than 25 languages. Even today it ranks as one of the most popular downloadable films worldwide, in part because Romero neglected to legally copyright it. Hundreds of zombie flicks have been successfully produced and marketed since 1968 and film historians also credit *Night/Dead* with influencing the subgenres of "splatter" and "slasher" horror films.

Because crime dramas also continued popular from the 1950s through the 1970s, two films involving the mafia—an episode from *The Untouchables* (1962), a TV show shot on film, and *The Godfather* (1972)—offer insight into the sea change that occurred in indicators of social cohesion in the US during the 1960s. *The Untouchables*, based on a fictionalized account of a Prohibition agent (Eliot Ness) and his team of Feds who fought crime in Chicago in the early 1930s, ran weekly on ABC Television for three seasons from 1959 to 1963. I will examine a 1962 episode entitled "The Case Against Eliot Ness." At a public meeting organized to facilitate the Chicago World's Fair of 1933, Ness (portrayed by Robert Stack, the award-winning star of the series) succumbs to a moment of anger and accuses a businessman-promoter named Mitchell Grandin of murder. The TV audience

already knows that Grandin is in league with the mafia, who killed the previous promoter so that Grandin could run the Fair and share the profits with the mob. Grandin sues Ness for libel, however, and most of the 50-min episode involves a search for witnesses who can testify that Grandin was implicated in the initial murder.

As in most films featuring mafia bosses and murders before 1970, dysphoric elements predominate over euphoric ones. The boss in this episode is Frank Nitti, who (the audience is led to understand) took over Al Capone's gang when he was sent to jail for tax evasion. Just as Ness's upright behavior to find and protect the witnesses leads to admiration, Nitti's actions to wipe them out evoke disgust and disdain. The mob kills two of the three witnesses and it looks like Grandin might go free and win his case. Then Ness figures out a way to trap the two-timing wife of the last witness into flushing out her husband. Although the witness is killed in a shootout, Grandin does not know that he is dead and Ness induces him to plan to kill the already-dead witness in a darkened room. The film-noir trap works; Ness gets a photograph of Grandin, knife raised over the dead body of the witness, the promoter is booked, and "the case against Eliot Ness" is thrown out of court. A few grim jokes from the Feds and some boasting and glad-handing from Grandin provide occasional semi-euphoric relief from the tension.

The Hollywood conventions of mafia crime films, set in the 1930s, changed little in mafia-centered episodes from *The Untouchables.* In response to criticism from Italian-American organizations that *The Untouchables* would perpetuate negative stereotypes of their ethnic group, Desilu Productions made some minor casting changes but continued to depict Italian-American gangsters as boastful, reckless, and bloodthirsty. "The Case Against Eliot Ness," like most mafia films, is a melodrama with unambiguous figures of good and evil. There can be little doubt that the primary TV audience for the episode knew how to interpret the story.

As in *Them!*, the Feds under Eliot Ness work cooperatively with other federal, state, and local agencies of law and order. Although the citizens of Chicago backing the World's Fair initially side with Grandin, Ness recognizes their good intentions and remains courteous and deferential to them. The patience and hard work of the Federal agents starkly contrast with the vainglorious recklessness of Grandin and the gangsters, who fight among themselves and fail to take advantage of their early success. Poetic justice is served at the end of the melodrama; the final shot shows Ness and his team passing through the entrance on the opening day of the World's Fair, with fireworks overhead. For the 1962 television audience, this image connecting the incorruptible Feds to "The Century of Progress," as the 1933 Fair was named, linked trust in the federal government with the progress of mankind. What better way to validate the polity's protection of American social cohesion for the future!

The massive success of *The Godfather* just 10 years later helped to undercut public confidence in the power of the government to guarantee justice and social cohesion in America. The highest-grossing film in 1972 (and for a time the highest-grossing film ever made), *The Godfather* claimed ten Oscar nominations and was eventually ranked as the second-greatest film in US cinema history (just behind

Citizen Kane) by the American Film Institute. Two *Godfather* sequels (in 1974 and 1990) followed and the new respect it won for the mafia helped to launch several other mafia-centered films and TV series, notably *The Sopranos*.

Unlike earlier mafia crime dramas, the screenplay by novelist Mario Puzo and director Francis Ford Coppola pulls the audience into a family situation that mostly excludes questions of public justice. Instead of focusing on the Feds vs. the mob, the film examines what happens when an extended mafia family, the Corleones, lose their patriarch and must find a new boss to run the family business and adapt it to the modern challenges of post-1945 New York. In the course of these difficulties, Michael Corleone (played by Al Pacino), initially an outsider to the rackets run by his family, emerges as its reluctant leader and finally becomes its new and more ruthless godfather. Consequently, the Puzo-Coppola script required what Whitehouse understands as orthopraxy and orthodoxy checks that were very different from those standardizing the performances and receptions of most mafia films before 1972. In brief, the rituals that gave authority to the role of godfather within the mafia family had to be underlined and the old and new Corleone godfathers had to be accorded sufficient sympathy, despite their obvious connections to murderous violence, to ensure that the audience would understand their legitimate and necessary role within an elite mafia family. Whatever one thinks of the public morality of the film and its effects on social cohesion in the US, *The Godfather* succeeds brilliantly in meeting both of these challenges.

The insular focus on mafia family values begins with the first scene of the film. In the midst of a joyful outdoors wedding celebration for his daughter, Don Vito Corleone (Marlon Brando) conducts business inside his house with Italian Americans who seek his advice and ruthless intervention. A father tells the story of the near rape of his daughter and asks the godfather for justice, for example. In another situation, a godson requests his godfather's help in securing a Hollywood contract so that he can become a movie star. The relationship between the petitioners and the godfather is essentially personal and feudal; Don Corleone avoids the legal complexities of modern justice to play judge, jury, and enforcer in each of these situations. Regarding the Hollywood contract, Don Vito dispatches his consigliere to make the film producer "an offer he can't refuse" and he gives in after discovering the severed head of his prize racehorse in his bed (Ruddy & Coppola, 1972). What might have been interpreted as vengeful and authoritarian in earlier mafia-centered films is understood—although neither justified nor rejected—as a traditional and necessary strategy to protect the family.

In another attempt to narrow the ethical reach of the film, Don Vito initially appears more humanitarian than the other gang bosses because he, unlike his rivals, does not want to involve his family in illegal drug trafficking. This rivalry leads to the shooting and eventual recovery of Don Vito and it begins the family's search for one of his sons to assume the mantle of the godfather's authority upon Don Vito's death. The long middle part of the film reveals the utter corruption of the police and the politicians in New York who are profiting from the mafia's "business" ventures. Not surprisingly, none of the figures representing public law and order approach the squeaky-clean morality of Eliot Ness and his "untouchables." After Don Vito's fatal

heart attack in 1955 (while the sympathetic old man is playing with his grandson in a flower garden), his son Michael steps into his role. The new Don arranges to participate in the church baptism of a baby for whom he stands as godfather on the same day as his Corleone avengers murder the other New York dons who had opposed his family.

The usual emphasis in previous mafia-centered films on dysphoric elements in the story also shifts to include more moments of euphoria in *The Godfather*. The initial wedding festivities include a wide range of positive, emotionally arousing scenes, with dancing, entertainment, toasts, feasting, and illicit sex in an upstairs bedroom. Hiding out in a safe village in Sicily to escape assassins, Michael falls in love with a beautiful local girl and marries her in an idyllic wedding ceremony. Still, dysphoric elements prevail and shock. In addition to the bleeding stallion in the producer's bed, there is the violent attempted murder of Don Vito, a knife driven through the hand and into the table of a Corleone capo caught pretending he is a rat, and Michael's murder of a crooked cop and two rival gang members for the attempt on his father's life. Then, in Sicily, Michael's new bride is killed when a car bomb, meant for him, blows her up instead. Back in the US, Sonny, Don Vito's first son and heir apparent to become the next godfather, savagely beats his sister's skirt-chasing, wife-thrashing husband and then is machine-gunned down in a blood-soaked toll-booth massacre scene.

Director Coppola saves the worst for last. At the climax of the film, the preparations for and killings of the Corleone enemies are intercut with the solemn rituals baptizing the baby and investing the new godfather with divine authority in a lavish church ceremony. As Pauline Kael (1972) pointed out in her review of the film, Coppola followed the "uncoercive, 'open' approach to the movie frame" pioneered by Jean Renoir (p. 7). This approach allows the spectator to "roam around in the images" (p. 7) without overtly directing attention and mandating specific interpretations of each scene. Again, Coppola presents a bloody action with ethical ambivalence; is the church ritual meant to critique or bless the revenge slayings? While both interpretations seem possible, neither finally matters. The sanctification of new godfathers and murderous vengeance are both made to seem necessary in the predatory world of the mafia. The audience's evolved fears of violent death likely drove many spectators to seek psychological safety in the protection of a mafia boss.

The Godfather sacrifices the social complexity and cohesion of the nation-state for feudal loyalties owed to an authoritarian mafia family. Several scenes of the film, in addition to its overall plot, underline the supremacy of allegiance to one family and the necessity for a strong, patriarchal godfather as its absolute leader. Scenes of oath-taking and ring-kissing bookend the film—first in fealty to Don Vito then to Don Michael—leaving no room for or even patience with the difficulties of democracy, the rule of law, or prying press discussions in the public sphere. The one voice in opposition to the drift of the film toward patriarchal authoritarianism is Kay Adams (Diane Keaton), who marries Michael after his return from Sicily. When midway through the story she asks Michael how he can justify the murders committed by his family, he answers that his father is "like a president," even to the point of having people killed (Ruddy & Coppola, 1972). In effect, the 1972 film invites

spectators to choose between the war in Vietnam and a family that must kill to survive in the gang wars of New York. By this point in the action, most spectators had likely made their choice. Near the end of the film, Michael hides his plans to wipe out the other gangs from his wife and literally closes the door on her when his killers come to discuss business, silencing her opposition.

The two post-1967 dysphoric dramas, *Night of the Living Dead* and *The Godfather*, substantially depart from the orthopraxy and orthodoxy checks of the two pre-1963 dysphoric dramas. The result is an increase in dysphoric shocks in the later dramas and a sharp decline in dramatic incidents that uphold social and political cohesion through prosocial emotions and public norms. Instead, these dramas represent the institutions of social cohesion above the level of family members—including the police, the federal government, broadcast journalism, public health, and the political process—as too corrupt to be reformed. In response to such a brutal and lawless society, *The Godfather*, which Coppola may have believed to be a critique of America as organized crime, probably backed many spectators into justifying the patriarchal control and vengeful murders practiced in one mafia family as necessary to ensure its survival. *Night/Dead* goes even further. With the return of the dead to attack the living, the nuclear family is no longer safe from its own children. This film, the original zombie horror movie, shows the gradual isolation of a man who attempts to practice the norms of traditional social cohesion only to be rejected by others in need of his help and finally killed because of the color of his skin.

Whitehouse's and Turchin's work on complex cultures and their dynamics of social cohesion showed that dysphoric religious rituals gradually retreated to the sidelines of history, settling into odd niches in such minority cultures as disaffected elites, military training circles, and revolutionary cadres. Clearly, however, many of the elements of dysphoric rituals migrated over time to dysphoric dramas, which established conventional narrative structures, expectations, and audiences, and became especially popular in what Turchin analyzes as disintegrative historical periods. We need look no further than the impeachment proceedings against President Donald J. Trump to discern one of the effects of dysphoric film media on politics regarding the present disintegration of democratic norms in the United States. In a telling life-imitates-art moment, when Congressman Adam Schiff, Chair of the House Intelligence Committee, began his interrogation of Trump's Acting Director of National Intelligence on September 26, 2019, he aptly summarized Trump's phone call to the President of Ukraine as "a classic organized-crime shakedown" (MSNBC, 9/26/19, 9:10 am, EST). Indeed, several news reports had already confirmed that the President's personal lawyer, Rudi Giuliani—deeply implicated in Trump's attempt to exploit Ukrainian weakness to get dirt on Joe Biden for Trump's political benefit—enjoys binging on reruns of all three *Godfather* flicks. Will it later emerge that Giuliani and the President shared a joke about Trump making President Zelensky of the Ukraine "an offer he can't refuse?" Stay tuned ...

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Part VII
Oral Narratives and Literature

Descent with Imagination: Oral Traditions as Evolutionary Lineages

Jamshid J. Tehrani

There's an old folktale told in many parts of China, Japan, Korea, and other countries in East Asia that is commonly referred to as "The Tiger Grandmother" (Ting, 1978). Like all folktales, no two tellings of The Tiger Grandmother are identical, and the details of the story vary from place to place. But it often goes something like this: There was a woman who lived in the mountains with her three daughters. One day, the woman told her daughters that she needed to leave them for a couple of days to go and visit their ailing grandmother. She packed a basket of food for the journey and told the girls not to open the door to any strangers while she was away. Soon after setting off on her journey, the mother encountered a tiger. The tiger greeted her politely and asked where she was from and where she was going. The mother replied that she was from the other side of the mountain where she lived with her three daughters and was on her way to visit her mother. The tiger noticed that the woman was carrying a basket and asked if she could spare any food. Not daring to deny a hungry tiger, the woman offered the creature some bread from the basket. The tiger greedily wolfed it down and asked for more. The mother gave it more, but still it wasn't satisfied. Soon, the tiger had eaten all the food in the basket but was still hungry. So the tiger attacked the defenseless woman and devoured her whole.

Later, with evening approaching, the tiger made its way to the other side of the mountain and found the woman's house. It knocked on the door. There was no answer. It knocked again, and this time imitated the voice of an elderly woman.

"Girls! Girls! It is your grandmother! I've come all this way just to see you!"

From the other side of the door, the girls nervously replied:

J. J. Tehrani (✉)
Durham Cultural Evolution Research Centre (DCERC) and Department of Anthropology, Durham University, Durham, UK
e-mail: jamie.tehrani@durham.ac.uk

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"But Granny, why have you come here? You're supposed to be in bed, sick, and mother has gone to visit you!"

The tiger explained that there must have been some kind of misunderstanding and pleaded with the girls to let it in. Eventually, they gave in. As soon as the tiger got into the house it blew out the lantern, concealing itself in the darkness.

"Granny needs to go to bed—it's been such a long and tiring journey … Won't you girls come and lie down and give me a cuddle?"

The children innocently climbed into the bed, but soon noticed that something felt wrong.

Touching her paws, the eldest daughter asked: "Granny, why do your feet feel so rough?"

"Those are the blisters on my feet from such a long journey."

Touching her tail, the eldest daughter asked: "Granny, what is that long fluffy thing on your back?"

"That is a jute rope that I've been weaving."

And then, hearing a strange noise she asked: "Granny, what is that crunching sound?"

To their horror, the eldest girl realized it was the sound of the tiger chewing on the bones of her youngest sister. Thinking quickly, she told the tiger "Granny, I need to pee!". "Me too!" said the middle sister. Reluctantly, the tiger let them go out into the yard, where they fled up a very tall tree. After waiting for some time, the tiger went outside to look for them, and eventually discovered their hiding place.

"What are you doing up there?" demanded the tiger.

"Oh Granny, we are eating some delicious nuts that grow in this tree. Would you like to try some?"

The girls lowered a basket on a rope and told the tiger to climb inside so that they could lift her up to the top of the tree. Eager to enjoy this unexpected treat, the tiger got into the basket. Using all their strength, the girls pulled the rope to lift the basket up, higher and higher. When the tiger was about halfway up the tree, the girls let the rope go, sending the basket crashing down to earth, and killing the tiger instantly.

I'm sure that most, if not all readers of this chapter will immediately recognize this story, even if they've never before encountered East Asian folklore. It bears an unmistakable resemblance to the famous European tale of Little Red Riding Hood, which was first published by Charles Perrault in the late seventeenth century—around the same time, in fact, that the earliest known version of The Tiger Grandmother was recorded (Tehrani, 2013). Although in the European tale it is Little Red Riding Hood, rather than her mother, who leaves the house, they both set off for the same reason: to visit the sick grandmother. And while the role of the tiger is taken by a more ecologically salient predator, the wolf, it uses the same strategy of luring its victim into bed by impersonating her grandmother. Like the little girls in The Tiger Grandmother, Little Red gradually realizes the villain's true identity after asking a series of questions ("My, what big ears you have!") that finally expose the deception. Although in most literary versions of the tale the wolf then eats Little Red, in oral traditions she often escapes using exactly the same ruse as her Asian

counterparts by demanding to go outside to answer the call of nature and then escaping into the woods (Dundes, 1989; Zipes, 1993).

Folklorists have long speculated that similarities like those between The Tiger Grandmother and Little Red Riding Hood can be explained by processes analogous to the descent with modification of biological organisms (Krohn, 1971; van Gennep, 1909; Zipes, 2006). Like genes, traditional tales mutate as they are transmitted from person to person and from generation to generation. New elements may be added while others become substituted or forgotten, generating new variants that catch on and flourish, or vanish into extinction. Through this process of selection, stories are adapted to suit different social and natural environments (for example, substituting a wolf for a tiger), generating locally specialized forms that parallel the adaptive radiation of species as they invade new habitats and ecological niches. Consequently, writers such as Stith Thompson (1951) have suggested that folklorists ought to classify their material in the same way as zoologists and botanists do, by grouping tales into hierarchically arranged "natural" categories akin to species, genera, and families. As Thompson points out, "biologists have long since labelled their flora and fauna by a universal system and by using this method have published thousands of inventories of the animal and plant life of all parts of the world … The need for such an arrangement of narrative has been realized for a long time" (p. 414).

To try and meet this need, folklorists associated with the "historic-geographic" school developed a taxonomy for classifying related tales from different cultures known as the "international type" system (Aarne & Thompson, 1961; Uther, 2004). An international type is defined as a basic plot that is recognizable across cultures due to the presence of common "motifs," which typically comprise specific characters, artifacts, or episodes that are highly stable in their transmission (Thompson, 1951). Based on this system, folklorists have codified over 2000 international tale types, which are catalogued in the Aarne–Thompson–Uther (ATU) Index (Uther, 2004). The ATU Index assigns each tale type its own ATU number. For example, Little Red Riding Hood and The Tiger Grandmother are classified as ATU 333. The founders of the international type system believed that each type represented a more-or-less coherent narrative tradition that could be traced back to an original "archetype" tale. By assembling all the known variants of a given international type and sorting them by region and chronology, they hoped to locate the sources and homelands of common folktales, track how they spread around the world, reconstruct their original *ur*-forms, and discover the ways they have been adapted to suit different social and natural environments (Sydow, 1948).

Unfortunately, the limitations of the folktale record made it extremely difficult to accomplish these goals: Since folktales are, almost by definition, mainly transmitted through oral tradition and rarely written down, the poverty of the historical record made it difficult to establish thorough chronologies. Furthermore, as European folklore traditions have been studied far more intensively than any others, inferences based on geographic distributions of variants are likely to be heavily skewed. More fundamentally, critics of the historic-geographic method have questioned the entire basis of the approach and its underlying assumptions (e.g., Jacobs, 1966; Propp, 1968). They argue that attempts to trace similarities in narrative traditions to

ancestral "archetypes" are unrealistic and mistaken: Folktales are inherently too fluid and ephemeral to be classified into types or groups based on common descent from a single ancestor in the way that biological organisms can be. Other critics, meanwhile, have claimed that it is naïve to think that folktales could have spread over vast geographical distances and endured for hundreds or thousands of years through oral transmission. For example, Ruth Bottigheimer (2009) has proposed that, rather than emerging from ancient oral traditions, the classic fairy tales were invented and popularized by writers such as Giovanni Francesco Straparola, Giambattista Basile, and Charles Perrault in the sixteenth and seventeenth centuries.

In this chapter, I will show how methods and models from evolutionary biology can help overcome some of the problems involved in reconstructing folktales and contribute to debates about the extent to which cross-cultural patterns in oral traditions can be explained in terms of basic evolutionary processes of descent with modification.

1 Folktale Phylogenetics

Like the historical folktale record, the fossil record is extremely patchy, with only a tiny fraction of species leaving any direct evidence of their existence. Instead, biologists are required to make inferences about species' descent relationships by using another source of evidence about the past: shared genetic mutations, which yield information about ancestral species that has been preserved through the mechanism of inheritance. The evolutionary history of the group of species under study is then reverse-engineered by searching for the phylogenetic tree or network that best accounts for the distributions of shared mutations based on the evolutionary model used in the analysis (Felsenstein, 2004). The simplest kind of model aims to minimize the number of evolutionary changes required to explain shared mutations, while fancier models might incorporate parameters for substitution rates that might even vary for different types of mutation, and so on. In recent years, this approach has been used to model relationships among various cultural phenomena based on the same principles, giving rise to the field of study known as "phylomemetics" (Howe & Windram, 2011). Rather than genes, phylomemetics focuses on culturally transmitted information ("memes"). For example, researchers have studied evolutionary relationships among languages based on changes in word forms (Atkinson, Meade, Venditti, Greenhill, & Pagel, 2008; Gray, Bryant, & Greenhill, 2010), and reconstructed manuscript traditions using scribal errors found in texts copied from the same exemplar (Howe et al., 2001). In the case of folktales, variants of a particular international type or story can be sorted into distinct narrative lineages by coding mutations in the characters and episodes of the story. For instance, versions of ATU 333 can be coded according to whether the daughter leaves the house or the mother leaves the house, whether the victim is attacked by a tiger or a wolf, and so on.

In an earlier paper (Tehrani, 2013), I applied phylomemetic techniques to analyze relationships among versions of ATU 333 (Little Red Riding Hood) and

another, supposedly related, international tale type ATU 123, "The Wolf and the Kids," which is popular throughout Europe and the Middle East. Like ATU 333, The Wolf and the Kids concerns a deceitful wolf who preys on vulnerable infants by disguising itself as a trusted relative. In this case, the wolf targets a litter of goat kids whose mother has left them home alone while she goes out to forage for food. In her absence, a wolf comes to the door and tricks the kids by impersonating their mother. They let the wolf in and are devoured. When the nanny goat discovers what has happened, she kills the wolf and rescues her kids by cutting them out of the wolf's stomach with her sharp horns. While this ending echoes some variants of Little Red Riding Hood (e.g., the Grimms' famous tale, "Rotkäppchen"), the story has even stronger parallels with The Tiger Grandmother, most obviously with the goat kids being attacked in their own home. Indeed, it has been suggested (e.g., Dundes, 1989; Haar, 2006) that The Tiger Grandmother is a kind of "missing link" between Little Red Riding Hood and The Wolf and the Kids. According to this theory, The Tiger Grandmother represents a survival of the original archetype tale from which ATU 333 and ATU 123 are both descended. This would suggest that the common ancestor of ATU 123 and ATU 333 originated in East Asia, and eventually mutated into two distinct international types after the tradition spread to the West (Haar, 2006).

To shed more light on these relationships, I analyzed 58 versions of ATU 333 and ATU 123 sampled from 33 populations. The analyses examined 72 traits, which included features such as character of the protagonist (single child versus group of siblings; male versus female), the character of the villain (wolf, ogre, tiger, etc.), whether the victim is devoured, escapes or is rescued, and so on (for a full list, see Tehrani, 2013). Overall, the results of the analyses suggest that relationships among the tales are largely consistent with a branching process of "descent with modification," and supported the existence of distinct narrative lineages, or "clades," corresponding to the international types ATU 123 and ATU 333 (Fig. 1). The ATU 333 clade consisted of primarily European variants of Little Red Riding Hood, and includes the famous literary versions of Perrault and the Brothers Grimm, French and Italian oral tales (where the girl escapes), and an eleventh century story contained in a sermon by Egbert of Liège (Ziolkowski, 1992). The latter branches off toward the base of the clade, which is not only consistent with the chronology of these tales, but provides quantitative evidence to support previous claims that it is indeed an early version of Little Red Riding Hood.

Similarly, the internal structure of the ATU 123 clade is consistent with chronological data, with the earliest recorded versions (attributed to Aesop and written down in AD 400), positioned at the base of the clade. Interestingly, this lineage also included a group of East and Central African tales that follow the same basic plot as other ATU 123 tales but are sometimes referred to as an "African Little Red Riding Hood" (Frazer, 1889) because they feature human, rather than animal characters (and in particular a single girl as a victim). The clear ascription of these tales to type ATU 123 demonstrates the ability of phylogenetic analysis to discriminate between distinct lineages of narrative transmission and sort ambiguous cases that don't fit comfortably within the standard definitions of international types employed in the ATU Index.

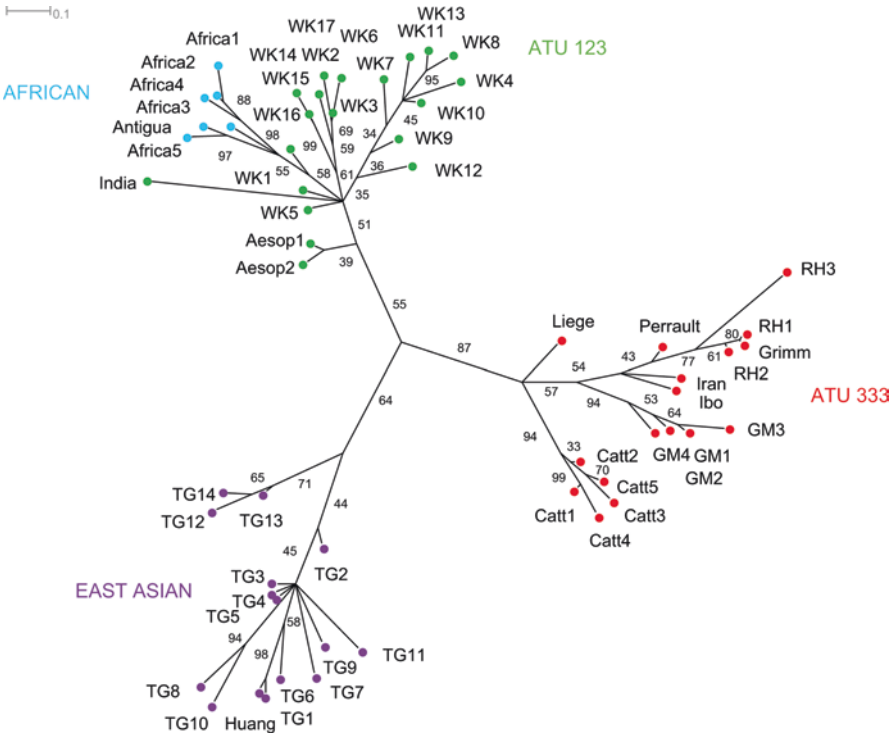


Fig. 1 Phylomemetic relationships among Little Red Riding Hood and related tales (From Tehrani, 2013). Numbers represent Bayesian posterior probabilities for each branch

The third major grouping returned by the analysis consisted of variants of the Asian tale "The Tiger Grandmother," which appear to form a separate clade from the other tales and therefore cannot be classified as either ATU 333 or as ATU 123. It is tempting to interpret this result in light of the previously mentioned theory that The Tiger Grandmother represents a "missing link" between The Wolf and the Kids and Little Red Riding Hood. Seen through this lens, the phylogeny resembles a tree with two great boughs, one branching into variants of The Wolf and the Kids, the other into Little Red Riding Hood, with The Tiger Grandmother sprouting from the roots.

Unfortunately, this interpretation does not withstand closer scrutiny. First of all, there is no evidence to suggest that The Tiger Grandmother is an older tradition than Little Red Riding Hood or The Wolf and the Kids. The first literary version of The Tiger Grandmother was recorded in the seventeenth century, long after the earliest written variants of ATU 333 (eleventh century) and ATU 123 (fifth century). Second, when we trace the development of these traditions using the phylogenetic tree as a historical map, it is clear that the East Asian and western tales have become more and more similar to one another as they evolved—which is the exact opposite of what would be expected if the tales all split from a shared common ancestor and gradually mutated into increasingly divergent lineages. For example, recent versions of The

Tiger Grandmother feature an episode that occurs in many versions of The Wolf and the Kids in which the children, suspecting that the villain may not really be their mother/grandmother, ask him to show them his hand through the door before letting him in. In the ATU 123 clade, this test first appears in a version of the fable recorded in the fourteenth century and is lacking in the last common ancestor shared with ATU 333. Similarities between the East Asian tales and ATU 333 are similarly lacking in the earliest variant, the medieval poem from Liège—such as the famous dialogue in which the victim(s) questions the "grandmother" about her strange appearance ("What big eyes you have!"). Overall, the evidence from these analyses fails to support the hypothesis that The Tiger Grandmother has preserved traits that were present in the original archetype tale from which Little Red Riding Hood and The Wolf and the Kids are supposed to have been descended. Instead, it seems that either these features evolved independently in East Asia—which would be a remarkable coincidence, given the number and closeness of the resemblances in plot, character, and even specific episodes—or, more likely, through a process of narrative "cross-fertilization," whereby elements of ATU 123, ATU 333, and local folktale motifs were borrowed and blended to create a new tale type. Importantly, the latter hypothesis would explain the temporal patterning of similarities observed among the tales, since the cumulative effects of transmission and mixing between traditions would lead to them becoming more and more similar over time (Tehrani, 2013).

Other studies have similarly shown how debates about the history and relationships among folktales can be usefully addressed using phylomemetic methods. In another Little Red Riding Hood study, Tehrani, Nguyen, and Roos (2016) analyzed a sample of literary and oral versions of the tale to test the theory that famous fairy tales were invented by early modern authors rather than deriving from ancient folktale traditions. Contrary to suggestions that Little Red Riding Hood may be a "fake" folktale authored by Charles Perrault in 1697 (Hüsing, 1989), our results strongly supported the "oral origins" hypothesis. Martini's analysis (Martini, 2019) of 300 variants of Cinderella from around the world discovered that only three of the currently recognized sub-types of the tale represent coherent phylogenetic lineages based on common descent, with one being a hybrid type and the other consisting of phylogenetically miscellaneous tales. Ross, Greenhill, and Atkinson (2013) used phylogenetic networks to discover that western variants of "The Tale of the Kind and Unkind Girls" can be sorted into five main geographic clusters that reveal how the story spread across land and sea, possibly going back to Viking expansions in the ninth century. d'Huy (2013a) carried out an analysis of the international type Polyphemus, finding that relationships among variants were structured by geographic patterns, which he interprets as evidence that the tale may have spread by population movements. d'Huy speculates that the story might have crossed over to the Americas via prehistoric human migrations across the Bering Strait during the last Ice Age. However, one of the problems with this and other similar studies (e.g., d'Huy, 2013b) is that it is very difficult to establish connections between population histories and folktale phylogenies without properly controlling for other factors that may be involved in the diffusion of these traditions, such as contact between societies, trade, conquest, and so on. It is to these issues that we now turn.

2 Folktales, Languages, and Genes: The Plot Thickens

Folktale phylomemetics provides an exemplary case of what cultural evolutionary theorists call "dual inheritance" (Mesoudi, 2011; Richerson & Boyd, 2005)—the idea that culture represents a second track of heritable variation that evolves through similar processes as the genetic track, but is based on separate mechanisms of transmission (social learning vs. biological reproduction) and mutation (memory distortions and innovation vs. genetic copying errors). One of the key aims of research into dual inheritance is to establish how and when these two systems interact and co-evolve. As it happens, this objective echoes long-standing questions in folklore studies concerning the relationship between folktale traditions on the one hand, and genetic and linguistic histories on the other. For example, Wilhelm Grimm famously argued that the traditional German tales that he and his brother Jacob had compiled were remnants of an ancient Indo-European inheritance that stretched from Scandinavia to South Asia:

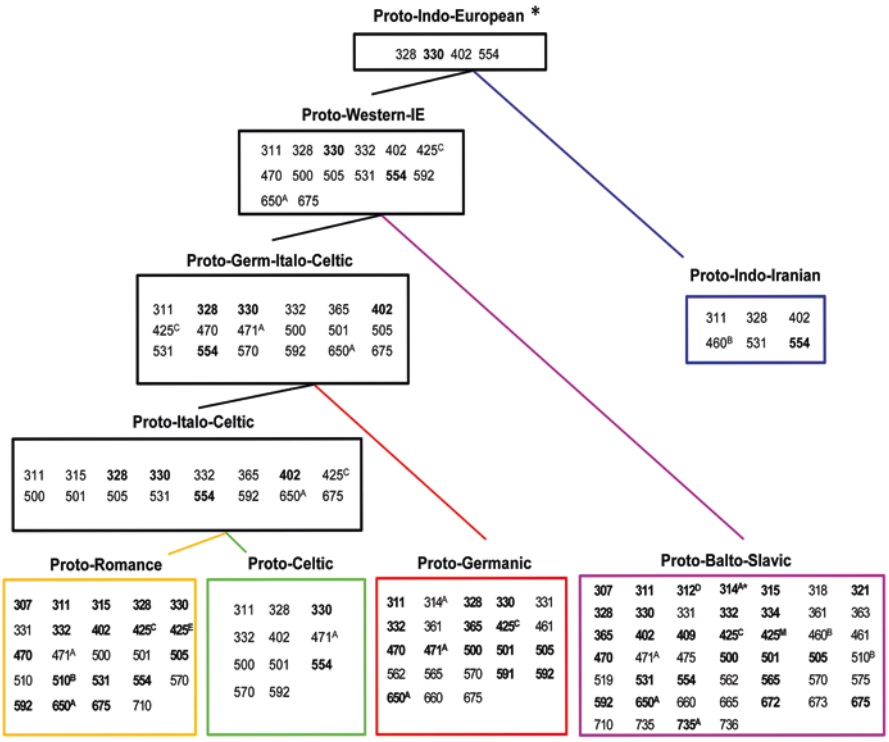
> The outermost lines [of common heritage in stories] … are coterminous with those of the great race which is commonly called Indo-Germanic, and the relationship draws itself in constantly narrowing circles round the settlements of the Germans … It is my belief that the German stories do not belong to the northern and southern parts of our fatherland alone but that they are the absolutely common property of the nearly related Dutch, English and Scandinavians. (Grimm, 1884)

Other writers, however, have emphasized that folktales can spread easily between neighboring groups without population expansion or displacement. Sir Walter Scott (1810), for instance, claimed that "the wide diffusion of popular fictions may be compared to the facility with which straws and feathers are dispersed abroad by the wind."

To investigate Grimm's "cultural descent" hypothesis, Graça da Silva and Tehrani (2016) used phylogenetic comparative methods to analyze 275 "Tales of Magic" (i.e., "fairy tales") shared among the 50 Indo-European-speaking populations represented in the ATU Index. First, we tested whether the distribution of each tale type could be predicted by the populations' linguistic relationships, as would be expected according to Grimm's hypothesis (which sees folktales and languages as part of the same Indo-European legacy). For example, imagine if Populations A, B, and C all speak closely related languages (like say, the Romance languages in the Indo-European family), while Populations D and E speak languages belonging to separate linguistic clades (for instance, Germanic and Balto-Slavic). Let's say Tale X is found only in the oral traditions associated with Populations A, B, and C and is absent in D and E. This kind of scenario would support Grimm's hypothesis ("the relationship draws itself in constantly narrowing circles…"). On the other hand, if Tale X was only recorded in Populations A, D, and E, this would represent a more phylogenetically random pattern, since the populations' linguistic relationships don't predict anything about which groups have the tale and which ones don't. By mapping the 275 international types onto a language tree derived from a phylogenetic analysis of Indo-European vocabularies (Bouckaert et al., 2012, 2013), we found a statistically

significant relationship between linguistic relatedness and the sharing of 100 tales. However, since populations that speak closely related languages are often each other's nearest geographic neighbors (e.g., Spanish and Portuguese), it is possible that some of these correlations may be due to "horizontal" cultural diffusion over space (like "straws and feathers are dispersed abroad by the wind," in Scott's phrase) rather than "vertical" transmission from common ancestors. Nevertheless, further analysis showed that even after controlling for geographical proximity, linguistic relationships had an independent effect on the distributions of 81 tales, and had greater predictive power than geography in 76 of those cases.

To investigate the origins of these relationships further, we mapped the descent histories of the 76 most phylogenetically conserved folktales onto the language tree, tracing them back to the last common ancestor of the populations that maintain these traditions. The results of this analysis revealed that—contrary to suggestions that fairy tales are a relatively recent, literary genre (Bottigheimer, 2009)—many of them can trace their roots back to ancestral Indo-European populations that gave rise to modern-day Romance, Germanic, and Balto-Slavic languages some 4000–6000 years ago (Fig. 2). They include such well-known tales as Rumplestiltskin (ATU 500, The Name of the Supernatural Helper) and Beauty and the Beast (ATU 425C), which don't appear in the literary record until the sixteenth and seventeenth centuries, respectively (Graça da Silva & Tehrani, 2016). Most striking of all, we were able to trace one tale all the way back to the last common ancestor of all surviving Indo-European-speaking cultures ("Proto-Indo-European," or PIE). The tale is known as The Smith and the Devil (ATU 330). While the details of the story vary across cultures, the most recurrent character—present in versions from Scandinavia to the Indian sub-continent—is a trickster blacksmith. The smith makes a bargain with a malevolent supernatural figure (e.g., the Devil, a jinn, or personification of Death) promising to give his soul in return for the power to weld any two materials together. But as soon as the devil agrees, the smith uses his new abilities to stick him to the spot, only releasing him on condition he gets to keep his soul after all. The likely presence of this tale in Proto-Indo-European culture has significant implications for wider debates about where and when the Indo-European family originated. Specifically, this inference supports the so-called "Kurgan hypothesis" (Anthony, 2010), which links the origins of the Indo-European language family to archeological and genetic evidence of massive territorial expansions made by nomadic pastoralist tribes from the Pontic steppe 5000–6000 years ago. The association of these peoples with a Bronze Age technological complex, as reconstructed from material culture data and paleo-linguistic inferences of PIE vocabulary (which include a putative word for metal, aios) (Mallory & Adams, 1997), suggests a plausible context for the cultural evolution of a tale about a cunning smith who attains a superhuman level of mastery over his craft. By contrast, the presence of this story in PIE society appears to be incompatible with the alternative "Anatolian hypothesis" of Indo-European origins (Renfrew, 1990). The latter proposes a much earlier and more gradual expansion of Indo-European languages associated with the spread of agriculture from Neolithic Anatolia 8000–9000 years ago—prior to the invention of metallurgy.



International Tale Types

307	The Princess in the Coffin	**409**	The Girl as Wolf	**562**	The Spirit in the Blue Light
311	Rescue by Sister	**425C**	Beauty and the Beast	**565**	The Magic Mill
312D	Rescue by the Brother	**425E**	The Enchanted Husband	**570**	The Rabbit-Herd
314A	The Shepherd and the Giants	**425M**	The Snake Bridegroom	**575**	The Prince´s Wings
314A*	Animal Helper in the Flight	**460B**	The Journey	**591**	The Thieving Pot
315	The Faithless Sister	**461**	Three Hairs	**592**	The Dance Among Thorns
318	The Faithless Wife	**470**	Friends in Life and Death	**650A**	Strong John
321	Eyes Recovered from Witch	**471A**	The Monk and the Bird	**660**	The Three Doctors
328	The Boy Steals Ogre's Treasure	**475**	The Man as the Heater	**665**	The Man who Flew and Swam
330	The Smith and the Devil	**500**	Supernatural Helper	**672**	The Serpent's Crown
331	The Spirit in the Bottle	**501**	The Three Old Spinning Women	**673**	The White Serpent´s Flesh
332	Godfather Death	**505**	The Grateful Dead	**675**	The Lazy Boy
334	Household of the Witch	**510**	Cinderella and Peau d'Âne	**710**	Our Lady´s Child
361	Bear Skin	**510B**	Peau d'Asne	**735**	The Rich and the Poor Man
363	The Corpse-Eater	**519**	The Strong Woman as Bride	**735A**	Bad Luck Imprisoned
365	The Dead Bridegroom	**531**	The Clever Horse	**736**	Luck and Wealth
402	The Animal Bride	**554**	The Grateful Animals		

Fig. 2 Reconstruction of ancestral Indo-European tale corpora based on analyses of the 76 most phylogenetically conserved tales (From Graça da Silva & Tehrani, 2016). Tales in bold were reconstructed with a high level of confidence, while those in light typeface were inferred with moderate statistical support

While our findings give support to Grimm's "cultural descent" hypothesis, other studies suggest that sometimes cultural diffusion among neighboring societies may play a larger role in explaining similarities among folktale traditions. Ross et al.'s (2013) study of "The Kind and Unkind Girls" (ATU 480) found that similarities among European variants of the tale are more strongly correlated with geographical proximity than with linguistic relationships. Another study by Ross and Atkinson (2016) similarly showed that the distributions of shared tale types among Arctic hunter-gatherer societies are more influenced by the geographical proximity of populations than their linguistic ancestries, suggesting that diffusion between neighbors rather than common descent was a more important process in the spread of these folktales.

Bortolini et al. (2017) brought a new perspective to these issues by exploiting newly available whole genome sequence data to obtain more direct estimates of shared population histories. They analyzed the distributions of 596 international tale types among 33 populations whose folktale traditions could be matched to available genetic samples and geographic locations. Bortolini et al. found that similarities among folktale corpora were significantly correlated with both genetic and geographic patterns, suggesting that these stories spread both through "demic" processes (i.e., population dispersals and intermigration) and cultural diffusion across space. Their analyses further showed that language barriers played a significant role in both cases: Stories and storytellers moved more easily between groups speaking closely related languages than between groups from separate language families. Most importantly of all, Bortolini et al. showed that the relative importance of these two modes of transmission varied at different spatial scales. Genetic relationships are better at predicting similarities among folktale traditions over ranges smaller than 4000 km, while between 4000 and 8000 km, geographic distances explain more of the variation in folktale corpora. This result probably reflects the fact that, until recently, people generally didn't travel or re-settle in places far from where they were born, and population expansions also tended to be relatively gradual and localized. But cultural diffusion enabled some stories to spread across much larger areas through trade and other forms of cultural exchange.

On a broader level, Bortolini et al.'s findings, together with those of the other studies discussed in this section, highlight the key point of "dual inheritance theory," which is that although cultural lineages can co-evolve with linguistic and genetic histories, they are based on autonomous mechanisms of transmission and may therefore follow divergent historical trajectories. In the case of folktales, we have seen that while oral traditions are indeed often associated with population histories—and may even provide novel lines of evidence about the lives and culture of our ancestors—these relationships need to be excavated carefully from many layers of cultural transmission, demographic movement, and historical interaction among societies.

3 The Endurance of Oral Traditions

There's a famous, if probably apocryphal, story about how, in the First World War, military commands were communicated via a series of radio relays that went back and forth from the trenches with less than perfect fidelity. "Send reinforcements, we're going to advance!" went one such order, but it eventually got so mangled that radio operators were passing on the message "send three and four pence, we're going to a dance!". Whether true or not, this anecdote encapsulates our typical assumptions about the vicissitudes of oral transmission, which are all too familiar to anybody who's played the children's game "Chinese Whispers" (or "Telephone," as it's known in North America). Yet, the research discussed in this chapter presents a very different impression of oral transmission. Folktales don't dissolve or decay after a few retellings, but can apparently remain intact over hundreds, even thousands of years and across vast geographic distances. How are we to account for this?

Cultural evolutionary theory suggests that human social learning is influenced by a range of mechanisms that militate against the sort of catastrophic errors seen in the example above. Unlike First World War radio relays or Chinese Whispers, cultural transmission does not usually involve an individual passively receiving a piece of information from someone else, memorizing it and then passing it on. Instead, learners typically have a range of potential role models available to them, and make strategic choices about who and what to copy (Mesoudi, 2011). For example, rather than just imitate a random member of the population, learners may seek out individuals who are especially skilled in a particular domain. This type of "skill-biased" cultural transmission is believed to play an important role in the development and maintenance of complex cultural behaviors such as tool-making, since it helps ensure that each generation builds on the best knowledge and practice of their predecessors (Henrich, 2004). These principles also apply in the transmission of folktales. Although oral narratives are commonly told in household settings, they are also performed by highly gifted storytellers in more public settings, such as campfires, local festivals, or even village pubs. Folklorists (e.g., Sydow, 1948; Thompson, 1951) have long argued that these narrators are like local story banks, and that their extensive knowledge of different tales and memory for details play a critical role in preserving and passing on their community's folkloric heritage. Indeed, to underline their importance as role models to their audiences, folklorists often refer to these individuals as the "active bearers of tradition" (Acerbi, Kendal, & Tehrani, 2017; Sydow, 1948; Thompson, 1951).

Another example of how social learning biases might stabilize the transmission of folktales within and across generations is "conformist transmission" (Mesoudi, 2011). Under conformist transmission, an individual's decision about whether to adopt one cultural trait over another is biased by the relative frequencies of both traits in the population. Traits that are demonstrated by the majority of the individual's community will be favored over rarer traits. Conformist transmission influences the evolution of a wide range of cultural domains, from languages and dialects to subsistence technologies, social values, and cooperative norms (Henrich & Boyd,

1998; Mesoudi, 2011). In the case of folktales, it has been well documented that individuals modify their own telling of a tale if the version they learned (e.g., from a parent) is at variance with the most common versions in their community, a phenomenon known as the "law of self-correction" (Anderson, 1923). This type of conformist learning can increase the fidelity of folktale transmission across generations by preventing the cumulative loss of information and/or error that would occur in a purely linear chain of individuals (such as a game of Chinese Whispers/Telephone). Furthermore, conformist transmission generates more coherent and homogeneous group-level traditions as members of a story-telling community coalesce around a dominant (i.e., most common) version of a particular tale. This is likely to be an important factor in the evolution of locally distinct versions of international tale types, or "ecotypes" (Sydow, 1948), such as the development of The Tiger Grandmother from ATU 333 and ATU 123 in East Asia.

Skill-biased and conformist-biased transmission are both examples of what cultural evolutionists call "context biases," which guide *who*, rather than *what*, learners choose to copy. However, while context biases are important to understand how folktales are faithfully transmitted within groups, we also need to consider the factors that have enabled them to remain so remarkably stable *across* groups. How have these stories managed to transcend large differences in language, culture, and ecology to endure over the massive geographic and temporal scales that have been discussed in this chapter?

One promising line of explanation is that successful folktales often exploit cognitive biases for certain kinds of content that we find especially attractive and memorable (Sperber, 1996; Stubbersfield, Flynn, & Tehrani, 2017; Zipes, 2006). An example of one such "content bias" is the Minimally Counterintuitive Information (MCI) hypothesis (Barrett & Nyhof, 2001). Counterintuitive information consists of concepts that violate basic ontological assumptions about the physical world, living kinds, and human psychology—for instance, an invisible object, or an animal that can transform into a different species, or a person who can see into the future. Studies suggest that narratives that include a small number of such violations are recalled and transmitted with higher accuracy than narratives that do not feature any counterintuitive content, or those that contain too many counterintuitive elements to make sense of (Barrett & Nyhof, 2001; Norenzayan, Atran, Faulkner, & Schaller, 2006). Phylogenetically stable and widely diffused tales such as Little Red Riding Hood, The Smith and the Devil, Beauty and the Beast, and other examples discussed above certainly appear to conform to the MCI template, typically featuring one or two counterintuitive concepts (e.g., a talking wolf/tiger, a person who can make any materials stick together, a beast who turns into a human, and so on).

Two other "content biases" that seem especially pertinent to the stable transmission of folktales include "survival information bias" and "social information bias" (Stubbersfield et al., 2017). In the former case, studies in cognitive science suggest that our minds have evolved to attend to and remember information that has high fitness consequences, such as dangers in our environment or predator risk. Social information bias, on the other hand, relates to the cognitive challenges of living in large groups, which selected for individuals who were adept at keeping track of

their own and their conspecifics' social relationships. Stubbersfield, Tehrani, and Flynn (2015) found evidence that both biases are important to the transmission of narratives in an experimental study of contemporary legends. They measured the stability of different kinds of legends as they were passed along chains of participants, and found that survival-relevant content and social information both increased the transmission fidelity of narratives, with social information conferring the greatest transmission advantage. In a separate study, the same authors found the same pattern reflected in a survey of urban legends curated by the fact-checking website *Snopes*, which showed that over three quarters of the urban legends contained social information, and just over a quarter contained survival information (Stubbersfield et al., 2017). They also found evidence of other biases, such as sexual and racial stereotyping, and emotionally arousing content (e.g., disgust or humor).

An interesting finding to emerge from Stubbersfield et al.'s work on urban legends is that many of these tales exploit more than one content bias. This also seems to be a strong feature of many successful and enduring folktales, which interweave counterintuitive, survival-relevant and social information. So, although these stories often take place in fantastical settings and feature magical beings, they gain their dramatic purchase from the kinds of adaptive challenges and social interactions that are inherent to their audience's worlds, such as threats from predators and outgroups, the dangers of children getting lost, choosing a mate, kinship obligations, the importance of reciprocity, the risk of deception, and so on (e.g., Gottschall, Martin, Quish, & Rea, 2004; Sugiyama, 2001, 2004; Zipes, 2006). This interplay of different content biases is exemplified by the ATU 333 type tales that I opened this chapter with. First, both The Tiger Grandmother and Little Red Riding Hood feature the counterintuitive character of a talking animal—and, in accordance with the requirements of being *minimally* counterintuitive, the character otherwise behaves as the audience would expect a sentient wolf/tiger to. It does not violate other intuitions (for instance, the creature has to put on a disguise/alter its voice/blow out the lights to pose as a human, rather than using magical shape-shifting powers or turning invisible, etc.). Second, both tales clearly involve a threat to the protagonist's survival, highlighting the vulnerability of infants separated from their parents and casting an ecologically relevant predator (wolf in Europe, tiger in Asia) in the role of the villain. Last, the ecological and counterintuitive aspects of the villain—a dangerous predator with the human capacity for speech—combine to generate a powerful social metaphor about trust and deception: people are not always who they appear to be!

It is fascinating to reflect that stories that are so compelling and well-crafted as these were not plotted by the creative genius of any individual author, but developed over the course of generations through a process of cumulative descent with modification—rather like those "organs of extreme perfection and complication" that so inspired Darwin (1859). In the final section of this chapter I have tried to sketch out how such a process might work by suggesting some of the ways that selection acts on variation in folktales via different kinds of social learning biases. By doing so I am not seeking to deprive either the "active bearers" of folktale traditions (or their audiences) of their agency. Instead, the kind of cultural evolutionary approach

developed here seeks to better understand how these individuals and communities are connected through space and time, and thereby understand how they have collectively shaped the stories that we continue to cherish and pass on to this day.

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I'm with You Till the End of the Line: The Romanticization of Male Bonds

Catherine Salmon and Rebecca L. Burch

> I think that's one of the more precious relationships for Steve Rogers, you know. It's one of the few relationships that's been able to transfer into modern day. It's one of the few relationships that he can identify as anything we would call home.
>
> —Chris Evans on the relationship between Steve Rogers and Bucky Barnes.

The importance of male–male friendships has been explored for decades and discussed across cultures (Hruschka, 2010). Most importantly, such bonds have been romanticized for ages (Fox, 2005). The bond between two men has been put forth as the epitome of love and friendship since Plato; "The love of man to woman is a thing common and of course, and at first partakes more of instinct and passion than of choice; but true friendship between man and man is infinite and immortal" (Edwards, 1908, p. 185).

This intense "platonic" friendship took on the name "bromance" (a portmanteau of "brother" and "romance") in skater culture in the late 1990s (Elliott, 2007) and the term entered mainstream American culture in the early 2000s (DeAngelis, 2014). A bromance is defined specifically as an intense, intimate, asexual bond between straight men (Robinson, Anderson, & White, 2017), but how is this different from a strong male friendship? What factors would justify such special terminology? The primary point of departure for bromances from everyday friendship is intimacy (Robinson, White, & Anderson, 2017). Robinson, White, and Anderson (2017) argue that bromances stand apart because men view them as based on trust, self-disclosure, and intimacy and rank them above other friendships and even romantic relationships. Men in Robinson, White, and Anderson's study (Robinson, White, & Anderson,

C. Salmon (✉) · R. L. Burch
Psychology Department, University of Redlands, Redlands, CA, USA
e-mail: Catherine_Salmon@redlands.edu

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2017) describe bromance as "an intimate same-sex male friendship based on unrivalled trust and self-disclosure that superseded other friendships" (p. 7). Hammarén and Johansson (2014) and Chen (2012) stated explicitly that bromances are "not premised on competition." It is also important to point out that one of the major benefits men see in a bromance is that needs for intimacy, socialization, cooperation, and support are met without the conflict of intersexual competition. Robinson, Anderson, and White's sample (Robinson, Anderson, & White, 2017) repeatedly mention a greater lack of conflict, similarity in conflict resolution tactics, and more similar preferences in the bromance relationship than what they experience in heterosexual relationships. These men also made it clear that they shared information with their male friends that they would never tell their girlfriends; they stated repeatedly that they feared judgment from their female partners (see also Davies, 2014). In the case of the bromance, the male friendship is the primary relationship, and heterosexual relationships are secondary (Robinson, White, & Anderson, 2017). The conflict between sexes, and particularly the conflict over sex, is minimized.

While this may seem counterintuitive, in an ancestral environment, male cooperation for food acquisition, shelter, protection, and competition with other groups would prove extremely important to survival (Seyfarth & Cheney, 2012). In addition, while Robinson, Anderson, and White (2017) argue, compared to Chen (2012), that these relationships may challenge "traditional" heterosexual relationships, evolutionary research would argue that humans have always been serial monogamists and heterosexual pair bonding appears to last just long enough to raise a child through toddlerhood (Fisher, 1989). These men, in stating "Lovers are temporary, a bromance can last a lifetime" are describing a social landscape far closer to the ancestral environment than modernity. This statement also illustrates how the bromance is viewed as a long-term commitment. Anderson and colleagues (Anderson, 2011; Robinson, Anderson, & White, 2017; Robinson, White, & Anderson, 2017) repeatedly reported men describing their bromances in absolute terms; male friends would "never judge you," "tell each other absolutely everything," and "are always on the same wavelength." They also vocalized their concerns that future marriages and children might threaten these relationships.

This raises the question: if bromances are prioritized over heterosexual relationships, wouldn't they result in lower reproduction? It is possible that decreases in intrasexual competition may result in reproduction through cooperative courtship, or the "wingman" strategy. As Ackerman and Kenrick (2009) ask, "is the mating game sometimes a team sport?" (p. 2). According to their data, men cooperate to "break down romantic barriers," to decrease intersexual conflict and increase their and their male friends' reproductive success. However, it is clear that putting trust in the right man is key; men must be careful to choose committed and trustworthy friends as they are entrusting them with their survival and reproduction in a number of ways.

One could argue that strong male bonds are unique, and are romanticized and celebrated, because they transcend intense male intrasexual competition. However, they appear to negotiate around and diminish both intrasexual and intersexual conflict. This lack of conflict can also result in longer male relationships, adding another facet to "Lovers are temporary, a bromance can last a lifetime." In fact, if both

intrasexual and intersexual conflict are diminished, this would increase male longevity through both less conflict and more cooperation like resource sharing. That "lifetime" would presumably be lengthened.

The importance of strong male bonds is acknowledged throughout the world, yet cultures may respond to it differently. Decades ago, researchers noted that men's same-sex relationships lacked intimacy, were based on activities, and were unsatisfying (Elkins & Peterson, 1993; Lewis, 1978), but this may be a generational effect particularly in western cultures. Chen (2012) stated that bromances were conflating friendship and romance in name only, and had problematic heteronormative "rigid contours," but McCormack (2013) commented on the increasing emotionality and intimacy in 2012 and by 2017 Robinson, Anderson, and White found a great deal of homosocial behavior, including kissing, cuddling, and physical contact, and a far less rigid definition. Anderson throughout his research (Anderson, 2011; Robinson, Anderson, & White, 2017; Robinson, White, & Anderson, 2017) makes it clear that close male friendships are not a newly emerging relationship type and details a long history of straight men being affectionate, taking photos together, writing emotional letters, and sharing beds (Anderson, 2011). The emergence of the "bromance" is not a new form of male companionship. It is actually the re-emergence of close male friendships that existed for millennia.

In Israel, male bonds are sought out as an escape from the drudgery of marriage and lauded for rare physical and emotional intimacy (Kaplan, 2007). Male bonds are idealized, romanticized, and considered great pleasures in life. Once again (just as in Robinson, Anderson, & White, 2017; Robinson, White, & Anderson, 2017), men describe their bonds as "always" reliable and trusting, and use the term "soul talk" to describe the intimacy of their conversations. Once again, male bonds are seen as more important than heterosexual pairings, as men recounted stories of how the men chose their male friends in need over female partners. Kaplan (2007) even describes marriage as "petty" in comparison.

In China, intense male friendships persist even in the face of extreme resource competition (Nye, 2000) and are based on common purpose (cooperation) or a "shared heart" (intimacy) (Mann, 2000). In fact, male friendship has been so persistent through Chinese history that it has been viewed as a threat to the collective culture (Mann, 2000; Nye, 2000). Nye (2000) makes the key point,

> The danger of the intimate male bond is explicitly acknowledged in the expression that one is willing to die for one's friend(s)…. it dramatizes the potential peril of standing in opposition to a corrupt or unenlightened society. When it is promised between friends or honored as an ideal of friendship, it asserts both the depth of the relation and the threat true intimacy poses to every other social bond (p. 1662).

This is a bond strong enough to disrupt societies. "Such bonds potentially undermined the authority of fathers, kings, and emperors, threatened the smooth transmission of inheritance, or created kinds of solidarity that patterned themselves on kinship relations but weakened their traditional forms" (Nye, 2000, p. 1666). While this may have been seen as a threat by those in power, Mann (2000) points out that these bonds created a survival network for vulnerable members of the population. These bonds kept men alive.

1 Societal Benefits of Male–Male Bonds

These bonds may have societal benefits as well as individual ones. Qi et al. (2017) show that this male bonding is vital to the development of multilevel societies in humans and other primates. In any social species, males would have to balance intrasexual competition and "tolerance" to maximize reproductive success. However, bonding is far more investment and effort than cooperation or mere tolerance. Investment in stronger bonds creates stronger societies. Once again, male cooperation has to transcend intrasexual competition, known as the "bachelor threat"; the decision of single males to compete for females, escalating violence and decreasing cooperation in both mating and nonmating contexts (Rodseth, 2012). Xiang et al. (2014) state that when "family men and bachelors engage in collective action that crosses family, village, tribal, and ethnic boundaries," and set aside intrasexual competition when the group is threatened, this "represents a fundamental part of the human adaptive pattern" (p. 616). It is this hallmark that makes male bonds so special.

One may argue that women create strong bonds, transcend intrasexual competition, and even entrust their children to their female friends; why is this not considered special and celebrated? The survival of the next generation depends heavily on female bonds; this prioritizing of other women and children over men is not "special" in women, it is exceedingly common (Sear & Mace, 2008; Chang, Burch, & Fisher, 2017). There is no transcendence beyond a "bachelor*ette* threat," because the intensity and consequences of female intrasexual competition pale in comparison to males (Kruger, 2010; Sell, Hone, & Pound, 2012). Male bonds form despite great pressure to behave selfishly. Burkart et al. (2014) argue that these bonds, this "intensive cooperation," in humans is ultimately responsible for the species' unique (and superior in many respects) cognition, technology, and culture. Given its importance in the survival and global domination of the species, and the uniqueness of this type of relationship between men, it is not surprising that these bonds have been romanticized throughout history and the arts. From historical epics to modern-day "buddy movies" and "bands of brothers," this male bond is the epitome of bonding and friendship.

2 Male Bonds in Fiction

Based on the adaptiveness of male bonds, we know what to expect in epic tales of male friendships; intimate, strong, loyal bonds in the face of threats and above intrasexual and intersexual conflicts. Fox (2005) provides a host of epics and other stories that support these predictions. *Gilgamesh*, *The Tain Bo Cualinge* (the Cattle Raid of Cooley), *Beowulf*, *The Iliad*, *King Arthur*, *Jason and the Argonauts*, *Robin Hood*, *Seven Samurai*, even Sherlock Holmes and John Watson and Butch and Sundance, each portraying male bonds, as Plato put it, "infinite and immortal."

Recent television bromances include House and Wilson (*House MD*) where despite their romantic relationships with various women, it is their friendship that is highlighted in the final episode. *Boston Legal* (airing from 2004 to 2008) highlighted the friendship between lawyers Denny Crane and Alan Shore which was also more durable than their romantic affairs and was a consistent feature of the show.

Fox (2005) again discusses one of the major tenets of the male bond: the tensions between the "reproductive bond" and the male bond that is necessary for predation and protection. In each of these epics, the bromance either transcends the heterosexual relationship or is destroyed by it. As Fox states, "we are dealing with something other than just male friendship. For what is being argued is that the strength of feeling men have for each other is the equivalent in intensity and specificity of the sexual feeling men have for women or of the feelings parents have for their children. That is to say … these 'male sympathies' … are a genuine, specific human need" (p. 142). Fox (2005) also discusses the age-old conflation of intimacy and sex; the question of whether the close male friends were *more* than friends. Fox concludes that the male bond could *involve* sex, but it was not *about* sex, as the heterosexual bond clearly was.

3 Women and the Romance of Bromance … The Heart of Slash Fiction

This centuries-old fascination with the fidelity, intimacy, and sexuality of male bonds has recently flourished with the genre of "slash" fiction, a version of pop culture bromance that appeals more specifically to women. Slash fiction consists of romantic/erotic narratives, written largely by women, in which the same-sex protagonists are expropriated male media characters like the co-stars of television shows like Kirk and Spock from *Star Trek*, Holmes and Watson from *Sherlock*, and Dean and Castiel from *Supernatural*. They also include characters from blockbuster movies like Steve and Bucky from *Captain America*. The term "slash" refers to the "/" used between the initials or names to indicate the pairing: K/S or Kirk/Spock. Many pairings are so popular that they are referred to by nicknames such as Stucky (Steve/Bucky) and Destiel (Dean and Castiel). Slash fiction can also be categorized by type of story such as hurt/comfort, rape/non-con, fluff (romantic but not explicitly sexual), smut, angst, etc.

Slash fiction, as a genre, was popularized in the early 1970s in the United States with the original *Star Trek* series. These early stories circulated privately and were only later published in fanzines. They were also preceded by a substantial number of stories that focused on emotions and relationships between these characters that were not sexual in expression, some of which were part of the subgenre of hurt/comfort, which will be discussed later. The first full length K/S story or novel is "The Ring of Soshern," which was circulated privately in the early 1970s (written in 1968) and later published in the fanzine *Alien Brothers* (a 275-page anthology) in

1986. The plot is one that would be frequently returned to in one form or another for this pairing. Spock goes into pon farr (part of the Vulcan mating cycle where he must mate with a partner to whom he is telepathically bonded or die) when they are alone on a planet and Kirk finds that he is willing to do anything to save his friend and thus begins their sexual relationship.

The 1980s and 1990s saw a proliferation of other slash fandoms. Often, though not always, the source material had strong bromance overtones including *Starsky and Hutch* (Starsky/Hutch) and *The Man From UNCLE* (Illya/Napoleon) in the United States and *The Professionals* (Bodie/Doyle) and *Blake's 7* (Blake/Avon among others) in the United Kingdom. Many slash pairings rose and fell in popularity over the next few decades, but the rise of the internet has had a significant impact (Coppa, 2006). It has made the slash genre much more accessible to a global audience and created an online forum not only for the sharing of stories and art (and musical fan videos) but also for discussion among a broad range of fans. Archive of our Own (AO3), one of the biggest online fannish archives, contains over 500 million stories in a number of languages for over 30,000 fandoms and preserve stories (slash and otherwise) that previously would have only been found in fanzines (which were often lost or damaged over time) for fans and scholars. AO3 has over 179 million views per month and was awarded the Hugo in 2019 for Best Related Work (one of a set of literary awards voted on by members of the current World Science Fiction Convention and presented annually by the World Science Fiction Society). Similarweb.com ranks AO3 #159 of websites worldwide and #1 in the arts & entertainment > books & literature category. The top 19 romantic/sexual pairings on AO3 based on number of stories are all slash pairings.

4 Why Do Women Sexualize the Bromance?

4.1 Popular Culture and Literary Approaches

The typical literary or popular culture approach to slash has mainly focused on the pornographic aspects of slash, though there are exceptions (Lamb & Veith, 1986; Russ, 1985; Salmon & Symons, 2001). In one of the earliest academic articles on slash, Joanna Russ (1985) documented the existence of male/male romance stories in the form of K/S. She focused on the lifelong monogamous relationship depicted in most K/S and argued that slash represents a new kind of pornography, written by and for women, noting that slash stories are about lovers who take a "personal interest in each other's minds, not only each other's bodies" and develop an "exclusive commitment to one another." This commitment echoes the strong bonds between men in platonic bromance discussed previously (Fox, 2005).

Lamb and Veith (1986) have argued that slash is a type of androgynous romance, as opposed to a new kind of pornography; a reworking of romance conventions to create a loving relationship between equals, which, they suggested, cannot exist

between men and women in a patriarchal society. They emphasized the intimacy of the telepathic bond that Kirk and Spock often share, and they noted that these characters mix and match traditional masculine and feminine traits. Like Russ (1985), they were largely influenced by K/S fandom specifically, but the core aspects, in particular the intensity of their emotional attachment (facilitated by the vulnerability and lifelong nature of the telepathic bond), are an essential aspect of slash stories more generally. They also pointed out that slash is similar to traditional romance and male bonding and yet a departure in some ways from both.

Two of the most influential academic writers on slash are Constance Penley and Henry Jenkins. Penley (1991) has proposed several explanations of why women write such narratives, including the hypotheses that slash readers and writers are "alienated" from their own bodies, that the slash pairing avoids the inherent inequalities of the romance novel formula, and that slash fans are "retooling" masculinity by creating sensitive but not wimpy protagonists. She also emphasizes the shifting point of view seen in many stories as facilitating identification with multiple characters, as well as the frequent convention of seeing Kirk and Spock (for example) as lovers and yet also as heterosexual. This convention is not seen in all slash pairings and is less common today than in the 1970s and 1980s. Bisexuality is more commonly portrayed today, though the slash pairing is still often seen as the characters' first same-sex sexual relationship.

It is also important to consider, given that these characters often begin as heterosexual and remain depicted as such, that this sexual intimacy is another level/manifestation of the intimacy they already share, and the full culmination of transcendence above intrasexual competition; they are so committed and intimate with each other that this relationship transcends their respective sexual orientations. This adds to the commitment of the relationship as no other man has ever, or ever will, have this effect on them. A key point in a great deal of slash is that the characters do not change their sexual orientation; they do not become sexually attracted to *men*. They become sexually attracted to *one man*.

Jenkins (1992) also focuses a great deal on how masculinity is portrayed in slash, arguing that "slash is not so much a genre about sex as it is a genre about the limitations of traditional masculinity and about reconfiguring male identity." Jenkins' general focus is on the ways in which fans interpret and rewrite mass media and less on why they do it. But he highlights the connection to the great male/male friendship themes in eighteenth- and nineteenth-century literature (friendships once again so strong they would give their lives for each other) and how that ties into the narrative structure of slash fiction. He describes the typical slash story as moving from an initial relationship of male friendship to a crisis of communication (where one realizes he is in love with the other) to a confession of love followed by the reconfirmation and deepening of their bond through sex.

Interestingly, Driscoll (2006) has more recently suggested that slash fiction brings together romance and pornography, rather than viewing them as separate spheres. She does not shy away from acknowledging the romance conventions seen in slash but she also draws attention to the importance of the sex itself (the pornography aspect), noting that the majority of slash contains sex or the suggestion of sex

and that there are two kinds of sex in slash which she labels "plot sex" and "porn sex." Plot sex serves the romance narrative as part of increasing emotional attachment and intimacy. As such, it is the most common form of sex in slash fiction as in the traditional romance where it serves to resolve the character/relationship development or plot. Porn sex is seen, for example, in the subgenre "PWP" (plot what plot?) where a sex scene is the main focus with little attention paid to context. They can often include "missing scenes" from a movie or television show and while they can be seen as just sex, because they are based on existing fictional characters, readers already have a lot of the context and character from the source product or other slash fiction.

Perhaps closest to the heart of bromance more generally is Woledge's (2005, 2006) focus on what she calls "intimatopia." Like Jenkins (1992), Woledge has a strong focus on homosocial bonds and intimacy between men and examines how this is explored in slash fiction and other "mainstream" texts. The combinations of male and female traits that Lamb and Veith (1986) also emphasized are seen here as a way to facilitate intimacy. Of course, certain plots and subgenres are also used to facilitate intimacy and these ways will be examined in a later section. Certainly Woledge (2006) is correct that slash isn't the only genre concerned with representing interpersonal intimacy between males. The bromance genre previously discussed also has that concern at its heart, even if in that context the intimacy is in a platonic romance rather than a sexual one as in slash.

4.2 Evolutionary Approaches to the Romanticization of the Bonds Between Men

Salmon and Symons (2001, 2004) have suggested that slash is best seen as a subgenre of romance fiction, a genre which has been well studied from an evolutionary perspective (Salmon, 2012, 2016; Salmon & Symons, 2001). At the heart of the romance novel plot is a love story in which the heroine overcomes obstacles to identify, win the heart of, and ultimately have a long-term relationship with the one man who is right for her. The emotional focus of a romance is on love and commitment with the goal of creating a permanent bond with the heroine's ideal mate, one who is strong yet caring and committed (Radway, 1984). Unsurprisingly, with this focus on long-term mating, the romance hero is a reflection of female long-term mate preferences. Gorry (1999) analyzed the descriptions of the heroes of 45 romance novels. In almost all, the hero was described as taller than the heroine, and the hero's physical appearance was most frequently described as muscular, handsome, strong, large, tanned, masculine, and energetic. Gorry also reported that romance heroes exhibit cues of physical and social "competence." They were capable of handling whatever situations arose. Heroes were described as sexually bold, calm, confident, impulsive, and, in most of the novels, "intelligent." All of these traits reflect female preferences for males of good genetic quality who will be good protectors and providers.

The protagonists of slash fiction also embody the features of high mate value men (take Steve Rogers and Bucky Barnes from Captain America as examples) in that they are in peak physical condition (Burch & Johnsen, 2019) and exhibit cues of competence, intelligence, and commitment to each other. But even more than the physical traits of the romance hero, slash has the same emotional focus as the romance (which is also shared with the platonic bromance), love, intimacy, and commitment. While the average slash story can contain a significant amount of graphic sex, it is not a necessary component of slash or romance. The intimacy of the sex is what is typically highlighted, much as intimacy between bonded men is highlighted in the bromance.

So if slash is a subgenre of romance, what is its specific appeal? That is, why read/write slash as opposed to a traditional romance? The appeal seems to be in the fusion of romance and bromance. Slash is based on shared adventure in a way that the romance is not, but bromance is. Slash fuses traditionally female romance with the traditionally male camaraderie, adventure, risk taking, and bonding present in the bromance. As a result, it solves some of the problems inherent in the formula of genre romance better than genre romances themselves do. Here is one example (see Salmon & Symons, 2001, for others): for the happily-ever-after ending to be credible, the reader of a genre romance must suspend disbelief regarding the way male mating psychology and male–female mating relations are portrayed. In the real world, intense sexual passion and romantic love are evanescent, but in romance they are not. To find the happily-ever-after ending credible and satisfying, the reader of a genre romance must believe that this bond is so durable that the hero will never be tempted by other opportunities that are bound to come his way. However, the essence of slash is that a deep, abiding, and most importantly tested friendship, a willing-to-die-for-each-other bond, is firmly in place long before the scales fall from the protagonists' eyes and they realize that they love each other. The partners have put their hands in the fire for each other in the past and they will do so again in the future. They have fully earned each other's trust. In short, before they fell in love, before they had sex, the partners were united by a durable, secure, and intimate bond. The strength of this bond is perhaps best summarized by one of the most well-known quotes from the extremely popular friendship of Steve Rogers and Bucky Barnes from Marvel MCU's Captain America films:

> Steve Rogers: Thank you, Buck, but I can get by on my own.
> Bucky Barnes: The thing is, you don't have to.
> [Bucky gives Steve a friendly pat on the shoulder].
> I'm with you to the end of the line, pal.

This line is repeated through the *Captain America: The Winter Soldier* movie, along with Steve's line "Even when I had nothing, I had Bucky." The key point throughout the film (as well as in *Captain America: Civil War*) is that Bucky and Steve are a constant; in this particular case, a constant for almost a century. And after 70 years of brainwashing, it's the repetition of the phrase "I'm with you till the end of the line" that allows Bucky to break free. This is a testament to the strength of their friendship, and a significant part of the appeal of both characters and their

relationship to male and female fans, whether they view the bond between them as platonic or a romantic sexual one. It is portrayed as lasting through everything, the ultimate demonstration of the commitment women desire (and men have benefitted from).

5 How Bromance Is Romanticized: Subgenres, Plot Devices, and What They Tell Us

The majority of slash pairings are already part of a solid male friendship in the storyline of the movie/comic/television series/novel from which they are taken. It is those strong male bonds that appeal to both male and female consumers. As a result, the slash romantic relationship is rooted in the bromance of the source material. Johnlock (Sherlock Holmes/John Watson from the BBC's *Sherlock*) is number two on the top 100 pairings of 2019 on AO3 (www.archiveofourown.com), based on number of stories posted. It has been in the top five for several years and it should not be surprising that this male relationship has been heavily slashed considering the portrayal of the relationship in the show, as can be seen in Sherlock's best man speech at John's wedding.

> I am the most unpleasant, rude, ignorant, and all-around obnoxious arsehole that anyone could possibly have the misfortune to meet. I am dismissive of the virtuous, unaware of the beautiful, and uncomprehending in the face of the unhappy. So if I didn't understand I was being asked to be best man, it is because I never expected to be anyone's best friend. Certainly not the best friend to the bravest and kindest and wisest human being I have ever had the good fortune of knowing. John, I am a ridiculous man, redeemed only by the warmth and constancy of your friendship. (Sherlock, BBC)

The detective/crime solving nature of their story can easily be adapted in slash to place them in situations where they are extremely vulnerable. Within the broadcast show, John being held at gunpoint by Moriarty and Sherlock's return from the dead are situations where both characters are under emotional stress, forced to confront the depths of their attachment to each other and how they "can't live without the other." In slash, that confrontation usually leads to the realization that their feelings are sexual/romantic as well. Tags (terms for indicating story content in fan fiction online archives) relevant to emotional trauma and vulnerability like "angst" and "hurt/comfort" appear frequently for this pairing on AO3, as well as warnings of graphic violence and rape/non-con. The tag "first kiss" is also more common for this slash pairing than for any other discussed here, as Sherlock is often portrayed as emotionally and sexually inexperienced (even nicknamed "the virgin" in one episode of the BBC show).

A slash couple that is somewhat unlikely (just based on physical characteristics) is that of Sam and Frodo from Tolkien's *Lord of the Rings* series of books and the associated movies (which spurred the slash fandom). Again, the source material itself emphasizes the strength of their friendship, particularly the devotion Sam has for Frodo.

> "Don't leave me here alone! It's your Sam calling. Don't go where I can't follow! Wake up, Mr. Frodo!" (Tolkien, *The Two Towers*, p. 423).
>
> "Come, Mr. Frodo!" he cried. "I can't carry it for you, but I can carry you." (Tolkien, *The Return of the King*, p. 248)

Because of the trials that Frodo faces in being the ring-bearer, he typically suffers greatly in slash fiction with Sam providing comfort and care and this vulnerability facilitates the development of their romantic relationship, often during or after the quest has been completed. It also can break down some of the barriers inherent in their relationship as written in the novels as Sam was Frodo's gardener, separating them by class. This pairing includes a lot of stories set well in the future, when Sam joins Frodo in The Undying Lands. Frodo/Sam is the most common pairing from Lord of the Rings on AO3 with angst and hurt/comfort frequent tags for this couple. Though, true to the nature of hobbits, there are as many fluff stories as angst. This sweetness is likely influenced by the books themselves, which hint at a romantic nature (even if platonic) to Sam's feelings for Frodo in the following passage.

> At that moment there was a knock on the door, and Sam came in. He ran to Frodo and took his left hand, awkwardly and shyly. He stroked it gently and then he blushed and turned hastily away. (Tolkien, *The Fellowship of the Ring*, p. 295)

In many ways, Tolkien's tale and the later films were ideal fodder for slash with the whole fellowship itself, a dangerous quest of all male companions, and certainly other couples have also had strong fan support and a substantial number of stories written, including Aragorn/Legolas, Aragorn/Boromir, and Legolas/Gimli.

One slash couple in AO3's top five since 2017 is the previously mentioned Steve Rogers (Captain America) and Bucky Barnes (The Winter Soldier). Like Johnlock and Frodo/Sam, the importance of their relationship to each of the men is a core feature of the source material. The screenwriters responsible for the three Captain America movies, as well as *Avengers: Infinity War* and *Endgame,* themselves articulated the core role of the Steve and Bucky relationship to these characters.

> No adventure is complete without a love story, and this tale has one. Platonic though it may be, from the meet cute, to the tragic separation, Steve and Bucky's relationship has all the elements of a classic romance. Their bond stretches across half of the twentieth century. The loss of it gnaws at Steve throughout modern day, and it slices his heart in half when the Winter Soldier rears his tormented head. Steve and Bucky are each other's soulmate, if you will, because no one on Earth understands what either of them has been through as well as the other does. (Christopher Markus & Stephen McFeely)

That unbreakable bond is what attracted slash fans to the Steve/Bucky pairing and has put it consistently at the top of AO3's rankings (despite the plethora of pairings available in the MCU). Popular tags include angst, hurt/comfort, PTSD (usually Bucky's), and it is common for stories to have warnings for graphic violence and rape/non-con. These physically powerful men are vulnerable/intimate with each other via a variety of plot scenarios from post-trauma comfort (whether physical or emotional) to alternate universe stories where they have a soulmate bond or link. In some stories, they were lovers pre-serum and had to hide their relationship because it wasn't socially acceptable. In others, they didn't recognize it themselves until the

danger and trauma of World War II (post Steve rescuing Bucky) or Bucky's fall from the train (and assumed death) made the sexually romantic nature of their bond apparent. Post *CA: Winter Soldier* or *CA: Civil War* stories more often focus on the emotional and physical trauma they both have experienced (or additional dangers or injuries) while separated and how caring for each other brings them back to a level of intimacy they experience with no one else. When Steve states that "Even when I had nothing, I had Bucky," the slash fan recognizes that losing Bucky is losing everything. In Steve/Bucky slash, the two men often recognize the sexual aspect of their intensely close, previously platonic bond when they find each other again after so long apart and experience their own emotional reaction to being reunited. In cases where the discovery is not immediate, hurt comfort is often used much as it is used in other pairings: to increase intimacy, to highlight the eroticism of suffering (especially of male bodies), and to make the formerly invulnerable vulnerable, at least to each other. Post *Endgame* (2019), the last film in the Avengers series, there has been an increase in Steve/Bucky stories tagged with "Fix-it" as a result of fan unhappiness with the end of the movie and Steve abandoning Bucky. Such stories rewrite the ending so that Steve and Bucky stay together. This continues the tradition in slash of creating a desired relationship mainstream entertainment does not provide.

Given that slash can be seen as uncompromising female romantic preferences, there are several subgenres that need further exploration, for example, "rape/non-consensual." Vampire slash (e.g., Spike/Angel) can often emphasize forceful sexual encounters, initially unwilling but later enthusiastic, with specific attention to the erotic nature of suffering (Keft-Kennedy, 2008). The connection between pain and the erotic can be used to reinforce the vampiric bond, for example, where this is a painful/erotic experience they can only share with another vampire. This sort of sire/child relationship also entails a long history and a bond that unites them across time and space. Of course, this type of forceful sexual encounter has been used as a vehicle for demonstrating overwhelming desire/need in traditional romance novels as well (Hazen, 1983). A comparison between slash "non-con" and traditional romance is warranted.

Likewise, how are female preferences illustrated in other types of fanfiction, like yaoi? Yaoi (originating in Japan) features female created homoerotic pairings that emphasize dominant and submissive partners. Is the focus here (like bromance) on intimacy or more traditional heterosexual dynamics? What is the interplay between these traditional dynamics and the less masculine/more androgynous characters yaoi usually depicts? Is yaoi an illustration of slight cultural differences in female preferences or something else?

Further, if slash is the manifestation of uncompromising female preferences, what are the parameters and themes of fan fiction produced by males whether it be m/m or f/f slash? Are male preferences a major theme in such stories? Are they more like porn than slash? Moreover, what are the themes illustrated in female/female slash fiction written largely for a female audience? Are these merely female versions of bromance or do they depict different preferences?

This also spurs questions regarding depictions of sexual orientation in slash. Is slash used as an outlet for greater representation, in which case traditionally heterosexual characters are consistently depicted as non-heterosexual, or is the male–male sexual relationship a manifestation of extreme commitment where sexual orientation shifts only for one character? As stated earlier, the literature appears to support the latter, but an examination of various subgenres and authors, as well as commercial and non-commercial venues, should provide more insight.

6 Conclusions

The popularity of male bonding themes in literary works, television, and movies should not be surprising considering the importance of strong relationships between men over our evolutionary history. While some men are each other's prime competitors, they can also be each other's staunchest allies in competition with other men. Strong bonds between men have been essential for male social success (and the society's success), and thus emotional well-being, over human history. As a result, men are interested in tales of male bonding and male adventures. But intimate bonds between men are also appealing to women as we see in the slash genre. Romanticized male relationships that transcend all others tap into a female psychology that desires intimacy and proof of commitment. Here the bond between males is a romantic one as well, arising out of an intensely devoted intimate friendship that goes beyond simple physical attraction, emphasizing commitment that is not tied to ephemeral qualities like female attractiveness. It is a relationship that lasts "till the end of the line."

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Literary Representations of Parental Investment: Fitness Quandaries and Strategic Decisions

Judith P. Saunders

Due to the long period of juvenile dependency in the human species, there is high correlation between parental investment and offspring survival. The care and training required to rear a child from infancy through puberty—to prepare that child for eventual reproductive success—is costly. And every commitment to invest in a particular child reduces a parent's ability to invest in other offspring, extant and future, or to pursue alternative means of passing on genes (Trivers, 2002b; Hrdy, 1999). Because parental investment decisions are central to an individual's life history, we can expect to find works of imaginative literature grappling with the fitness trade-offs parents must consider and make. Drawing largely on materials from the British and American canons, this chapter investigates the evolutionary logic behind variable allocation of care and resources to children. (The clearly related topic of allo-parental care, an investment provided by persons other than a child's biological parents, is too vast to include as part of this discussion.) In fiction, drama, and verse, literary artists engage their audiences with vivid depictions of parental strategizing and its outcomes. They direct attention to environmental influences on parents' child-rearing decisions, as well as to preferential, ambivalent, paradoxical, or misguided investment. The "emotionally saturated images" and dramatic conflicts generated in literary plots (Carroll, 2011, p. 49) effectively underline the significance of parenting behavior. Readers are invited to project themselves into fictive situations, to rehearse and to assess—at one remove from reality—possible responses to a wide range of parenting dilemmas.

J. P. Saunders (✉)
Marist College, Poughkeepsie, NY, USA
e-mail: judith.saunders@marist.edu

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1 The Value of Offspring

From an evolutionary perspective, the value of offspring to parents is clear: inheriting one-half of each parent's genes, a child is capable of transmitting this genetic material to the next generation, thus sustaining and perhaps increasing the incidence of parental DNA in the gene pool (Dawkins, 1989). Long before the workings of genetic inheritance were scientifically understood, people observed resemblances between children and their progenitors, formulating the notion of lineage. As the narrator of *The Scarlet Letter* observes, every child serves "to connect [its] parent for ever with the [species] and descent of mortals" (Hawthorne, 1850/1961, p. 88). Rhina P. Espaillat's (2001) poem "Variations" celebrates intergenerational resemblances—"the living echoing the dead"—which can seem to contradict the finality of death: "Not bad, as resurrections go" (line 5, line 22). Because offspring offer the comforting prospect of continuity, elegiac works often highlight the destabilizing effect of losing a child. The widow in "The Prioress's Tale" searches for her missing son, so frantic with "moodres pitee" that she appears to be "half out of hir mynde" (Chaucer, 1476/1963, lines 1779, 1783, 1784). In the well-known poem bidding "farewell" to his "first sonne," Ben Jonson (1606/1951) likewise conveys emotional devastation. He has invested "too much hope" in the boy: the child represented an infinitely expansive genetic future that now has been cancelled. Declaring the boy to be "his best piece of *poetrie*" (line 10), Jonson underlines the worth of offspring by comparing biological paternity to artistic creation. Like a poem, a child can showcase its maker's quality.

Shakespeare's (1606/1952c) *Macbeth* illustrates the deep, evolutionary roots of parental attachment. The play's protagonist famously bewails the "fruitless crown" and "barren scepter" prophesized for him by the three weird sisters (III, lines 61, 620). Indirectly, Macbeth confirms a sometimes overlooked evolutionary reality, namely, that individuals seek status, power, and wealth not as ends in themselves but as means to reproductive success: to attract desirable mates and to rear healthy offspring (Buss, 2003). Banquo, marked for "lesser" greatness than Macbeth, is judged to be more fortunate than his friend because he will *beget* kings (I, 3, lines 65, 67, 66). In the evolutionary competition to pass on genes, all men are rivals; thus Macbeth's initial delight at learning that he is destined for high office sours quickly as he realizes his achievements will only benefit someone else's "issue" (III, 1, line 64). A ruthless competitor, Macbeth sets out to eliminate the biological future of another rival, Macduff, killing his "wife, his babes, and all unfortunate souls/That trace him in his line" (IV, 1, lines 151–153). Macduff reacts with "o'erfraught heart" to this loss, focusing with repetitive, unbelieving questions on its comprehensiveness (IV, 3, line 210). "My children too?" he asks; "Wife, children, servants, all?" "Did you say all? … All?" (IV, 3, lines 211, 212, 217). He is shattered by the wholesale destruction of his genetic future.

If individuals did not regard themselves as in some sense living on in their "posterity" (Banquo's term), we would expect Macbeth to celebrate his rise in status rather than to mourn, as he does, that his achievement is meaningless if it ends with

him (III, 1, line 4). Shakespeare's tragic hero is only one of many literary figures who articulate the idea that striving for wealth, power, and privilege is important largely because of the expectation that these will help one's children—and their children's children, in a long line of biological succession—to prosper in their turn. This goal is selfish in the sense that parents strive to obtain advantages that will favor perpetuation of their own phenotypic characteristics (Dawkins, 1989). By endowing a child with social and material advantages, the parent facilitates the survival of a "variation" of self (Espaillat, 2001). John Updike's (2003) sonnet "Relatives" offers sardonic comment on the self-love underlying kin selection and nepotistic behavior, a narcissism especially evident in parental investment (Trivers, 2002b). Updike's speaker portrays biological kinship as an inescapable "spidering of chromosomes" that "holds us fast" even in the face of aggravation and "boredom" (lines 8, 9–11). Altruistic behavior toward relatives is inevitable, he wryly concludes, precisely because of its selfish core: "The cousins buzz, the nephews crawl; to love one's self is to love them all" (lines 13–14).

T. C. Boyle (2004) effectively demonstrates the selfish foundations of parental love by invoking an unusual and powerful analogy for the death of a child. Throughout the story "Chicxulub," its narrator, father of a teenage girl critically injured, perhaps killed, in an automobile accident, equates the loss of a child with the damage caused to the earth by extraterrestrial collisions. Structurally, the story alternates between narration of the parents' experience at the hospital where their daughter presumably lies dying or dead, and descriptions of exploding asteroids. These descriptions emphasize destruction and barrenness on the largest possible scale: "day became night," and "seventy-five percent of all known species were extinguished" (p. 80). From the bereaved parents' point of view, the death of a child signifies the end of the world. Equating extinction of species and, indeed, of all earthly life, with the end of a single human lineage, Boyle's narrator plainly exhibits the biologically rooted love of self that motivates parental investment. The startlingly incommensurate parallel between planet and child, structurally and thematically central to "Chicxulub," may remind readers of Arthur Dimmesdale, who believes he sees an announcement of his guilt-ridden paternity written in the sky (Hawthorne, 1950/1960). Hawthorne's narrator criticizes Dimmesdale for having "extended his egoism over the whole expanse of nature" (p. 154): this is precisely what the father in Boyle's narrative does. Unlike Hawthorne, Boyle does not rebuke his protagonist for describing his child's significance in cosmic terms; he implies, rather, that such "egotism" is natural and inevitable.

2 Costs of Parental Investment

The value of a child to its parents is matched by the value of parental care to the child. In assisting a child to achieve fitness goals, a parent necessarily incurs high costs. Those costs take varied form, typically time-consuming personal care supported by material and social resources. The proximate mechanism encouraging

parents to make adaptive investment in their offspring is parental love: an unforced upwelling of affection for a child. The parent need not consciously think, *rearing this child is my best hope of getting my genes into the next generation*, in order to provide the years of altruistic care needed to achieve that end. The parent need only feel *I love my child* and act accordingly.

Many literary works highlight the sacrifices parents make to guard the genetic legacy each child represents. In *The Age of Innocence*, May Archer dies of an "infectious pneumonia through which she had nursed [her] youngest child" (Wharton, 1919/2000, p. 274). This parenting effort is clearly costly yet makes evolutionary sense: 49 years old at the time of her death, May almost certainly will bear no more children. Her best means of maximizing her fitness is to guard the well-being of those she has. Her offspring (two already are high-functioning adults) have ample material resources and numerous caring relatives, including a fully investing father, to assist them and their future offspring. Given these conditions, forfeiting the possibly significant role she might play as a grandmother does not seem nearly as important to May as preserving the life of her third child. She is satisfied, readers learn, with the cost-benefit analysis she has consciously or unconsciously made: "having snatched little Bill from the grave, and given her life in the effort, she went contentedly to her place in the Archer vault" (p. 275). The reference to a vault reserved for the interment of family members underlines the idea of lineage: individuals die, but the DNA they share marches on.

A slower but nonetheless life-draining form of parental sacrifice is portrayed in Sherwood Anderson's tale "The Untold Lie" (1916/1966). Protagonist Ray Pearson is the father of six young children, whom he supports by working as a farm hand. The family's situation is described as economically marginal: its members are poorly sheltered, shabbily clothed, and meagerly fed. Ray is prematurely "old and worn out," debilitated by the hard physical labor he cannot quit if his children are to survive (p. 207). His existence is likened to that of a beast: "harnessed up and driven through life" only to be "worn out like an old horse" (p. 205). Ray is, in effect, renouncing his life—time, vigor, and freedom—to support his descendants. His sacrifice is less dramatic than May Archer's but perhaps more agonizing because of its drawn-out privations.

Ray Pearson sacrifices himself less "contentedly" than does May Archer, sometimes picturing alternative destinies in which he might have avoided the grinding labor of paternal commitment. His genetic legacy is potentially large if all six of his children survive and reproduce, but the harsh demands of his day-to-day existence undermine the comfort he might take in that prospect. Only occasionally does "some memory of pleasant evenings spent with the thin-legged children" indicate his ability to regard this taxing parental commitment in a positive light (p. 209). His wavering assessment of his children's value—in comparison with the high cost of his burdensome paternal investment—points to the crucial role played by material resources in child-rearing. People with easy access to food, shelter, and clothing can provide for their children's needs without suffering the deprivations experienced by less prosperous parents. The discomforts of his life do not cause Ray to abandon

parental care, but they do affect the spirit in which he provides it. His sometimes bitter protests no doubt resonate with many readers.

Ray Pearson is not alone in his sense that the proximal satisfactions deriving from sexual activity have "tricked" him into "paying" an unanticipated price (p. 204). Among female characters who lament the cost of maternal investment, Edna Pontellier in Kate Chopin's *The Awakening* (1899/1970) and Susan Rawlings in Doris Lessing's "To Room Nineteen" (1963/2000) stand out. Though committed to their offsprings' welfare, these protagonists grow to resent the all-consuming demands of motherhood. When their resentment meets with no validation from those around them, they endure the additional discomfort of guilt. The implied authors of both narratives suggest that prevailing social norms may have inflated the demands of motherhood, at the same time conceding that those demands would be great in any cultural context. "Nature" provides sexual pleasures as "a decoy to secure mothers for the race," the doctor in Chopin's novel muses (p. 335). Realizing that her bid for autonomy, especially sexual autonomy, would embroil her young sons in fitness-threatening scandal, Edna drowns herself. She terminates her maternal investment, choosing a mode of death that can be interpreted as accidental. Thus she preserves her children's social capital as best she can, even as she refuses to stifle her "essential" self in her parental role (p. 257).

Like Edna Pontellier, Susan Rawlings finds the demands of maternity oppressive and unsatisfying: she is convinced that "children can't be a centre of life and a reason for being," (Lessing, 1963/2000, p. 1002). She feels as though "the essential Susan were in abeyance … in cold storage" (Lessing, 1963/2000, p. 1006). "A high price has to be paid," Lessing's narrator confides, "for the happy marriage with the four healthy children in the large white gardened house" (1963/2000, p. 1005). Finding that price exorbitant, Susan kills herself. Her suicide, like Edna's, brings no evolutionary profit to her or to anyone else. Both these mothers reasonably can assume, however, that their children's lives and reproductive prospects will not be substantially damaged by maternal abdication, since caring fathers and plentiful resources are available. Both women strike a tragic compromise: they refuse to continue their parental commitment but at the same time they refuse to benefit from the withdrawal of it by seizing freedom and building new lives for themselves. Above all else, their wretchedness in the role of investing mothers sheds light on ambivalences and questions likely to trouble many parents, if only dimly and infrequently. Here literature carves space in which resistance to evolved adaptations—such as those influencing altruistic investment from parents—can be articulated and explored.

Parental sacrifice may take on paradoxical dimensions when a parent gives a child away, yielding custody to someone else in order to maximize its chances in life. Mrs. Price in *Mansfield Park* (Austen, 1814/1973) and Amelia Osborne in *Vanity Fair* (Thackeray, 1847–1848/1963) both transfer guardianship of a child to wealthier, higher-status relatives in order to secure material and social benefits. The surrendered child profits from enlarged opportunities; the remaining family also may profit if the advantages enjoyed by one member are disseminated in any degree to others (as is the case in the Price family). And by positioning a child to achieve

better success in life than otherwise might be predicted, parents enable that child to contribute more to its progenitors' fitness. Perhaps the boldest instance in literature of such investment-by-transfer occurs in *Puddn'head Wilson* (Twain, 1894/1980b), when a wet-nurse in the pre-Civil War South secretly switches her baby with her master's. Her action stands to benefit her child both materially and socially: he is changed at a stroke from an African American slave to a high-status white citizen. Due to the convoluted ironies of Twain's plot, the advantages Roxana foresees for her son are not realized, but her daring baby-swap is presented initially as a bid for fitness pay-offs.

Madame Merle in *The Portrait of a Lady* (James, 1881/1963) is another character who abdicates parental custody surreptitiously. By concealing the fact that she is Pansy Osmond's mother (supporting her partner in the pretense that Pansy is the child of his deceased wife), she shields the child from the stigma of illegitimacy and at the same time preserves her own reputation from blemish. Her deception secures her daughter a respectable position in upper-class European society, including elite marital prospects. Forfeiting the social rewards and personal intimacies of motherhood, including her daughter's affection (Pansy "does not like her"), Madame Merle accepts the emotional consequences of the separation she has engineered in order to obtain advantages for both her child and herself (p. 445). The peculiar nature of the investment parents like her have made requires them to reduce or cease intimate expressions of their parental affection, and the thwarting of a powerful proximate impulse may prove painful.

Paradoxical expression of parental love is presented with particular vividness in the Biblical judgment rendered by King Solomon (Kings I). Solomon orders that a child claimed by two women shall be divided by sword and each of the contesting mothers be given exactly half. To preserve the infant's life, the biological mother immediately offers to let her rival keep him: "O my Lord, give her the living child, and in no wise slay it" (3:26). Her behavior highlights the evolutionary benefits at stake when a parent surrenders a child: fulfillment of proximate desires (for mutual nearness and affection, for example) is secondary to preservation of parental DNA. Solomon demonstrates his wisdom by awarding the child to the woman who indicates that the child's life is more important to her than personal possession of it. Her willingness to yield custody of the child proves the authenticity of her maternal investment.

The value of parental care also is demonstrated in literary works portraying parents who repudiate its costs outright. Characters such as Becky Sharp in William Thackeray's *Vanity Fair* (1847–1848/1963), Undine Spragg in Edith Wharton's *The Custom of the Country* (1913), and Pap in Mark Twain's *The Adventures of Huckleberry Finn* (1884/1980a) are notorious examples of uncommitted parents. Becky and Undine neglect their young sons, regarding offspring as unwelcome encumbrances to their materialistic and social ambitions. Pregnancy takes "a whole year out of life," Undine moans: it destroys personal beauty and circumscribes recreational activities (Wharton, p. 184). Following individual self-interest with casual ruthlessness, these two uncommitted mothers leave their children to be raised by an assortment of fathers, stepfathers, and collateral relatives. Huck Finn's father, the

most callously self-aggrandizing of the three, adds abuse and exploitation to abandonment. His aggressive efforts to seize ownership of Huck's property are fueled by a cupidity unleavened by parental attachment. Like Becky and Undine, he is deficient in the "love" that ordinarily inspires adaptive parenting behavior.

Thackeray, Wharton, and Twain encourage readers to react with abhorrence to the deserting parents they portray. These fictional characters' refusal to provide adequate care for their children—and without compelling reason—signals a troubling deviation from universal human norms, leading readers to expect bad behavior from them in other realms of life: an expectation that the plots of all three novels fulfill. Since investing in children is ultimately selfish, an effort to ensure propagation of one's own genes, withholding that investment is evolutionarily self-destructive. These particular neglected children do survive (at least to the end of the narratives in which they feature), a fact that points to the biological advantage a non-investing parent potentially may reap. So long as others, kin or not, are willing to provide minimal care to a child, the deserting parent may obtain fitness benefits without having paid the full cost of rearing it (Trivers, 2002b). This is high-risk behavior, obviously: even if an abandoned child survives, it may never reach its full physical, social, or reproductive potential. Counting on readers' intuitive sense that defecting parents are exhibiting perverse or pathological impulses, authors can direct negative judgment toward selected characters by providing no excuses for their abdication of parental care.

In some circumstances, radical repudiation of parental investment may evoke sympathy in readers. In cultures where premarital sex, adultery, and illegitimacy are not countenanced, unmarried women may kill infants to avoid social or legal penalties for their sexual behavior. In Goethe's *Faust* (1808/1962), Gretchen commits infanticide because the father of the baby has deserted her, leaving her to face social repercussions and assume the costs of child-rearing by herself. Hetty Sorrel in George Eliot's *Adam Bede* (1859/1960) is caught in a similar set of circumstances. She, too, is deserted after romantic dalliance with a man whose wealth and status far exceed hers. Like Gretchen, she kills her baby because she is unwilling to accept the disgrace of unmarried motherhood. Authors muster sympathy for such economically and socially powerless female characters, young girls who withhold maternal investment for one reason only: their partners have deserted first. She may serve her fitness better, each girl consciously or unconsciously calculates, by giving up on the current reproductive project as soon as possible, evading social reprisals and clearing the way for a possible future partnership with a more investment-inclined man. Had the infanticides remained undiscovered, this strategy would have proven more advantageous, from an evolutionary perspective, than accepting the reputationally damaging role of unwed mother. These fictional examples highlight the desperate solutions to which women may turn when grappling with the fitness-threatening problem of refused paternal investment.

Literature abounds with stories of men who court, impregnate, and abandon their partners, leaving survival of their offspring to chance. As Robert Trivers (2002b) points out, there is a fundamental, sex-based asymmetry in parental investment. Large sex cells, internal gestation, and post-birth lactation mean that a woman

makes a much greater initial investment in every reproductive project than does her male partner. A woman's lifetime reproductive success is limited, moreover, by the number of successful pregnancies she can bring to term before menopause. A man's lifetime reproductive success, contrastingly, is limited only by his access to fertile partners. For these reasons, every pregnancy and every child is more valuable, potentially, to its mother than to its father.

The difference between male and female parental investment tendencies, illustrated in countless poems, plays, and narratives, is presented with admirable clarity in Hemingway's "Hills Like White Elephants" (1927/1966). The narrative consists almost entirely of one-on-one dialogue concerning a pregnancy not explicitly identified as such. The male partner in the couple argues obliquely but definitively in favor of abortion, "an awfully simple operation" and "perfectly natural": "really not anything" (p. 275). He assures Jig that afterwards they will "be happy" (p. 275). Repeatedly he avers that the decision is hers, that she must do what she thinks best, but it is clear to readers and to his partner that he wants her to terminate this pregnancy. "I am perfectly willing to go through with it if it means anything to you," he tells her, thereby revealing that this new life they have created together means nothing to *him* (p. 277).

His partner lets him know that the child means "everything" to her, noting that resources are no obstacle: "we could get along" (p. 276, p. 277). To him, however, the child in the womb is the "white elephant" of the story's title: an albatross-like burden that will require elaborate and expensive care. He is obviously not disposed to commit himself to such a burden at this time. No doubt he assumes there are numerous future reproductive opportunities ahead of him, either with this woman or with others, and that ending the currently inconvenient pregnancy does not represent a threat to his fitness. The pregnant woman is bound to judge her fitness prospects differently. By withholding information about the couple's future (does she have the abortion? do they stay together?), Hemingway concentrates attention on the crux of the story: contrasting male and female valuation of the couple's unborn child.

Men's greater potential for reproductive success, relative to women, is the major reason for their more frequent tendency to refuse or limit parental investment in any one child, but there is another crucial factor at work: paternal uncertainty. Because men do not gestate offspring in their own bodies, they are less certain than women which children are actually theirs. Paternal investment decisions thus hinge on a man's trust in his mate's sexual loyalty, as numerous literary texts illustrate. This is nowhere more evident than in the abrupt about-face in King Leontes' attitude toward his newborn daughter in *The Winter's Tale* (Shakespeare, 1623/1952d). Convinced initially that his wife Hermia has committed adultery, Leontes regards the baby as a "bastard," a biological interloper (II, lines 155). Almost immediately after he arranges to dispose of the child, however, a supernatural pronouncement (via oracle) causes him to regain trust in Hermia's fidelity. If she has been a loyal wife, it follows that his daughter is "truly begotten" (III, 2, lines133, 135). Repenting his ill-founded jealousy, which he believes has angered the "Heavens" (and resulted in

the deaths of his wife and son), he yearns to recover his lost daughter, now his sole hope of perpetuating his lineage (V, 1, lines 173–74).

There is tragic irony in this extreme reversal of feeling and intention: Leontes now is eager to invest in the child he so very recently disowned. She has become infinitely valuable to him once he views her as a genuine descendant. The suddenness of the change he undergoes points to the difficulties involved in weighing the all-or-nothing probability of paternity. Either a man is the father (sharing half of his genes with a child), or he is not (sharing no genes whatsoever). Paternal investment in any given child is either genetically advantageous or genetically suicidal: there is no in-between. This evolutionary reality, along with the jealousy and possessiveness it inspires, makes for dramatic and often violent literary plots.

3 Preferential Parental Investment

Because parents share the same number of genes with every child, there is "no genetic reason" for unequal investment in offspring (Dawkins, 1989, p. 125). Yet parental favoritism occurs frequently in life and emerges as a significant topic in literature (Hrdy, 1999). The reasons for preferential investment are varied, but some of the most intractable are environmental. When circumstances in the physical environment reduce access to vital resources, parents may be compelled to sacrifice one or more children in order to ensure the survival of others. In *The Good Earth*, for example, O-lan responds to famine by killing her newborn infant, with her husband's tacit approval (Buck, 1931/2004). Since she lacks the resources to provide for the infant even minimally, an attempt to do so almost certainly would fail. That effort would consume some of the family's extremely limited resources, jeopardizing the mother's survival, her future reproductive potential, and the lives of her older children (whose chances of surviving obviously are greater than those of a fragile newborn). O-lan's and Wang Lung's sacrifice of their newborn daughter achieves the best outcome possible, given the scarcities they face: their two older sons do survive, and O-lan goes on to bear three more children. In environmentally dire situations, when parents cannot preserve the lives of all their children, their best strategy is to try to save those in whom they already have invested most (Dawkins, 1989).

The quality of the child itself is another important factor in parental preference. A child manifesting poor health or a debilitating handicap is not as promising an investment prospect as are more robust siblings, and literature offers examples of favoritism based on such considerations. The Mazzini-Ferraz parents in "The Decapitated Chicken" treasure their one healthy child, lavishing resources and attention on her with an enthusiasm deriving from their disappointment with their four mentally incapacitated sons (Quiroga, 1935/1976a). After the birth of a healthy daughter, the mother "virtually ignore[s] the other children." Having now a far better investment option, the parents "focus all their contentment" on the one child who has the potential to pass on her parents' genes (p. 61) When resources are plentiful, care may be given without question to reproductively nonviable offspring, but this

Uruguayan family is not prosperous enough to spare "love without any possible hope of renewal" (p. 58). Another instance of favoritism based on health can be found in *The Children* (Wharton, 1928). Young Chip Wheater, though only a toddler, is regarded as the "hope" and "consolation" of the Wheater family because his strapping physique provides a comforting contrast to the frailty of his elder brother (p. 21). Since the elder son is "so delicate" and there are "millions to inherit," his father has wished "dreadfully" for a physically sturdier male heir (p. 21, p. 23). Once he obtains a promisingly healthy son, the father demonstrates a distinct preference for him.

Favoritism is demonstrated more subtly in Wharton's novel than in Quiroga's story: the Wheaters' wealth enables them to invest substantially even in the less preferred son and, additionally, the qualitative difference between the two boys is far less obvious: apart from his vaguely tubercular symptoms, the elder boy is in every respect a high-quality child. For good evolutionary reasons, the Wheaters' preferential investment in favor of the younger boy is not absolute. By the end of the novel, in fact, it is he, rather than his frailer brother, who has died of an infectious illness. This outcome points to the uncertainty parents face in making investment decisions. A healthy child may be unexpectedly handicapped by illness, like Mary in the *Little House* books (Wilder, 1939/2008), or killed in an accident. A child's value to its parents always is relative, particularly with respect to that of its siblings, and subject to fluctuation. Quiroga's narrator acknowledges this harsh truth, observing that until the birth of a healthy child, the Mazzini-Ferraz parents invested considerable "compassion" and care in their sub-optimal offspring, reducing these efforts only after the birth of a child capable of contributing to parental fitness (p. 59). In some situations, too, a parent may choose to increase investment in a physically fragile child instead of reducing it, if there is hope that this greater effort will pay off in grandchildren. In "The Revolt of Mother," for instance, the maternal protagonist responds to the "delicate" health of her daughter by sparing her the most physically taxing household tasks (Freeman, 1891/1974, p. 120). She plans to continue to take "the heft of everything off her" even after the daughter's marriage (p. 226). This maternal strategy may enable a weakly child to bear and rear more children than she might without assistance.

Sex and birth order, separately and in tandem, contribute substantially to variable parental investment (Hrdy, 1999). Literature reflects a widespread preference for male children. Wharton's Cliffe Wheater, for one, finds no solace in his three healthy daughters: he wants a strong and vigorous son to inherit his wealth. When her partiality for her firstborn son is criticized, Eleanor Sullivan insists that her preference is natural: "a mother often has an especial feeling for her eldest son" (Compton-Burnett, 1941/1985, p. 35). Characters in *The Good Earth* inhabit a social environment in which only boys have value. Wang Lung spends his hard-won resources gladly to celebrate the birth of his firstborn son. Daughters, contrastingly, are commodities, sometimes sold as slaves if family resources dwindle. Already the mother of two healthy sons, O-lan thinks it necessary to apologize to her husband for bearing a girl: "it is only a slave this time—not worth mentioning" (p. 65).

In many cultural settings, property and titles can be bequeathed only through the male line. Typically co-existing with primogeniture, such customs enforce high investment in firstborn sons. In "The Needlecase," Elizabeth Bowen (1941/1981) portrays the preferential treatment meted out to the eldest son in a landed family rapidly sinking into genteel poverty. Because he is heir to the family estate, including a house that "drank money," Arthur "must marry money" (p. 456). He is equipped as a gentleman and given funds to enjoy a gentleman's social life, while the daughters and younger son enjoy "few advantages" (p. 456). The resentment of offspring whose options in life are limited by discriminatory patterns of investment, together with the often inflated expectations of parents for their crucially important firstborn sons, provides the stuff of many literary plots, from *The Tempest* (Shakespeare, 1623/1952b) to *Brat Farrar* (Tey, 1949/1997).

Legitimacy is another significant influence on parental investment. Since men often initiate short-term, extra-pair relationships with women whose status is considerably less than theirs (Buss, 2003), they are apt to view the resulting offspring as socially and qualitatively their inferiors even apart from the stigma of illegitimacy. For these reasons—when they do not simply abandon pregnant partners and unwanted children—men tend to provide fewer resources and less care to offspring born out of wedlock. Sir Jesse Sullivan in *Parents and Children* sires a second family for which he accepts paternal responsibility after the death of the children's mother (Compton-Burnett, 1941/1985). Predictably, he does not provide his second family with a standard of living equivalent to that enjoyed by the first. His acknowledged son and grandchildren enjoy comfortable prosperity, while the unacknowledged offspring must make do with "bare necessities" and are adjured to practice rigid economy (p. 134). When his concealed paternity is exposed, the judgments passed upon Sir Jesse's conduct—by members of the first and second families, by neighbors and friends, by women and by men—are far from uniform. The range and variety of moral response to a privileged man's employment of a mixed sexual strategy form a central part of Compton-Burnett's unsentimental scrutiny of human nature.

The need for secrecy in cases of illegitimacy plays a crucial role in limiting both material and emotional support. An entire extended family may be exposed to social stigma if the truth becomes publicly known. When Alan Woodcourt in *Bleak House* shows interest in the worthy and beautiful Esther Summerson, his mother is certain, initially, that Esther's illegitimacy—widely known though not directly mentioned—disqualifies her for marriage to her son (Dickens, 1853/1956). Often, too, legitimacy is a prerequisite for inheritance of property and titles. Parents who wish to make substantial investment in their out-of-wedlock children often must seek ways to do so surreptitiously, as Gilbert Osmond and Madame Merle succeed in doing with Pansy (James, 1881/1963). In some social settings it is possible for a man to include a child he has previously sired in the household he establishes with his wife, where the child enjoys a more generous (though probably not equal) share of paternal attention and resources. Pamela's willingness to take her husband's illegitimate daughter into her household, despite her own unswerving commitment to premarital chastity, is lauded by Richardson's misogynist narrator as one more proof of her wifely merit (Richardson, 1817/1958).

Women with children conceived out of wedlock sometimes may persuade husbands to rear illegitimately conceived children as their own. In "Roman Fever," for example, Grace Ansley marries with sufficient promptness after a premarital tryst to pass her infant off as her husband's, securing paternal investment and social acceptance for her child (Wharton, 1934/1936). Other unwed mothers manage to invest in their children by assuming the role of foster-caregivers, as Charlotte Lovell does: she poses as a textbook-perfect old maid to maintain the deception she has engineered (Wharton, 1924). Parents may devalue an illegitimate child if there are social and legal obstacles to its advancement in life—and thus to its reproductive success. Absent such obstacles, a child's evolutionary value to its parent is the same no matter how it is conceived. Plots featuring illicit sexual activity and the resulting offspring exploit the dramatic conflicts, secrets, and revelations inherent in such activity (notably demonstrated, for instance, by Edmund's scheming against his legitimate brother in *King Lear*), and also provide indirect comment on culturally enforced behavioral constraints (Shakespeare, 1623/1952a).

More subtly, parents may prefer children whose phenotypic characteristics resemble theirs or those of cherished relatives. John Hilton harbors special affection for the younger of his two daughters chiefly because she reminds him of his mother, both in physical appearance and in qualities of mind: he dreams wistfully that she may become a teacher like her grandmother (Jewett, 1893/1956). The more the shared qualities are ones the parent particularly cherishes, the stronger is the tendency to favor the child manifesting them. A parent even may feel more intimately related to such a child. In *A God and his Gifts*, Hereward Egerton claims a closer genetic or "blood" relationship to his last-born son than to the three elder ones. "No other" of his sons "has been so much blood of my blood, so deeply derived from me," he avers (Compton-Burnett, 1963/1986, p. 99). This is arithmetically impossible, of course, since parents share the same number of genes with every child, but the perception of conspicuous resemblance highlights a parent's consciousness of biological relatedness, at the same time appearing to justify partiality.

Favoritism based on personal traits may be augmented, in many cases, by a child's responsiveness to its parent's teachings. A child who conforms consistently and conspicuously to parental "molding," adopting a parent's opinions or principles and imitating a parent's behavior, may win special favor (Trivers, 2002a, p. 145). The intelligent and witty Mr. Bennet in *Pride and Prejudice* prefers his daughter Elizabeth not only because she has inherited his intelligence and wit but because she appreciates and imitates his critical-minded evaluation of their social environment (Austen, 1813/1956). His wife, contrastingly, chooses as her favorite the youngest daughter, Lydia, to whom she has passed on her "mean understanding" and who also has adopted Mrs. Bennet's shallow values (p. 3). Sir Walter Elliot in *Persuasion* similarly favors the daughter who inherits his good looks and also has learned to share his dedication to material comfort, worship of rank, and self-importance (Austen, 1817/1964).

4 Quality and Effectiveness of Parental Investment

Because so many variables affect the outcome of child-rearing decisions, parental investment efforts are not unfailingly effective. In his story "The Son," Horatio Quiroga (1909/1976b) portrays a father whose carefully considered parental strategy leads to a fatal outcome. Living in a relatively wild region where "danger always exists," the widowed father decides that his son, who represents his "only hope and faith," should be taught to hunt and instructed in the use of a shotgun (p. 190). Fighting against his own "selfishness" (that is, his inclination to protect the boy and keep him safe), the father teaches the boy from an early age "to rely on nothing but his own strength" (p. 190). His decision to foster his son's self-reliance is presented as eminently reasonable. The father's worst fears are realized, nevertheless, when the son trips while climbing over a wire fence and accidently discharges his gun, killing himself. The story underlines a sobering truth all parents must face: even seemingly sensible choices do not guarantee a child's survival.

Depictions of unsuccessful child-rearing strategies abound in literature, and frequently parental behavior is targeted for criticism. Unlike the father in Quiroga's story, many fictional parents do not appear to have weighed the possible consequences of their investment strategies. Unwise indulgence appears as one of the most common forms of misguided parenting. Jane Austen (1813/1956) offers readers several examples of the harm it can wreak, most memorably in Lydia Bennet's elopement with Wickham in *Pride and Prejudice*. Lydia's imprudence almost destroys her reputation as well as that of her closest relatives. In the absence of Darcy's intervention, her sisters would have lost all chance of marrying well. Lydia's "errors," which put the reputation—and hence the fitness—of all her family members at risk, are attributed by Austen's narrator to Mrs. Bennet's "ill judging indulgence" (p. 213). In *David Copperfield* (Dickens, 1850/1965) Steerforth's faults, which culminate in his conscienceless seduction of Little Em'ly, similarly are presented as the result of maternal doting. This mother has nurtured an "unyielding, wilful spirit" in her son (1853/1956, p. 397). She has "gratified [him] from a child in every wish," even choosing a school where staff members "bow" to his supposed "superiority" (p. 671, p. 256). She does not consider what mischief her son's self-centered rashness might cause in other lives or, indeed, how it might blight his own.

Excessive pampering is a common example of good parental intentions gone wrong and thus is well represented, with numerous twists, in literature. Writers also explore more extraordinary cases of injudicious parenting. Sir Austin Feverel, a notoriously misguided father, raises his son according to a "System" of his own devising (Meredith, 1859/1966, p. 9). He allows his painful marital experience—his wife's adultery with a trusted friend—to shape his child-rearing method, which emphasizes social isolation, avoidance of women, and rigorously supervised sexual development. Sir Austin makes an undoubtedly high-cost investment in his child, devoting himself "entirely to [his] welfare," but his efforts to safeguard his son's happiness by repressing universal human desires precipitates tragedy in the life of the unhappily "systematized" Richard (p. 191, p. 136).

In Nathaniel Hawthorne's Rappaccini (1844/1966), readers encounter an even stranger example of failed parental investment. This ambitious scientist hybridizes his daughter with a poisonous plant, prefiguring the in-utero intervention, surrogate selection, and genetic engineering gradually becoming available to twenty-first-century parents. His purpose in rendering his daughter toxic, he claims, is to make her powerful. Because her touch, her very breath, is poisonous, she is invulnerable to attack. As a result of her father's paternal experimenting, Beatrice Rappaccini can never be coerced, enslaved, or assaulted (sexually or otherwise) but also, as she points out, she can never experience physical intimacy. The poison that protects her also excludes her. She cannot share in many of the affiliative benefits essential to the well-being of all social animal. Although Rappaccini's motives include the hope of achieving scientific renown, his goals are principally fitness-oriented: he works to endow his descendants with a unique genetic advantage. His foiled purposes demonstrate that even evolutionarily positive goals—if too narrowly and bizarrely conceived—may prove self-defeating.

Tracing wrongheaded, yet undoubtedly committed, parental behavior through several generations in *The Way of All Flesh*, Samuel Butler (1903/1973) cynically concludes that most humans are incapable of effectual parental investment. Imagining that they act on the basis of loving concern and educative principles, the parents he depicts render their offspring miserable, setting in motion a self-perpetuating model of tortuous child-rearing practices. The foregrounded couple, Theobald and Christina Pontifex, instill a confused sense of guilt in their children, telling them how fortunate they are—and what good parents they have—while maintaining a climate of cruelty and fear. Undoubtedly substantial, their parental investment is perversely damaging to their offspring. Butler's conclusion is that children would be better off if they had no contact whatsoever with their progenitors. "Why cannot we be buried as eggs in neat little cells with ten or twenty thousand pounds each wrapped round us in Bank of English notes," the omniscient narrator asks, "and wake up, as the sphex wasp does, to find that its papa and mama have not only left ample provision at its elbow, but have been eaten by sparrows some weeks before" (p. 109). With this witty image, Butler proposes a fantastical re-engineering of human biology and psychology. He knows, as do readers, that juvenile *Homo sapiens* could not survive with material "provision" alone. He offers his alternative, wildly unrealistic model as a protest against adaptations that are, in his estimation, the source of much human unhappiness.

Aldous Huxley's novel *Brave New World* (1932/1989) might be read as a thoughtful reconsideration of Butler's argument. The novel's setting is a future world in which much of what Butler hoped for actually has been set in place. Since the World State now controls human reproduction, biological processes have been replaced with laboratory technology: there are no mothers or fathers. Children are produced in carefully planned batches and reared in "State Conditioning Centres" by trained personnel (p. 23). Parent–child relations in the "understerilized" past are disparaged as "suffocating intimacies," full of "misery," and "reeking with emotion" (p. 36, p. 38). Huxley's readers may well recognize some truth in this dismal assessment. Unlike Butler, however, Huxley is not prepared to agree that the damage wrought by

parental investment is greater than the benefits it typically confers. He exploits the satiric techniques of reversal and inversion to good effect, evoking mockery for a society in which nearly all natural processes have been replaced by robotic mechanization. Exhibit A in the case he makes for the worth of parental care is Linda's emergent devotion to her son John on the Savage Reservation. Even after all her negative conditioning, she finds herself accepting unsought motherhood with unexpectedly positive feelings. She sings to her young child, introduces him to rhymes and rhythms, stimulates his imagination with fabulous stories, teaches him to read, and procures books for him. She is an imperfect parent by any measure, but she manages to help her son to survive in a hostile social environment and to achieve functional adulthood. With his portrayal of this mother–child relationship, Huxley suggests that evolved adaptations influencing parental behavior cannot be entirely eradicated and ought not to be judged as overridingly injurious in their effects.

Despite the many defecting, ambivalent, injudicious parents to be found in literature and in life, the biological value of offspring to parents tends, on average, to steer parental care in positive directions. Numerous parents choose to make high-cost investment in the small beings upon whom their genetic survival largely depends. Parents typically take action to protect their biological legacy from external threats: the fairy-tale personage who demands a firstborn child meets with appalled resistance, and the strongest proof of faith the Old Testament God can exact of a parent is the sacrifice of a child (Genesis 22). The mechanisms for passing on genes from one generation to the next allow for great behavioral variety in response to differing cultural, material, and psychological contexts. Individual parents confront harsh necessities and wrestle with hard choices: inevitably, their decisions sometimes fail to achieve genetically advantageous—or individually happy—results. Portraying a wide range of parenting choices and outcomes, literary art explores the "richly contingent systems" of human decision-making and the "dazzling repertoire" of human behavioral options in this arena of life (Tooby and Cosmides, 2005, p. 13).

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Why the World Is a Better Place with Stephen King in It: An Evolutionary Perspective

Mathias Clasen

The bestselling author Stephen King is famous for his scary stories. He has terrified millions of people and must be directly responsible for countless nightmares and sweat-drenched sleepless nights. I have heard of people who have had to sleep with the lights on for months because of a King story. I have heard of people whose childhood love of clowns curdled into dread because of King. If one were to type up King's literary rap sheet, the section "Incidents of Sleep Disturbances Caused by Stephen King's *It*" alone would require many sheaves of paper. Enough, maybe, for a limited print run of a new King novel. And yet, even though King has dispersed dread, anxiety, horror, and fear since the mid-seventies, I'll argue that the world is a better place with him in it.

There's an obvious reason why that claim is true. The world is a better place with King in it because King generates a lot of sheer monetary value—with an annual income of some $20 million (Watson, 2019), he pays a lot of taxes, and his prolificacy must keep dozens of people employed in the creative industries. Moreover, King and his wife Tabitha are famous for their philanthropy, donating an estimated $4 million to charity each year (King, 2017b). That's value. But King also generates another kind of value, one that is harder to measure—*literary* value, by which I mean the pleasure and insight that people derive from reading his stories. It is this latter kind of value that is my focus here, and I approach the subject from the perspective of evolutionary literary criticism. This particular perspective has two benefits: One, it is lodged in empirical science, which gives the perspective genuine explanatory power (Carroll, 2011). And two, evolutionary literary theory—with its focus on storytelling as an adaptive mechanism—is keenly attuned to the psychological effects and functions of fiction (Boyd, 2009; Carroll, 1995). Indeed, previous King scholarship has tended to disregard the psychological appeals and

M. Clasen (✉)
Department of English, Aarhus University, Aarhus C, Denmark
e-mail: mc@cc.au.dk

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functions of his stories, focusing predominantly on the ideological underpinnings and ramifications of his work (e.g., Dymond, 2013; Hansen, 2017; Hornbeck, 2016) or on his place in the literary-historical or critical landscape (e.g., Birke, 2014; Magistrale, 2013; Strengell, 2005).

While horror is a widely popular and culturally pervasive genre, some critics consider the genre—and King—unworthy of serious attention, typically on aesthetic and/or moral grounds (Smith, 2002). Such dismissals are misguided. The horror genre fulfills an important psychological function as threat simulation (Clasen, 2017). King provides literary threat simulation, but his horror has extraordinarily wide appeal because it is not just about frightening readers. It is also about using threat simulations to probe *character*, about people's attempts to cope with terrible situations. When an interviewer asked about the "most essential element of a good horror story," King responded: "Character. You've got to love the people … There is no horror without love and feeling" (Winter, 1990, p. 306). Indeed, character is central to King's fiction, and to his appeal.

King's literary world is one in which evil is real, but so is goodness. His protagonists—compassionate, imaginative, courageous—usually stand a fighting chance against awe-inspiring, supernatural forces of evil. And while King's human characters are seldom wholly good or wholly evil, some characters are more receptive to the forces of evil than others—and some characters, usually the most imaginative ones, are more *alert* to the forces of evil than others. Imagination, in King's view, is a double-edged sword—a capacity that generates fear and anxiety by producing images of "dark and draggling horrors" (King, 2011b, p. 413), but also a source of pleasure and a force for good. King tends to associate imaginative traits with his protagonists, and frequently pits imaginative protagonists against unimaginative evil. In *The Dark Half* (King, 1990), King's protagonist, Thad Beaumont, is an imaginative writer whose family is taken hostage by Beaumont's evil twin, George Stark, who has been brought to life by Beaumont's imagination—a dangerously antisocial literary character emerged in the flesh. But the flesh is ephemeral. Stark is slowly decomposing until he is written back into full health, but he himself is unable to create—he needs Beaumont to write for him. Like Stark, King's antagonists tend to be dully self-absorbed, whereas his protagonists are usually highly prosocial and imaginative, if somewhat socially awkward—not unlike King himself. As he said of his childhood in an interview, "I had friends and all that, but I often felt unhappy and different, estranged from other kids my age." He found pleasure in reading and was an imaginative child, but his vivid imagination seems to have been unusually morbid:

> An active imagination has always been part of the baggage I've carried with me, and when you're a kid, it can sometimes exact a pretty grueling toll … [W]hen I was growing up, I'd think a lot of what would happen if my mother died and I were left an orphan … [W]ith the kind of imagination I had, you couldn't switch off the images once you'd triggered them, so I'd see my mother laid out in a white-silk-lined mahogany coffin with brass handles, her dead face blank and waxen; I'd hear the organ dirges in the background; and then I'd see myself being dragged off to some Dickensian workhouse by a terrible old lady in black (Norden, 1988, p. 40).

To the terror and delight of millions of readers across the planet, King has managed to convert his disposition for imaginatively probing the darkest possibilities of the world into a lucrative creative pursuit. His horror stories resonate with those millions of readers because King is uncommonly good at creating immersive imaginative worlds that look very much like our world, but in which vividly depicted and intuitively compelling supernatural forces of good and evil are afoot. Those forces collaborate with and work through fictional characters, whose motives—good or evil—King probes with real understanding of the complexities of human nature. King is not sadistic; he likes to scare readers, but he does so through compassionate depictions of vulnerable characters in confrontation with terrifying forces. This allows King to provide psychological and social insight and prompts for moral calibration by satisfying an evolved appetite for vicarious experience with threat scenarios. And while King is famous for his vivid depictions of horrifying evil, I maintain that his stories are, in fact, a force for good.

1 The Divided Reception of Stephen King

King enjoys massive popularity and continues to wield immense pop-cultural influence. He has published more than 60 novels, in addition to some 200 short stories and several non-fiction books. By one estimate, he has sold 350 million books. Many of his stories have been adapted for the screen—some of them to great critical acclaim (e.g., Darabont's *The Shawshank Redemption* [1994]), and others to almost universal derision (e.g., King's own *Maximum Overdrive* [1986]). Several King creations have entered popular culture and are instantaneously recognizable even to people who have never read any of his works, such as telekinetic Carrie, the haunted Overlook Hotel, or Pennywise the Dancing Clown. There are King fan clubs, there's King merchandise (from *Carrie* t-shirts to Pennywise plush toys), and there are King quiz books to keep King fans occupied at get-togethers (e.g., Spignesi, 1990). There are anecdotes of deranged fans violating King's privacy (Lant, 1997). Indeed, anybody who has read King's 1987 novel *Misery* (2011a) must have wondered about the autobiographical element. In this novel, bestselling author Paul Sheldon is held captive by his self-proclaimed "number one fan," Annie Wilkes, who forces him to resurrect the heroine of the bodice-ripper romance series for which Sheldon is famous, but which he has left behind to pursue more "serious" fiction. And although it's too easy to read *Misery* as King's hate-mail to his fans—Sheldon is clearly not a clone of King—the novel is supposedly inspired by King's experiences with rabid fans (Beahm, 1998).

King's wide appeal is undoubtedly due chiefly to the literary qualities of the stories he writes—the complex characters, the vividly depicted images of horror, the verisimilitude of his imaginative worlds, his suspenseful plots, and the accessibility of his language. Those are the recurrent qualities mentioned by King enthusiasts on such fora as Goodreads. King's public persona and his life-story add to his appeal. He seems like an easy-going, down-to-earth guy, despite his massive wealth.

He does interviews on national television wearing well-worn blue jeans and casual t-shirts. He jokes about being a bumpkin from Maine. He talks plainly and candidly about growing up with an overworked single mother, struggling financially during college and up until he sold the paperback rights to his 1974 debut novel, *Carrie* (1999), and about a life-long dance with the demons of substance abuse (King, 2012). He loves dogs and thinks farts are funny. And his rags-to-riches story is authentic and appealing (Magistrale, 2013; Rogak, 2009). There's a lot to like here, and King's easy-going, good-natured yet compulsively morbid personality bleeds into his stories.

Alongside the hard-core King fans are diehard critics. Among them, the ghost of the late literary scholar Harold Bloom stands out as the most vocal and influential. Bloom edited a volume of critical writings about King's work and said in his brief introduction to the volume that "I find King very hard to read." (Why he would edit such a collection remains a mystery.) He went on to say that "the triumph of the genial King is a large emblem of the failures of American education" (Bloom, 2007, p. 2). While Bloom granted to King a certain "decency," a certain "social benignity" (p. 3)—presumably referring to King's acts of charity as well as to the "redeeming social values" (p. 2) that Bloom found in some of King's stories—he was unequivocal in his scorn. When in 2003 the National Book Foundation awarded King the prestigious Medal for Contribution to American Letters, Bloom wrote an angry op-ed, saying that the award represented "another low in the shocking process of dumbing down our cultural life." He added that King "is an immensely inadequate writer on a sentence-by-sentence, paragraph-by-paragraph, book-by-book basis" (Bloom, 2003).

King scholars have puzzled over this divided reception. How can a writer inspire almost-religious devotion in some and tooth-grinding scorn in others? While they have not yet adequately answered that question, they have identified reasons why some critics dismiss King (Smith, 2002)—the most prominent one being *genre*. Horror, the genre for which King is best known, continues to struggle with a bad reputation. The genre is, at least in some circles, conceived as a psychologically shallow, aesthetically uninteresting, and maybe even morally problematic mode of writing (Gutiérrez, 2017; Jancovich, 1992). And while there is a lot of bad horror out there, there is also horror that has real merit—horror that is psychologically probing, aesthetically ambitious, and morally nuanced (Clasen, 2017).

The best of King's horror has those qualities. King uses the elements of horror, whether naturalistic or supernatural, not just for their own sake, but to examine people and the world in which they find themselves. He has used pretty much every Gothic and horror trope there is: haunted houses, psycho killers, ghosts, vampires, zombies, werewolves, demons, evil extraterrestrials, possessed dolls, abominations from other dimensions, terrors from the grave, you name it. Those tropes carry intrinsic interest and value for King, but they are also used to qualify and deepen his investigations of human motivations and social structures. In *The Shining* (King, 2011c), for example, he casts his eye on the main character, Jack Torrance's, futile struggles against his inner demons and his psychological freefall into homicidal madness. By situating this drama in a hotel haunted by external demons that fuel

Torrance's inner ones, King elevates a social realist drama of thwarted ambition and pathological family relationships to an imaginatively and symbolically explosive scenario of horror (Clasen, 2017). He uses the trope of the haunted hotel with a sordid past to suggest that evil deeds leave lingering supernatural traces in the world, just as they leave lingering psychological traces. Conversely, he brings the horror tropes to life by situating them within a believable imaginative world that resembles the empirical one in most respects. As King himself puts it, he is "not merely dealing with the surreal and the fantastic but, more importantly, using the surreal and fantastic to examine the motivations of people and the society and institutions they create" (quoted in Smith, 2002, p. 338).

King says that "the art of story-fiction" is "one of the vital ways in which we try to make sense of our lives, and the often terrible world we see around us" (2010, p. 365). This functional proposal aligns with evolutionary theories about the adaptive functions of fiction, in particular the empirically supported hypothesis that fiction provides motivational orientation (Carroll, 2012). We use fiction to make sense of ourselves and the world. King, through his stories, thus provides to readers the kind of "emotionally saturated images of the world and of human experience" (Carroll, 2006, p. 42) for which we have an evolved desire, because such images help us navigate the uniquely complex social and psychological worlds in which we humans find ourselves.

2 The Uses of King's Horror: An Evolutionary Perspective

The imaginative virtual worlds into which King invites his readers are usually scary, and King evidently enjoys scaring his readers. He is temperamentally drawn to the horror genre. As he said in a 1985 interview, "There are a lot of people who are convinced that, as soon as I've made enough money, I will just leave this silly bullshit behind me and go on to write *Brideshead Revisited* and spy novels and things like that. I don't know *why* people think that. This is all I've ever wanted to write" (Winter, 1990, p. 305). And as he said in another interview, "I don't think there's anything sweeter on God's green earth than scaring the living shit out of people." He went on to explain that:

> if somebody wakes up screaming because of what I wrote, I'm delighted. If he merely tosses his cookies, it's still a victory but on a lesser scale. I suppose the ultimate triumph would be to have somebody drop dead of a heart attack, literally scared to death. I'd say, "Gee, that's a shame," and I'd mean it, but part of me would be thinking, Jesus, that really worked! (Norden, 1988, p. 40).

King's readers, in turn, enjoy being scared. As one Goodreads user wrote of *Pet Sematary* (in a five-star review), that novel "is the scariest and creepiest book I've ever read" (Mario, 2014). It is, at least on the surface, paradoxical that readers would enjoy being frightened by fiction.

While horror is a pervasive pop-cultural phenomenon, not *all* readers enjoy horror. In a previous study sampling the American population (Clasen, Kjeldgaard-Christiansen, & Johnson, 2018), we found that more than half claim to enjoy horror media. Slightly more than a quarter say they don't like horror. And the remaining respondents are indecisive, claiming neither a preference for or against horror. This distribution of people on a scale ranging from avoidance of horror to liking of horror, which results at least partly from personality differences among media users (Clasen et al., 2018), may help explain the divided reception of King. Some readers simply don't enjoy being scared by fiction. They stay away from anything labeled horror, and their understanding of what the genre is may be impoverished. For such readers, horror as a genre label may conjure up images of masked killers chasing buxom teenage scream queens. But as I hope to show in this chapter (and have argued elsewhere, e.g., Clasen, 2017), there is more to horror than masked killers and scream queens.

The widespread desire to be frightened by fiction is explicable in terms of threat simulation. Horror is a means for readers to become immersed in frightening fictional worlds—virtual worlds in which they can empathize with vulnerable characters who confront terrifying forces of evil—and so to expand their experience. They learn what it feels like to be hunted prey, to be assaulted by dangerous forces. They vicariously live through worst-case scenarios (Morin, Acerbi, & Sobchuk, 2019). That kind of threat simulation is pleasurable to most people because it satisfies an adaptive desire for expanding experience through imaginative simulation (Clasen et al., 2018). The imaginative structures provided in King stories usually offer *dark* simulated experience—simulations that take us to the fringes of human experience, into realms of darkness and horror and despair.

King, then, like other accomplished horror writers, makes his living by creating imaginative virtual worlds in which his readers can playfully engage in threat simulation. However, his exceptionally wide appeal suggests that he offers readers something more than the literary equivalent of yelling "BOO!" His horror allows him to provide psychological and social insight into the extremes of experience, and the compassion that saturates his stories appeals to many readers, perhaps because it makes the darkness into which he delves bearable by shooting it through with light. Some of King's stories are bleak, in particular the books written early in his career under the pen name Richard Bachman and in a state of "low rage and simmering despair" (King, 1996, p. vi). But while King can be bleak, and gleefully morbid, and irreverently gross, he is never nihilistic, never sadistic.

3 Charting the Dark Corners of the Psychological World: *Pet Sematary*

Consider *Pet Sematary* (King, 2011b), King's notoriously scary 1983 novel about a family that loses first a cat and then a toddler to the highway that runs past their new house. The protagonist, Louis, learns from his elderly neighbor, Jud, about an ancient Native American burial ground deep in the woods behind his home. Whatever one buries there comes back from the grave, but it comes back "a little

dead. A little strange" (p. 181). When the family cat is killed by a vehicle, Louis hides the death from his daughter to protect her from the shock of mortality. He also hides the death from his wife, Rachel, who was traumatized by the horrible demise of her sister when she was a child, and now lives in denial of mortality. Goaded by Jud, who is compelled by a supernatural force of evil, Louis buries the cat in the Native American burial ground. The cat comes back, but it's weird and mean. It kills and mangles a lot of birds and mice. Louis discreetly disposes of the corpses, thinking to himself that he is to blame—that he has "bought them"—by having taken advantage of the supernatural burial ground. Shortly thereafter two-year-old Gage is hit and killed by a truck. Louis, devastated by grief, decides to exhume his son and re-bury him in the Native American burial ground. Gage, too, returns from the grave, but he's now evil. Resurrected Gage kills both Jud and his own mother. Louis, now completely shattered by horror and sorrow, takes his wife's corpse to the Native American burial ground. She, too, returns. The end.

Even though this scenario is wildly implausible, there is real emotional depth here, real psychological insight. King gives us an imaginative world that is darkly re-enchanted, one in which magical forces and supernatural agents are real. There is a peculiar and ambivalent appeal in envisioning such imaginative worlds. The human mind evolved to helplessly, promiscuously, project magical forces and supernatural agents into the world (Atran & Norenzayan, 2004; Boyer, 2001). Science has struggled for centuries to banish those forces from the world, to disenchant the world, but science is up against deep-seated intuitions. Most people, despite rational convictions, occasionally intuit supernatural forces at work. And to most people, the intuition that such forces exist is both comforting and terrifying, suggesting some ulterior meaning to the universe and the individual life but also suggesting the existence of frightening supernatural agents. King exploits such intuitions by describing an imaginative world in which the forces are real. Doing so allows him to take his investigation of the depths of grief and horror to a level beyond that which a realistic depiction of the loss of a child would allow.

King takes on a big topic, one that most people don't much enjoy thinking about, and creates an absorbing, deeply disturbing, but ultimately life-affirming story around it. That big topic is death. Death is a prominent theme in literature because it is a prominent theme in life. It is vast and shrouded in mystery, inescapable and unknowable, terrifying yet fascinating. Death excites the imagination, "goading people into attempting to imagine the end of all imagination, and compelling them to wonder about the meaning and value of a life that seems a mere flicker of conscious experience isolated within an unimaginable infinity of nothingness" (Carroll, 2019, p. 137). In *Pet Sematary*, death is not the end, but it should be. The dread of undeath makes the value of life stand out. Jud knows he should not bury anything in the Native American burial ground, and that he should not encourage his friend to do so. But the force of evil works on him, compels him. "That place … all at once it gets hold of you," says Jud in an attempt to explain why he told Louis about the burial ground. "You make up the sweetest-smelling reasons in the world" (King, 2011b, p. 183). Later in the story, when Gage is dead and Jud suspects that Louis may be contemplating the interment of his son in the Native American burial ground,

he tries to warn Louis: "It's an evil, curdled place, and I had no business taking you up there to bury that cat. I know that now" (p. 307). Too late. Louis, weakened by grief and unable to accept the finality of death, gives in to the lure of the place and sets out on the course that ends with him toppling into an abyss of horror.

In the most disturbing scene of the novel, Louis breaks into a cemetery at night to exhume his son. King lets the reader into the thoughts and emotions of Louis, with whom the story is focalized. We do get a brief description of Gage's corpse—which looks like "a badly made doll" with "damp moss" growing on its face (p. 387)—but the focus is on Louis's inner turmoil, his rage and grief and deep doubts. When Louis has opened the coffin and shines his flashlight into it, "a deep horror that was very nearly awe stole over him—it was the sort of feeling usually reserved for the worst nightmares, the ones you can barely remember upon awakening" (p. 386). Louis then proceeds to lift the corpse out of the grave:

> Somehow, panting, his stomach spasming from the smell and from the boneless loose feel of his son's miserably smashed body, Louis wrestled the body out of the coffin, then out of the grave. At last he sat on the verge of the grave with the body in his lap, his feet dangling in the hole, his mouth drawn down in a trembling bow of horror and pity and sorrow (p. 388).

The image is vivid and resonant. King paints the scene in uncomplicated, colloquial language and provides enough sensory detail for us to mentally simulate the scene, including the stench of decomposition and the tactile reality of a broken corpse. We see before us Louis's "dangling" feet, we see him giving in to powerful emotion. We are being put right by the grave with Louis, and we are invited to share his pain, his grief. Since people respond to literary characters in much the same way as they respond to real people (Mar & Oatley, 2008), our empathy is mobilized and our emotions powerfully roused by this description of Louis's response. Moreover, the death of an innocent child is a potent motif, for good evolutionary reasons—humans evolved to value and feel protective of children, who are more vulnerable to danger than are adults. Even the fictional death of a fictional child can stir our sympathy and grief. The "magnitude of the loss [of a child] evokes a special pathos," says Carroll, because what is lost when a child dies "is the whole potential future life of the child" (Carroll, 2019, p. 148). King skillfully capitalizes on this in a short chapter that comes after Gage's funeral. This chapter begins: "But none of those things happened" (King, 2011b, p. 309). The chapter goes on to detail, in short order, how Gage narrowly avoids being hit by the truck, how he grows up to become a university student and an avid swimmer and has a full and fulfilling life. And then Louis "woke up in the cold dead light of a rainy seven o' clock, clutching his pillow in his arms … the pillow was wet with his tears" (p. 312). It was just a dream. This gut-wrenching chapter brings home the "magnitude of the loss" by first giving the reader a sense of relief and then ramming home the terrible diegetic reality. Gage *did* die. He did not grow up, did not attend Johns Hopkins, never learned to swim.

King clearly wants us to feel what Louis feels. He has also been careful to depict Gage as a lively, trusting, likeable toddler and to depict the loving bond between

father and son. One long passage describes father and son flying a kite. Louis gets the kite into the air and hands Gage the kite-string:

> "Gage flyne it?" Gage said … He pulled the string experimentally; the kite nodded in the windy sky … Louis and his son laughed together. Gage reached out his free hand, groping, and Louis took it in his own. They stood together that way in the middle of Mrs. Vinton's field, looking up at the [kite].
>
> It was a moment with his son that Louis never forgot. As he had gone up and into the kite as a child himself [imagining himself flying], he now found himself going into Gage, his son. He felt himself shrink until he was within Gage's tiny house, looking out of the windows that were his eyes—looking out at a world that was so huge and bright … where the kite soared miles above him, the string drumming in his fist like a live thing as the wind blew around him, tumbling his hair.
>
> "Kite flyne!" Gage cried out to his father, and Louis put his arm around Gage's shoulders and kissed the boy's cheek, in which the wind had bloomed like a wild rose.
>
> "I love you, Gage," he said—it was between the two of them, and that was all right.
>
> And Gage, who now had less than two months to live, laughed shrilly and joyously. *"Kite flyne! Kite flyne, Daddy!"* (pp. 248–249).

The scene captures the emotional depth and power of a healthy father–son relationship in general and of Louis's affectionate bond with his son in particular. It also captures something of the evanescence of life. The stark subordinate clause toward the end of the passage—"who now had less than two months to live"—serves as a brutal memento mori to the reader who, absorbed in the moving depiction of these characters, had perhaps forgotten that they were reading a horror novel that thematizes the fragility of life and the tragedy, but also inevitability and naturalness, of death. The scene, moreover, captures the transformation of the pure pleasures of childhood into the mature, but more complicated, joys of parenthood. A child can be content with (and may be unable to transcend) its own perspective. A responsible parent, however, is always invested in several perspectives—their own, that of a co-parent, those of offspring. Here, in this passage, Louis inhabits his own and Gage's perspectives and shares in Gage's childish joy at the flying kite. As the story progresses, however, and Louis sinks into horror and grief, he forgets all but his own perspective.

King's sympathetic depiction of Louis is nuanced by a critical perspective on his actions. We share Louis's perspective visually and emotionally, but not necessarily morally. As the plot unfolds, Louis's actions become increasingly morally problematic—culminating, of course, with the resurrection of his son. In one scene—not shocking, like the exhumation scene, but symptomatic of Louis's psychological decline—Louis, his wife Rachel, his friend Jud, and his colleague Steve are gathered for a meal after Gage's funeral service. Rachel has a breakdown, "sobbing into her hands":

> There was a queer moment then. There were crossing lines of tension then, and they all seemed to focus on Louis … Even the waitress felt those converging lines of awareness. He saw her pause at a table near the back where she was laying placemats and silver. For a moment Louis was puzzled, and then he understood: They were waiting for him to comfort his wife.
>
> He couldn't do it. He wanted to do it. He understood it was his responsibility to do it. All the same, he couldn't. It was the cat that got in his way … The fucking cat ... with his

> ripped mice and the birds he had grounded forever. When he found them, Louis cleaned up the messes promptly, with no complaint or comment … He had, after all, bought them. But had he bought this? (pp. 270–271).

Louis is so wrapped up in his own grief, and his aimless rage at the unfairness of Gage's death ("had he bought this?"), that he finds himself unable to comfort his wife. He suddenly becomes aware of the others' perspectives, the "lines of awareness" that converge on him, but he is locked into his own concerns. "After a moment … Steve put an arm around [Rachel] and hugged her gently. His eyes on Louis's were reproachful and angry" (p. 271). It's a painful scene. The reader is invited to share Louis's perspective, but also Rachel's, and Steve's. We understand Louis's behavior, but also condemn it. This scene—which is the kind of scene I have in mind when I say that King uses horror tropes to conduct serious and sensitive investigations of psychology and sociality—signals Louis's self-absorption, which, together with his unwillingness to accept the finality of death, becomes his tragic flaw. The flaw eventually leads to his fatal and immoral decision to resurrect his son. That selfish action serves only to counteract his own grief. It is depicted as unnatural and wrong, and it unleashes a horror that causes the death of both Jud and Rachel and also the complete mental unravelling of Louis. As Douglas Winter writes, "The death of a child is the ultimate horror of every parent, an outrage against humanity; and the reanimated Gage is precisely that horror made flesh, savaging and literally eating away at his mourning family" (1984, p. 134).

Pet Sematary allows the reader to vicariously feel the near-insane grief of a bereaved parent, to probe the disturbing question of "just how much horror the human mind can stand and still maintain a wakeful, staring, unrelenting sanity" (King, 2011b, p. 255). It prompts the reader to reflect on death and the value of life—not on an abstract level, but through emotional engagement with vividly drawn characters who find themselves confronted with a truly horrifying situation. The responsive reader participates imaginatively in this situation, but also stands back from it and evaluates it and the characters' behavior. The pay-off of reading a novel like *Pet Sematary*, then, is not just about the pleasure of being absorbed in an imaginatively and emotionally stimulating story populated by interesting characters. That pleasure is real and valuable. But the pay-off is also about "deepening and widening one's emotional experience," in the horror writer Peter Straub's words (quoted in Clasen, 2009, p. 40), about coming face to face with a nightmarish evocation of death, embodied in the reanimated corpses, and about becoming sensitized to the value and fragility of life, and about gaining insight into painful but important psychological and social dynamics. Nobody goes through life without pain and loss. Fiction that seriously explores the depths of pain and loss steels us for that.

4 Moral Calibration: Agonistic Structure in *It*

Fiction has the capacity for letting us vicariously live through scenarios that would, in real life, be unattractive (like losing a child) or even impossible (like resurrecting a child), thus widening and qualifying our experience and ability to cope. Speculative

fiction—horror, fantasy, and science fiction—deals in imaginative worlds that depart from the empirical one, but such fiction still tends to aspire to psychological realism, which is how it can teach us about the qualities of experience. Fiction may also have the capacity for improving social cognition by "[augmenting] our capacity for empathy and social inference" (Mar & Oatley, 2008, p. 173). It does so by letting us adopt the perspectives of fictional characters and by giving us insight into their mental processes. Moreover, since fiction typically has a moral structure—expressed perhaps most clearly in agonistic structure, the distribution of characters along a moral continuum from evil to good—it can tweak the reader's moral compass (usually toward the pole of prosociality, cf. Carroll, Gottschall, Johnson, & Kruger, 2012; Johnson, 2012) and help them assign weight and value to behavioral alternatives.

Consider King's *It* (King, 2017a), perhaps his most famous novel. This massive 1986 book depicts a small group of friends in the fictional town of Derry, Maine, in their attempt to defeat an ancient and shape-shifting force of evil that awakens every 27 years or so to feed on the flesh and fear and faith of the citizens of Derry, and to infect them with its evil. The good guys—a rag-tag band of kids who call themselves the Losers' Club—take up the fight with this force of evil and with its human collaborators. They manage to momentarily defeat the evil force, but it returns 27 years later. The now-adult protagonists, most of whom have left Derry, must return for a final battle against It. They manage, through their combined efforts, to vanquish It.

It is a sprawling and famously frightening novel, a wide-ranging depiction of the terror and awe of childhood, the magic of friendships, the wonders of imagination, the horrors of history (Mercer, 2019), and the dark forces that hide in the sewer system under Derry and deep within human nature. The central conflict in *It*—man versus monster—reflects an ancient struggle, one that predates modern humans (Clasen, 2012). Our mammalian ancestors have for millions of years been preyed upon by hungry, fanged animals roaming in the dark (Hart & Sussman, 2009). The idea of being hunted by a hungry monster still carries salience and resonance beyond reason. The monster of *It* is a predator, but it is more than that. It has a supernatural ability to adopt a shape that mirrors the deepest fears of its prey, and it is able to manipulate its prey's perception of reality. Despite the monster's extraterrestrial origin, it has found Earth very hospitable to its needs:

> *It had discovered a depth of imagination here that was almost new, almost of concern. This quality of imagination made the food very rich. Its teeth rent flesh gone stiff with exotic terrors and voluptuous fears: they dreamed of nightbeasts and moving muds; against their will they contemplated endless gulphs* (King, 2017a, p. 1220).

It targets children in particular, because King's children are more perceptive, open-minded, and imaginative than adults (Alegre, 2001). Their fears are "simpler and usually more powerful" than adults' fears (King, 2017a, p. 1232). Children are able to accept the impossible, King suggests. They are able to accept the reality of a shape-shifting monster, which makes them more vulnerable to the monster. However, as the protagonists discover, their faith can also be weaponized. They are

able to fight back when they believe that their weapons, such as home-made silver bullets, are effective against the monster.

One memorable scene depicts one of the Losers—11-year-old Eddie Kaspbrak—coming face to face with one of the monster's embodiments. Eddie is investigating an abandoned house, thinking about his fear of hobos. Eddie suffers from hypochondria, instilled by his domineering mother, and is terrified of infection. Suddenly, he is assaulted by what appears to be a hobo leper:

> The skin of its forehead was split open. White bone, coated with a membrane of yellow mucusy stuff, peered through like the lens of a bleary searchlight. The nose was a bridge of raw gristle above two red flaring channels. One eye was a gleeful blue. The other socket was filled with a mass of spongy brown-black tissue. The leper's lower lips sagged like liver. It had no upper lip at all; its teeth poked out in a sneering ring (p. 376).

This detailed depiction of Eddie's nightmare monster—helpfully peppered with similes that facilitate visualization ("like the lens of a bleary searchlight"; "sagged like liver")—exploits an evolved fear of contagion. Humans are biologically disposed to respond with aversion to cues of infection (Tybur, Lieberman, Kurzban, & DeScioli, 2013), and King provides plenty such cues here, again using unassuming and colloquial language ("yellow mucusy stuff"). More than a zombie-like abomination, however, this particular monster is an externalization of Eddie's fear, a horror image that reflects the psyche of a psychologically abused boy, and thus has a narrative function beyond grossing the reader out.

Eddie and the other kids in the Losers' Club share traits with protagonists throughout literary history. They are keenly attuned to other people, considerate of their needs, and respectful of their perspectives. They are self-sacrificing and prosocial. They are also socially awkward and slightly at odds with society. Bill has a heavy stutter that impedes social interaction and makes him feel insecure. Ben is overweight and friendless. Mike is an African-American and the target of racist abuse. Richie is a wisecracking misfit. Stan is a geeky Jew with a passion for birdwatching. Beverly is a social outcast with an abusive father. This motley crew bands together and finds great pleasure in collaborative, constructive pursuits such as building a dam and an underground clubhouse in the Barrens, the secluded area in which they play. They are also united in being "extraordinarily imaginative" (King, 2017a, p. 1232). Their imagination gets them into trouble—by making them particularly vulnerable to It—but also helps them defeat evil. Here, again, King depicts the imagination as a double-edged sword.

The Losers' power to vanquish the evil force comes not just from their healthy imaginations, King suggests. It comes from the strength of their bonds, from their being a strongly bonded group with prosocial values even toward out-group individuals. In one scene, the Losers are bonding over a game of Monopoly. One of their parents observes as the kids "[roar] with laugher" at an inappropriate joke: "There was a feeling in the air, like static electricity, only somehow much more powerful, much more scary. She felt that if she touched any of them, she would receive a walloping shock" (pp. 1029–1030). King here depicts the social bonds between the children as an almost-physical phenomenon, a power that frightens the parent.

Similarly, the force of evil intuits that the children's togetherness is their primary power. It looks for a "wedge to drive among them, splitting them apart and destroying any chance of concerted action" (p. 955)—not just because of their aggregated strength, but because of the emergent supernatural or quasi-supernatural force that results from their bond. By elevating the bonds of friendship to an almost-supernatural or spiritual force—conceptualized here, colloquially, as a kind of electricity—King satisfies an evolved tendency to see supernatural or spiritual forces as real agencies.

In contrast to the prosocial protagonists stands the evil force, which finds nourishment in people's fear and suffering. It also eats children. That's about as evil as it gets. This supernatural agent is selfish and sadistic. It recruits people who share its antisocial orientation. In King's stories, external forces of evil often work through human characters by appealing to their antisocial motives. A signal instance of such a recruit is the minor antagonist Patrick Hockstetter, a 12-year-old who becomes a willing tool for It. One chilling chapter takes us into his head. We learn that Hockstetter "could not remember a time when he had believed that other people—any other living creatures, for that matter—were 'real'" (p. 995). His pathological lack of empathy sets him in stark contrast to the Losers. So does his complete lack of artistic inclination, his lack of interest in imaginative activities. At one point, his mother asks about his school day: "Patrick said it was all right and showed her his drawing of a house and a tree. His paper was covered with looping meaningless scribbles made with black and brown crayon … Patrick brought home the same looping scrawls of black and brown every day. Sometimes he said it was a turkey, sometimes a Christmas tree, sometimes a boy" (p. 998).

In this chapter, we also learn of Hockstetter's dislike of his baby brother, Avery, who causes him minor discomfort—meals are late, Avery cries in the night, and so on. Hockstetter goes into Avery's room, where the infant is sleeping, and presses Avery's face into the pillow. When the noisome baby is dead, Hockstetter goes to the kitchen and gets himself a "plate of cookies and … a glass of milk" (p. 998). Apart from a transitory feeling of excitement, he registers no strong emotion after the infanticide. No regret, no grief, no horror—not even sadness. He is just relieved, eventually, to find that his meals once again arrive on time. His selfishness is pathological, and he serves as a human analogue to the inhuman force of evil that terrorizes the protagonists.

This distribution of protagonists vs. antagonists on a prosocial-to-antisocial scale is no mere literary convention, but a reflection of evolved human social motives (Carroll et al., 2012). We tend to see prosociality as good and selfishness as bad; indeed, evil in popular culture tends to be characterized as selfish (Kjeldgaard-Christiansen, 2016). Empirical studies have shown that prosociality is universally seen as morally desirable (Curry, Mullins, & Whitehouse, 2019). The reason is that we are an ultra-social species that depends on functioning social structures for psychological well-being and biological fitness. Prosocial individuals make up the fabric of such structures; antisocial ones endanger it. In the real world, however, most people harbor prosocial as well as antisocial motives, and we all feel the conflict of such competing motives occasionally. In fiction, the motives are often artificially

crystallized in morally polarized characters (Carroll et al., 2012). It seems that one of the functions of fiction is to tip the scales a bit and orient us toward prosociality at the expense of selfishness. It does so by mobilizing our admiration at prosocial characters and our disgust at antisocial ones—even *supernatural* antagonists like It. Indeed, the novel epitomizes King's talent for embodying such abstractions as prosociality and antisociality in vivid and engaging characters.

5 The Value of King and Directions for Future Research

Stephen King's popularity as a writer of scary stories makes sense from an evolutionary perspective. By constructing immersive stories populated by engaging characters in terrible situations, he provides an entertaining yet instructive experience to his readers. King thus caters to an evolved desire for imaginative experience with threat scenarios, and to an evolved desire for vicarious insight into psychological and social dynamics. A reader absorbed in *It* is likely to come away not just with a sense of horrified delight at having been immersed in a compelling but frightening virtual world of friendship, horror, loss, and death, but also with an admiration for the imaginativeness and prosociality that allow the Losers' Club to prevail and with disgust for the dominance-seeking bullies who torment the Losers. Indeed, empirical research has demonstrated that our values are subtly shaped by the fictional stories that we consume (Johnson, 2012; Gottschall, 2012). Norm transmission seems to be a chief function of fiction, and the norms transmitted by King's stories are invariably prosocial.

King, then, does a lot more than "keep the publishing world afloat," in Bloom's dismissive phrase (2003). King's best stories do good things in the world. Clearly, *Carrie* didn't spell an end to bullying. *The Shining* didn't abolish parental abuse. And *Pet Sematary* didn't put an end to pathological coping with offspring loss. All the same, those novels, and other King stories, have done more than provide hair-raising entertainment for their readers. They have helped people understand the dark forces that roam the psychological as well as the socio-moral world. They have done so through their powerfully evocative depictions of "ordinary people in extraordinary situations" (King, 2010, p. 365)—of protagonists struggling with social exclusion, destructive ambition, soul-crushing loss, and terrifying forces of evil.

I hope to have demonstrated here that an evolutionary perspective can put into focus the value of King's *oeuvre*. Even though evolutionary literary study has shown its explanatory and interpretive value (Carroll, 2018), King has largely escaped the attention of evolutionary critics. Indeed, "despite being one of the most widely read authors of all time, King is woefully understudied" (Cowan, 2018). There is plenty of work left to do for evolutionarily and quantitatively oriented scholars. Future research might investigate individual King stories from an evolutionary perspective, or perform systematic studies of agonistic structure in King's works. It might take advantage of quantitative methods for hypothesis testing. To give just two examples, empirically minded scholars might investigate the psychological, behavioral, and

moral effects of King's stories in controlled experiments. And they might use machine-assisted data analysis of publicly available reader responses (such as the user-generated reviews on Goodreads) to achieve a better understanding of what it is about King's stories that readers enjoy. Such research would help us understand not just why King is popular, but what the effects of his stories are, and thus provide evidence for or against my claim that the world is a better place with Stephen King in it.

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Heart of Darkness: Joseph Conrad's Confrontation with Amoral Nature

Emelie Jonsson

> Droll thing life is—that mysterious arrangement of merciless logic for a futile purpose.
> —Joseph Conrad, *Heart of Darkness.*

Joseph Conrad (1857–1924) is one of the great puzzles of literary history. Though his influence reaches from the poetry of T.S. Eliot to the garish violence of *Apocalypse Now,* scholars have disagreed fundamentally about the meaning of his novels. Contradictory cultural categories have been used to describe his work: "disdainful skepticism" or "magazine-writer" romance, "nihilism" or a poetic heritage that is "modern and Romantic simultaneously" (Leavis, 1950, p. 180; Mencken, 1917, p. 16; Peters, 2006, p. 126; Thorburn, 1974, p. 165). His moral attitude cannot be explained by cataloguing his cultural environment. He was an aristocratic Polish emigre who spent his childhood in Russian exile, his youth apprenticed to French sailors, and his middle age adulated by British intellectuals whose language he learned to become a master mariner at 21. As Geoffrey Harpham (1996) put it, this "comprehensive" experience "confuses the moralizing mind, and is, indeed, genuinely confusing" (p. 10). Conrad had no straightforward national or political allegiances and was not affiliated with any conventional moral systems. Nor did he affirm what he called the "inverted creed" of moral nihilism (Joseph Conrad, 1996, p. 93). Since the latter part of the twentieth century, scholars have appealed to ideology for explanation, but have continued to contradict each other about Conrad's basic moral attitude (Achebe, 1977; Martin, 2015; Moore, 1996; Mallios, 2013).

Conrad lived during a time when intellectuals around the world were confronted by Darwinian evolution—the first account of humanity's origin that was not shaped to fit human cognitive and emotional dispositions. Darwin revealed a natural world governed by amoral laws. Conrad faced the challenges of that natural world through

E. Jonsson (✉)
Department of Language and Culture, University of Tromsø, Tromsø, Norway

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an unusually conflicted personality profile: neurotic and depressive, sympathetic and highly imaginative, but also rigidly conscientious, extremely emotionally restrained, and intellectually humble (John Conrad, 2008; Joseph Conrad, 2015; Galsworthy, 1925; Najder, 2011). Darwinian evolution put more pressure on Conrad than it did on less sensitive and intellectual writers, but he withstood that pressure with unusual fortitude. His confrontation with amoral nature—most powerfully represented in *Heart of Darkness*—brought his imagination to a heroic achievement. He neither imposed human morality on the natural world nor discarded morality from human nature. Through his personal response to the psychological pressures of his cultural moment, Conrad created a moral vision that makes his novels transcend both personality and cultural moment. He created a pragmatic mythology for the post-Darwinian world.

Darwinian evolution poses quite specific challenges to the human mind. Unlike mythological explanations of nature, it does not identify any special role for humanity or any cosmic purpose for life. Thus, it fails to guide motivation the way myths and stories do (Boyd, 2009; Carroll, 2012; Dissanayake, 2000; Dutton, 2009; Gottschall, 2012). But it is also difficult to assimilate, involving abstract, complex, long-term ecological changes that are hard for humans to envision (Griskevicius, Cantú, & van Vugt, 2012). It puts pressure on human tendencies to structure events into narratives (Gottschall, 2012; McAdams & McLean, 2013), to think in terms of protagonists and antagonists (Carroll, Gottschall, Johnson, & Kruger, 2012; Stillweli & Baumeister, 1997), and to extend mind-body dualism and teleology into religious systems (Willard & Norenzayan, 2013). The core challenge of Darwinian evolution is that it reveals the natural world as amoral—lacking in humanlike intentions, and not operating according to human conceptions of justice.

In Ian Watt's (1980) words, "Conrad grew up in the heyday of evolutionary theory" (p. 155). Scholars disagree about his precise level of familiarity with Darwinian evolution. At one extreme is Allan Hunter (1985), who argues that Conrad used his novels to participate in scientific debates, at the other extreme is George Levine (1991), who groups Conrad with authors "who probably did not know any science first hand, who could have been 'influenced' by Darwin only indirectly" (p. 3). A few of Conrad's novels unquestionably address naturalistic cosmology (Watt, 1980, pp. 44–45). There is *Almayer's Folly* with its sun-reaching plants "climbing madly and brutally over each other," *Heart of Darkness* with its "icthyosaurus"-haunted prehistoric backdrop, and *Nostromo* with its doomed "imaginative materialist" Decoud who watches everything "in the dry light of his scepticism" (Joseph Conrad, 1895/1992a, p. 71; Joseph Conrad, 1899/1992b, p. 45; Joseph Conrad, 1904/1974, p. 302). Conrad's (2015) letters to the socialist MP and gaucho laird Robert Bontine Cunninghame Graham famously evoke the horror of the materialistic cosmos: "It evolved itself (I am severely scientific) out of a chaos of scraps of iron" (pp. 81–82). Whether or not Conrad read Darwin, he displays the symptoms of assimilating Darwinian evolution imaginatively. Like other authors of the time, he envisioned an essentially amoral naturalistic world in conflict with moral ideals, saw the human

mind divided between contradictory impulses, depicted Western civilization encountering its deep past in tropical locales, and engaged agonizingly with the relationship between human nature and political idealism (Jonsson, 2013, 2018, 2019).

Many Victorian intellectuals responded to the psychological pressures of evolution by introducing purpose and heroes into evolutionary history (Jonsson, 2018). Conrad (1912/1996) responded by becoming, as he put it, a resigned but sympathetic spectator of humanity: "open-eyed, conscious, and informed by love" (p. xix). On the one hand, he called skepticism "the tonic of life" and declared that moral interpretations of the cosmos produced "cruel and absurd contradictions" (2015, p. 146; 1912/1996, p. 92). He speculated that it is humanity's "appointed task" simply to witness the spectacle of the universe (1912/1996, p. 92). On the other hand, he admired those who strove to make the world better according to their own conceptions of good (1912/1996, p. 92; 1921/2004). He himself upheld simple moral ideals: sincerity, fidelity, resignation, restraint, honor, conscience, and efficiency (1912/1996, pp. xviii–xix). These ideals, so general that they could contain his comprehensive experience, were Conrad's defense against nihilism. He called them "as old as the hills," and his friend John Galsworthy identified their source as "the simplest springs of human nature" (Joseph Conrad, 1912/1996, p. xix; Galsworthy, 1925, p. 7).

Without understanding the epochal challenge of Darwinian evolution, it is difficult to account for Conrad's combination of moral relativism and simple morality. Both tendencies are essentially naturalistic. The moral relativism is a recognition that human morality is flexible and does not govern the cosmos; the simple morality is a recognition that humans are capable of moral values and social attachments, romantic love, devotion to crafts or ideas, and self-forgetful resilience. Conrad's position as cosmic spectator invests human morality with value without claiming that the cosmos itself is moral. The purpose of the universe is purely "spectacular," and "the rest is our affair" (Joseph Conrad, 1996, p. 92). But if humans are the spectators, there is reason to prefer human behaviors that leave a lasting favorable impression in human minds. Fidelity to people and tasks acquires a form of cosmic value because many of us consider it valuable. Any type of faith and idealism has the same cosmic value, as long as it does not "climb upward on the miseries or credulities of mankind" (Joseph Conrad, 1996, p. 92). In this convoluted way, Conrad's mythology made way for every other mythology, outlined simple but flexible guidelines for his own life, and invested meaning in human attachments. He saw himself as a watching consciousness and found peace in his capacity to watch without reserve.

Conrad's idiosyncratic cosmic vision achieved a remarkable balance between human psychological needs and non-mythological reality. With good reason, he has been connected to every major movement of post-Darwinian skepticism, from existentialism to postmodernism (Bohlmann, 1991; Cox, 1974; Erdinast-Vulcan, 1999; Peters, 2006, pp. 128–133). With equally good reason, he has been credited with an

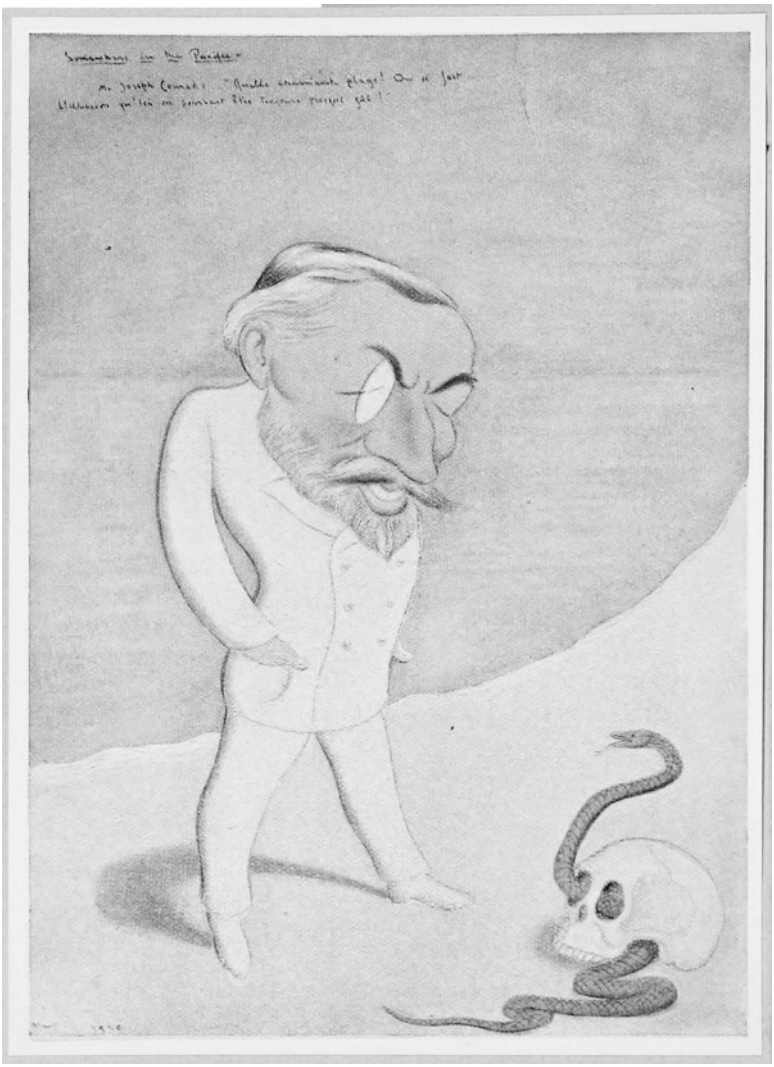

Fig. 1 "Somewhere in the Pacific. Mr. Joseph Conrad: What a delightful coast! One catches an illusion that one might forever be almost gay here." Caricature by Max Beerbohm (1921)

aesthetically intense moral vision that harks back to the Romantics and aligns him with certain types of adventure fiction (Leavis, 1950; Thorburn, 1974; Woolf, 1924). The contradictory cultural terms can be united and explained as a psychological strategy—a life narrative in response to naturalistic cosmology. That life narrative is powerfully enacted in his most famous work, which is also his most overtly evolutionary novel: *Heart of Darkness* (Fig. 1).

1 *Heart of Darkness* (1899)

Heart of Darkness, like Conrad's general outlook, merges the personal with the cosmic. It is based on his own experience in the Belgian Congo, and it is an allegory of the human mind encountering amoral nature. The novel is structured as a dream-like retelling of a journey to Africa by the master mariner Charles Marlow. His whole story is told between ebb and tide as dusk falls on the deck of a cruising yawl on the river Thames. The events of the journey are few and relatively simple: Marlow travels to the Congo, finds his steamboat in disrepair, repairs it, and follows the river to retrieve the sick ivory agent Kurtz. Kurtz has become a depraved warlord, and dies on the way back with an expression of horror on his lips. Marlow then falls ill himself, returns to Brussels, and tells Kurtz's fiancée that Kurtz died pronouncing her name. The imaginative effect of the novel depends on Marlow's reflections on his experience. He begins his tale with a parallel between the Congo river and the river Thames in early Roman Britain, and weaves an ever-tightening connection between his journey and the fate of human civilization. He observes the senselessness and cruelty of the Belgian ivory trade, hears whispers of Kurtz's brilliant idealism and becomes psychologically allied with him, then recoils violently from the real Kurtz. Nonetheless, he affirms a form of moral victory in Kurtz's dying words, and in speaking to Kurtz's fiancée, he helps sustain her illusion about Kurtz's moral nobility. As the story progresses, Marlow increasingly struggles to convey his experiences and make sense of them, while the novel's first narrator—one of Marlow's listeners—puzzles over both the story and Marlow himself.

Heart of Darkness is difficult even for its narrators to interpret. For Conrad, that difficulty was central to the novel's meaning. Marlow is faced with the extremes of human moral depravity and sees his society—and all of civilization—as a flicker of light in the amoral natural world. Like Conrad, he presents that experience to his audience without spiritual relief. He does not filter it through moral systems or ideas of supernatural justice. Marlow quietly judges the behavior of himself and those he encounters, admiring restraint and constructive effort, despising self-serving cruelty, cowardice, and loss of control. But these simple ideals are not enough to protect him from the pressures of naturalistic cosmology. Kurtz's reputation as a great idealist gives Marlow hope of some higher interpretation. Through Kurtz's depravity, that hope becomes cruelly ironic. The capacity for faith has turned foul in the wilderness, producing a greater force of destruction than the ordinary greed of the other ivory traders. But when Marlow lies to Kurtz's fiancée, half in spite of himself, he ends up on the side of that capacity for faith. Though he does not himself have a system of beliefs, he prefers to watch those who do. The novel comes to rest in a position of cosmic observation that acknowledges the full range of contradictory human behaviors, including the impulse to interpret the cosmos and to believe that it is meaningful.

In a critical history of *Heart of Darkness*, Ross Murfin (1992) considers it beyond doubt that the novel is "about the immorality of whites in Africa" (p. 100). This focus on social issues has been shared by scholars who interpret the novel's politics

very differently. Most critics up until the mid-twentieth-century thought that Conrad predominantly sympathized with the Congo natives and critiqued the Belgian colonists (Murfin, 1992, p. 100; Watt, 1980, p. 52). In the late 1970s, Nigerian novelist and professor Chinua Achebe (1977) famously denounced *Heart of Darkness* as racist on the grounds that it centers on the immoral whites and thus tacitly marginalizes the whole continent of blacks. Achebe's critique was directed at the dominant West's perspective on perceived out-groups rather than at Conrad's novel—and, as Gene Moore (1996) suggests, it is both ironic and rhetorically understandable that he targeted an author largely resistant to nineteenth-century racial prejudice (pp. 225, 231–233). But Achebe's political case against *Heart of Darkness* inspired a vast critical tradition (Peters, 2006, p. 127; Watt, 1980, pp. 52–53). Because Conrad cannot be tied to any consistent political position, he has been freely appropriated on both sides of contemporary debates about class, gender, and ethnicity (Moore, 1996; Murfin, 1992). Hence, Peter Mallios and Gabrielle McIntire both consider gender politics a core issue for Conrad, but Mallios sees a feminist impulse behind his portrayal of masculine struggles without women, and McIntire argues that he "uses race and gender together" to uphold oppressive distinctions between the Belgians and the Congolese (Mallios, 2013, p. 132; McIntire, 2002, p. 261). Jeffrey Myers (2001) brings the non-human natural world into this political discussion, but only to cast it as another victim of human political oppression: "the Eurocentric bias inscribed in the text is the narrow point of a broader anthropocentric bias" (p. 98).

Political discussions of novels that are not openly political can in theory be illuminating, but the political interpretations of *Heart of Darkness* have tended to bypass its meaning. The novel depicts an encounter with human moral flexibility in the amoral natural world. By focusing on whether it is complicit in oppression or opposed to it, scholars discuss its meaning within the comfort of clear-cut human moral divisions. Even when historical allowances are made for Conrad's perspective, his tendencies toward racism and sexism are conceived as transcendentally evil, and his tendencies toward racial and sexual equality are conceived as transcendentally good. Mallios's (2013) good Conrad—read through the feminist Mary Austin—portrays differences between people as a path to "larger political goals of solidarity and justice" (p. 133). McIntire's (2002) evil Conrad insists on differences between races and genders to "guard the difference between male and female forms of knowledge" (p. 280). Tim Christensen (2012) calls *Heart of Darkness* "prescient" because it supposedly reveals differences between white and black bodies as "a foundational fetish of imperial ideology" (p. 24). Jesse Oak Taylor (2012) agrees that *Heart of Darkness* "productively" exposes masculine imperialist identity, but states that its racism is "inexcusable" (p. 208). In this way, politically motivated scholars have placed Conrad with the angels or devils in a perceived historical progression toward justice—and made the type of certain moral judgment about him that Marlow cannot make about Kurtz. Though Conrad might have appreciated the idealist convictions of such scholars, he would no doubt have been as skeptical of their moral absolutes as he was of the late-Victorian ones.

Scholars without overt political agendas have also tended to leave out the cosmic level of *Heart of Darkness*. Ian Watt (1980) deals with proxies for the challenge of the amoral cosmos: Conrad's satire of Victorian jingoism and progressivist rhetoric (pp. 155–161). That analysis illuminates the novel's cultural context, but it does not address the psychological challenges underlying the Victorian rhetoric, or Conrad's own response to those challenges. Several scholars have tried to explain *Heart of Darkness* through philosophy: Schopenhauer, Buddhism, or even Nietzsche (Alpert, 2016; DeMille, 1990; Knowles, 1994; Madden, 1999). Less traditionally, Patrick McCarthy (1986) and Linda Dryden (2013) have interpreted the novel through the influence of H. G. Wells. These explanations through influence are at most partial. Like all studies of cultural influence, they struggle to capture Conrad's idiosyncratic cosmic vision. As Conrad's biographer Najder observes, Conrad was not a close follower of Schopenhauer, who is the most well-established philosophical influence; and as McCarthy and Dryden acknowledge, Conrad and Wells had fundamental differences of outlook (Najder, 2011, pp. 254–256; McCarthy, 1986, pp. 59–60; Dryden, 2013, p. 230). Scholars seeking explanation beyond cultural influence have looked to non-naturalistic frameworks that cannot encompass Conrad's naturalism. F. R. Leavis (1950) sees the novel as a "simple" contrast between the human soul's "corruption" and "innocence"—evil and good—and considers it unnecessarily embroidered with rhetoric (p. 180). J. Hillis Miller (1992) sees it as a "cacophony of dissonant voices" in harmony only with the poststructuralist impossibility of knowledge and communication (p. 216). Frederick Crews launched an interpretive tradition relying on psychoanalysis—which acknowledges the importance of family connections, somewhat in line with Conrad's moral ideals, but which departs both from Conrad and reality by framing those connections as pathological (Murfin, 1992, pp. 106–108).

As an imaginative evocation of Conrad's cosmic vision, *Heart of Darkness* is unrivalled. His letters and essays contain rhetorical high points and intricate cosmic metaphors modulated by irony, but they do not sustain those features in an interconnected way for 90 pages. In *Heart of Darkness,* the cosmic symbolism resembles a symphony. The novel establishes its cosmic scope in its first scene. The framing narrator describes the Thames stretching "like the beginning of an interminable waterway," into a sea haze that merges with the horizon (Joseph Conrad, 1899/1992b, p. 17). The mood on the cruising yawl is "meditative" (p. 18). When the sun reddens and cools, "as if about to go out suddenly," the former sailors find a sense of permanence in the river: "We looked at the venerable stream not in the vivid flush of a short day that comes and departs for ever, but in the august light of abiding memories" (p. 18). The idea of a perishing sun is warded off with reflections on the British explorers, great or mercenary, carried by the river throughout history: "bearing the sword, and often the torch, messengers of the might within the land, bearers of spark from the sacred fire" (p. 19). It is at this point that Marlow interjects. He observes that London was wilderness "the other day," with Roman triremes on the river (p. 20). He claims that British ideals are not an abiding sacred fire but a wildfire in the grass—a "flicker" that may, with the best possible fortune, only last "as long as the old earth keeps rolling" (p. 20). Yet, Marlow wishes that the ideals may last that

long, and that they may be granted "unselfish belief" and "sacrifice" (p. 21). In a few pages, the reader's mind has been elevated to a meditation on transient lives in an eternal natural and cultural setting, then wrenched into a recognition that the setting itself is transient—and then, implored to dedicate its own transience to a slightly larger transient ideal.

Marlow's story is told within the cosmic frame of the first scene. The story can be regarded as one long illustration of this transient earth with flickering human ideals—and an explanation of how he came to view the earth in that way. Colonialism is the subject of the story, but on the cosmic level at which the novel is pitched, the colonists represent the sword and the torch: self-interested domination and idealism. Marlow is contemptuous of the self-interested domination—the "robbery with violence" he associates with the Romans, and the "weak-eyed devil of rapacious and pitiless folly" that drives the Belgians (pp. 21, 31). The idealist impulse of colonialism is the only thing that "redeems" it (p. 21). In Marlow's account, that impulse is no more specific than Conrad's most general idea of faith or hope: the capacity to believe that "there is no impossibility" the world might be made good (Joseph Conrad, 1921/2004, p. 13). Kurtz represents the fundamental unreliability of that capacity for faith—because, as Conrad saw it, moral emotions lack any cosmic purpose, and altruistic enthusiasm is inadequate as a guide for behavior. For Marlow too, Kurtz's idealism merges with the lack of cosmic justice revealed by naturalistic cosmology.

Marlow's story is impelled by his need for cosmic meaning. His commitment to the flicker of British civilization is an attempt to preserve lasting purpose in the transient world he is evoking. The African wilderness gives him a powerful impression of the naturalistic cosmos. He imagines that he is "travelling back to the earliest beginnings of the world," he feels cursed or welcomed by "prehistoric man," and he compares the noise of a stream to "the tearing pace of the launched earth" (Joseph Conrad, 1899/1992b, pp. 49, 51, 31). The impression disorients him. He becomes lost "in another existence," dwarfed on the silent river, unable to decide whether the wilderness is "like evil or truth" (pp. 49, 38). Analyzing his response to the natives on shore, he concludes that "the mind of man is capable of anything—because everything is in it, all the past as well as all the future" (p. 52). He has an acute need to find some kind of human ideals to light his way. But his encounter with the colonists is a crescendo of senselessness, inefficiency, and cruelty. He watches a French man-o-war "incomprehensible, firing into a continent"; he stumbles through broken machines among the "objectless blasting" of a stagnant railway construction, and he ends up in a grove where the natives who have been recruited for the useless work are "dying slowly" (pp. 29, 30, 32). The first competent man he meets only worries about proper dress and accounts, but even that is a relief for Marlow (p. 33). It is in this context that he learns of Kurtz, "who had come out equipped with moral ideas of some sort" (p. 46). Marlow's increasing desire to meet Kurtz is an increasing need to find a manifestation of human idealism—both to guide his own mind through the naturalistic cosmos and to learn the truth about idealism.

Marlow's cosmos is amoral, but the idealism he seeks is—like Conrad's moral attitude—weighted toward certain simple moral ideals. Throughout his narrative, he

appeals to the same ideals as Conrad. He admires the British government's "devotion to efficiency," the "honest concern" in a book on seamanship "for the right way of going to work," and the "restraint" of the starving cannibals who do not attack the European crew (Joseph Conrad, 1899/1992b, pp. 21, 53, 58). In his culminating interview with Kurtz's fiancée, he admires her "mature capacity for fidelity, for belief, for suffering" (p. 91). He is proud of his own discipline as he repairs and steers the steamer, and ashamed of unrestrainedly throwing his shoes overboard when they are filled with the helmsman's blood (pp. 43–45, 60–64). These ideals, however vague and general, predispose him toward visions of cosmic purpose that stress long-term cooperation. He cannot see domination as a source of meaning, though he does not see it as a transcendental evil either: "strength is just an accident arising from the weakness of others" (p. 21). The Belgian colonists represent a less admirable version of the domination exemplified by the Romans, and it is taken to its extreme in a group of explorers Marlow meets:

> Their talk … was the talk of sordid buccaneers: it was reckless without hardihood, greedy without audacity, and cruel without courage; there was not an atom of foresight or of serious intention in the whole batch of them, and they did not seem aware these things are wanted for the work of the world. To tear treasure out of the bowels of the land was their desire, with no more moral purpose at the back of it than there is in burglars breaking into a safe. (p. 46)

Had these adventurers been hardy and courageous, they might have starred in a simpler novel. Daring quests for land and trophies was an adequate cosmic purpose for Arthur Conan Doyle's heroes in *The Lost World* (1912). For Marlow, it is not. Like Conrad, he needs not only courage and hardihood (which he grants the Romans), but a "moral purpose at the back of it" that sustains his idea of civilization at its best. He needs to attach his self-discipline to a more general serious intention, backed up by matter-of-fact competence, toward some goal of impersonal benefit.

Kurtz's reputation leads Marlow to believe that there is hope of higher intentions among the colonists. He hears that Kurtz wants each colonial station to be "like a beacon on the road toward better things," tasked with "humanising, improving, instructing" (Joseph Conrad, 1899/1992b, p. 48). Kurtz is described to him as "an emissary of pity, and science, and progress" (p. 40). One of the earliest impressions of this emissary is a sketch in oils he has left behind: a woman walking through darkness, "draped and blindfolded, carrying a lighted torch" (p. 40). Like the initial vision of the eternal Thames, these hints have a dark undercurrent. The colonists speak of Kurtz's idealism in tones of venomous cynicism, and the light on the torch-bearer's face is "sinister" (p. 40). It is apparent from the start that Kurtz is a particularly ruthless ivory agent: "he had collected, bartered, swindled, or stolen more ivory than all the other agents together" (p. 63). Nonetheless, Marlow gradually becomes obsessed with meeting Kurtz. He deals with the overwhelming wilderness by focusing on his steamer's progress, and he imagines it going "toward Kurtz—exclusively" (p. 51). When a skirmish with the natives suggests that Kurtz is dead, Marlow's response is plainly existential:

> There was a sense of extreme disappointment, as though I had found out I had been striving after something altogether without substance. I couldn't have been more disgusted if I had travelled all this way for the sole purpose of talking with Mr. Kurtz. … I couldn't have felt more of lonely desolation somehow, had I been robbed of a belief or missed my destiny in life. (p. 63)

In light of the novel's cosmic drama, this moment is not disproportionate. Marlow has become fundamentally disoriented—convinced that the human mind is capable of anything in an inexorable natural world. On the verge of despair, he has invested Kurtz with the guiding purpose that he needs. Conrad anticipates the readers who have not followed his emotional trajectory by having one of Marlow's listeners interrupt with a "beastly" sigh that suggests to Marlow that his disappointment is "absurd" (Joseph Conrad, 1899/1992b, p. 63).

Neither Marlow nor Conrad makes a final judgment of the human capacity for faith. Kurtz's idealism is tainted by an unrestrained self-assertion that is invisible from afar. Thus, Marlow finds the evidence of Kurtz's imaginative influence—the "unspeakable rites" and "ceremonies" offered to him—more disturbing than the physical evidence of his murders (Joseph Conrad, 1899/1992b, pp. 66, 74). The religious tributes to Kurtz suggest humanity's ability to invest pure self-assertion with meaning, and to be satisfied with pure self-assertion as a purpose despite expressing the most enthusiastic altruism. Kurtz can "make himself believe anything," and he finally believes only in his personal ability to influence (p. 89). Marlow is so disturbed by this reality that his own "belief in mankind" withers, and he descends into a depressive delirium on his return to Europe: "It was not my strength that wanted nursing, it was my imagination that wanted soothing" (pp. 83, 88). But instead of judging Kurtz and humanity in terms of cosmic right and wrong, Marlow retreats into a Conradian position of observation. While telling his story, he looks on Kurtz the way he looks on himself, the natives, the other colonial agents, and Kurtz's fiancée—the way he describes looking on the steamer's crew of cannibals: "as you would on any human being, with a curiosity of their impulses, motives, capacities, weaknesses, when brought to the test of an inexorable physical necessity" (p. 57). Kurtz, when brought to the test of unrestrained power, dissolves into moral incoherence. There is "barren darkness" in his heart, and his soul has "gone mad," but his rampant self-assertion is not the result of some transcendental evil (pp. 85, 83). For Conrad, Kurtz's seduction by those "primitive emotions"—and his power to seduce—is simply a human contingency that is slightly reduced by social restraints (p. 85). The charismatic enthusiasm Kurtz uses to make people kill for his personal benefit is the same ability he used to inspire his own altruistic hopes and the faith of his fiancée. That natural reality is enough to unsettle Marlow's imagination.

Conrad presents Marlow's inconclusive judgment of Kurtz as a deliberate challenge. The other colonists, who interpret the situation through their political intrigues, view Marlow and Kurtz as a coalition—first as "the gang of virtue," then as "the party of 'unsound method'" (Joseph Conrad, 1899/1992b, p. 41, 85). The two of Kurtz's disciples that Marlow meets, his fiancée and a Russian adventurer in the Congo, both treat Marlow as a fellow disciple (pp. 74–75, 92). Marlow himself

is drily amused by these assumptions: "I found myself lumped along with Kurtz as a partisan of methods for which the time was not ripe"; "I suppose it did not occur to him that Mr. Kurtz was no idol of mine" (pp. 79, 75). But his irony does not amount to a denunciation. Marlow is conscious of his imaginative attachment to Kurtz, which culminates in his moment of existential crisis on the river but remains as a half accidental loyalty. He acknowledges that his aloofness from the other colonists, who are conspiring against Kurtz, has made him "Mr. Kurtz's friend—in a way" (p. 79). Even after seeing the impaled heads around Kurtz's hut, Marlow is so repelled by the other colonists' petty and dishonest cruelty that he turns to Kurtz "for relief—positively for relief" (p. 79). But he does so in reluctant terms that register the limitations of his relief. Kurtz is his "choice of nightmares"; Kurtz is conflated with the amoral natural forces that seem a comfort next to the colonists' self-serving pretense: "I turned to the wilderness really, not to Mr. Kurtz" (p. 79). Marlow is more disturbed by Kurtz's degradation than are either the mercenary colonists or the blind disciples, and yet, Marlow is more willing than they are to face Kurtz's degradation. His imaginative attachment to Kurtz does not prevent him from seeing the full horror of what Kurtz has become. Neither does his awareness of the horror prevent him from remaining attached to the capacity for faith that Kurtz represents. That relationship is impossible to categorize in the terms of alignment used by the colonists and the disciples.

Marlow's double vision of Kurtz is crystallized in his reflections on Kurtz's final moment. Kurtz dies in anguish, whispering his vague condemnation "the horror" (Joseph Conrad, 1899/1992b, p. 86). What is he condemning? He might, as Marlow suspects, be seeing something of his own psychological "deficiency": "I think the knowledge came to him at last—at the very last" (p. 74). But he might also, as Marlow imagines elsewhere, be "embracing, condemning, loathing all the universe" (p. 91). Both of these interpretations are contained in Marlow's most general view of Kurtz's last words: a "burst of sincerity" (p. 83). Until the last, Kurtz has been discoursing on his "right motives"; he has been indulging childish "images of wealth and fame revolving obsequiously round his unextinguishable gift of noble and lofty expression" (p. 85). Marlow hears the murderous ivory thief muttering about living "rightly" (p. 86). But in his final moment, Kurtz abandons his altruistic rhetoric and fantasies of prestige:

> It was as though a veil had been rent. I saw on that ivory face the expression of sombre pride, of ruthless power, of craven terror—of an intense and hopeless despair. Did he live his life again in every detail of desire, temptation, and surrender during that supreme moment of complete knowledge? He cried in a whisper at some image, at some vision—he cried out twice, a cry that was no more than a breath … 'The horror!' He was a remarkable man. After all, this was the expression of some sort of belief; it had candour, it had conviction, it had a vibrating note of revolt in its whisper, it had the appalling face of a glimpsed truth—the strange commingling of desire and hate. (pp. 86–87)

For Marlow, Kurtz's moment of sincerity is at once his most admirable and his most disturbing. The only purpose Conrad maintained for the non-ethical universe was to be witnessed sincerely. Sincere observation was, as he saw it, threatened by any type of mental incoherence—self-deception, inconsistency, or emotional excess. Marlow

frames sincerity in similar terms: “There is a taint of death, a flavour of mortality in lies—which is exactly what I hate and detest in the world—what I want to forget” (Joseph Conrad, 1899/1992b, p. 42). But Kurtz’s final words are not a lie. Whether they condemn himself, or the world, or a fleeting vision, Marlow sees them as a response to his actual experiences, without hypocrisy or fantasy: “a judgment upon the adventures of his soul on this earth” (p. 87). In the eyes of Marlow—and Conrad—that is “a moral victory” (p. 88). But it is a victory “paid for by innumerable defeats” (p. 88). The victory is a full revelation of moral defeats. When Kurtz’s fiancée declares that Kurtz “died as he lived,” Marlow’s response implies how he feels about the truth he saw: “‘His end,’ said I, with dull anger stirring in me, ‘was in every way worthy of his life’” (p. 94).

Marlow’s initial images of light and darkness—human ideals and the amoral cosmos—are woven into his reminiscence about Kurtz throughout the narrative. Kurtz is the torch and the silent gloom of the wilderness, his rhetoric is “the pulsating stream of light, or the deceitful flow from the heart of an impenetrable darkness” (Joseph Conrad, 1899/1992b, p. 63). This double vision foreshadows the hallucinatory overlap between Kurtz’s horror and his fiancée’s sorrow, and it reflects Conrad’s deep ambivalence about the human capacity for faith. Marlow is permanently suspended between the rotten idealism of Kurtz and the illusory idealism of Kurtz’s fiancée: “I shall see this eloquent phantom as long as I live, and I shall see her too, a tragic and familiar Shade” (p. 94). As Kurtz is dying, Marlow imagines a better man that he never met: “the shade of the original Kurtz” (p. 85). As Kurtz’s fiancée displays her credulous grief, Marlow admires her for the very qualities that lead to her delusion: her readiness “to listen without mental reservation, without suspicion, without a thought for herself,” “guileless, profound, confident, and trustful” (pp. 90, 91).

Marlow is a personification of Conrad’s idea of cosmic observation. Like Conrad, he sees human motivations flowing through “the sea of inexorable time,” toward “that oblivion which is the last word of our common fate” (Joseph Conrad, 1899/1992b, pp. 85, 90). And like Conrad, he makes his last stand for a cosmic purpose through the idea of observation with open-eyed resignation. He watches those around him with both sympathy and ironic detachment. He holds his own mind together with his simple Conradian ideals, but he does not imagine that the universe prefers his efficiency and restraint to Kurtz’s moment of unrestrained horror. He praises Kurtz for a “summing-up” of which he claims to be incapable himself, but he follows Kurtz’s moment of sincerity with his own laconic conclusion (p. 88):

> Droll thing life is—that mysterious arrangement of merciless logic for a futile purpose. The most you can hope from it is some knowledge of yourself—that comes too late—a crop of unextinguishable regrets. (p. 87)

This is the core of Conrad’s outlook: life is governed by amoral natural laws from which you must stand back, in skeptical self-reflection, to pursue integrity for your moral self. Kurtz’s self-knowledge—such as it is—comes so late that the regrets are immediately extinguished. Marlow’s self-knowledge and regrets have become part

of him. He notes that his listeners, who know him as he is now, "see more" in his story than he himself did when he arrived in Africa (Joseph Conrad, 1899/1992b, p. 43).

Marlow's distance from his younger self reflects his development toward Conrad's naturalistic moral outlook. His listeners know him much as Conrad might have wished them to know him: as an ascetic, curious "wanderer" who watches "the changing immensity of life" (Joseph Conrad, 1899/1992b, p. 19). In the feverish Congo, that same Marlow attached his hopes to Kurtz's idealism, losing his shoes and nerve to the river. He yearned for proof of enduring human ideals and was stricken into mental paralysis when he found flexible morality swayed by primeval emotions. As an older man, he calls his meeting with Kurtz "the culminating point" of his experience (p. 22). His culminating experience revealed the conflict between human ideals and amoral nature, and Marlow used the same phrase to describe the conflict that Conrad later would: "cruel and absurd mysteries not fit for a human being to behold" (p. 92). The young Marlow could not satisfy his need for justice—or his commitment to sincerity—by telling Kurtz's fiancée the truth. Partly, he was prevented by an old-fashioned chivalry that dictates she should be protected from life's horrors: "the women are out of it" (p. 64). But it would also have hurt his own unsteadied imagination to disturb her grief with Kurtz's depravity: it "would have been too dark" (p. 94). Like Conrad, Marlow prefers the fiancée's "light of belief and love" to Kurtz's "eternal condemnation" (p. 92). Neither faith nor condemnation is a relief to him personally. Instead, like Conrad, he relieves his mind by expressing the full range of his spectator's perspective. He finds coherence in his experience and satisfies his sense of justice about Kurtz ("Hadn't he said he wanted only justice?") by shaping it into an imaginative account for his listeners on the Thames (p. 94).

Heart of Darkness manages its readers in a remarkably effective way. Marlow's interaction with his listeners anticipates and guides responses from the least to the most sympathetic. His first comment on the transience of British civilization does not make an impression on his audience: "It was just like Marlow"—"no one took the trouble to grunt even" (Joseph Conrad, 1899/1992b, p. 20). The framing narrator invites readers to have patience with the peculiar Marlow—to follow him in finding "the meaning of an episode" beyond its apparent events (p. 20). As the tale progresses, this framing narrator becomes Marlow's ideal listener: "on the watch for the sentence, for the word, that would give me the clue to the faint uneasiness inspired by this narrative" (p. 43). Other listeners sigh and grunt at Marlow's imaginative susceptibility, or growl at him to be civil, provoking reflections about the impossibility of communication (pp. 63, 52, 50). When the tale comes to an end, the silence is broken only by the practical remark that they have lost "the first of the ebb" (p. 95). But the framing narrator sees a different Thames:

> I raised my head. The offing was barred by a black bank of clouds, and the tranquil waterway leading to the uttermost ends of the earth flowed sombre under an overcast sky—seemed to lead into the heart of an immense darkness. (p. 95)

There is no more eternal river that carries eternal cultural ideals. The framing narrator who began by resting in sacred light ends by tracing the darkness of moral transience across the globe. Whether or not he has found his clue to Marlow's narrative, he has transformed his faint uneasiness into a distinct imaginative impression. And so, despite Marlow's frequent despair of being understood, he has transferred his culminating experience to at least one of his listeners.

2 Conclusion

At the level of cosmic meaning that motivates the novel, *Heart of Darkness* is not widely accessible. It is Conrad's cosmic testimony, translating a nightmare journey into a conscious reckoning with the transience and moral flexibility of the human species. Its deepest drama is Marlow's mind facing the cosmos and achieving Conradian skeptical resignation. To experience that drama, readers need to be willing and able to face the amoral cosmos, and they need to understand—if not sympathize with—Conrad's position as cosmic spectator. Conrad realized that most readers would not. He may not have planned to write an allegory of his cosmic vision—as he told his friend Graham, he started the novel with "definite images" rather than with "abstract notions"—but he had some idea of what he had ended up doing (2015, p. 113). He told his publisher William Blackwood that the novel comes together in the conversation between Marlow and Kurtz's fiancée: "into one suggestive view of a whole phase of life," "something quite on another plane than an anecdote of a man who went mad in the Centre of Africa" (2015, p. 152). The scene that united the novel for him marks the culmination of Marlow's encounter with the naturalistic human condition. In Marlow's hallucinatory overlap between the real and idealized Kurtz—the worst and the best of faith—he faces the human imagination and sees the simultaneous cruelty and beauty of a natural phenomenon. Conrad expected even Graham to be puzzled by this finale—partly because it did not support Graham's political "convictions" (at least through nothing "practically effective") and partly because "the idea" was obscurely expressed: "so wrapped up in secondary notions that You—even You!—may miss it" (2015, p. 113).

Conrad's self-confessed obscurity raises a question: If the cosmic level of *Heart of Darkness* has been consistently overlooked or translated into different terms by competent commentators, does the cosmic level matter to the novel's meaning? One answer is that Conrad matters to the meaning of *Heart of Darkness*. He was concerned with naturalistic cosmology and its implications for human morality, and his personal way of dealing with those issues corresponds to Marlow's reflections in *Heart of Darkness.* Another answer is that the cosmic interpretation makes more general sense of what scholars have described in other terms: self-discovery, satire of Victorian progressivism, Wellsian alienation, Schopenhauerian pessimism, deconstructive impossibility of reconciliation. The scholars cited in this chapter do largely agree that *Heart of Darkness* is about the nightmarish failure of idealism under pressure of an increasingly complex world. As Moore (1996) puts it, "'Heart of darkness' is frequently invoked as a cultural token signifying the 'horror' at the

heart of modern Western civilization" (p. 223). If the novel is seen as an allegory of facing the amoral cosmos, its horror can be recognized as more universal, even if Marlow's response is personal and idiosyncratic.

Clearly, the cosmic level of *Heart of Darkness* was not necessary for it to become canonical. It is possible to appreciate the novel as a satire of colonialism, or as a stylized tale of a traumatic experience in an exotic setting—or as an anecdote of a man who went mad in the center of Africa. Conrad's literary confidant Edward Garnett, for instance, admired Marlow's story and considered it a high-water mark of Conrad's talent, though he saw it simply as a story of white depravity outside the restraint of civilization (Murfin, 1992, p. 99). Such particular cultural or ideological readings cannot, however, make the novel come together as it did in Conrad's (2015) comment to Blackwood: "the whole 30000 words of narrative description" (p. 152). If Marlow's lie simply hid the ugly side of colonialism, or the personal failings of Kurtz—or the masculine world of action, or the existence of racial others—his rhetoric about the beginnings of time and the flexibility of the human mind would truly be excessive. The cosmic imagery that aligns with Conrad's own cosmological reflections would have to be dismissed as bombast. If Kurtz were simply sinful and his fiancée simply virtuous, Leavis (1950) might have been right to designate Conrad "a simple soul" (p. 182). If Marlow had dissolved into incoherence and his listeners responded randomly, Miller (1992) might have been right that "his tone and meaning are indeterminate" (p. 219). But *Heart of Darkness* is a clear depiction of a very particular uncertainty. Conrad's (2015) response to Garnett's political reading discreetly praised the "brave attempt to grapple with the foggishness of H of D, to explain what I myself have tried to shape blindfold" (p. 157). This claim of blindness comes off as a Marlowian fib next to his hope that Graham—his sparring partner on questions cosmological and idealistic—would catch the novel's "idea."

By understanding Conrad's worldview as an idiosyncratic response to Darwinian evolution, it is possible to unite the two main tendencies of Conrad scholarship. Conrad was not just a Romantic, or a Realist, or a Romantic Realist. He was an unusual man with a tumultuous life, caught between cultural allegiances, upholding simple naturalistic ideals in response to the natural world he recognized as amoral. His response to the amoral cosmos was neither moral relativism nor simple morality, but a tragic commitment to transient human attachments—occasionally enlivened by absurdist humor. That vantage point illuminates his individual authorship, and also the guiding function of verbal art. Conrad found solace in describing himself as an open-hearted spectator of the universe. The simple ideals he articulated allowed him to admire the fidelity of fiancées and military commanders, the efficiency of sailors and accountants, the sincerity of Henry James, and the restraint of Congolese cannibals. His novels—most prominently *Heart of Darkness*—allow us to inhabit his cosmic vision. For those who follow Marlow through the darkness, there may be new clarity in the uneasy sense of cosmic transience and chaos, and a new appreciation for the human values embodied by steamboat rivets and light. For those who sigh and grunt at him—wishing he would use fewer adjectives and be more civil—there may be a renewed passion to stave off the darkness using systems of their own. In both cases, the symbolic intermingling of human darkness and light provides mythic texture for the post-Darwinian world.

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