Sangeetha Menon
Anindya Sinha
B.V. Sreekantan *Editors*

Interdisciplinary Perspectives on Consciousness and the Self

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ISBN 978-81-322-1586-8 ISBN 978-81-322-1587-5 (eBook)
DOI 10.1007/978-81-322-1587-5
Springer New Delhi Heidelberg New York Dordrecht London

Library of Congress Control Number: 2013955357

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Foreword

Consciousness is at once intimately familiar and deeply mysterious. Each of us knows what it is like to wake from a dreamless sleep to a continuous and continuously changing flow of conscious contents, including thoughts, visual images, emotions and the like; yet how these subjective phenomena arise from the electrochemical machinery of the brain may seem as perplexing today as ever. At the same time, it is increasingly assured that the brain, embodied in the organism and embedded in its environment, really is the physical ground of all our conscious experiences. Among these experiences is the experience of *being* and of *having* a self, which is the basis of the subjective aspect of consciousness. Selfhood, so fundamental to human consciousness, can be elaborated at many different levels from a basic sense of organismal integrity grounded in homeostasis, through the emergence of a first-person perspective by the egocentric structuring of sensorimotor signals, to the development of a full-blown narrative stream linking experiences and memories across time. While consciousness might in principle exist without self in all (perhaps even any) of these forms, it is certainly the self that endows consciousness with its importance in life. Efforts to expose the physical basis of consciousness and selfhood must therefore advance together, while recognizing that the concepts and explanatory targets remain distinct.

Over the last 25 years, the biological bases of consciousness and self have become firmly established as central questions within contemporary neuroscience, guided but no longer entirely constrained by philosophy. New theories are motivating increasingly subtle experiments which in turn rely on ever more powerful neuroimaging and data analysis methods. The new data is itself inspiring and refining theoretical developments, generating a virtuous circle. But of course there is a significant risk in cleaving too tightly to this circle, however productive it might seem. For instance, to understand consciousness and self requires understanding what consciousness and self actually consist in at the level of phenomenology and experience. And here, at least two different bodies of work offer much promise: philosophical work within phenomenological, analytic and spiritual traditions (i.e. not only Western-centric philosophy of mind) and studies of non-human animal cognition and behaviour. While the first emphasizes the variety of human experience and of selfhood, the second provides a comparative opportunity to examine how consciousness and selfhood may manifest in different ways in different species.

Just these considerations motivated the organization of the conference "Looking Within" which was held in Bangalore in January 2012 and which I was fortunate to attend. Over three days, speakers – drawn from all over the world but with a happy concentration of Indian researchers – described and debated approaches to consciousness from a variety of different perspectives: theoretical neuroscience and physics (including so-called quantum-theoretical approaches); applied neuroscience and animal cognition; and philosophical, phenomenological and spiritual (with an emphasis on Hindu traditions). Each day emphasized one of these perspectives, and certainly every participant was well outside of their intellectual comfort zone on at least one day – definitely a good thing when grappling with the nature of consciousness.

This book collects together a selection of the many new insights and new questions generated during the conference. As such it represents an important contribution to interdisciplinary consciousness research, and the editors are to be congratulated for having shepherded a very diverse group of characters in its creation. One useful way to read the book is, as a starting point for potentially novel branches of consciousness research, drawing on the unique insights of particular disciplines – both old (spiritual thought) and comparatively new (animal cognition) – that are of importance throughout the world but of particular significance in India. The book offers many useful chapters which develop these issues, ranging from discussions of self-experience during meditative practice, to the neurophenomenology of spiritual experiences, to social consciousness in macaque monkeys in the Bandipur National Park, not far from Bangalore. In each case there is much to be learned, and there is throughout an important emphasis on how a better understanding of consciousness and self may contribute to improved strategies for enhancing health and well-being. An important open question is whether new physical theories (e.g. those based on quantum mechanics) are necessary to advance our understanding of consciousness. At this moment it is probably right to say that classical physics applied to neuroscience is still where the greatest potential lies; however, the possibility of empirically grounded and neuroscientifically embedded quantum theories cannot be ruled out, and this book offers some provocative ideas in this direction.

On a personal note, I hope this book will also inspire new generations of consciousness researchers especially within India, whose rich intellectual tradition has so much to offer this most fundamental of fields.

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Anil K. Seth

Preface

Consciousness continues to be one of the more intractable problems for both the natural sciences and philosophy. A fascinating attribute of consciousness is that it is accompanied by a full-fledged, intimate, experiential self or at least a set of behavioural experiences that minimally involve a subjective quality. Consciousness thus remains a wonder as we still seem to be far from solving the riddle of the grand transition from quantitative neurochemical processes to an enriched, unitary subject.

Interdisciplinary Perspectives on Consciousness and the Self is inspired by recent discussions in philosophy, psychology, biology and physics on the nature of consciousness and the role that it plays in influencing the functions of the self. While the interdisciplinary stance on the origins of consciousness is not a new subject in itself, the concept of the self and its relationship with consciousness is a relatively recent area of academic interest. The goal of this book is twofold: first, to examine how consciousness can be contextualized differently within an interdisciplinary framework and second, to highlight the significance of the concept of the self in raising new questions in consciousness studies, particularly with relevance to questions on agency, body, health and transformation. In short, the chapters in this volume attempt to extend the boundaries of different disciplines that can potentially contribute to widening the scope of our understanding of the self and consciousness.

The authors of the chapters in this volume include, on the one hand, well-known physicists, philosophers, psychologists and biologists and, on the other, promising young scholars of the discipline. Some of the authors were invited to present their work at the conference *Looking Within: An International Conference on Multidisciplinary Approaches to Consciousness*, held at our institute, the National Institute of Advanced Studies, in Bangalore in January 2012. We also invited other scholars to write specially for this volume. We are gratified that every author has taken the effort to style their writing for an audience interested in interdisciplinary discussions on consciousness. At the same time, the requisites of the concerned disciplines have encouraged them to use theories and expressions that could occasionally be of a somewhat technical nature.

We are sure that the set of chapters presented in this volume will help raise larger questions concerning the nature of consciousness in the light of our recent understanding of the self. We are also hopeful that these chapters will be equally inspiring for a scholar as for a student in terms of the concerns they have raised.

We thank Anil Seth, Professor of Cognitive and Computational Neuroscience and Co-director of the Sackler Centre for Consciousness Science at the University of Sussex, for finding time to write the foreword for the volume. We also thank Stuart Hameroff and Les Lancaster for their endorsements of the volume. We would also like to record our sincere gratitude to all the authors without whom this book would not have been possible. Finally, we thank V. S. Ramamurthy, Director, National Institute of Advanced Studies, for encouraging the Consciousness Studies Programme and for his abiding interest in the field.

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Contributors

Mani Bhaumik is a physicist, international bestselling author, celebrated lecturer, entrepreneur and a philanthropist. With mentors like Professor Satyendra Nath Bose, he earned a Ph.D. in physics from the Indian Institute of Technology Kharagpur, India and went to University of California, Los Angeles (UCLA), USA for postdoctoral studies with a Sloan Foundation Fellowship. His phenomenal success was featured in the syndicated TV serial, *Lifestyles of the Rich and Famous*. He then turned to the study of the hidden relationship between advanced science and spirituality. His intense search spanned a decade and published his lines of reasoning in the international bestseller, *Code Name God*. He is the coinventor of the excimer laser that made the very popular Lasik eye surgery possible. For his pioneering research, he has been elected by his scientific peers as a Fellow of the Institute of Electrical and Electronics Engineers as well as of the American Physical Society. He also received an honorary D.Sc. degree for Lifetime Academic Achievements from his alma mater, Indian Institute of Technology Kharagpur. He has published over fifty papers in professional journals and is a holder of a dozen US patents. He is the recipient of many awards for his various philanthropic and community activities in India and the USA. Dr. Bhaumik has recently authored a book on cosmology for young readers, entitled *The Cosmic Detective*, Penguin India.

Benoy Chakraverty did his undergraduate studies at Presidency College, Calcutta, in the 1950s. He obtained his Ph.D. at Carnegie Tech, Pittsburgh, USA, in 1961. He then worked at IBM T J Watson Research Center in New York for the next several years and went to France in the late 1960s to join CNRS, Grenoble, where he has been ever since. He built the “Laboratory of Phase Transition” at CNRS that he directed for many years and also animated a condensed matter theory group. His own research interest has been in the domain of metal-nonmetal transition, disordered semiconductors and high-Tc superconductors.

Philip Clayton is Provost of Claremont Lincoln University and Dean of Claremont School of Theology, where he is Ingraham Chair of Theology. He received a joint doctorate in philosophy and religious studies from Yale University. Since that time he has written or edited over twenty books and several hundred articles in the field. His previous teaching posts include Williams College and the California State University; he has also held invited guest professorships at the University of Munich (two years), the University of Cambridge and Harvard University (also two years). Clayton has written or edited some twenty books on topics in religion and theology, as well as philosophy of science, philosophy of mind, history of philosophy and the philosophy of religion. Within the natural sciences, Clayton's research has focused on emergent dynamics in biology and on the neural correlates of consciousness in neuroscience. He has co-authored or edited a number of publications with physicists, chemists and biologists, analysing emerging natural systems and exploring their significance for the study of religion.

Ramanath Cowsik had his education from the Mysore University and the Karnataka University. After a year's study at the Atomic Energy Training School, he joined the Tata Institute of Fundamental Research (TIFR), Mumbai, for his Ph.D. under the supervision of Prof. Yash Pal. Subsequently, he served in the Physics Department, University of California, Berkeley, as Assistant Professor and Max-Planck-Institut für Physik and Astrophysik, Garching, Munich, as Senior Visiting Fellow, before he returned to TIFR as a Member of the faculty and became a distinguished professor. He was on lien from TIFR as Director, Indian Institute of Astrophysics (IIA), Bangalore, for the period 1994–1999, and took up the responsibility of setting up the Hanle telescope. Upon successful completion of this project, he moved to the Physics Department, Washington University in St. Louis and is now concurrently the Director, McDonnell Center for the Space Sciences. He has won several prestigious awards and has been decorated by one of the highest civilian awards from the President of India, the Padma Shri Award by the Government of India, and the Fellowship of the National Academy of Sciences, USA.

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Shreejata Gupta joined the National Institute of Advanced Studies, in Bangalore in 2010, as a doctoral student. Earlier, she worked as a Research Assistant in the Institute of Wildlife Biology and Game Management at the University of Natural Resources and Life Sciences, Austria, and at the National Centre for Biological Sciences, Bangalore. Her research interests broadly fall in the area of animal behaviour, animal cognition and evolutionary biology. Her research particularly focuses on the possible social influences on development of vocal and gestural communication in bonnet macaques *Macaca radiata.* Academics aside, Shreejata finds joy in travelling, reading, photography, movies and cooking.

V. Hari Narayanan is an Assistant Professor at the Indian Institute of Technology, Rajasthan in Jodhpur. He obtained his Ph.D. from IIT Kanpur in the area of foundations of cognitive science. Subsequently, he taught at a university in Jammu for around two and half years. His present research interests are centred on embodied cognition mainly in relation to self-conception and mindfulness.

Malavika Kapur is a Visiting Professor at National Institute of Advanced Studies, Bangalore. She was the Professor and Head of the Department of Clinical Psychology at the National Institute of Mental Health and Neurosciences, Bangalore. She has a Ph.D. in clinical psychology from Bangalore University and has eight books and over a hundred publications to her credit. She is a Fellow of the British Psychological Society, the Indian Association of Clinical Psychologists, the Indian Association of Child and Adolescent Mental Health and the National Academy of Psychology. She has been a Consultant for organizations such as the WHO, UGC, NCERT, IPCCD, ICMR and ICSSR. She has been twice awarded the scholar in residency at the Study and Conference Centre at Bellagio in Italy, by the Rockefeller Foundation. Her areas of interest are developmental psychology, community mental health programmes for children and adolescents in urban and rural schools, and development of assessment tools and intervention packages for children and adolescents in the indian context.

Rajesh Kasturirangan is an Associate Professor at National Institute of Advanced Studies, Bangalore, India. His research interests are in cognitive science and philosophy of mind. His current work relates to applying a combination of philosophical argument, mathematical techniques and empirical observations to classical problems in cognitive science and the philosophy of mind such as *Looking Within: Interdisciplinary Approaches to Consciousness*, the semantics of natural languages, the epistemology of beliefs and the structure of intentionality and consciousness. His most significant research contribution has been to develop a computational theory of how language and concepts are grounded in the world.

Lakshmi Kuchibhotla is a currently a doctoral student at National Institute of Advanced Studies, Bangalore, India, working on aspects of self and well-being in the Mahabharata. Her research interests are in the areas of self, well-being, Indian psychology, counselling and therapy. She holds Master's and M.Phil. degrees in Psychology and a Master's degree in Health Counselling. She also learns Indian classical music and dance and is deeply interested in relations of music and dance with emotions and therapy.

Namitha A. Kumar is a Ph.D. Scholar at the National Institute of Advanced Studies, Bangalore, working out an interdisciplinary research straddling disability studies, psychology and critical theories. The research aims at de-psychologizing disability and bringing out strands of resistance and agency in the life stories of people with disability. Namitha's academic interest spans across disability studies, inclusive education and social psychology. Apart from academics, Namitha is passionate about disability activism and alternate movements in education, free medicine, community living, organic farming and eco lifestyles.

Sangeetha Menon is Professor at the National Institute of Advanced Studies, in Bangalore, and heads the Consciousness Studies Programme of the Institute. She is a Philosopher-Psychologist working in the area of consciousness studies and Indian psychology. Her published works that span about 20 years have highlighted the importance of understanding the nature of complex experiences in the light of global humanistic values such as well-being and personal growth. Her publication in The Journal of Transpersonal Psychology argues for altruism as a fundamental value that drives human actions. She is a distinguished Member of the International Society for Science and Religion whose 100 plus invited members include Nobel laureates. She is a Board Member of the International Association for Transpersonal Psychology and Asia Consciousness Society. In 2012 she was nominated by the Government of India as a Member of the Board and Governing Council of Indian Council of Philosophical Research. Apart from her academic interests, she writes poetry and is an avid photographer, artist and web designer. Being a Trustee of a not-for-profit institution, Sambodh Foundation, she cherishes her passion for tree plantation, charity for the underprivileged, and living sustained by nature. Website www.consciousnessshop.com.

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Jonathan Shear was a Woodrow Wilson Fellow in philosophy at the University of California at Berkeley, where he received his Ph.D. and a Fulbright Scholar in philosophy of science at the London School of Economics. Since the early 1960s his work, complimented by daily practice of eastern experiential procedures, has focused on implications of basic meditation experiences for western philosophy and psychology. Professor Shear was a founding faculty member of Maharishi International University in 1971 and served as Chair of its philosophy department for a dozen years. Currently he is an Associate Professor of Philosophy at Virginia Commonwealth University, where he has taught for twenty five years. He has published and lectured widely in the USA, Europe, India and China and was the founding Managing Editor of the *Journal of Consciousness Studies*. His books include *The Inner Dimension: Philosophy and the Experience of Consciousness* (Peter Lang, 1990); *Explaining Consciousness: the Hard Problem* (MIT Press, 1997); *The View from Within*, co-edited with Francisco Varela (Imprint Academic, 1999); and *The Experience of Meditation: Experts Introduce the Major Traditions* (Paragon House, 2006).

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Mario Varvoglis, Ph.D., has been active in parapsychology since the mid-1970s, beginning with investigations of telepathy and altered states of consciousness at the *Maimonides Hospital Division of Psychophysics and Parapsychology* (New York). While at Princeton's *Psychophysical Research Laboratories* (PRL), he designed and executed experiments assessing conscious and nonconscious forms of micro-psychokinesis (purported direct mental influence upon probabilistic systems, such as true random number generators). He was also one of the principal authors of the PRL autoganzfeld studies, generally acknowledged as among the strongest sources of experimental evidence for telepathy. After moving to France, he introduced novel multimedia approaches for testing precognition and micro-psychokinesis, culminating with his educational CD-ROM, *Psi-Explorer*. Since 1998, Mario has been President of the *Institut Métapsychique International,* the principal educational and research centre for parapsychology in France. He has also served as President of the international *Parapsychological Association* (an affiliate of the *American Association for the Advancement of Science*). He is the author of numerous professional publications as well as two general public books on parapsychology. Websites:www.metapsychique.org; www.mariovarvoglis.com.

Max Velmans has been involved in consciousness studies for around 35 years and is currently Emeritus Professor of Psychology, Goldsmiths, University of London; Visiting Professor in Consciousness Studies, University of Plymouth; Indian Council of Philosophical Research National Visiting Professor for 2011; and an Academician of the Social Sciences. His main research focus is on integrating work on the philosophy, cognitive psychology and neuropsychology of consciousness. His book *Understanding Consciousness* (2000) was short-listed for the British Psychological Society book of the year award in 2001 and 2002 and is now in its second (2009) edition. Other publications include *The Science of Consciousness: Psychological, Neuropsychological and Clinical Reviews* (1996), *Investigating Phenomenal Consciousness: New Methodologies and Maps* (2000), *How Could Conscious Experiences Affect Brains?* (2003) and *The Blackwell Companion to Consciousness* (2007). He was a Co-founder and, from 2004 to 2006, Chair of the Consciousness and Experiential Psychology Section of the British Psychological Society.

Chapter 1
Introduction

Sangeetha Menon, Anindya Sinha, and B.V. Sreekantan

The brain sciences, psychology and philosophy adopt different approaches to understanding the individual mind and, in the process, explore how an individual can attain better health. All the three disciplines thus correlate health with experiential transformation and the nature of the self. Experiential transformation entails a functional transformation (of the body and the mind), accompanied by changes in the sets of values and beliefs that one holds. This implies that, by any method, "experience" is complex even to conceptualize, let alone understand from the viewpoint of any one single discipline. An attempt to understand "experience", be it a simple physical pain of the pinprick or a deeper sense of sanctity, thus demands an inclusive path that considers the person and the environment as a whole. One's thoughts, body practices and psychological traits such as hope for betterment, change and transcendence from the tangible to the intangible, to a great extent, narrates the nature of consciousness that underlies personal experiences.

A discussion on consciousness, therefore, implies two distinct challenges, and it is vital that such a distinction be made. The first challenge, which is also the common "hard problem" in the neurosciences, is: How do functionally different physical units of the brain, namely, neural structures, along with their associated

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*,
DOI 10.1007/978-81-322-1587-5_1, © Springer India 2014

electrochemical systems, produce an output that is qualitatively different, unified and subjective? The second challenge is: What is the role of the self and its functions and experiences in making one's consciousness distinct and unique to that individual or even to that species?

Consciousness is all pervasive in our lives and most intimate to our very being. Consciousness is also an elusive and uncharted phenomenon. The intimacy of consciousness is such that our brains do not demand upon us to remember "to be conscious" in order to possess it. In other words, we are bodies *with* consciousness, so much so that the existence of zombies has virtually become a matter of thought experiments.

A theme that runs through all the major discussions in neuropsychiatry, neurophenomenology and neurophilosophy is the place, nature and origin of the self. The theories and debates on the self today consider it less an abstract object and more a living subject, whose personhood is challenged, enhanced or framed by neural dispositions. The renewed interest in values of antiquity, such as empathy and compassion, and their biological foundations in systems such as mirror neurons, invites us to think about the phasing out of stark division between "selves". An enquiry into the self and its relation with consciousness too is one of the most exciting topics today, given the varied nature of the studies that we conduct in neuropsychiatry, neurophenomenology, neurophilosophy and cultural neuroscience. Several chapters in this book, in remarkable and unique ways, thus bring to discussion the two connected signs of life and, according to some lines of thought, the universe—consciousness and the self.

The 23 chapters in *Interdisciplinary Perspectives on Consciousness and the Self* employ a distinctly interdisciplinary stance to address the complexities involved in understanding consciousness and the self conceptually, philosophically, theoretically or empirically. These chapters are grouped into three thematic parts: Consciousness, agency and the self, The self and its first-person phenomenology and Boundaries of the self and origins of consciousness.

Is the self a conscious agent? Are the mental operations initiated by the self largely preconscious/unconscious? Max Velmans, in his chapter, discusses these questions and suggests that the processes that we normally associate with "conscious free will" emerge from preconscious processes that constitute a form of "preconscious free will". The conscious experiences associated with other so-called conscious processing in complex tasks such as speech perception and production, reading and thinking *also* result from preconscious processing—and this requires a more nuanced analysis of how conscious experiences relate to the processes with which they are most closely associated. According to Velmans, we need to distinguish between conscious processes in the sense that we may be conscious *of* them or that they *result* in a conscious experience or in the sense that consciousness may cause the appearance of these processes.

Anand Paranjpe focuses on the different, but complementary, approaches to dealing with ego boundaries in psychoanalysis and Indian psychology. By way of contrast, he suggests that for Indian psychology, the search for the ego's boundaries has examined the frontiers of the higher states of consciousness and led to the discovery that the immersion of selfhood in pure consciousness can allow one to overcome one's ego boundaries, remove any vestige of selfishness and experience limitless joy and compassion. Thus, while the aim of psychoanalysis has been to largely strengthen the ego in order to avoid the pathological consequences of an unruly id, Indian psychology has strived to establish processes by which the ego boundaries can be crossed and superior states of being reached.

Is selfhood devoid of empirical properties? Is the self at all imaginable? In his chapter, Jonathan Shear contrasts Western philosophy, Eastern meditation and current scientific research for answers to these questions. Shear argues that while Western philosophers such as Kant could not conceive, leave alone experience, "pure consciousness", Eastern traditions have strongly suggested that such consciousness cannot only be imagined but actually experienced. And current empirical research appears to support a conclusion that several physiological correlates of individual experience reflect human consciousness and point to networks that could underlie our natural sense of the self.

In the next chapter, Rajesh Kasturirangan suggests that the whole-world experience of each individual indicates the existence of the self as an organizer. In his opinion, different traditional approaches including computational modelling or the more recent perspective of the embodied mind, to cite two examples, cannot really account for the wholeness of the world; it is the self, in its role as the organizer, that structures experience and integrates it into a whole.

Is a "free-floating or separative self" the most effective way of conceptualizing the self? Hari Narayanan V, in his chapter, confronts the aggrandizement of the self that we are typically prone to and questions our belief in a free will that is characteristic of the free-floating self. He, in fact, suggests that several human problems can actually be traced to our separation of the self from the complexities of our everyday life and exhorts us to search for an alternative view of the self.

Malavika Kapur presents the age-old wisdom of an ancient Ayurvedic text, which, according to her, is also a paediatric text dealing with certain aspects of well-being in children. In her chapter, Kapur focuses on the discussions on the functions of memory, consciousness and dreams in the original text and ends her treatise by raising certain questions embedded in the text that could be subjected to empirical investigations.

Empirical and observational studies of consciousness in nonhuman species will truly benefit if different behavioural manifestations of higher cognitive processes can be defined functionally. This is vitally important because, when studying animals, consciousness has to necessarily manifest in behaviour for it to be tractable, and the performance of such behaviour, in turn, needs to be unambiguously ascribed to an effect of particular cognitive processes. One theoretical framework to investigate cognition and consciousness in animals in terms of mentalistic notions is that of the intentional stance, which assumes that each individual is an intentional system capable of mental states like beliefs, desires and emotions. To attribute such mental states to both oneself and to others is to have what has been termed a theory of mind. Social animals appear to be knowledgeable about the behaviour of other individuals to different extents, but do they know as much about the beliefs and intentions of these individuals and of their own? Do individuals acquire social information of other individuals when they either interact with them or observe the interactions of other members of their social group? How much do they know of themselves? Behavioural decisions that individuals make during social interactions need to be analysed carefully in order to ascertain whether true social knowledge and intentional phenomena guide such decision-making acts. And if indeed animals do possess social knowledge of themselves and of other individuals, what are the possible mechanisms that underlie the nature of such mental representation and the general ability to categorize social information in these non-verbalizing species?

Anindya Sinha, in his chapter, argues that the knowledge that individual primates may possess of the dominance ranks and social relationships of other individuals may be important in evaluating one's own position in the prevailing affiliative and dominance networks within the society and such knowledge could be acquired through direct or perceived experience. In an observational study on a troop of wild bonnet macaques, a primate species common in peninsular India, Sinha shows how individual macaque females possess egotistical knowledge of their own positions, relative to those of others, in the social hierarchy and appear to abstract and mentally represent their own personal attributes as well as those of other members of the group.

It may be argued that the idea of the self—and its recognition—is intrinsic to many of the higher cognitive phenomena that manifest in species evolutionarily closely related to us. But given the history of our vain search for consciousness as a singular phenomenon in animals, should we perhaps explore the structure and organization of other processes such as basic executive functions as potential building blocks of consciousness in nonhuman species?

Shreejata Gupta and Anindya Sinha begin their chapter from the view that consciousness, as manifest through individual goals and intentions, is best expressed through language in humans. They argue that certain behavioural expressions including those of planning, monitoring, regulation of emotions, inhibition of actions, attentional flexibility, working memory or decision-making, often collectively referred to as executive functions, have often been considered behavioural proxies of human consciousness. The key point that the authors present in this chapter is that processes underlying behavioural expressions in animals differ from those in humans only in degree and not in kind and that the functional understanding of such executive functions could help understand the development and evolution of the conscious human mind.

How is the concept of self different from that of identity in the social sciences? Shridhar Sharma, in his chapter, presents an account of the formation of cultural identity and argues how important it is to examine the two processes by which a self is formed (the "I") and the cultural context of the schematic that forms the self concept (the "me") independently of one another. According to Sharma, the process that defines individuals to others and to themselves includes a sense of continuity, a sense of uniqueness from others and a sense of affiliation with them.

The next set of chapters addresses a variety of boundaries, such as first- and third-person approaches, neurophenomenology and the philosophy of religion, inside and outside consciousness, the inner individual and the world outside, normal body versus the disabled body and the ecological and embodied body, using primarily a first-person phenomenology, and imagines how the boundaries can be used, reduced or transcended to understand the well-being of the self. The major challenge that these chapters address is the interrelations that arise from the self's situatedness in a world of lived experiences.

Is phenomenology always first person? Natalie Depraz makes a set of arguments using what she describes as "experiential phenomenological writing and reading" to suggest that the only way to equate phenomenology and a radically first-person approach is to demonstrate that Husserl's phenomenology is mostly a third-person phenomenology. She attempts to explore the lived experience of the philosopher/phenomenologist who is writing or reading in order to experientially examine her lived disposition: Does she "see" what she reads or writes? How does she relate to her concepts, arguments or descriptions? To what extent does she truly embody her writing or reading?

Can neurophenomenology help to address the nature of the emergent self and its spiritual experiences? Philip Clayton proposes that we must turn to neurophenomenology to address the most urgent questions in consciousness studies and suggests how it may be possible to explore boundary issues and unsolved questions in contemporary neuroscience. He considers reductive approaches on one hand and the overly ambitious claims of the so-called neuro-theologians on the other. He believes that the ideal solution is to analyse spiritual experiences in a phenomenological fashion—neither presupposing nor denying the real existence of their referents—and that the results of such analyses will help advance both neurosciences and the philosophy of religion.

According to Nilanjana Sanyal, there is an inside and outside of consciousness. In her chapter, she distinguishes between two levels of reflection: the surface glare of consciousness and a pre-reflective innermost base. Sanyal suggests that the sole experience of consciousness is the self and all experiences are characterized by a quality of "mineness". She then goes on to argue that the phenomenological approach serves as an indicator of evolution of the self from the pre-reflective to the reflective state in the Dasein format of ontological development.

The chapter by Lakshmi Kuchibhotla and Sangeetha Menon discusses the process of empathy and how it connects the individual with the outside world. They propose that, in empathy, the emotional aspect involves being aware of and experiencing one's feelings, while the cognitive aspect takes the perspective of the other and argue that a strong sense of self is imminent to developing a psychological wealth of human potentials and skills. When one perceives the other in need, an empathic emotion is aroused and this motivates the person to act in such a way that promotes the other's welfare improving one's own psychological state and, thus, well-being.

Namitha Kumar and Sangeetha Menon focus on the "ecological self" in their chapter and argue that the ecological self is based on the perception of information from the position of the body embedded in the physical world. They propose the idea of "an adapted self", particularly in the context of disability, and argue for complex adaptation in subjects negotiating the corporeal experience of either physical/sensory disability. The physical body has to adapt to the physical environment and take adaptive steps to negotiate altered physical and sensory environmental conditions. According to the authors, the complex experience of disability does not end with the physicality of the body and has to negotiate the psychological factors relating to disability, a process that is inevitable in a normative society that upholds and preserves the concept of the "normal body".

In her chapter, Sangeetha Menon argues that an understanding of the self, in its association with the unitary and subjective nature of consciousness, currently presents the greatest puzzle confronting humankind in the medical, philosophical and psychological arena. Suggesting that the very sense of "I and mine", "you and yours" or "me and the other" are brought to us by the "humble", and often taken for granted, presence of consciousness, Menon presents three philosophers from India and their distinctive approaches and analyses to understand the structure of experience and the possibility of self-transformation.

Where do physics and biology meet? At least a few physicists are hopeful that this junction can perhaps provide better insights into understanding the workings of the brain and its various manifestations such as consciousness and the self. Considerable progress has been made over the past few decades in delineating, in intricate detail, the physiochemical processes of the brain, its neural networks and sensors, through the use of laser and tomographic techniques. While these have helped neurosurgeons, neurophysicians and psychologists in treating brain disorders more effectively as compared to earlier times, it is fair to believe that the ontological and mechanistic aspects of consciousness remain far from comprehensive explanations. The "hard problem" thus remains as hard as ever. Attempts to solve the unbending riddle of the subjective nature of consciousness now involve new approaches based on the applications of current theoretical ideas of quantum processes, quantum entanglement, quantum coherence, quantum vacuum and their varied manifestations. Many of these hitherto unexplored connections are now receiving serious attention. Information theories are also being discussed while new lines of experimental investigation have been proposed and are in progress. Several chapters in this volume have, therefore, attempted to explore these classical and novel relationships and span the apparent divide between physics and the phenomenology of consciousness and self-awareness.

More precisely, these chapters are in favour of perceiving the currently existing boundaries but not in haste to resolve or bind them across disciplines and species. Consciousness is a fascinating subject for physicists particularly because of its unavailability to explain a variety of physical phenomena, ranging from common experiences such as the freedom of will to uncommon ones such as psi phenomena. The authors of these chapters use a set of esoteric, but potentially powerful, ideas to explore the microcosmic causes of physical phenomena and their representations in functional terms. Many questions are thus raised. Is the source of awareness present in the quantum vacuum? Is there a "meta-self" behind the phenomenal self that is largely nonlocal? Is quantum biology the discipline in waiting to resolve the "hard problem"? What is free will and quantum randomness? How are functional geometry and internal representations related? Is human brain a coherent state of the mind?

Mario Varvoglis, in his chapter, puts forward the view that the self is still evolving, not just in neural terms but also more fundamentally. He hopes that our models of consciousness and the self will improve significantly if the different hypothesized quantum-mechanical microstructures and processes turn out to be relevant to the functioning of the brain. He proposes a "meta-self" as "a larger reality", which is nonlocal and is behind the phenomenal self. He uses instances from experimental parapsychology to propose that such approaches can help us to empirically evaluate whether the self is truly the wetware of our brains or could be conceived more as a "mind-at-large".

While BV Sreekantan clarifies the ideas behind the phenomenon of quantum vacuum in his chapter and expresses the hope that the emerging field of vacuum quantum biology might be able to solve the "hard problem" of consciousness, Mani Bhaumik proposes that awareness is the fundamental aspect of the universe. In his chapter, Bhaumik uses the concept of quantum vacuum to investigate the source of universal awareness and suggests that the origins of awareness too can be traced to such a phenomenon, thus presenting a possible ontology of awareness consistent with our current scientific notions.

Ramanath Cowsik delves into fundamental questions in cosmology in his attempt to understand the origins of consciousness. According to him, the "primitive" concepts of consciousness and life are hard to define and it is even more difficult to fully comprehend their origins. He pays particular attention to the difficulty explaining the emergence of order that we encounter in many natural systems including life processes, particularly given that simpler physical systems exhibit a natural tendency to move from order to disorder.

In his chapter, Benoy Chakraverty develops the idea that a coherent state of the mind emerges when the different cognitive functions of the brain develop a complete phase coherence amongst themselves. He argues that the "mental" and the "physical" together form a dual Hilbert space and remain completely entangled in the normal human brain. According to him, all the information created by the self-operator has awareness built into it as an inner quantum number akin to the naturally attached spin of every electron, and the emergence of consciousness can simply be conceived as a passage from the microscopic to the macroscopic, precisely as implied in a coherent state.

In the next chapter, Sisir Roy presents his views about the representations of the internal world and its connection to consciousness through a functional sense-dependent geometry. He opines that the relationship between the brain and the external world is determined by the ability of the central nervous system to construct an internal model of the world, and this is accomplished through the interactions of our sensory and motor systems. The central concern that Roy explores is to determine the relationship between the functional geometry associated internally with the central nervous system and that at the macroscopic level in the external world, believing that such an attempt will shed new light on the epistemological issues related to the nature of consciousness and the validity of physical laws associated with it.

Chetan Nayakar, S. Omkar and R. Srikanth bring in a fundamental discussion on the philosophically and physically relevant phenomenon of free will in the last chapter of this compilation. They conjecture that the existence of free will itself can be questioned even before an attempt is made to scientifically define the phenomenon. The authors explore the possibility of using "quantum randomness" to develop a concept of free will as a new causal primitive that can override physical causality under certain conditions.

In conclusion, the chapters in this volume largely argue for essentially interdisciplinary approaches to fully comprehend the nature of the self and consciousness, both inherently complex phenomena. They implicitly argue that while the analyses of these phenomena within the isolated boundaries of independent disciplines may prove useful, they cannot offer sustained measures for their understanding. Consciousness continues to be one of the major challenges that the ancient histories of science and philosophy have presented to us. But can this challenge be better confronted in modern times? Although several of the authors and many readers may respond in the negative, given the inherent problem of objectively investigating the subjective entanglement that these phenomena invariably entail, new beginnings have to be made, new approaches defined.

Part I
Consciousness, Agency and the Self

Chapter 2
Conscious Agency and the Preconscious/Unconscious Self

Max Velmans

2.1 The Self Viewed as a Conscious Agent

In everyday life, we assume that we have a Self that is in control of our voluntary acts. But what kind of "Self" is in control? Our inner sense of Self is closely tied to our *conscious* Self. Yet, the evidence that our mental processing is largely preconscious or unconscious is extensive. How the conscious Self relates to mental processing and the precise sense in which such processing might "be conscious" therefore has to be examined with care.

One can of course examine these relationships in many different ways, for example, in terms of the interplay of heredity and environment or in terms of the influences of family, education and society. However, rather than entering into a biological or sociocultural analysis, I want to adopt an experiential approach that focuses on a phenomenological analysis of conscious agency and of how this is expressed in conscious wishes and decisions. I also ask how these conscious experiences of the Self acting as an agent relate to the workings of our preconscious and/or unconscious mind/brain.

Note that to speak of "conscious agency" already assumes that in some sense we can exercise control over our actions rather than being creatures whose behaviour is entirely predetermined by physical forces. So before turning to the question of who or what our inner "controller" might be, we have to consider the senses in which *voluntary action* is possible, thereby taking a stance on the ancient free will versus determinism debate.

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*,
DOI 10.1007/978-81-322-1587-5_2, © Springer India 2014

2.2 How Free Will Is Normally Experienced

Within current philosophical discussions, free will is commonly thought of as "contra-causal free will", that is, as a form of agency operating outside the chain of physical causation. However, that is not how voluntary actions are understood within the scientific community. For example, current understanding of voluntary and autonomic nervous system activities assumes that the former and the latter operate according to physical (neurophysiological) principles. Nor are freely willed actions usually *experienced* as being entirely free of determining factors. Rather, choices, decisions and actions are normally experienced as operating, with some degrees of freedom, within mental, physical and social constraints. I do not, for example, feel that I can choose to fly (unaided), and in most social situations the range of my permitted activities feels constrained in quite restrictive ways. Consequently, in their studies of voluntary action, psychologists have typically focused their interest on the systems that enable humans to have the freedom to choose, decide and act that they actually *experience* themselves to have—a form of *constrained* free will that turns out to be compatible with determinism.

Psychological studies of voluntary actions in humans have made it clear that the systems that control them must be extremely complex, including inner needs and goals that operate as drivers for action, a global knowledge store (based on previous interactions with the world) that provides a basis for planning, processes for modelling current inner and external states of affairs and any required changes in those states, alternative strategies for action, methods for assessing the likely success of alternative strategies in the light of existing physical and social constraints and the ability to learn from experience. Although such systems follow deterministic principles, their operation must be partly self-organizing and flexible, and their complexity must allow sufficient degrees of freedom to permit the ability to make choices and decisions, within the available alternatives, that humans actually experience. Properly organized, such a system would be able to assess a given situation and carry out appropriate acts in the light of inner needs and goals and an assessment of the consequences. Consequently there is nothing within current psychological understanding of the mind, viewed as a complex system that rules out a form of constrained free will—a position known in philosophy of mind as "compatibilism".

2.3 Distinguishing Free Will from Conscious Free Will

Free will does however have to be distinguished from *conscious* free will, as, in principle, the operations of such decision-making systems do not have to be conscious. If the detailed information processing involved could be sufficiently well specified, it could, for example, operate equally well in a nonconscious robot. Neuropsychological findings have also cast doubt on the role of conscious experiences of wishing or deciding to do something in the operation of volitional processes in the brain.

It has been known for over 40 years that voluntary acts are preceded by a slow negative shift in electrical potential recorded at the scalp known as the "readiness potential" (RP) and that this shift can precede the act by up to 1 s or more (Kornhuber and Deeke 1965). In itself, this says nothing about the relation of the readiness potential to conscious volition, i.e. to the *experienced wish* to perform an act. To address this, Libet (1985) developed a procedure which enabled subjects to note the instant they experienced a wish to perform a specified act (a simple flexion of the wrist or fingers) by relating the onset of the experienced wish to the spatial position of a revolving spot on a cathode ray oscilloscope, which swept the periphery of the face like the sweep-second hand of a clock.[1] Recorded in this way, the readiness potential preceded the voluntary act by around 550 ms and *also preceded the experienced wish* (to flex the wrist or fingers) by around 350 ms (for spontaneous acts involving no preplanning).

In a replication of Libet's findings, Haggard and Eimer (1999) used the same methodology. However, they varied whether subjects had to use their left or right hand to respond, in order to allow calculation of the lateralized readiness potential (LRP). This is obtained by measuring the activity over the primary motor cortex and subtracting activity from the hemisphere on the same side as the response hand from activity of the hemisphere on the opposite side to the response hand. As the left hemisphere controls the right hand and vice versa, this provides a marker of motor preparation for a particular hand movement in a given hemisphere rather than the more general preparedness indexed by the RP. As was the case with RP, LRP occurred before the conscious wish to act, although in this case by around 100 ms. That is, LRP onset was about 300 ms prior to onset of motor activity (measured on an electromyogram), with the wish to act occurring around 200 ms prior to this activity. They also found that LRP onsets that were earlier than average tended to be followed by wishes to act that were earlier than average, while later LRP onsets were followed by later wishes, suggesting a direct relationship between wishes and LRP. However, no such relationship was found between wishes and RP. Consequently, while they supported Libet's conclusion that the brain prepares for action prior to both the wish to act and the act itself, they argued that LRP rather than the RP is a more direct index of the brain's preparations.

This suggests that, like the act itself, the experienced wish (to flex one's wrist) may be one *output* from the prior (preconscious) processes that actually select a given response—which poses a challenge to our conventional understanding of conscious free will.

[1]Libet established the accuracy and reliability of this method of establishing a "clock time" for the onset of a conscious experience, by requiring subjects to judge the clock time of a felt, tactile stimulus (applied to the hand) with a known onset time. They found judged onset to be around 50 ms earlier than actual onset, with a standard error of ± 20 ms. See also Banks and Pockett (2007) for a review.

In an attempt to find a role for the conscious experiences associated with voluntary acts, Libet pointed out that although conscious wishes follow the RP by around 350 ms, they precede the act by around 150 ms, time enough to veto the wish. So he suggested that the ability to veto the wish is the function of conscious volition (rather like a conscious Freudian ego controlling the unconscious id). However, a decision *not* to act (after a readiness to do so) can be shown to have its own preconscious antecedents. For example, a readiness to respond inhibited by a decision not to respond can be directly investigated in psychology experiments using various go/no-go tasks, e.g. where subjects are asked to fix their attention on a screen where one of two target stimuli will appear. One target stimulus cues the subject to press a button as quickly as possible (go) while the other stimulus cues the subject not to respond (no-go). Behavioural measures in the no-go condition remain a problem as, if they follow the instruction, the subject does not do anything. The brain nevertheless responds differently under the two conditions. Response inhibition in this situation is thought to be associated with the "no-go N2", a negative-going potential measured over frontally placed electrodes occurring about 200 msec. after the no-go stimulus onset, arising from cognitive control processes in the anterior cingulate cortex (Falkenstein et al. 1999; Nieuwenhuis et al. 2003). In a series of experiments designed to investigate preconscious influences on a decision *not* to respond, Hughes (2008) found that the onset of this N2 on no-go trials could be influenced by masked (unconscious) primes presented 100 msec. before the conscious no-go stimuli. In particular, a masked prime that cued a no-go response led to a significantly earlier no-go N2 than a masked prime that cued a go response, demonstrating preconscious priming of a decision not to respond. In short, even a decision *not* to respond can be initiated preconsciously! (see also Hughes et al. 2009)

2.4 How Conscious Is Conscious Speech Perception and Conscious Reading?

Surprising as such findings might seem, evidence suggests that the timings of experiences associated with volition are not a special case. For example, the same patterns have been found in studies of speech perception and reading. Marslen-Wilson (1984) reviewed evidence that the analysis of words in attended-to connected speech is both "data-driven" and "cognitively driven", combining knowledge of the stimulus with knowledge of its context. For example, in Grosjean's (1980) word recognition task, successively longer initial fragments of a word were presented. If the words were presented in isolation, subjects required fragments of 333 ms (on average) to identify them (total word length was in excess of 400 ms). But if the words were presented in normal verbal contexts, a fragment of 199 ms (on average) was sufficient to identify them. In a related experiment, Marslen-Wilson and Tyler (1980) found that if subjects were required to press a button as soon as they detected a target word presented in the context of a spoken sentence, the average reaction time was 273 ms although the mean length of the words was 370 ms Once one takes into account the 75 ms or so required to make a response (the time to press a button), this again suggests a word identification time of around 200 ms.

Now, a word fragment of 200 ms is large enough to contain just the first two phonemes, and according to Marslen-Wilson (1984), these convey useful information. Assuming that one has a "mental dictionary" of around 20,000 American English words, knowledge of the first phoneme reduces the set of possible words to a median of 1,033, knowledge of the first two phonemes reduces the set size to a median of 87 and so on (Kucera and Francis 1967). In this way, sensory analysis (a largely "data-driven" process) contributes to word identification. After two phonemes, however, a large number of possible words remain (a median of 87). Hence, subjects who can identify the word on the basis of the first two phonemes must use their knowledge of the context to decide which of the remaining words is the correct one (a "cognitively driven" process).

On the basis of this and other evidence, Marslen-Wilson (1984) concluded that to cope with a complex acoustic waveform developing over time, the speech processing system moves the analysis of the sensory signal as rapidly as possible to a domain where all possible sources of information (semantic as well as phonemic) can be brought to bear on its further analysis and interpretation. Such "on-line interactive analysis" has considerable sophistication and flexibility.

These findings and conclusions have a surprising consequence. The stimuli to be identified in these experiments are at the focus of the subject's attention and eventually become conscious. Yet, if words (in context) are identified within 200 ms, this confluence of data-driven and cognitively driven processing *cannot be conscious*, for according to converging sources of evidence, consciousness of a given attended-to stimulus does not arise until at least 200 ms *after* the stimulus arrives at the cortical projection areas,[2] i.e. after the identification of a word (in context) has been achieved!

In these experiments, spoken words in the attended channel are therefore analysed in preconscious fashion. Rather than consciousness *entering into* input analysis of well-known stimuli, consciousness of those stimuli appears to *follow* sophisticated, preconscious analysis and identification. If this is the case, consciousness cannot be *necessary* for the analysis and identification of such stimuli even when they occur in novel, complex combinations.

As with the preconscious nature of free will, this conclusion about preconscious input analysis may seem counterintuitive. It is, however, easy to show how it applies to everyday situations. For example, *reading*, like speech perception, is universally thought of as a *complex, conscious* process. So, try silently reading the following sentence and note what you experience:

If we don't increase the dustmen's wages, they will refuse to take the refuse.

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[2] See, for example, Libet et al. (1979), Merikle (2007), Neeley (1977) and Posner and Snyder (1975) or the review in Velmans (2009) chapter 10.

Note that on its first occurrence in your phonemic imagery or "inner speech", the word "refuse" was (silently) pronounced with the stress on the second syllable (re*fuse*) while on its second occurrence the stress was on the first syllable (*re*fuse). But how and when did this allocation of stress patterns take place? Clearly, the syntactic and semantic analysis required to determine the appropriate meanings of the word "refuse" must have taken place prior to the allocation of the stress patterns; and this, in turn, must have taken place *prior* to the phonemic images entering awareness.

Note too that while reading, one is not conscious of any of the visual processing or pattern recognition that is required to identify individual words or of any syntactic or semantic analysis being applied to the sentence. Nor is one aware of the processing responsible for the resulting inner speech (with the appropriate stress patterns on the word "refuse"). The same may be said of the paragraph you are now reading, or of the entire text of this chapter. You are conscious *of* what is written, but not conscious of the complex input analysis involved.

2.5 How Conscious Is Conscious Speech Production and Conscious Thought?

Speech production, like reading, is one of the most complex tasks humans are able to perform. Yet, one has no awareness whatsoever of the motor commands issued from the central nervous system that travel down efferent fibres to innervate the muscles nor of the complex motor programming that enables muscular coordination and control. In speech, for example, the tongue may make as many as 12 adjustments of shape per second—adjustments which need to be precisely coordinated with other rapid, dynamic changes within the articulatory system. According to Lenneberg (1967), within 1 min of discourse as many as 10–15 thousand neuromuscular events occur. Yet only the *result* of this activity (the overt speech itself) normally enters consciousness.

Preconscious speech control might of course be the result of *prior* conscious activity. For example, Popper (1972) and Mandler (1975) suggest that consciousness is necessary for short- and long-term planning, particularly where one needs to create some novel plan or novel output response. In the case of speech production, for example, planning *what* to say might be conscious, particularly if one is expressing some new idea or expressing some old idea in a novel way.

Conveniently, the planning and execution of speech have been subject to considerable experimental examination. Speech production is commonly thought to involve hierarchically arranged, semantic, syntactic and motor control systems in which communicative intentions are translated into overt speech in a largely top-down fashion. As noted above, articulatory control (motor programming and execution) is largely preconscious. According to Bock (1982), syntactic planning by skilled speakers is also relatively automatic and outside conscious voluntary control.

Planning *what* to say and translating nonverbal conceptual content into linguistic forms, however, require effort. But to what extent is such planning conscious? Let us see.

A number of theorists have observed that periods of conceptual, semantic and syntactic planning are characterized by gaps in the otherwise relatively continuous stream of speech (Goldman-Eisler 1968; Boomer 1970). The neurologist John Hughlings Jackson, for example, suggested that the amount of planning required depends on whether the speech is "new" speech or "old" speech. Old speech (well-known phrases, etc.) requires little planning and is relatively continuous. New speech (saying things in a new way) requires planning and is characterized by hesitation pauses. Fodor et al. (1974) point out that breathing pauses also occur (gaps in the speech stream caused by the intake of breath). However, breathing pauses do not generally coincide with hesitation pauses.

Breathing pauses nearly always occur at the beginnings and ends of major linguistic constituents (such as clauses and sentences). So these appear to be coordinated with the syntactic organization of such constituents into a clausal or sentential structure. By contrast, hesitation pauses tend to occur within clauses and sentences and appear to be associated with the formulation of ideas, deciding which words best express one's meaning and so on.

If this analysis is correct, conscious planning of *what* to say should be evident during hesitation pauses—and a little examination of what one experiences during a hesitation pause should settle the matter. Try it. During a hesitation pause, one might experience a certain sense of effort (perhaps the effort to put something in an appropriate way). But nothing is revealed of the *processes* which formulate ideas, translate these into a form suitable for expression in language, search for and retrieve words from memory or assess which words are most appropriate. In short, no more is revealed of conceptual or semantic planning in hesitation pauses than is revealed of syntactic planning in breathing pauses. The fact that a process demands processing *effort* does not ensure that it is *conscious*. Indeed, there is a sense in which one is only conscious of what one wants to say *after one has said it*!

2.6 How Conscious Is Conscious Thought?

It is particularly surprising that the same may be said of *conscious verbal thoughts.* That is, the same situation applies if one formulates one's thoughts into "inner speech" through the use of phonemic imagery, prior to its overt expression.

This is, once again, easy to illustrate. For example, decide how well you have followed the argument so far, and simply note what thoughts come to mind. [Pause your reading to carry out this experiment.]

Once something comes to mind, read on.

You might have thought something like "I'm with it so far", "I'm not sure about some of this" or even "I disagree with this"—but for the purpose of this exercise it doesn't matter. All that matters is that once a verbal thought comes to mind, it will be manifest in the form of inner speech (phonemic imagery).

Now ask yourself, "Where did that thought come from?"

Although you might be able to give reasons for whatever judgment you made after the fact, you have little or no introspective access to the *detailed processes* that gave rise to the immediate thought, i.e. to the processes that somehow analysed the meaning of the question, accessed your global memory system, somehow made the judgment about how well the arguments presented here fit in with your current understanding of the topic and then expressed that judgment in the form of a verbal thought. Once one *has* a conscious verbal thought, manifested in experience in the form of phonemic imagery, the complex cognitive processes required to generate that thought, including the meaning it expresses, the choice of grammar and words and the processing required to encode these into phonemic imagery, *have already operated*. In short, the conscious aspects of inner speech and overt speech have a similar relation to the processes that produce them. In neither case are the complex antecedent processes available to introspection.

In short, whether we consider conscious forms of input analysis (speech perception and reading), information transformation (verbal thinking) or output (speech production), the conscious experience that we normally associate with such processing *follows* the processing to which it relates. Given this, in what *sense* are these "conscious processes" conscious?

2.7 Unravelling the Three Senses in Which a Process May Be "Conscious"

According to Velmans (1991a), the psychological and philosophical literature often confounds three distinct senses in which a process might be said to be "conscious". It might be conscious:

(a) In the sense that one is conscious *of* the process
(b) In the sense that the operation of the process is *accompanied* by consciousness (of its *results*)
(c) In the sense that consciousness *enters into* or *causally influences* the process

We do not have introspective access to how the preconscious cognitive processes that enable thinking produce individual, conscious thoughts in the form of "inner speech". However, the content of such thoughts and the sequence in which they appear does give some insight into the way the cognitive processes (of which they are manifestations) operate over time in problem solving, thinking, planning and so on. Consequently such cognitive processes are partly conscious in sense (a), but only in so far as their detailed operation is made explicit in conscious thoughts, thereby becoming accessible to introspection.

Many psychological processes are conscious in sense (b), but not in sense (a)—that is, we are not conscious of how the processes operate, but we are conscious of their *results*. This applies to perception in all sense modalities. When consciously reading this sentence, for example, you become aware of the printed text on the page, accompanied, perhaps, by inner speech (phonemic imagery) and a feeling of understanding (or not), but you have no introspective access to the processes which enable you to read. Nor does one have introspective access to the *details* of most other forms of cognitive functioning, for example, to the detailed operations which enable "conscious" learning, remembering, engaging in conversations with others and so on.

Crucially, having an experience that gives some introspective access to a given process, or having the results of that process manifest in an experience, says nothing about whether that experience *carries out* that process. That is, whether a process is "conscious" in sense (a) or (b) needs to be distinguished from whether it is conscious in sense (c). Indeed, it is not easy to envisage how the experience that makes a process conscious in sense (a) or (b) *could* make it conscious in sense (c). Consciousness *of* a physical process does not make consciousness responsible for the operation of that process (watching paint dry does not actually make it dry on the wall). So, how could consciousness *of* a mental process carry out the functions of that process? Alternatively, if conscious experience *results* from a mental process, it arrives *too late* to carry out the functions of that process.

2.8 Is Conscious Agency an Illusion?

Given such findings, is conscious agency an illusion? Answers to such questions have clear consequences for our ethical and legal systems. I *feel* responsible for my voluntary acts and am likely to be held responsible for them by the courts. But, if my conscious Self is not responsible for my acts and if the act is determined by preconscious processing, can't I plead, in mitigation, that I could not have chosen to do otherwise as the acts were controlled by my preconscious mind/brain? Adjudication of such a plea requires one to make sense of one of the hardest of the "hard" problems of consciousness: how to understand the causal interaction of consciousness and brain.

In Velmans (2000, 2002a, b, 2003, 2009 chapters 13 and 14) I have suggested a way of understanding "conscious causation" that both accommodates the scientific findings *and* defends our common sense view of freedom and responsibility. How could an act that is executed preconsciously be *my* act? Because I (the agent) include the operations of my unconscious and preconscious mind/brain as well as my conscious sense of Self. How could a preconsciously determined act be "voluntary"? Voluntary acts imply the possibility of choice (albeit choice within constraints).[3] Voluntary acts are also potentially flexible and capable of being novel.

[3] As noted earlier, we can only choose to act within the range of human possibility, constrained by heredity and environment, past experience, inner needs and goals, available strategies, current options offered by physical and social contexts and so on.

In the psychological literature, such properties are traditionally associated with controlled rather than automatic processing and with focal-attentive rather than pre-attentive or nonattended processing. I do not deny that voluntary processes are controlled and focal-attentive. Nor do I deny that they are conscious. They are conscious in sense (b) and, to a lesser degree, sense (a) above. They are merely not conscious in sense (c). In Libet's experiments, the conscious wish to act appears around 350 ms after the onset of preconscious preparations to act that are indexed by the readiness potential. This says something about the timing of the conscious wish in relation to the processes that generate it and about its restricted role once it appears. But it does not argue against the voluntary nature of that preconscious processing. On the contrary, the fact that the act consciously feels as if it is voluntary and controlled suggests that the processes that have generated that feeling *are* voluntary and controlled, as conscious experiences generally provide reasonably accurate representations of what is going on. Such feelings of being in control contrast sharply with the feelings of constraint where voluntary choice is absent—for example, where one's range of action is controlled by others or where voluntary control is not possible, as in the muscular twitches induced by Parkinson's disease.

In sum, the freedom or lack of freedom of an act is not *determined* by the accompanying experience of freedom. On the contrary, once the conscious feeling of wishing or deciding to do something arises, the relevant preconscious choice has already taken place. Given this, the impression that the conscious feeling *itself* makes the choice is indeed an illusion. Whether or not an act is free is not determined by *how we feel about it*. Rather we feel and judge an act to be free, and are generally right to do so, because our conscious experiences represent what is going on, and barring illusions, delusions and hallucinations, such conscious representations are usually accurate. My conscious wishes usually represent the current state of my motivational processes, my conscious thoughts represent the current state of my cognitive processes, my conscious decisions to act or not to act in given ways represent the current state of my decision-making processes and so on. If I feel free to choose between alternatives, I usually am (within constraints), and if I feel that my choice was entirely constrained or absent, it usually was. Does this make free will itself an illusion? No. There are circumstances under which the feeling might be misleading[4] (e.g. if I feel that I am free to move a phantom limb). But in the many circumstances where the feeling is accurate, the voluntary agency that it represents is not an illusion.

According to this analysis, the feeling that we are free to choose or to exercise control is compatible with the nature of what is actually taking place in our own

[4]Being *representations* of preconscious and unconscious mental processes, conscious experiences can also, occasionally, be *mis*representations. For example, following a long programme of research into experienced free will, the psychologist Daniel Wegner (2002, 2004) provides various examples of misattributed volition (where people believe themselves to have willed an act that was determined by external forces or believe external forces to have determined acts that they actually carried out themselves). It does not of course follow that people normally misattribute the internal or external determinants of action.

mind/brain, following processes that select amongst available options, in accordance with current needs, goals, available strategies, calculations of likely consequences and so on. While I assume that such processes operate according to determinate principles, the system architecture that embodies them enables the ability to exercise the choice, flexibility and control (within constraints) that we actually experience—a form of determinism that is compatible with experienced free will.

2.9 What Does Phenomenal Consciousness Do?

In the examples considered above, conscious phenomenology follows the information processing to which it most closely relates, in which case it arrives *too late* to influence that processing. Although I do not have space to develop a full analysis here,[5] there are good reasons to believe that this applies not only to conscious wishes, conscious decisions (to act on that wish or not), conscious speech production, conscious reading and conscious thinking but to *all* forms of "conscious" human information processing. These findings present an acute problem: if conscious experiences arrive too late to influence the processes to which they most closely relate, what do these experiences do?

This problem is deepened when first-person conscious experiences are viewed from the conventional, external perspective of science. Viewed from an external, third-person perspective, one can, in principle, trace the effects of input stimuli on the central nervous system from input to output, without finding any "gaps" in the chain of neural causation that consciousness might fill.

In any case, if one inspects the brain from the outside, no subjective experience can be observed at work; nor does one need to appeal to the existence of subjective experience to account for the neural activity that one *can* observe. If, as is widely assumed, each conscious experience has its own distinct neural correlates, these neural correlates would *already perform* any functions proposed for that conscious experience in the operation of the brain.

The same is true if one thinks of the brain as a functioning, information processing system. Once the processing within a system required to perform a given function is sufficiently well specified in procedural terms, one does not have to add an "inner conscious life" to make that system work.

2.10 What Phenomenal Consciousness Does

Nevertheless, when viewed from the *first-person perspective* of the person who has them, conscious experiences seem to be of central importance to human life. Although all conscious experiences have unconscious and/or preconscious

[5]But see Velmans (1991a, b, 2009 chapters 10, 12, 13, 14).

causal antecedents, these experiences usually give useful information about what is going on. Just as inner experiences usually give useful information about our own cognitive, motivational and volitional states, visual, auditory and other exteroceptive experiences normally give useful, veridical information about their initiating causes in the external world, and bodily experiences normally give useful information about states internal to the body or on its surface that have produced them. As has often been noted in Western philosophy of mind (following Brentano), phenomenal consciousness is always *of* something, i.e. phenomenal conscious states are *representations*. Consciousness is also intimately bound up with knowledge. When we are conscious of what is going on, we also *know* what is going on. That said, consciousness in humans is not *coextensive* with either representation or knowledge. There are many forms of representation in the brain that are preconscious or unconscious. And we know how to carry out many sophisticated mental tasks, although knowledge of how the mind/brain analyses information, stores it, retrieves it, transforms it and controls the musculature to make some appropriate response has little (if any) manifestation in what we experience. A vast reservoir of knowledge about the world and about ourselves is also encoded in long-term memory. While some of this knowledge might, at a given moment, become conscious, it largely remains unconscious even while it plays a role in ongoing adaptive functioning (in the interpretation of input, the creation of expectations, the planning of appropriate responses and so on). That is, representation and knowledge may be *either* conscious *or* unconscious.

What difference then does phenomenal consciousness make? Conscious experiences represent what is going on in a very special way. There is a big difference between having something described to us and experiencing it for ourselves. And there is an even bigger difference between actually experiencing a given situation or state and merely having unconscious information about it (stored, e.g. in long-term memory). It is only once we experience something for ourselves that we *real-ize* what it is like. It is only when we experience something for ourselves that it becomes subjectively real. In this, *consciousness is the creator of subjective realities.*[6]

It is when I hear myself speak that I real-ize what I want to say. When I experience this print on the page in the form of inner speech I real-ize what has been written. When I have a conscious thought, I real-ize what I think. And when I have a conscious wish or decision, I real-ize what I want or what I have decided to do.

Note too that consciousness of individual acts form part of an ongoing stream of experiences. For example, a chosen action is generally followed by a conscious feeling or thought that *evaluates* that action and its outcome. (How well or how badly did it go?) Similar evaluative feelings accompany processing of input. Notice,

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[6]I deliberately hyphenate the term "real-ize" to stress that it is only when one consciously experiences an entity, event or process that it becomes *subjectively real* (see Velmans 2009 chapters 13 and 14 for a deeper analysis). Note too that the distinction I draw here between having something described to us and experiencing it for ourselves relates directly to the distinction drawn by Bertrand Russell between "knowledge by description" and "knowledge by acquaintance".

for example, whatever feeling you might have about how well or badly you have understood this paper so far. In modern consciousness studies (following William James), such evaluative feelings about whatever is at the current focus of attention are thought of as being at the "fringes" of consciousness (cf. Mangan 2007). Like wishes and decisions, such evaluations appear to arise, fully formed, from the preconscious mind, but only become real-ized once they become conscious. Consequently, once such evaluative feelings arise, the judgments that they represent must have *already been made*.

2.11 Who's in Control?

Who chooses, has thoughts, carries out acts and evaluates them and so on? In 20th century psychology, the conscious Self (sometimes thought as the "conscious ego" or "conscious mind") has often been likened to the tip of an iceberg that is supported by a vaster, unconscious base. Why doesn't the Self *seem* to be supported and embedded in this way? Only the consciously experienced ego is above the waterline. The bulk of the Self, like the iceberg, remains unseen below the water. On this view, human phenomenal consciousness is embedded in and supported by an embodied mind/brain that is, in turn, supported by the greater universe (just as the tip of an iceberg is supported by its base and the surrounding sea). Viewed from the first-person perspective of an embodied human, what is below the waterline can be thought of as the "unconscious ground" from which conscious experiences arise—and many practices exist in both the East and West whereby the nature of this ground can be subject to scientific, psychotherapeutic and meditative exploration.

Given the above, what is the nature of the Self? Is the Self the *consciously experienced* Self or the unconscious ground that supports it? We habitually think of ourselves as being our *consciously experienced* selves. But if preconscious processes produce our thoughts and Self experiences and organize and evaluate our activities, then the larger Self must *include* such preconscious processes. In short, whether we think of our Self as an agent, an entity or an organizing system, we are *both* the preconscious generating processes *and* the conscious results. We are as much one thing as the other, and this requires a shift in our sensed "centre of gravity" to one where our consciously experienced Self becomes just the visible "tip" of our own embedding, unconscious ground.

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Chapter 3
Finding the Self and Losing the Ego in the State of Pure Consciousness

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Paul Federn (1926/1952) is often credited with introducing the concept of ego boundaries[1] in psychoanalysis. He viewed persons as continually involved in defining and redefining ego boundaries. He made a distinction between ego boundaries in the external world, such as those between the self and the other, and internal boundaries between the conscious ego and the unconscious id. Following Freud's lead, Federn's focus was more on the internal than on external boundaries, where he saw the dangers arising from the weakening or loss of the ego's internal boundaries with the unconscious id often leading to hallucinations, delusions, estrangement and, worse, depersonalization. In the context of the clinical setting where he worked, the main aim was to strengthen ego's boundaries with the id to avoid various forms of pathology arising from the ego's inability to control the blind impulses of the id. One of Federn's students, Erik Erikson (1968), focused on ego boundaries in the external world. In this context he developed his ideas in light of William James's views of the self. James (1890/1983) made a distinction between the self-as-subject and self-as-object and divided the latter into material, social and "spiritual" selves.

[1]It would be useful to say a few words about certain difficulties and possible criticisms about the concepts of ego and ego boundaries. The idea of an agentic ego may be viewed as invoking a homunculus, which is a bugaboo raised by hard determinists like BF Skinner. I reject such criticism since it effectively denies the human freedom to choose between right and wrong. As to the use of the concept of ego by Federn and many others, I recognize an ambiguity: that it seems to often indicate the *process* of drawing and defending the boundaries between the self and the world, while at the same time it also suggests the *territory* within the boundaries. I shall not deal with deeper theoretical issues in this context since my purpose here is mainly to indicate the explicit or implicit usage of the concepts of ego and ego boundaries in the comparative context of Indian and Western psychologies.

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*,
DOI 10.1007/978-81-322-1587-5_3, © Springer India 2014

The issue of the self-as-subject is rather complex, and on the whole it has received more attention in Indian Psychology than Western. There will be more on this in the later part than in the earlier part of this chapter.[2]

The meaning of boundaries of the ego in the context of material and social spheres should be clear: Persons must draw clear boundaries in the material world between what belongs to them and what belongs to others and continually redefine such boundaries in the normal process of give and take of things and money in daily transactions. In the social world one is required to decide whether a stranger is acceptable as a friend, or else place him in the alien or neutral zone. James's idea of the "spiritual" self is a bit ambiguous, but a close look at his writings indicates that by spiritual he meant everything intangible and nonmaterial. In other words in the category of the spiritual self, he included the entire domain of one's ideas, beliefs, opinions, attitudes and values as opposed to tangible objects such as body and possessions. In this context, it should be clear that we are daily required to draw boundaries between the self and nonself by either accepting or rejecting newly presented ideas, beliefs, opinions and values. Erikson, being particularly interested in the *development* of individuals from cradle to the grave, saw persons as continually involved in defining and redefining ego boundaries throughout the life cycle. He introduced the concept of ego identity to designate the things, social roles and ideas with which a person feels identified. Driven by changes from the inside by the processes of maturation and forced by never-ending changes in the environment from the outside, a person's ego identity is always on the make.

Against this background, Erikson views psychosocial identity as "an evolving configuration of roles" that is *forever* revisable (1968, p. 211). However correct this account may be, it presents a dilemma insofar as identity implies continuing *sameness*, not incessant change. It is true that for most of us, for the most part in our lives, we experience a sense of being *one* and the *same* person despite having multiple and continually changing images of the self. Indeed, the loss of the sense of unity and sameness is a form of pathology that happens in the relatively rare cases of split personality and of selective forgetting called the *amnesic fugue*. Erikson admits that we can only get a *sense* of sameness – rather than actually discovering a principle of selfsameness on which our identities can be firmly grounded. He adds, however, that "there is in fact in each individual an 'I,' an observing centre of awareness and of volition, which can transcend and must survive the psychosocial identity" (Erikson 1968, p. 135). However, he did not – or could not – explain what a "centre of awareness" is like and whether it is open to direct experience. Like the "numerical identity of the self" spoken of by Immanuel Kant (1781/1966, p. 259), the idea of "centre of awareness" remains a mere postulate which, as William James

[2] An overview of some early developments in the use of the concept of ego boundaries in psychoanalytic literature may be found in Landis (1970). Working within the framework of Jungian analysis, Rosen (1993) talks about the symbolic death of the ego among suicidal patients and describes a therapeutic strategy for the integration of their lost ego with the Self. The similarity of these ideas with the overcoming of the ego in Self-realization described in this chapter is superficial, so further comparison of such approaches is avoided.

had noted, can neither be verified nor do any useful consequences follow from its postulation (1899/1983, pp. 343–344). We shall return to this issue later in this chapter.

The question "what, if anything, remains unchanged within the individual throughout life?" is an important question that has been addressed by many great thinkers over centuries. It is important, *first*, because the idea of continued sameness of a person is foundational in law and ethics. Clearly, it is only the same person who is witnessed in conducting a crime can be punished for his infraction. *Second*, the lack of a clear definition of what accounts for the sameness in us, we are at a loss to know *who* ceases to exist upon death – and this implies that a deeply existential dilemma remains unsolved. It is precisely this dilemma that psychology in India has tried to address. As an instance of such an inquiry, we may cite the example of Ramana Maharshi (1879–1950), who embarked on a rigorous path of self-realization upon realizing the prospect of his own death while witnessing in his youth the death of an old man. By and large, psychology in the West has valued change and presumably assumed the possibility of *perpetual progress*. This is reflected in the emphasis on self-*actualization* in the Western tradition from Aristotle in ancient Greece to Abraham Maslow in modern America. For, by "actualization" is meant the manifestation of a hidden potential by way of some worldly *accomplishment* in one walk of life or another, and there is no end to potentials that may remain hidden within a person! Standing within this tradition, Erikson, like Carl Rogers (1961), speaks of "Becoming" – a process where one always continues to transform into something *different* from what one has been till the present, without ever finding out what one must have been, and will forever *be*, in the future. In contrast, the emphasis in Indian Psychology has been on "Being", i.e. on finding the unshakable basis of sameness or on figuring out who one has been and would remain forever.

In the balance of this chapter, I wish to show that the discovery of the basis of selfsameness in persons involves *overcoming* the continually changing ego boundaries. To that end, I shall show how the idea of ego boundaries has appeared in either explicit or implicit manner in various sources of Indian Psychology from ancient to recent times, indicating the various methods designed to transcend the boundaries so as to attain the true Self with bliss, unselfishness and limitless compassion.

3.1 The Conceptualization of Ego Boundaries in the History of Indian Psychology

In a well-known hymn of the *Ṛg* Veda called the *Nāsadīya Sūkta,* a sage speculates that at the origin of the universe, there was something single and undivided that mysteriously became aware of its being alone, and there arose a desire to become many. This single primeval entity is often designated as Brahman which, although essentially indescribable, has been thought of as having three fundamental characteristics: Existence (*sat*), Consciousness (*cit*) and Bliss (*ānanda*). When the undivided *One* split itself into *Many*, consciousness which pervaded the entire Existence got reflected in countless centres of awareness in separate living beings. This story of genesis implies that, in the process of multiplication, individual centres of awareness got "trapped", as it were, in the limited bodies of individual organisms. The *Kaṭha Upaniṣad* (2.1.1) follows this view of genesis to suggest that individualized consciousness "pierced the openings (of the senses) outward" in the boundaries of the organisms, thereby opening avenues for interaction with the world outside. Needless to say, the idea of ego boundaries is implicit in the scenario thus conceived.

The *Kaṭha* Upaniṣad makes interesting observations that follow from this world view: It suggests that, given such origination, consciousness in individuals is normally directed outward, rather than inward. It adds (in 2.1.1): "Some wise man, however, seeking life eternal, with his eyes turned inward, saw the Self".[3] Note the reference in this quote to "seeking life eternal". It implies that, to discover the principle of selfsameness, it is necessary to turn one's attention *inward*; the common tendency to look outward only helps comprehend the continually changing world of objects (including various aspects of self-as-object). This initiative for inward looking in this ancient Upaniṣad has been followed up in the history of Indian thought, resulting in a wide array of meditative techniques in search of self-knowledge.

3.2 Overcoming of Ego Boundaries in Patañjali's Yoga

One of the most widely known techniques of meditation is the one described by Patañjali in his Yoga aphorisms (see Taimni 2007). Although Patañjali's account of the eight steps to Yoga does not explicitly use the metaphor of ego boundaries, those steps are interpretable in the language and idiom of ego boundaries. Thus, the two initial steps, which involve ethical guidelines for one's conduct, can be seen as involving managing behaviour across the boundaries between the self and others. The proscription of stealing (*asteya*), for instance, implies that in embarking on the path of Yoga, one should not overstep one's own boundaries and violate the boundaries of anyone else by taking anything from his or her territory. While the various postures involve managing the contours of one's body in three-dimensional space, the breathing exercises require controlling the transactions across the body's boundaries in the biochemical sphere. Then comes the more important step called the *pratyāhāra*, which requires an adept to turn attention inward and remain within the boundaries of one's mental sphere. The next step (called *dhāraṇā*) requires the adept to avoid jumping from one object of thought to another, thus restraining the

[3]Unless otherwise stated, translations of Upaniṣadic words given here are adopted from Radhakrishnan (1953/1994).

mind to a narrower part of the mental sphere. Once the adept learns to remain steadily focused on a single object of thought for a length of time, he or she is said to enter the inner domain of consciousness called the *Samādhi*. This domain involves a graded series of higher states of consciousness. According to Patañjali (1.43), there are three basic levels of *Samādhi*: 1, *lower* level based on the *object* of cognition; 2, *middle* level based on the *means of knowing* such as the imagery involved in thoughts about the object; and 3, *higher* level focused on the *knower*. The adept can then focus on the self-as-subject (*draṣṭā*) at the centre of awareness. Thus, a yogi can be said to penetrate through various layers of the inner domain so as to ultimately rest on the centre of awareness. This description evokes the imagery of a series of concentric circles with successively narrowing boundaries that need to be penetrated so as to ultimately reach the innermost point – or the centre of awareness.

The traditional form of Yoga described by Patañjali has been practised, variously improvised and interpreted and continues to be taught from generation to generation. In the early 20th century, for instance, Sri Ramana Maharshi (1879–1950), a modern sage and saint, prescribed a technique of meditation somewhat different from that of Patañjali's Yoga, but effectively leading to the same outcome. He repeatedly suggested that one should focus on where the "I-thought" comes from and abide there. This implies focusing on the "I", which lies at the centre of awareness, and *staying* focused at that point for a sustained period of time. Numerous sages and saints in history have accomplished such a feat and have described their experience. Tukaram, a 17th century saint-poet from Maharashtra, has described his experience as follows:

> Tinier than an atom, Tuka is as large as the skies
>
> I have swallowed my own corpse, the basis of world-illusion
>
> The trilogy of knower, knowledge, and the object of knowledge is transcended
>
> A light is lit in the clay-pot called the body
>
> What remains of me now on is for others, says Tuka
> (poem #993; paraphrased by A.C.Paranjpe)

All this expression is surely enigmatic, but in my view it makes sense if interpreted in the language of ego boundaries. Here, Tukaram is essentially describing what happens when one *stays* at the centre of awareness. As noted in the above account of the journey of a Yogi, one must turn to the inner world lying within the boundaries of the ego, so to speak, and penetrate the various layers of ordinary consciousness so as to ultimately focus attention on the centre of awareness. Unlike the body, which has physical extension, and the ego which extends to areas of the social and ideational spheres, the "centre" is a *point* which, like its definition in geometry, has *no extension*. In the process of reaching the innermost regions of the mind, the ego's boundaries have successively contracted, as it were, so that the "me" is ultimately "tinier than an atom" as Tukaram puts it. But at the same time, the ego boundaries have continued to contract so as to ultimately disappear. To put it differently, the ego is *dissolved* into the ubiquitous One (the Brahman) resulting in the experience of being "as large as the skies"!

The paradoxical nature of feeling tiny and huge at the same time has led the accounts of such experience in being dubbed as "mystical". In another poem Tukārām (1973, # 2669) describes his experience in equally enigmatic terms. "I witnessed my own death" he says, which is consistent with the expression of "gulping his own corpse" mentioned above. Further, he adds in the same poem that his experience was a moment of incomparable joy, an occasion to celebrate! This kind of "dying" is no occasion to mourn! Surely nobody can witness the death of one's own body; the expression must be understood metaphorically and not literally. In the same poem Tukaram explains that the boundless joy resulted from discarding the narrowly conceived ego (*ahaṁkāra*) which he had been clinging onto in the past. It is said that such experiences do not last for long periods of time. However, they have lasting consequences on the subsequent life of the experiencer. Thus, Tukaram no longer felt attached to the narrow sphere of his body, his possessions and his social roles and some limited sphere of the "we". The dawning of this insight had relieved Tukaram from everything within the domain of his "ego identity" to use an Eriksonian expression. This in turn implies that there is no ego with egotistic strivings; there is no limited sphere of the "me" and "mine" that he would want to protect, embellish and enhance. All selfishness is gone, and therefore life after arrival of this insight is not to be lived *for the sake of* a narrowly defined self or ego. Limitless compassion and genuine altruism is then a natural consequence. The biography of Tukaram, like the biographies of similar saints, provides evidence for his infinitely compassionate behaviour towards others around him.

3.3 Insights from the Muṇḍaka Upaniṣad

The boundary metaphor is found in a different form in the *Muṇḍaka Upaniṣad*. It speaks of ego boundaries in its own distinctive way thus: "The knot of the heart is cut, all doubts are dispelled and his deeds terminate, when He is seen – the higher and the lower" (*Muṇḍaka*, 2.2.9). This again is a metaphoric expression that needs some explaining. It is my understanding that here the reference to the heart does not imply a physical organ, but something that is "at heart" for most of us, namely, the ego or everything that lies at the core of the "me". Our convictions such as "I am this body" and "this is MY property, MY family, MY country" and so on imply specific *regions* of the physical and social worlds with which we identify, thereby defining the boundaries of the ego. It is important to note in this context that elsewhere in the text, the *Muṇḍaka* (2.1.10) refers to the knot of the heart as the "knot of ignorance" (*avidyā granthiḥ*). Here *avidyā* implies *misconceptions* of the nature of the Self. In other words, it implies one's self-definitions or feelings of being identified with varied notions of what William James called the self-as-object: one's body and possessions, social roles and reputation, one's chosen ideas and beliefs and so on.

This idea is interpretable in light of certain developments in modern psychology, especially Anthony Greenwald's (1980) view of the ego as a knowledge organization, which he has characterized as "totalitarian". Giving the analogy of political ideology on the one hand, and science on the other hand, Greenwald points out that the ego, as a knowledge organization, evinces conservatism – or resistance to change. The ego, in other words, clings to once-formed beliefs even as scientists and political ideologues try to resist change. Metaphorically speaking, once a rope is tied around a set of beliefs and assumptions considered "mine", it is hard to untie the knot. And that is the challenge that the *Muṇḍaka* speaks about.

According to the Upaniṣads, the way to "cut the knot of the heart" – or to transcend the boundaries of the ego – is to discard the misconceptions of the self (called *avidyā*) and attain the correct knowledge of the Self (called *vidyā*). Although *avidyā* is commonly translated as "ignorance" and *vidyā* as "knowledge", in the Upaniṣadic tradition they are technical terms with specific meanings. According to the *Īśāvāsya* (#14) and the *Śvetāśvatara* (5.1) *Upaniṣad*s, *avidyā* refers to knowledge of perishable things (*kṣara*), while *vidyā* is the Knowledge of the imperishable (*akṣara*). The former implies knowledge of objects in the world, which are perishable, and their knowledge is *contingent* on who sees what under what conditions and is forever *revisable* – as in the case of scientific knowledge. The latter, or *vidyā*, on the other hand, is about that which never decays or changes. In the context of the self and ego, this means that *avidyā* involves not "ignorance", but knowledge of continually changing aspects of selfhood, which pertain to the ego and given its continually changing boundaries on multiple fronts, remains forever revisable as Erikson clarifies. In contrast, *Vidyā* implies the experience of the self-as-subject at the centre of awareness, which never changes; like the "I" it remains selfsame through the entire life cycle. As the *Māṇḍūkya* Upaniṣad shows, such "Knowledge" is attained in the Fourth State of consciousness (*turiyā*) or the highest state of Samādhi that Patañjali's Yoga speaks of.

From the point of view of the Upaniṣads, the major challenge in life is to figure out the unshakable foundation of selfsameness that lies behind the screen of the continually changing images of the self. In the language of the *Muṇḍaka*, this challenge involves "cutting the knot" of false (read changeable) self-definitions which tie down the ego to a specific region (social, ideational, etc.) with fortified boundaries. In the process of growing up in society, we are provided a name, a periodically changing set of social roles to play and a code of conduct to abide by. Thereby we get attached to and become identified with a niche in the society with relatively defined boundaries. We are rewarded in various ways for behaving within legitimized boundaries and are punished for breaking out of those boundaries; we are "conditioned". The *Muṇḍaka* suggests a process of *deconditioning* to help overcome the limits imposed by such boundaries. It uses the language of "karma" traditionally used in Indian thought to express the basic "law of learning" stated in the context of the Doctrine of Karma (*karma siddhānta*). According to this doctrine, it is a natural law that in the long run (read across life cycles) each individual being is justly rewarded for his or her good deeds and punished for bad deeds (for a brief account of the Doctrine of Karma, see Potter 1964). Muṇḍaka uses the expression "deeds terminate" (*kṣīyante cāsya karmāṇi*) to indicate the *deconditioning* of the self-definitions that one has been conditioned to believe in as a result of social learning since childhood. What follows from this is that the person is liberated from the boundaries imposed by identifications with varied self-definitions. The *Muṇḍaka* (2.2.12) further explains that, thus liberated from the "knot of the heart", one experiences vastness of the Self in the following way: "In front is Brahman, behind is Brahman, to the right and to the left. It spreads forth below and above".

When Tukaram said that he is vaster than the skies, he was affirming the discovery of the limitlessness of the Self indicated by the words of the *Muṇḍaka* just quoted. As long as one is stuck with common self-definitions that serve as ego boundaries, one experiences being a *part* of the surrounding world. Upon cutting this knot, the perception reverses from being part of the world to the world being part of the Self. Sri Aurobindo (1972–1950), a modern sage, describes such an experience in the following words: "... the whole world is felt in oneself and oneself suffused through the world ... The separate ego either does not exist or is only a convenience for the Universal Spirit ..." (Sri Aurobindo 1970, p. 1605). Such experiences are rare, but clearly *possible* as evidenced by several Self-realized individuals throughout history. There is no reason to discount the veracity of their accounts, especially given the ample evidence of selflessness of such persons; they had not axe to grind in saying such things. For many of us who do not have similar experiences, claims to having experience of the world being part of the Self – rather than the other way around – may sound not only odd but may even appear to be indicative of some form of pathology. It would therefore be useful to take a close look at the behaviour of persons who are said to have attained the experience of Self-realization. This we can do after considering some other examples of the loss of ego boundaries that appear in Indian Psychology.

3.4 Emptying of Conscious Contents in Higher States of Consciousness

The *Māṇḍūkya Upaniṣad* explains the nature of a higher state of consciousness called the Fourth State thus: "[It is] unseen, incapable of being spoken of, ungraspable, without any distinctive marks, unthinkable, unnameable, the essence of the knowledge of the one self ... peaceful, the benign, the non-dual ..." (Stanza #7). The nature of the experience of the Fourth State is *unspeakable* because it dawns when all thinking is brought to a stop, the mind is silenced and the contents of consciousness are depleted. Patañjali and his commentators describe the step-by-step process whereby, upon the successful practice of Yoga, the contents of consciousness that constitute the normal cognitive states are dropped one after another (for a detailed discussion of this issue, see Paranjpe 1984; n.d.).

To help understand the process of depletion of the contents, let us consider the nature of the ordinary wakeful consciousness which exists at the time of the beginning of concentrative meditation as described by Patañjali. In the state of ordinary wakeful consciousness, one may be thinking of a simple object such as the cow, for instance. In common experience, even if we try to focus on a particular object, one tends to keep jumping from one thought to another thought of the same object in a process commonly described as *free association*. One could, for instance, begin with the thought that "I bought this cow a year ago" and quickly switch to another thought "Would it not be nice if she gives as much milk as the seller promised?" – and then switch on to another thought, and yet another till perhaps one falls asleep. Now suppose that one is effective in avoiding switching, and focus instead on a particular thought about this object, say: "The cow is a sacred animal". An idea such as that of sacredness would involve a *connotative* meaning culturally imposed on the object and shared by the thinker (it is conceivable that a person raised on the Canadian prairies – rather than in India – would think of it not as sacred but simply as an animal fattened for its meat). According to Patañjali and his commentators such as Vyāsa and Vācaspati Miśra, such connotative meanings are first to be dropped from mind when one moves on to the next higher stage of meditation. As one advances to the next higher stage of meditation, it is the *denotative meaning* of the object focussed on that gets dropped out from the mind's contents. This means that the notion "this cow" imposed on the figure of a creature is dropped, and what remains is a visualized figure distinguished from the background of a pasture. Subsequently, it is claimed, the yogi's mind is rid of the sensory contents that constitute the perception; the mind is emptied of all of its contents. What remains then is "pure consciousness" devoid of content. Attention is then ready to be drawn to the centre of awareness. According to Patañjali (1.3), it is under these conditions that the Self is revealed in its pristine state (*tadā draṣṭuḥ svarūpe avasthānam*).

All this is not easy to understand primarily because such experience is uncommon. A second reason for the difficulty in understanding this is that the process of depletion of the contents of consciousness implies the *virtual reversal* of the process whereby we, all human beings, develop cognitive processes and acquire varied mental content staring from early childhood. Note that at birth an infant is equipped merely with sense organs with capacity to see, hear and so on, with the addition of a capacity for perceiving objects against their backgrounds. We may grant, for instance, that a newborn baby is able to perceive a nipple against its background of the nursing mother's breast. However, perception of varied objects delineated against their respective backgrounds must develop only gradually over a period of time. As is common knowledge, infants often perceive all four-legged animals as a common category without being able to distinguish a cat from a dog and so on. The development of denotative and connotative *meanings* must follow the perception of objects during the course of development. It is only after the delineation of furry four-legged creatures into cats and dogs that cognition of distinctive classes develops, with their respective linguistic labels. It is after such a step that connotative meanings such as the notion of loyal commonly get attached to dogs rather than cats and so on. It should now be clear how yogic meditation involves the virtual reversal of the process of cognitive development.

Let us now see how the experience of pure consciousness helps in self-knowledge, mainly in terms of the selfsameness issue. The key is to understand that the "I", lodged in pure consciousness, retains and ensures continued experience of selfsameness, while the ego keeps continually changing with twists and turns in life. Here a metaphor borrowed from modern psychology might help. In one of his minor writings, Freud (1925/1953) presents the metaphor of a "mystic writing-pad", a children's toy in which a translucent sheet of plastic is placed on top of a black waxed surface. Anything written with a stylus on the translucent sheet shows up and can be read as long as it sticks onto the waxed surface below. However, when the top sheet is lifted up, the writing disappears displaying the clean translucent sheet devoid of any content. Mind, it may be said, is similar to such a toy in that the "I" is lodged in the translucent sheet which is unaffected by the matter written and endlessly rewritten, including the content representing the changing images of the world and of the ego within it. The changing images pertain to the ego that identifies itself with the changes in the self-as-object. One feels normally identified with one's body image in the mirror and with one's "images" reflected in the looking glass of the significant others' eyes – as C.H. Cooley (1902/1964) would have it. The boundaries of the ego are defined by the contours of the images of the self that keep changing: from the face without beard to that after it grows, from the image of the unmarried self to the one after the wedding or from the one that had lost its face in shame while failing to do something to the one who has recovered her pride upon attaining success. While the contents of ordinary states of consciousness keep changing, pure consciousness that is devoid of content remains unaffected by such changes, thereby ensuring lifelong experience of selfsameness.

In Indian thought, special attention is given to develop various methodologies for Self-realization through different techniques of meditation. The grammarian philosopher Bhartṛhari, for instance, describes what is called *Śabdapūrva Yoga* in which meditation begins with normal speech with words going through one's mind, then moves through middle (*madhyamā*) and higher (*paśyantī*) stages of increasingly abstract levels of thinking, till one reaches the transcendental level (*parā*), at which point the transcendental Self is revealed in pure consciousness (for an account of this type of Yoga, see Sastri 1980).

3.5 Notions of Ego Boundaries in the Advaita Vedānta System

In *Vivekacūḍāmaṇi* (stanza #139) Śaṅkara (1921) uses the metaphor of a moth in its cocoon to convey the notion of an ego encased within its (self-defined) boundaries. Even as a moth creates a cocoon made of a yarn produced from its own body, a man fabricates notions of himself and of the world he belongs to and lives in this self-created world, feeling protected and well nourished. Needless to say, the notion of ego boundaries is implicit in Śaṅkara's metaphor of man as a moth in its cocoon. We may see echoes of this view in the social and cognitive constructionist perspectives in contemporary sociology and psychology (Mead 1934; Markus 1977). Elsewhere (Paranjpe 1998) I have discussed the parallels between Śaṅkara's perspective and varieties of modern constructivism, so I shall not repeat the discussion here. There is however a major difference between constructivist views of the self in Śaṅkara when compared with modern perspectives: Unlike most modern thinkers, Śaṅkara suggests a workable solution to the problem of what can we *do* with ego boundaries that we tend to erect around ourselves.

Śaṅkara, following the *Bṛhadāraṇyaka* Upaniṣad, suggests a programme of meditation involving (1) the *study* of the fundamental tenets of the Advaita Vedānta system (*śravaṇa*), (2) the critical examination of those tenets (*manana*) and (3) getting fully absorbed into contemplation (*nididhyāsana*) till one ultimately slides into a higher state of consciousness (called the *Nirvikalpa Samādhi*). As Śaṅkara's followers (e.g. Dharmarāja, 17th century/1972) explain, the meditation specifically involves a relentless critical examination of each and every self-definition with a specific mandate to see whether it is open to change or it must remain changeless (*nitya-anitya viveka*). As explained in *Dṛg-dṛśya Viveka* (n.d./1931), a text of uncertain authorship well known as a treatise on the principles of the Advaita Vedānta, what always remains unchanged through the passage of life is the self-as-subject (*dṛk, draṣṭā*) and not the self-as-object – to put it in the language of William James. Self-as-subject is the experiencer whose nascent form is revealed in experience when one withdraws attention from all objects of thought and *stays* in a sustained manner at the centre of awareness.

William James (1890/1993), the father of the modern phase of Western psychology, discussed in detail the issue of personal identity, i.e. the question of what, if anything, remains unchanged in a person across the entire life cycle. He came close to accept as solution to this problem Immanuel Kant's notion of the Transcendental Ego. However he pointed out (rightly in my opinion) that in Kant's *Critique of Pure Reason,* the notion of the Transcendental Ego is a mere postulate designed to demonstrate that we must *assume* the continued existence of an unchanging self-as-knower or else we would have to deny the very possibility of knowledge in any form. Knowing, in Kant's view, inevitably implies making judgments, and to be able to say whether A is, or is not, B, the knower *must* remain unchanged. For, if the knower K1, who comprehends A, is replaced by a different knower K2 by the time B is comprehended, who is there to judge whether they are similar or different? Although convinced about such reasoning, James was not willing to accept a mere postulate without any *empirical* support – and surely the Transcendental Ego is *not observable* as is the body or are the events confirming one's social existence. Besides, James, the quintessential pragmatist, found no utility in real life following from the Kantian postulate. So, on the grounds of verifiability and utility, James (1890/1983) rejected the Kantian notion of the Transcendental Ego to be "as ineffectual and windy an abortion as Philosophy can show" (p. 345).

Here we may again turn to Indian thought and note that similar objections do not apply to the claims of unchanging nature of the Self experienced in pure consciousness. First, the various techniques of meditation, whether that of Patañjali's *Dhyāna Yoga*, Bhartṛhari's *Śabdapūrva Yoga* or Śaṅkara's *Jñāna Yoga*, each offers a practical and effective method for the direct experience of the Self-as-subject, which offers its *experiential* (if not empirical) verification. Besides, various Indian sources, from the ancient Upaniṣads to modern sages like Sri Aurobindo and Ramana Maharshi, explain and demonstrate the practical utility of Self-realization in life. To this issue we may now turn.

3.6 Life After Self-Realization

It should now be clear that, as indicated by the *Muṇḍaka* Upaniṣad and as poetically conveyed by saints such as Tukaram, one has to effectively erase, or at least overcome in one way or another, one's ego boundaries to be able to directly experience the Self and thereby attain Self-realization. But didn't Federn warn us about the pathological consequences of even the weakening – let alone the erasure – of ego boundaries? Yes indeed he did, and it makes sense to see the logic behind the argument. For, if the ego is unable to fence off the intrusions from the "blind" id impulses, then the totally unconstrained instincts would mean *depersonalization*, i.e. turning a civilized human being, who would normally follow civic constraints on his behaviour, into an "animal" that knows no such constraints. But here it is important to remember that, as suggested before, Federn's concern was about the ego's boundaries on the frontiers of the unconscious, whereas the concern in Indian Psychology has been about its frontiers with the higher states of consciousness.

We need to remember here that the job of a psychoanalyst is primarily to help patients to develop a strong ego that can effectively channelize the impulses which, for want of adequate control, may lead to obsessive-compulsive behaviours, anxiety, depression or other forms of pathology. In contrast, spiritual guides teaching one or other form of yogic meditation are not expected to deal with patients needing such help. Their "clients" are spiritual seekers who are presumably able to function normally in society and are seeking some higher states of functioning, possibly Self-realization which is the putatively highest state of human functioning. Indeed, textbooks of Yoga such as Patañjali's Yoga aphorisms, or manuals of Advaita such as Dharmarāja's *Vedānta paribhāṣā,* stipulate the qualities of persons wishing to start their prescribed form of meditation. A person wishing to embark on the path of Patañjali's Yoga, for instance, must *begin* her enterprise with practices indicating high levels of self-control as in avoiding injury to others (*ahiṁsā*), not stealing others' property (*asteya*) and sexual abstinence (*brahmacharya*). Surely this would mean having a strong ego that effectively controls acquisitive, sexual and aggressive impulses. In the highest form of *bhakti*, or religious devotion (called *ātmanivedanam*), the devotee is supposed to voluntarily surrender one's ego. It is only an ego in control of itself that could possibly cede control and completely surrender itself to a deity; surely one cannot give away what is not in one's possession. But assuming that, as a devotee (*bhakta*), one has surrendered one's ego, or through meditation has transcended one's ego boundaries, then what kind of a life would that person live?

Let us now return to Sri Aurobindo, who is said to have successfully practised the major forms of Yoga and concluded that (as quoted before) "The separate ego either does not exist, or is only a convenience for the Universal Spirit" (1970, p. 1605). Herbert Fingarette, while describing the life of mystics, said: "He [a mystic] suffers, enjoys, knows pain and pleasure, but he is not driven and dominated by these" (1958, p. 26). The highest state of *Samādhi*, in which the true nature of the Self is discovered, may not last for a long time; she or he returns to the state of normal wakefulness. However, in the case of the most highly spiritually advanced persons, the behaviour *after* the experience of Samādhi is radically different. The *Muṇḍaka* Upaniṣad explains the situation metaphorically, suggesting that it is like two birds on a selfsame tree: While one of the two birds eyes the fruit and enjoys its sweet or bitter taste, the other bird simply witnesses what is happening in the surrounding world. What this metaphor implies is that a Self-realized person remains firmly grounded in the unchanging Self as an uninvolved witness while functioning normally in daily life. With a cultivated sense of detachment, she or he remains unaffected by the ups and downs in the travails of daily life, while at the same time she or he is able to adequately play various roles in society without loss of the capacity to feel pleasure and pain as appropriate to the occasion.

The behaviour of a Self-realized person is like that of a person with stable intellect (*sthita-prajña*) described in the *Bhagavad Gītā* (2.55–72): a person who retains emotional equanimity through the rough and tumble of life. A person who has attained such a state has one foot in the transcendental domain and the other in the mundane domain, so to speak. She or he is *in* the world, but not *of* it, like a lotus leaf, remaining in the water without getting wet. Needless to say, overcoming the boundaries of the ego leads to a highly desirable state of Being, not pathology!

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Chapter 4
Converging on the Self: Western Philosophy, Eastern Meditation and Scientific Research

Jonathan Shear

4.1 Introduction

Questions about the nature of self have always been central to Western philosophy. Descartes held knowledge of the self to be the "Archimedes point" of all knowledge, Hume held it to be the "capital or centre" of all human understanding, and Kant held it to be the "supreme principle" of all employment of the understanding. Despite its importance, self-knowledge has proven very elusive. One might at first wonder why this should be. From the perspective of common sense, it would seem that there is nothing we are better acquainted with than our own selves. What could be more obvious than the fact, for each of us, it is *I myself* who am having my present experience, was there in all my remembered past experiences, and participates in every experience I even imagine having? Yet, it has been extremely difficult to discover just what this "I" supposedly continuing throughout one's conscious experiences might be. And after centuries of searching, the consensus among modern Western thinkers is that nothing in our experience actually corresponds to this idea of self. So the idea itself, despite its seeming naturalness, would seem to be some kind of empirically vacuous "fiction". Common sense, of course, finds this unpalatable. This, in effect, is the philosophical "problem of self".

In what follows we will explore this problem in a variety of ways. A brief discussion of some common types of dreams will illustrate how difficult it is to locate anything in experience that could correspond to our ordinary idea of a self that continues throughout all of our experiences. We will then see how Descartes, Hume and Kant's analyses of self both clarify the logic of this difficulty and appear to imply that nothing in our experience could *ever* correspond to our ordinary idea of self. We will see nevertheless how Eastern meditation traditions report

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*,
DOI 10.1007/978-81-322-1587-5_4, © Springer India 2014

experiences, said to be locatable at the depths of inner awareness, which appear to fulfil otherwise unfulfillable criteria for self derivable from Descartes, Hume and Kant. The empirical significance of these reports will be examined in terms of analyses of their content and the existence of unusual physiological correlates, including correlates linking the experience with brain mechanisms held to underlie our ordinary notions of self.

4.2 The Problem

It might seem obvious that each of us has a self that continues throughout all of our actual and possible experiences. Indeed, common sense would hold that we know this from experience. Nevertheless, it has proven very difficult to locate anything in experience that corresponds to this idea of self or even define the idea in terms of things we do experience. One does not need any special training to see why this should be the case. Consider, for example, the following observations. People sometimes think of themselves simply as being their bodies. But people easily can, and often do, imagine they can exist independently of their bodies. Belief that they can do this (whether via reincarnation or in heaven) is a tenet of most religions. In addition, many people remember dreams in which they experienced themselves as inhabiting a body different from their real one. Yet the dreams are remembered as ones in which *they themselves* were acting and experiencing, despite the absence of any perceived or even conceived association with their real bodies. These dreams show that ordinary people naturally have a core pre-reflective sense of self felt to be capable of existing independently of their bodies and thus not definable in terms of them.

Attempts to identify the self with one's personality encounter similar difficulties. People often remember doing things in dreams that, as the common expressions puts it, they "would never dream of doing". What this means, of course, is that they found themselves doing things outside the boundaries of their personalities as they conceive them, indicating that a core component of people's pre-reflective notion of self appears to be independent of their own notions of their personalities as well as their bodies.[1]

Another common type of dream reinforces both of these observations. Here people remember seeming to be a bare observer, with no body, emotional responses or discursive thoughts, much like a disembodied video camera. Yet, they nevertheless report a clear sense of *being there* observing the dream action, even though it seems

[1] Young people, especially in affluent societies, often spend considerable time fantasizing about what kind of person they would like to be and imagine and try out various types of personalities. This in itself shows there is a basic notion of self felt to be independent of the imagined personalities. For what is wanted is not the mere existence of the imagined personalities but that the person doing the fantasizing, who already exists, should *have* them and enjoy them *for* himself or herself.

entirely unclear *what* this self might be, and whether it could ever be characterized as anything other than mere (disembodied and "impersonal") observer.

Such dreams serve to illustrate in a rough and ready way how difficult it is to capture our ordinary notion of self in terms of such things as body, personality and other contents of experience. The careful work of philosophers such as Descartes, Hume and Kant, as we will next see, goes much further. For it provides strong reason to think that all attempts to capture the notion of self in this way are necessarily doomed to failure. This result has appeared highly problematic for centuries. But, as we will then see, it need not appear at all negative when viewed in the light of experiences reported by Eastern meditation traditions.

4.3 Western Philosophy

In his foundational *Meditations on First Philosophy*, Descartes reported withdrawing his attention as completely as he could from sensory awareness and sense-oriented thought, and observing that the one thing he could be absolutely certain of was his existence as a conscious being.[2] This result is widely regarded by philosophers today as a product of flawed reasoning. Descartes, however, explicitly denied that it was a product of reasoning at all, insisting instead that this self-awareness was given in a simple "intuition" that the mind "sees", "feels" and "handles".[3] His experiential language could hardly be clearer. Upon reflection he concluded that this simple conscious self had to exist throughout all his conscious experience. He also concluded that it was outside the range of the senses and sense-oriented thought and thus unimaginable. This idea of the self as single, simple, continuing and beyond the grasp of the senses appeared then, as now, to resonate with a core component of people's ordinary intuitions, and the *Meditations* quickly became influential throughout the Western intellectual world.

A century later Hume's observations, first published in his *Treatise on Human Understanding*, called Descartes' position strongly into question. Hume reported that when he looked within all he ever observed were discrete, ever-changing, sensory-oriented mental contents. He concluded that the seemingly commonsensical notion of a simple unchanging continuing self was completely unsupported by experience, a mere, if naturally occurring, "fiction" that did not actually refer to anything at all. He then attempted to account for the idea by means of his

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[2]This is Descartes' famous "*cogito ergo sum*". While Descartes' "*cogito*" used to be translated as "I think", Descartes himself made it clear that he intended us to understand the term to indicate what we now call "being conscious", rather than merely "thinking", including such things as willing, sensing and imagining in addition to various types of thinking. Compare, for example, Anscombe and Geach's now widely used translation of the *Meditations* in their *Descartes: Philosophical Writings* (1971) and their "Translators' Note" (1971: xlvii–xlviii).

[3]Compare Descartes' own "Replies to Objections" and "Letters", quoted in *Descartes: Philosophical Writings*, Appendix I (Anscombe and Geach 1971: 299–301).

associationist theories of how mental contents naturally interrelate. By the time his hugely influential *Treatise* went to press, however, Hume felt constrained to report in the book's "Appendix" that he had rejected his own account of self, and he declared that the issue was too difficult for him to resolve.[4] Nevertheless he reiterated his introspective conclusion that nothing in our experience appears to correspond to Descartes' seemingly commonsensical notion of a single, simple, continuing self. So far, then Descartes and Hume seem directly opposed.

A century and a half later, however, Kant, in his famous *Critique of Pure Reason*, strengthened *both* Descartes *and* Hume's conflicting positions. Kant first pointed out that our experiences are not just zero-dimensional logical points; they are all *extended*. (No one, e.g. could see a coloured patch that had zero area or have an experience or thought that had zero extension in time.) Thus, for an experience to exist at all, all of its parts, whether temporal or spatial, have to be experienced by *one and the same* experiencer. For unless all of its parts were experienced *together* by some person, something of it would always be missing in every person's experience, and *that* particular experience would never be had by anyone.[5] Furthermore, since experiences are all extended in time (no one can experience something of zero duration), this means that a single self-identical experiencer has to continue throughout the time of each of his experiences. Reasoning in this way, Kant concluded that the continuing existence of a single, continuing self-identical self is not only *absolutely necessary* for experiences even to exist but also that the unity of the self is the "*supreme principle* of all employment of the understanding" (Kant 1964: 165). Kant's support for this aspect of Descartes' account of self could hardly be clearer.

Nevertheless, Kant paradoxically also strengthened Hume's critique of the very idea of such a self. Hume's critique, based on introspective examination, was empirical in nature. And staunch empiricist that he was, he explicitly left open the possibility that other people might be different enough from himself that *they* might be able to discover introspectively something corresponding to the natural idea of a single, simple, continuing subject of all of one's experiences. Kant went beyond this purely empirical observation and offered logical arguments to the effect that no humanly conceivable experience could *ever* be discovered corresponding to this idea. For the very fact of being, the subject of (every part of) all of one's possible experiences implies that the self cannot be characterized by any "empirical quality" or "special designation" at all. Kant's reasoning here is often difficult. But the basic idea is easy enough to follow. If there *were* some empirical quality that characterized the presence of the self, every part of every experience would have that quality (just as every visual experience would have to be yellow if one's glasses were yellow). And if every experience had that quality (yellow), it could not serve as

[4]"For my part, I must plead the privilege of a skeptic, and confess that this difficulty is too hard for my understanding" (Hume 1978: 636).

[5]Thus, for example, consider an experience of a hand with all five fingers visible. *That* experience would not exist if no one saw all five fingers together, even if all the fingers were seen by several people separately.

a "special designation" distinguishing experience of the self from other experiences (identifiable by virtue of being non-yellow).

Another way of seeing this is to note that it is the nature of all qualities properly referred to as "empirical" (e.g. yellow, sweet) that they can be *either* present *or* absent in any given experience. That is an essential part of their usefulness—they distinguish between different things and experiences.[6] So given Kant's (commonsensical) position that the self necessarily has to be present at every part of every one of one's experiences (or it wouldn't be *one's* own), it is not hard to see why he would conclude that the self could only be empirically *qualityless* "pure consciousness," with no special empirical designation of its own.[7] Furthermore, he reasoned, if it has no special empirical quality or designation of its own, it can *never* be experienced, since experiences are all composed of such qualities. And since it has no qualities of its own, we cannot ever even form a significant concept of it and are constrained to thinking of it vacuously as a blank, unknowable "something = X".

In sum, while Kant strengthened Descartes by arguing that the self as single, simple and continuing throughout all of one's experiences is *the necessary precondition of all experience and thought*, he also paradoxically strengthened Hume, Descartes' strongest opponent. For while Hume concluded that he himself could never find anything in experience corresponding to the self, Kant argued forcefully that *no one* could *ever* experience or know it (Kant 1964: 157).[8]

Kant was so disturbed with this result that he called it a "paradox" that "mocks and torments" even "the wisest of men" (Kant 1964: 328). No theory of self after Descartes, Hume and Kant's conflicting analyses has been able to gain general acceptance in Western philosophy, leaving a profound gap at its core.

4.4 Eastern Meditation Traditions

Knowledge of an experience reported by Eastern meditation traditions introduces a new element into traditional Western discussions of self. The experience appears to display a feature of inner awareness until very recently not known to modern Western philosophy in general. It is also, as we will see, highly relevant to our discussion of self. The experience is said to be produced by different kinds of meditation procedures using various sensory, affective, cognitive and other

[6] "Empirical" qualities, technically understood, have to be able to be either present or absent in experiences. Otherwise they would not be capable of specifying anything within the field of experience, and their presence or absence would not make any empirical difference.

[7] Another way of seeing this is to note that if the self *did* have some quality, it would have to pervade all of one's experience and as such would not be an "empirical quality" or "special designation" capable of distinguishing between them.

[8] We should note, in light of the next section below, that Kant did not argue that this was a *logical* impossibility but only that, given our actual modes of awareness, we human beings "cannot form the least conception" of how any being might be able to do this (Kant 1964: 157).

modalities in different ways (cf. Shear 2006: xvi–xvii). Nevertheless, the general logic of how they produce the experience is readily apparent: remove everything from awareness while one nevertheless remains awake. What is left over? One's own consciousness—the nature of self. We can represent this graphically as follows:

The normal structure of experience can be represented as "I am aware of this" or

I – it

Enable the objects of experience, the "its" of "I – its", to disappear

I-it

I-it

I-it

I-

I

until consciousness alone remains.

What is experienced here? Consciousness alone, without objects—no colours, sounds, feelings or thoughts. Despite the absence of all discernable content, this is not *un*consciousness, for it is experienceable and *rememberable*. What is it remembered as? Not *as* anything—just *itself*. And despite the fact that it is rememberable, it is completely *unimaginable*. For anything we can imagine is foreign to the experience, since it contains no content to be imagined.[9] Nevertheless

[9]The closest thing to this experience that can be imagined appears to be completely empty space. Imagining pure, empty consciousness in this way is useful insofar as it illustrates experience devoid of all phenomenological objects (sense objects, sensations, thoughts, etc.). But this image actually represents another experience related to but distinctly different from that of pure, empty consciousness itself. If the ordinary contents of awareness happen to fade away in meditation slowly enough as one settles towards pure, contentless consciousness, one may notice having an experience of being nothing but a bare "point of view" surrounded by empty phenomenological "space". This experience (often referred to as "pure individuality" or "ego") is like the deeper experience of consciousness devoid of all content insofar as it, too, is devoid of all perceptual objects (colours, sounds, thoughts, etc.). But it is important to remember that this second experience is really quite different from the first. For, as abstract as it is, it still contains both the "I-it" observer-observed structure and the (albeit empty) perceptual "space" (or "phenomenological manifold") in which objects of awareness ordinarily appear. And it is only when both this perceptual "space" and the observer's "point of view" disappear as one settles deeper into contentless awareness that the nature of what was at the "centre" of the "point of view," consciousness itself, emerges with full clarity. With this caveat in mind, the image of a bare awareness in empty perceptual space can help illustrate relationships between consciousness by itself and our more ordinary experiences (e.g. Ibn Sina's famous "Flying Man" simile).

we can describe the identifying feature of the experience quite clearly—the absence of all empirical content.

Different traditions interpret this experience of pure, empty consciousness in different ways and use different terms to refer to it, depending on their metaphysical predilections. But there is wide agreement about its phenomenological (experiential) nature. So for purely phenomenological, non-metaphysical analysis such terminological differences will not matter, and we will simply use Yoga and Vedanta's expression, "pure consciousness" ("pure" in the sense of "nothing but"), simply noting here that what follows could be expressed just as well using other expressions, such as Buddhism's "emptiness".

4.5 Pure Consciousness and Western Theories of Self

Let us now apply this experience of pure consciousness to the problem of self analysed above. Our ordinary pre-philosophical intuition insists that each of us has a self that has to be the same throughout all of one's experiences, past, present and future. Descartes looked within and reported gaining direct knowledge of such a "single, simple and continuing" self. Hume reported that, try as he would, he could not discover anything corresponding to such a self. Kant strengthened both of their opposing positions, arguing that a single, simple continuing self *has to* exist as the precondition of all knowledge and experience and that it is *necessarily unexperienceable*. For it can only be *qualityless* "pure consciousness", and we cannot even conceive of a qualityless experience. But just such a "pure consciousness" devoid of empirical qualities is precisely what Eastern meditation traditions report *can be* experienced.

The paradox of self that "tormented" Kant, and beleaguered modern Western philosophy for centuries, would thus appear to be resolved by knowledge that pure qualityless consciousness can actually be experienced. For this experience is the only thing that can give experiential significance to Descartes, Hume and Kant's respective analyses of self as (1) single, simple and unimaginable; (2) supposedly distinct from all thoughts, perceptions and other "impressions"; and (3) qualityless pure consciousness, respectively. Their analyses in turn thus also provide strong grounds for identifying the experience as being experience of self.[10] What remains after everything is removed from awareness, and one nevertheless remains awake, in other words, has to be one's conscious self.[11]

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[10]This conclusion is further reinforced by the fact that sufficient familiarity with pure consciousness in meditation reportedly leads to its becoming noticeable throughout daily life along with our more ordinary experiences, as common sense suggests self ought to be.

[11]For more extended analyses of pure consciousness and modern Western philosophical discussions of self, compare Shear (1990b Ch. IV) and (1998), reprinted in Gallagher and Shear (1999).

The above account is far from complete. Objections were raised to the very concept of pure consciousness as reports of the experience entered into Western philosophical discourse in the latter part of the 20th century. These objections required significant responses.[12] Such objections and responses notwithstanding, the above account should be enough to give an idea of how knowledge of the experience of pure consciousness appears capable in principle of resolving the deep paradox of self that has existed at the core of Western philosophy since Descartes, Hume and Kant.[13]

4.6 Scientific Research

The preceding sections introduced knowledge of pure consciousness experiences into Descartes, Hume and Kant's analyses of self in the spirit of new empirical "data" to see how knowledge of these experiences might affect our understanding of their analyses,[14] and how their analyses might in turn help us understand the significance of the experiences. Strictly speaking, however, what was inserted was knowledge of *reports* of the experiences, rather than the experiences themselves. This naturally raises the question of how seriously the reports should be taken.

[12]For example, some *a priori*-oriented philosophers have insisted that all experience *in principle* has to have "I-it" structure and objective phenomenological content. Other, more empirically oriented philosophers responded that this claim about the structure of experience is in fact an empirical claim and as such is subject to empirical falsification, precisely the falsification that pure consciousness experiences of the sort described would in principle provide. (For questions of how seriously we should take reports of the experience, see Sect. 4.6 below.) A second, common *a priori* argument insisted that every experience we can have has to contain and be structured by culture-dependent elements such as language and other symbols. So experiences of "pure consciousness" gained in the context of different cultures and traditions would in principle have to be different from each other, and discussion of "the" experience is at once misguided. This argument, too, would be falsified by any experience properly identified as "pure consciousness" within any culture whatsoever, since its *defining characteristic* is the absence of content in general, including in particular such things as beliefs, language and other symbols, a point explicitly emphasized by different meditation traditions all over the world (cf., e.g. Shear 1990b).

[13]It should be emphasized that this conclusion is purely phenomenological. Nothing ontological is intended here. The relationship of pure consciousness experiences to ontological issues is complex and far from transparent, as the long-standing debates between Eastern traditions that agree on the existence of the experience make quite clear. The analyses above are accordingly intended to be compatible with a wide variety of ontological stances, including, but not confined to, those of Descartes, Hume, Kant and the Eastern traditions referred to.

[14]We can note, for example, that the experience falsifies Kant's claim that such an experience can never be had. Memories of the experience falsify Hume's related conjecture that there would be no way to differentiate such an experience from non-existence (Hume 1978: 252). This and other related experiences also suggest the importance of taking seriously Descartes' claims that his text often reflected his own meditative experiences when trying to understand his texts. (For more on this, cf. Shear 1990a.)

One reason for taking such reports seriously is that they are found in diverse cultures and traditions, with different and often directly opposed metaphysics, throughout the world. This makes it seem unlikely that the culture-invariant nature of the reports is based on the highly variable contexts of belief in which they occurred and continue to occur. In addition, meditation traditions often offer scientifically relevant evidence that the reports have an objective, belief-independent basis. For the reports traditionally have often been correlated with an unusual physiological state characterized by suspension of perceptible respiration and significant reduction of metabolic activity. This correlation was so widely accepted in China, for example, that Chinese Zen (*Chan*) sometimes simply uses the phrase "breath stops" (*qi shi*) to refer to the experience itself. Indian texts describe the correlation repeatedly, and Indian scientists have reported observing it in yogis for many years. And in the West, laboratory studies show high correlation between the experience as reported by ordinary people practising the transcendental meditation (TM) technique and episodes of respiratory suspension. These studies also report unchanged O_2 and CO_2 levels in blood during the episodes and no compensatory breathing afterwards. This makes it clear that the respiratory suspension is quite unlike what happens when one intentionally holds one's breath and associates it with unusual reduction of aerobic activity. The experience has also been associated with increased frontal α-EEG coherence and other unconscious neurophysiological parameters (cf. Orme-Johnson and Haynes 1981; Badawi et al. 1984; Travis and Wallace 1997; Travis and Pearson 2000).

These correlations between reports of highly unusual experiences and unusual, typically unconscious physiological parameters in diverse cultures and belief contexts suggest strongly that the reports reflect what people naturally experience (i.e. the absence of empirical content) when their bodies and brains are in the associated unusual state, independent of cultural variables such as suggestion, expectations and belief.[15] Research on meditating subjects in other words now gives reason to take quite seriously the idea that experiences described in culture after culture throughout history as devoid of all empirical content actually occur. With this, the philosophical arguments identifying the experience as self become empirically as well as logically significant.

Philosophical questions aside, meditation-related research, perhaps surprisingly, now also appears to provide an empirical neurophysiological connection between the experience of pure consciousness and our ordinary concept of self. The default mode network (DMN) is a network of brain regions thought to correspond to ordinary self-referential mental activity. The activity of this network is lowest during object-oriented activity, higher during eyes-open self-referential activity, higher still

[15]This correlation is so natural and robust that it appears even when techniques producing the experience are extremely different and even directly opposed, as (to cite the techniques most associated with the experience in the West) the effortless, concentration-eschewing, α-associated use of *mantras* in TM and the intensely concentrative, γ-associated and α-*blocking* concentration of Zen *koan* work. See Shear (2011).

with eyes-closed rest and even higher during the practice of pure consciousness-associated TM (Travis et al. 2010). These results, showing correlations between ordinary self-referential activity and concepts, the default mode network, and experiences of pure consciousness are at present preliminary. More research is needed both on correlations between DMN activity and episodes of pure consciousness during meditation and between DMN activity and self-referential activity in general. But the results so far suggest that pure consciousness experience is associated with unusually high activation of the brain network now thought to be centrally implicated in our ordinary sense of self.

The scientific work is evolving. But it already appears to be providing empirical support for the conclusion that reports of the pure consciousness experience not only are empirically significant but reflect something very deep about our ordinary sense of self, as both Western philosophical analysis and Eastern meditation traditions would indicate.

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Chapter 5
The Self as Organizer

Rajesh Kasturirangan

5.1 Introduction

We experience the world as an articulated whole; it is the rare person who can see the smile without the Cheshire cat. The coherence and continuity of the experienced world is in contrast with the typical cognitive scientists claim that the input to our sensory systems is greatly impoverished (Chomsky 2005). Linguists wonder how children acquire a full-blown language from sparse data (Pinker 1995), and perception researchers wonder how the visual system recovers three-dimensional shape from two-dimensional images (Marr 1982).

The seamless continuity of vision, language, movement and other mental and bodily faculties is the backdrop against which we lead our lives. Whether we are seeing, moving or thinking, we take a regular world for granted, a world to which we can respond appropriately without being mechanical. Without those regularities, our experience would be the blooming buzzing confusion that William James (1890) so evocatively described the baby's world. Far for being a blooming buzzing confusion, the world hangs together just fine for most people most of the time since it is "deeply regular". When you pick up a cup, it's no longer in the location that you picked it from; we know this not as an abstract fact about the conservation of mass but, in our bones, as a visceral being in the world.

Traditional, i.e. computational, cognitive science has never able to explain the viscerality of our knowledge. While computational approaches have made impressive progress in recreating our knowledge of the world from their supposed origins in the pinhole (Mach 1959) (see Mach's famous illustration in Fig. 5.1), computationalism has failed as a theory of the human and animal world. Post-

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*, DOI 10.1007/978-81-322-1587-5_5, © Springer India 2014

Fig. 5.1 Mach's rendering of the "pinhole" perspective (Source: Mach 1897: 16)

computational cognitive science – whether Gibsonian or embodied – starts with the ambulatory world of the animal (Gibson 1986).

This chapter serves three purposes: first, it is an overview of the principles that inform the study of the human and animal world, or what I call the "whole world problem"; second, it is a brief survey of how post-computational theories such as direct perception and embodied cognition engage with the whole world problem. In this section, I argue that the current post-computational theories have fatal flaws. Finally, in the last section I put forward an alternative framework called the "enselved mind" to explain the wholeness of the world. I argue that experience needs an owner self; that the owner self is also the organizer of experience; and that the whole world is created through self-organized experience.

The arguments presented in this chapter are conceptual rather than empirical though I do allude to the empirical literature as and when required. Consequently, my arguments for the enselved mind are plausibility arguments rather than empirical truth.

5.2 The Whole World

Why do we experience the world as a whole? Or rather, why do we experience the world as a whole even when we don't experience much of it and what we experience is quickly forgotten? The wholeness of the world is the bedrock of our existence. Consider a simple situation: I feel thirsty. I walk up to the kitchen, fill a glass of water from the water filter, turn off the faucet and lift the glass to my mouth and start drinking. At each step in the process, the next one presents itself and the previous one erases itself from my mind; see (von Uexküll 1957). I am never confused that my thirst will vanish by itself or the water will rise up in the air by itself. We take these regularities for granted.

The world's regularities are not just of perceptual or motor origin. Suppose the phone rings, your partner answers the phone and tells you that your friend is on the phone. You get up, walk to the phone and start talking. Five minutes after the conversation ends, you are only left with the trace of the phone call – while it is important to act upon any promises made during the phone call, it is no longer important to know that your friend desired to talk to you just a little while ago. Both the acquisition of a new experience and the erasure of past experiences depend on a whole world that lies in the background. Ordinary life sees continuous feedback between experience acquisition, experience testing and experience discharge (von Uexküll 1957). For the most part, we do not question these experiences; we accept them as "facts" about the world. Robert Browning (Browning and Cook 1994) put it best:

> God's in His heaven—
> All's right with the world!

Under normal conditions, there's perfect coherence between intention, communication and action. Concepts, percepts and action are part of our "way of being", of responding appropriately to environmental demands without being mechanically determined by them. We are used to human beings picking up objects when asked to do so and get to their desired location when given directions. These cognitive ways of being are opaque to us; not only is the cognitive way of being hidden to introspection, it is also quite hard to model and replicate in artificial systems. The best computer scientists would be tremendously impressed if a robot had the ability to pick up the right objects on command. Consider the following excerpt from Dennett's Brainchildren (Dennett 1998):

> Once upon a time there was a robot, named R1 by its creators. One day its designers arranged for it to learn that its spare battery, its precious energy supply, was locked in a room with a time bomb set to go off soon. R1 located the room and the key to the door, and formulated a plan to rescue its battery. There was a wagon in the room, and the battery was on the wagon, and R1 hypothesized that a certain action which it called PULLOUT (WAGON, ROOM) would result in the battery being removed from the room. Straightaway it acted, and did succeed in getting the battery out of the room before the bomb went off. Unfortunately, however, the bomb was also on the wagon. R1 knew that the bomb was on the wagon in the room but did not realize that pulling the wagon would bring the bomb out along with the battery. Poor R1 had missed the obvious implication of its planned act.
>
> Back to the drawing board. "The solution is obvious," said the designers. "Our next robot must be made to recognize not just the intended implications of its acts, but also the implications about their side effects, by deducing these implications from the descriptions its uses in formulating its plans." They called their next model, the robot-deducer R1D1. They placed R1D1 in much the same predicament that R1 had succumbed to, and as it too hit upon the idea of PULLOUT (WAGON, ROOM) it began, as designed, to consider the implications of such a course of action. It had just finished deducing that pulling the wagon

> out of the room would not change the color of the room's walls, and was embarking on a proof of the further implication that pulling the wagon out would cause its wheels to turn more revolutions than there were wheels on the wagon – when the bomb exploded.
>
> Back to the drawing board. "We must teach it the difference between relevant implications and irrelevant implications," said the designers, "and teach it to ignore the irrelevant ones". So they developed a method of tagging implications as either relevant or irrelevant to the project at hand, and installed the method in their next model, the robot-relevant-deducer, or R2D1 for short. When they subjected R2D1 to the test that had so unequivocally selected its ancestors for extinction, they were surprised to see it sitting, Hamlet-like outside the room containing the ticking bomb, the native hue of its resolution siclied o'er with the pale cast of thought, as Shakespeare (and more recently Fodor) has aptly put it. "Do something!" they yelled at it. "I am," it retorted. "I'm busy ignoring some thousands of implications I have determined to be irrelevant. Just as soon as I find and irrelevant implication, I put it on the list of those I must ignore, and ..." the bomb went off.

Robots might be smart at automatic theorem proving, but they are woefully inadequate when it comes to common sense. The wholeness of the world is at the root of common sense.

The ability to choose what's relevant and ignore what isn't is central to our facility with the world. But what does the term "world" mean? By world, I don't mean the world of physics or our subjective experience of the world as colours and shapes, though that's closer to where I want to go. In this chapter, the term "world" indicates the *instant by instant lifeworld* of the organism. Let me clarify what that means.

By *lifeworld*, I mean the world outside my mind that's nevertheless filtered through the species specific registers[1] that differentiate human experience from cat and bat experience (von Uexküll 1957). Even the registration of the world is a magical feat; research in cognitive science and AI has uncovered the complexities underlying our effortless ability to see, hear and talk (Dennett 1998). For example, money is part of the human world; it makes no sense to chimpanzees, but the money in my pocket is outside me. If the world was in my head, there would be nothing to it's being whole – it would entirely be a function of my brain or mind. The puzzle arises because the world is not in my head and yet is experienced as a whole.

By *instant by instant*, I mean the immediately available aspects of the lifeworld. The lifeworld is broadly the same for all members of my species. However, each individual in that species occupies one particular slice of space-time that's distinct from other individuals of that species and other species. The instant by instant lifeworld is the slice of the species lifeworld that is available immediately to an individual from their particular location. It is the sum total of all possible engagements with the environment that I can perform right here and right now. Sitting in my office writing this chapter, I can access the computer table and bookshelf in front of me, the table to my right and the chair to my left all of which are integrated into a seamless, dynamic whole which makes it possible for

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[1]I use the term "register" as a placeholder for sensation, perception, representation, etc., so that I have a way of talking about information flow without getting into debates about the reality of sense data or representations.

me to rotate my chair to the right, grab a paper from the adjacent table, read a relevant paragraph and get back to typing. This instant by instant lifeworld combines registration, response and engagement.

At any given instant, we register the environment as consisting of coherent objects arrayed in space and we register sounds as utterances with meaning. Our being-in-the-world is more than registration though. Going back to my earlier experience of thirst, registration (feeling thirsty), response (walking to the kitchen) and engagement (filling a glass with water) are incomplete by themselves. The seamless continuity of the world reveals itself only in the cycle that envelops all three. That is to say, we experience the (instant by instant life)world as a whole in three related but distinct ways (Edelman et al. 2012):

1. The world is *seamless*: there are no holes in it. Unlike the computer screen, part of which can disappear, the world is there wherever you look. Despite blind spots and our inability to see around obstacles, we don't experience loss. The completeness of the world isn't dependent on access to a full range of inputs – blind people are as complete in their experience as fully able people, and the human world as a whole is as complete as that of a bat even though both species possess capacities that the other does not.
2. The world is *continuous* and *complete*: as a dynamic whole, the world does change moment to moment, but it does so continuously, and in total there isn't anything that is not in it. Ghosts and galaxies, if they exist, exist in the sum total of all worlds, and behind their existence is the tacit assumption that whether it is the Andromeda galaxy or the next-door neighbour, we can get there through a continuous transformation of worlds.
3. The world is *coherent*: the way the world behaves in one location is not that different from a neighbouring location. We don't have gravity going down here and going up right next to it. Without the coherence, continuity would be impossible.

Whatever the physicist might think of these intuitions about the world – she will probably disagree with all of them – these three design principles are part of our bio-ontology. Philosophers have thought about these questions for a long time; what's interesting now is that these questions can now be approached with the tools and ideas of biology and cognition.

These three design principles aren't apparent in the static, pinhole camera view of the world (Fig. 5.1). In fact, it is clear that the static cognition assumed by most representational theories of mind as an impoverished access to the world (Rensink 2002; Simons and Chabris 1999). The dynamic, ambulatory mind is the mind to which the world is a whole. This much can be agreed upon by various post-computational cognitive scientists, i.e. the Gibsonians (Gibson 1986), the embodied and enactive cognitive scientists (Noe 2004; Thompson 2007; Varela et al. 1991), cognitive linguists (Lakoff and Johnson 1999) and others who are emerging from the long shadow of the computational theory of mind. However, I will argue that none of these post-computational theories explain the wholeness of the world and that we need to go back to some of the key intuitions of the rationalists, but suitably modified to integrate dynamic design principles into a theory of the mind.

5.3 Post-computationalism

Cognitive science was traditionally not an investigation of the world per se but an investigation of our knowledge of the world – how is it that we see, hear, speak and think. The legacy of the rationalist-empiricist debate resulted in two competing hypotheses about our knowledge of the world:

1. The world isn't complete. Or more precisely put, the child starts with experiencing an incoherent world and slowly develops a coherent view.
2. The world is complete because our minds make them that way.

The extreme version of the first is certainly wrong. Children aren't born into an incoherent world; they have many capacities. Even when their knowledge is incomplete, there are developmental patterns that reliably lead to complete knowledge. There are disagreements as to the nature of the developmental process – for example, it is best explained by dynamical systems or by innate maturational processes, but it is clear that the blooming buzzing confusion is more in philosophers heads than in children's. If we reject the radical empiricist stance, we are left with three approaches to the problem:

1. Traditional rationalism and computationalism
2. Gibsonian direct perception
3. Embodied cognition

As we will see, all three have their defects.

5.3.1 Computational Rationalism

Computational rationalists have addressed the problem of coherence and continuity by postulating innate mental structures that make human beings and other animals develop specialized modules for speaking and seeing. These modules are computational devices that create coherence and continuity out of impoverished data. In other words, the particular manner in which we experience coherence and continuity is in our heads, not in the world. Unfortunately, despite all the technical brilliance of the computational theories, the rationalist, "mind-in-the-head" model is unable to address two important questions about the world:

1. If coherence are continuity are in the mind, how is it that the mind hooks on to the world so nicely? In other words, while the rationalist model helps us understand the complexities of internal structure, it is not an account of the world. In fact, the rationalist model, by separating competence and performance, washes its hands off any responsibility for understanding the world at all. To compound the problem.

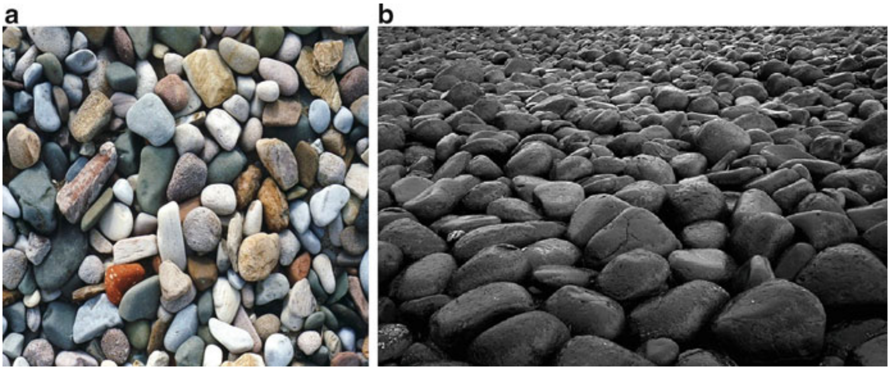

Fig. 5.2 Stones and boulders

2. Why is it that our representations are so impoverished (Rensink 2002; Simons and Chabris 1999). Our minds are not as coherent as we think; when probed, individual experiences are far more impoverished than we think – sentences are broken and ungrammatical and perception is full of missing details. The Machian perspective (Fig. 5.1) is wrong.

In other words, if computational cognitive science asked the question "why is the experience of the world rich despite poor sensory inputs?" we now ask "how is our experience of the world coherent and continuous despite poor internal representations?" The second question drives research in direct perception and embodied and enactive cognition.

5.3.2 Direct Perception

Of the various theorists, Gibson is the one least concerned with internal processes; he doesn't want to peer into the mind or the brain. In that sense, he is also the most behaviourist of the post-computationalists. According to Gibson (1986), vision doesn't happen *in here*, it happens *out there*. The ecological approach to perception is fundamentally a theory of perceptual knowledge, which, according to Gibson, is directly available to be picked up. The world *presents* itself to the observer, so it doesn't have to be *re-presented* at all. Gibson also highlights the regularities that structure the organism's environment. For example, take a look at the two pictures in Fig. 5.2a, b.

If I were to ask you which image contains stones and which image contains boulders, you would have no hesitation – the one on the left contains stones while the one on the right contains boulders even though no overt cues as to the size or scale of the pictures are given. Gibson argues that our environment consists of nested, hierarchical regularities from which the size of entities is directly available. Gibson is surely right about the structured regularities that physically "inform" the world, as in constituting the form of worldly entities. However, direct perception fails to take into account two important facts:

1. If perception is out there, the information is available to all species. So why is my perception different from that of a bat (Nagel 1974)? In the best case scenario, both humans and bats sample from a larger pool of regularities, but even then we have to answer why humans sample colour while bats sample sonar. More likely, what is available to a bat doesn't intersect fully with what is available to a human; in which case, we need a subtler account of information "out there".
2. Why do humans (and bats, presumably) not pick up information that's readily available? The inattentional blindness experiments (Rensink 2002; Simons and Chabris 1999) show that our information pick up is quite impoverished. While those arguments are used to argue against representational accounts of the mind, they are curiously valid against direct perception as well. Unlike the static pinhole camera, the Gibsonian animal suffers from a surfeit of information and the animal's environment, by itself, has no way of telling what to keep and what to reject. Without an active "evaluator and decider", we have too much on our hands. While we can agree with Gibson and the embodied cognitive scientists that the judgement of value doesn't happen in the head, it still happens. Passive information isn't enough; we need active information.

For these reasons, I believe that direct perception theories, though enormously important, are not enough. We need an entity that actively structures the world. Embodied cognitive scientists believe that the body is that active entity.

5.3.3 Embodied Cognition

Embodied cognitive scientists believe that mental faculties such as perception, cognition and emotion are constituted by bodily states and actions. A typical example in embodied cognition is the cognitive linguists invocation of metaphors and other conceptual mappings (Fauconnier 1997; Lakoff and Johnson 1999) in language. Metaphor theorists like to point out that our conceptualization of abstract concepts often comes from concrete sources such as space, time and the structure of the body – for example, note that we refer to political leaders as "heads of state". Lakoff and Johnson invoke the container schema, i.e. the schema that captures our embodied experience of being contained in a room, to explain the use of prepositions like IN in the sentences below:

1. The cucumbers are in a pickle.
2. The politicians are in a pickle.

These sentences mean different things, but they both – according to Lakoff and Johnson – ground the meaning of IN in container schema. Another important example of embodied cognition is the enactive theory of perception: according to

Varela and Noe (Noe 2004; Varela et al. 1991), to see is nothing but to act in certain ways. To see the front of an object is to know that by walking to it and then around it, I will experience its back side. The enactive approach to perception converts the old Gestalt insight about amodal completion into skilful know-how, i.e. I see the object in front of me as a whole rather than a facade with a hole because I know that by moving I will register its backside. According to embodied cognition, abstract knowledge is grounded in more concrete perceptual knowledge, and perceptual knowledge itself is a form of know-how. From this embodied perspective, our bodies provide coherence and continuity, which is why the world is whole.

Unfortunately, there is a problem with this dyad, which hinges crucially on our understanding of the term “body”. If, by “body”, we mean the material body as physicists would understand it, then the body cannot explain the normative and evaluative aspects of cognition and perception and the qualia that accompany perceptual states. For example, if our understanding of sentence two above is metaphorically projected from our understanding of sentence one above (or more precisely, the container schema that underlies sentence one), how do we know what to project and what not to project? When cucumbers are in a pickle, they are constrained (in a “tight spot” so to speak), submerged and wet. Politicians in a pickle only suffer from the first of the three consequences. The container schema doesn’t tell us which entailments of picklehood are acceptable (constraint) and which ones aren’t (submergence and wetness). The material body can’t be a source of those evaluative judgments.

Embodied cognitive scientists often talk about the body being more than the material body; they say it is a living body, “corpore”. Indeed, the body that experiences is not a third person, objective material body alone; it is also the body experienced from the inside as a subject. The living body is a plausible organizer of the whole world. Unfortunately, cognitive scientists are yet to analyse the living body in a manner that does justice to its subjective and objective elements, so we are back to the original problem: what is the living body and how does it organize our experience into a coherent and continuous whole? Further, what aspects of the living body are relevant to the problem of wholeness?

I have nothing against the living body. The enselved mind can be fruitfully explored as one aspect of the living body; the aspect responsible for organizing experience. The rest of this chapter is organized as follows: first, I introduce the self then I show how it can plausibly organize the world into a whole. To put it another way, it is not the body that structures experience. Instead, there is an entity that structures experience and is the precondition of experience of any kind at all, which is the self. The self is embodied in a particular manner in human beings but there is always the possibility that it is embodied in another organism or robot in some other manner. It is the structuring capacity that matters. Two analogies, one with computational vision and the other with physics, might help clarify matters.

David Marr (1982), in his approach to vision, was trying to understand how human beings come to see the way they do. While he recognized that any computation must ultimately be implemented in the neurobiology of human vision, he argued that the computational theory is where one starts, that depth perception is better explained by geometry than by biology. Physicists go one step further. While they agree that gravity is a material force, they argue that our ordinary conceptions of matter are simply not adequate to understand gravitational attraction. In their view, a geometric theory of fields is a much better explanation than an understanding of bodies as entities that push and pull at each other.

Similarly, I believe that the wholeness of the world can be better explained by postulating the self as an abstract organizing principle that makes coherent experience possible than the concrete body.

5.4 The Enselved Mind

The existence and nature of the self is one of the oldest metaphysical questions across cultures (Ganeri 2007; Sorabji 2006). While philosophers have thought about the self for millennia, it's only recently that cognitive scientists and neuroscientists have started paying attention (Damasio 2010; Metzinger 2004, 2010; Tippett et al. 2011), partly because of the resurgence of interest in consciousness and the connection between consciousness and the self. A review of the literature on the self is beyond the scope of this chapter; as far as the discussion here goes, the self is (Sorabji 2006):

> Meanwhile, what I am postulating is not an undetectable soul or immaterial ego, but an embodied individual whose existence is plain to see. This individual is something that has or owns psychological states as well as having or owning a body and bodily states.
>
> Embodiment is a tricky theoretical term; like the term "matter", it means different things to different people. Just as physicists believe that the entire universe is material, some cognitive scientists believe that all mental processes are embodied. However, our ideas of matter are rather different now from 300 years ago. Is embodiment poised for a similar transformation? What does the term "embodied" mean?

It is the self as the individual owner of an experience that I want to explore. The arguments in favour of the enselved mind go as follows:

1. Experiences must be owned to be experienced; otherwise, they are data, not experience.
2. The act of owning is integrative; it binds different experiences to a single owner.
3. Therefore, through the act of owning, the enselved mind constructs the (whole) world.

Let us take these claims one by one.

5.4.1 Experience Needs an Owner

Experience, whether perceptual like seeing the sunset or conceptual, like thinking about sunsets, is always normative. Not only do we see sunsets, we evaluate those visions as well. My experiences can be wrong (or right): therefore, every experience comes built not only with form but also with a judgement. Now consider the usual explanation of visual experience: light from the environment strikes the retina, where it is a 2D pattern of stimulation, and then through a series of stages, it is transformed into a 3D experience. Unfortunately, the transformation of 2D stimulation to 3D shape is not enough to make it into an experience – a purely computational process cannot turn stimulation, which is neither wrong nor right, into an experience which is either valid or mistaken. There is more to experience than the transformation of stimulation into shape.

Where does the magic happen then? Only an owner can transform stimulation into experience. In other words for an experience to be *of something*, it has to be *someone's* experience. There is symmetry between the intentionality of the experience and the possession of that experience. Why can't the experience carry its own verification? Why can't the experience of the rose also declare, "I am that of a rose?"

The issue is not that of self-verification; whether the experience certifies itself or not, there must be a certifier, an "I", an identity to who that truth is certified. Let me make that more explicit. Suppose there is an experience of a sunset that self-declares "I am a sunset". By itself, that declaration is just another facet of the experience itself, it is neither true nor false. What makes the declaration true is an I saying "this is true". Whether that I is separate from the experience or part of the experience itself is irrelevant to this discussion. The argument is compatible with the truth declarer being a separate entity and is compatible with the truth declarer being within the experience itself.

5.4.2 Ownership Is Integrative

Let's assume that every experience has an owner. Why should the owners be same? One argument is through parsimony: if my experiences can all be owned by the same owner, then why postulate two or more?

The parsimony argument seems to be empirically false if we are to believe reports of multiple personalities, so we need to supplement that argument with a continuity argument. Note that the multiple personalities are not relevant to the instant by instant world. At any given point, one of the personalities owns all the experiences that the organism undergoes at that instant. The multiple personality case is no different from different individuals being distinct owners. When you are standing next to me, you and I have similar experiences, but as we go our own ways, the family of experiences I have has a continuity that's different from the continuity of your family of experiences. Now, let us combine the continuity of experience with an assumption that I cannot prove here:

> Owners are discrete entities in the instant by instant lifeworld

Given this assumption, we can think of identity assignment as an inductive learning problem – how do I best assign ownership to an experience? A good inductive rule, combining continuity and parsimony is:

If experiences lie within the same continuous family, assign them to the same owner.

Therefore, if I have two experiences A and B and they have potential owners assignments O_A and O_B, then continuity dictates that $O_A = O_B$.

5.4.3 World Construction

Finally, having assigned a common identity, world construction becomes a problem similar to deriving 3D shapes from 2D images via stereoscopy where the correspondence problem plays the role of the identity assignment problem here.

Our eyes receive slightly different images of objects and those images travel to the brain along different paths. Therefore, given an image A_R from the right eye, the brain has to figure out which image A_L from the left eye is its counterpart image. Once the image correspondence problem is solved, the brain can proceed to fuse the images and extract 3D structure.

Similarly, once the ownership assignment is solved, the organism can proceed to fuse experiences into a coherent world. However, even if the organism *could* fuse the experiences into a world, why *should* it do so? There are two arguments that can be given for fusing experiences into a world:

1. A parsimony argument
2. A stability argument

Our experiences are highly redundant; much of the content of one is contained in the content of the next one. Why should we store these separately? By stitching the two together, the organism extracts what's common and what's different, and by doing so, it can throw out most of the replicated information. Further, no organism wants to live in the past, its life is in the present and in the future; all it needs is the continuity with the past so that the past is accessible. To take a concrete example, when I walk around a large boulder, I have no need to remember what the front of the boulder looks like from the back – as long as I know how to access the front from the back, it can be re-presented. The fusion of my experiences into an amodally completed world (Kanizsa and Kanizsa 1979) is exactly what I need to act appropriately in the world. Therefore, the dynamic wholeness of the world is the right enabler of action – by knowing that "God is in His heaven and all's right with the world", I trust the world to present more experiences to me.

The last point about trust brings me to the final stability argument. The fused world is far more stable than individual experiences.[2] Every time my head moves,

[2]I do not mean the instability of the sensory stimulus, but the instability of individual views. As I move around a boulder, a different face is exposed to me, but the world consists of that exposed face along with the amodally presented invisible surfaces.

a different experience is presented to me; an ambulatory organism needs to have a rapid understanding of the stable configuration of surfaces, what Gibson called the layout. The world makes the layout available (mostly) amodally to the organism, as a result of which is then able to undertake its routine existence knowing that the regularities of the world are available. I have n't explicitly invoked evolutionary arguments, but the parsimony and stability arguments make it clear that the construction of a whole world confers advantages to the organism.

Now, if you combine the three steps: the existence of the organizing self, its role as an integrator and its post-integration function as a constructor of the world, there is a strong plausibility argument for making the self the locus of wholeness. The enselved mind, as the owner of experience is the precondition of having any experience; further because the enselved mind binds experiences into a whole, it makes possible an effective engagement with the world. There are problems with my arguments. For one, there is one unproven assumption – that selves are discrete. There are alternatives to the parsimony and plausibility arguments as well, but my goal was not to develop a watertight argument that would take a work far longer than this one but to show how the organizing self is potentially a creative hypothesis for understanding a long standing problem in the mind sciences.

5.5 Conclusion

I started with the claim that the wholeness of the world is an important but relatively unaddressed problem in the mind sciences. I showed how traditional computational theories, primarily of the rationalist persuasion, are incapable of addressing the whole world problem. Then I argued that post-computational approaches such as direct perception and embodied cognition have paid more attention to the world problem and suggested their own solutions. While I have borrowed much from those accounts, I also believe that we need to add one more layer to our explanations, namely, incorporating the self in the mind.

The main constructive argument in this chapter was a plausibility argument for the self being the owner and organizer of experience and the constructor of the whole world. To conclude, if you are willing to admit one assumption – that the owner self is a discrete entity – there is a strong argument to be made in favour of the owner self also being the organizer of experience. I have not shown how those organizational problems are to be solved or presented the results of experimental tests for the "self as organizer" hypothesis; my arguments are conceptual, aiming for plausibility rather than proof. Consequently, they do not show either via logical necessity or empirical demonstration that there must be such a thing as the organizing self as the constructor of the whole world. A rigorous test of the self as organizer hypothesis requires empirical research combined with computational and theoretical investigation, but I believe that these arguments point the way to making the self an important – perhaps *the* important – locus of cognition and experience.

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Chapter 6
Reconceptualizing the Separative Self

V. Hari Narayanan

6.1 Introduction

The proprioceptive ability to distinguish oneself from the rest has to be present in all organisms capable of surviving. But the self-conception humans are endowed with is much richer than this kind of ability. The common characteristics associated with the human self-conception involve the ability to treat oneself as an entity separate from the rest and capable of doing things by free will. It presupposes the capacity to represent the representations themselves. The human self-conception is much richer than the proto form of self-conception presumably present in some animals.[1] The ability to plan in advance, introspecting with a view to improve one's behaviour, treating certain things and persons as one's own possessions, feeling pride or guilt over the actions one has performed, etc. appear to be advantageous traits as far as the organism is concerned.

The human self-conception can be described in terms of a free-floating self—something over and above the biological organism and separated from the web of life. The self is treated to be something that stands out in the world and capable of doing actions on the basis of the exercise of the ability called free will. Further, it feels pride or guilt over actions. The expressions like "my body" and "my life" are commonly used, and these suggest the separative or free-floating nature of the self-conception. The relation between the self and the world may be of a different order in some cultures, and it can well be the case that such a self-conception developed

[1] Mirror test is designed to find out whether a chimpanzee can consider the image seen on a mirror as that of oneself.

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*,
DOI 10.1007/978-81-322-1587-5_6, © Springer India 2014

over the course of human evolution. Anyway, it is incontrovertible that the notion of the free-floating self finds ready acceptance in almost all cultures and is even treated as quite natural and part of pre-reflective understanding.

6.2 The Fragility of Self-Conception

The fragility of self-conception is seen clearly in many studies. For instance, experiments show that an external object can be perceived as constituting one's own bodily parts.[2] That means, the representation of oneself need not be limited to the things internal to the body. In fact, the phenomenon referred to as "possessiveness" can be understood as extending the boundaries of self. Moreover, there is no singular conception of the self. There are multiple metaphors of self used widely in language (Lakoff and Johnson 1999). The expressions like "I lost myself" (an object), "I looked at myself" (a person) and "I have to improve myself" (a process) involve different ways of understanding the self.

The relation between the self and the nature is another way to understand the self-conception. The common attitude that humans have towards nature is that of estrangement. But, as a matter of fact, human beings are products of nature, and we cannot survive without regular input from nature. Our bodily functions themselves require hundreds of different species of bacteria, yet we think of ourselves as independent from the rest of the life forms or the web of life. Human beings tend to either worship or control nature, and this is similar to the fight or flight attitude shown towards enemies. It can be contended that the divisions that we see among humans stem from the fundamental division present in the separative self-conception.

To trace the roots of divisions and conflicts to the separative self-conception is not to deny the evolutionary advantages of the self-view. The next section deals with the adaptive benefits accruing from viewing oneself as a separate entity.

6.3 Self in the Context of Evolution

The moorings of the separative self-conception can be traced to the concern for physical protection. Planning for the future helps in keeping resources, and brooding over the past opens a mechanism of improving behaviour based on feedback from

[2] Thomas Metzinger (2010) describes an experiment in which the subjects are asked to observe a rubber hand lying on the desk in front of them, with their own corresponding hand concealed from their view by a screen. The visible rubber hand and the subject's unseen hand were then synchronously stroked with a probe. After a certain time, the rubber-hand illusion emerges. The rubber hand is experienced as one's own, and one feels the repeated strokes in this rubber hand.

different directions. Talking to oneself is indeed an effective way of channelizing one's resources. It is easy to observe that our ordinary thought process involves a constant concern with the future in order to fulfil several wants. This may also be adaptive because overlooking the future can turn out to be detrimental. As Edward Wilson points out, a false positive can only be an inconvenience but a false negative can become catastrophic (Wilson 1999). Having a separative conception of the self is beneficial not only to keep essentials for hard times but also to develop bonding towards small groups which, in turn, can be helpful in ensuring survival. At the same time, these traits, in excess, can cause a lot of harm also.

In the present environment, there is often a long gap between efforts and their results and this gives rise to chronic cases of anxiety. Divisive tendencies and identifying with groups can turn out to be dangerous when humans are armed with the capacity to destruct the whole life on the planet with a couple of weapons. Moreover, there are innumerable things to possess, and it is common to feel insecure in this regard. Such a scenario cannot but result in interminable conflicts. Most cases of suicide are not because of any direct threat to bodily survival but due to thwarted relationships or factors such as money and prestige. That is to say, seeking psychological security easily affects biological security. But, it is often taken for granted that if our concerns are restricted to survival of the body, then our life tantamounts to animal life and, therefore, infrahuman. But this picture misses the fact that plants and animals contribute in many ways to the existence of the biosphere even while working for the survival of their bodies, whereas much of the "supra-survival" activities of humans are harmful to the biosphere. It is in such a situation, that the self, its adaptive advantages notwithstanding, turns out to be a curse (Leary 2004). That is to say, the adaptive value of a trait can diminish in a markedly changed environment, and therefore, new traits may be required to ensure the survival of the species.

In this context, it is pertinent to look into how the present self-conception got evolved. One interesting hypothesis in this regard is that of Julian Jaynes who holds that ancient people were not conscious of themselves in the way we do (Jaynes 1976). That is to say, they did not consider themselves as doing things on their own but as being led by some voice. This happened because the voices in the head were not treated as their own but as arising from some other source. This made the mind bicameral. One evidence given in defence of this position is the absence of mentalistic words corresponding to the concepts like "deciding, willing, wanting, understanding" etc. in the earliest literature found.

The hypothesis of the bicameral mind, though lacking any clinching evidence, suggests a plausible scenario where human beings lacked the concept of talking to oneself. The role that gods played in various myths prevailing in almost all parts of the world can be understood on the basis of the need to ascribe a source to those voices. The evolution of the self-conception might have resulted in appropriating the voices as one's own. Thus, from being obedient of certain voices, humans started treating themselves as capable of doing things out of their own will. It is this exaggerated sense of the capacity of self that needs rethinking in the light of present understanding of cognitive processes.

6.4 Free Will and the Free-Floating Self

It is common to feel that we do things in the sense of causing them by exercising free will. In fact, the distinction between action and events are made on the basis of the assumption of the notion of agency. That means, actions are the result of free will of agents, whereas events just happen as part of natural course of things.

But the evidence for the existence of some capacity called will is scanty. As Daniel Wegener succinctly puts it "the experience of consciously willing an action is not a direct indication that the conscious thought has caused the action" (Wegner 2002). Consider the famous Libet studies on free will (Libet 1985). In this experiment, subjects were asked to wiggle a finger at any time of their own within a 10 min period. It was found that the actual brain potential to do the action is recorded full three quarters of a second before the action is done, whereas the subject's sensation of consciously willing the action almost exactly coincided with the action itself. That is to say, the actual brain processes needed to carry out the action take place before any thought concerning the decision to do that action is available in consciousness. This can be interpreted that the conscious decision to do something may have no causal role in the actual performance of the action.

The same point is shown in contexts where intentional actions are inhibited. Cases where we decide not to do what we intended to do are common in our daily life, and they are often touted as paradigmatic cases of conscious will or conscious veto of unconscious impulses. This sort of endogenous inhibition of intentional action is also traceable to some neural activity inaccessible to consciousness (Brass and Haggard 2007). That means, in such cases also consciousness lacks access to actual causes.

It can be the case that there is a conscious feeling of willing because consciousness has no access to the actual cause of action and, therefore, it has to confabulate one. Of course, many actions are treated as involuntary. What is different in the case of voluntary actions is that there is some conscious prior thought process which is consistent with the action (Wegner and Wheatley 1999).

The notions of free-floating self and free will are inextricably interlinked. The belief that we have got free will which is not determined by anything else makes sense only when the self is understood in a free-floating manner. That which considers itself to be separated from nature alone can feel itself to have supra-causal capacities. Though our manifest image contains this feeling strongly, the scientific image is far from defending the same.

Why is it the case that human beings find it difficult to revise the self-conception even if it appears to be illusory? An account of the way we feel certain may hold a key to answer this.

6.5 What It Is to Feel Certain

Experimental epistemology can be done by studying the way we feel certain about something. What is shown in some studies is that the feeling of certainty needs to be understood as an involuntary sensation (Burton 2008). That is to say, the feeling of knowing is an involuntary brain mechanism similar to anger, fear, etc. This implies that we can feel that we know something quite independently of undergoing any reliable means of acquiring that knowledge. Evolutionarily, such a mechanism is quite adaptive because a Doubting Thomas can hardly survive in a hostile environment.

The gut feeling of being certain about something is indeed an everyday occurrence. Arguing for one's cherished opinions with full vigour even over issues that are apparently trivial is a part of day to day to life. What is commonly called lack of open mindedness can be understood as the inability to overcome the gut feeling of knowing something. Mystical experiences and near-death experiences, though not so common, can also be interpreted as states of feeling that one knows something with absolute clarity without having to go through any reliable means of reaching knowledge. Studies show that stimulation of limbic system is directly responsible for the arising of such feelings (Burton 2008). It has been shown experimentally that external stimulation of the brain is sufficient to produce them. Anaesthetics such as chloroform and nitrous oxide can produce the mental sensations of being pure, true, etc. without resulting from any antecedent thought process. The occurrence of cases of blind sight, however rare they are, can be interpreted as showing the separation between knowing something and the awareness of that knowledge. If it is possible to know something without being aware of that knowledge, it can well be the case that we can feel that we know something without actually knowing that thing.

Given the above account, the only way to salvage the picture of human being as a rational animal is by arguing that humans are those animals capable of reasoning. It does not mean that humans engage in reasoning as a matter of habit. There are indeed cases where we do feel being certain after deliberate reflection. There may be more such cases with the institutionalization of scientific inquiry but even then such a rigorous inquiry is limited to certain domains. There is hardly any change in the way we carry out our daily life with many inveterate assumptions concerning the self and the world playing the central role.

The feeling of consciously willing and that of the free-floating self can be treated as paradigmatic cases of gut feeling of certainty. Apart from such fundamental misconceptions, humans tend to make several mistakes on a regular basis (Philips 2008). Consider the case of confirmation bias. It is our tendency to notice and assign significance to observations that confirm our beliefs and expectations, while filtering out or rationalizing away observations that do not. This can be understood as an attempt to minimize changes in the belief system so that the hold of the gut feeling of certainty is not challenged. The wide presence of stereotypes, the popularity of pseudosciences like astrology, etc. can be understood in terms of confirmation bias.

The phenomena like confirmation bias can be treated as cases of self-deception. In fact, the conception of self itself can be treated as a form of delusion and that may be the reason why such deceptions are far away from being uncommon. The narratives we weave and live with are replete with cases of partial perception and misleading interpretation.

What emerges from the above account is that the self or the conscious system does not have access to much of the actual causes of behaviour but the system is oblivious of this and ends up thinking of itself as the actual cause. This can result in a particular form of self-conception which is far away from the minimal notion of subjectivity.

6.6 Subjectivity and Self

Subjectivity is closely linked with the ability to have meta-representations. As Damasio points out, the emergence of subjectivity constitutes a turning point in evolution without which much of human advancement would not have been possible (Damasio 2010). The ability to have representation about representations is certainly remarkable, but it is important to note that subjectivity as such amounts only to the awareness of oneself as having thoughts and feelings. This can be called a separate perspective, but this does not necessarily result in any alienation and conflict provided it is complemented with the awareness of the whole of which everything else is an equal part.

A deeper understanding of this point can be made by looking into Metzinger's self-model theory of subjectivity (Metzinger 2010). According to Metzinger, minimal phenomenal selfhood arises due to the need to have an integrated self model for proper coordination and action. This minimal self-consciousness can lead to a rich first person perspective when there is representation of oneself as being directed towards an object. This inner image of ourselves as subjects directed at the world, Metzinger contends, is the key to the emergence of full-blooded self with apparently irreducible subjectivity.

It may be objected that mere representations cannot be constitutive of subjectivity as there is the feeling of a distinct ontological category associated with subjectivity. Metzinger ingeniously meets this objection by arguing that this happens due to the transparency of the model. That is, the system using the representation is in direct touch only with the content of representation and is not able to realize the fact that they are mere representations. This gives rise to the notion of direct contact with reality and subjectivity is understood as something that exists by itself.

The most important question is whether such a perspective necessarily leads to the free-floating self or not. In this context, it is pertinent to make a distinction between perspective and ownership. Having a perspective or being directed at something does not necessarily mean considering oneself to be completely separated from everything else and being able to possess other things. The interconnectedness of things can be understood even while living with a subjective perspective. That is to say, there is something real in the self-conception, but there are several embellishments which can be safely done away with (cf. Miri Albahiri 2007).

This point needs to be explicated in more detail. Human beings are taken to have not just a body to protect but a self to defend and aggrandize as well. This is taken to be the distinguishing feature of being human. But this misses the simple fact that biologically what distinguishes humans is the capacity of meta-awareness. A dog is able to see but it can hardly have the ability to entertain any thought about this ability. That is to say, it cannot conceive of the counterfactual of not being able to see. This ability is what makes humans unique among animals. This, in addition to the model of the whole body, can be the basis of the minimal self-awareness which can be dispensed with only at the expense of survival.

This minimal self-awareness need not assume a form so as to feel alienated from the rest of world and to perceive the world solely as a place to seek gratification. Instead, it is possible to treat oneself as simply a part of the whole. Such a transformation presupposes more and more meta-awareness. Unconscious representations may continue to remain transparent, but as far as conscious thoughts are concerned, there is scope for enhancing their opaqueness (Metzinger 2010). This can be understood as thought becoming more and more proprioceptive (Bohm 2007). That is to say, when a thought arises the awareness that that thought is the result of one's own impulse comes part of the overall awareness. This is similar to the awareness we have about our bodily movements. This, in turn, can challenge the implicit notion that thought is literal in the sense of reflecting what is out there. To see that thought is not literal amounts to the ability to overcome the feeling of necessity attached to thoughts.

6.7 Conclusion

Human self-conception has undertaken a huge deviation from the original simple form of meta-awareness. We have ended up treating the "body" as simply a tool to achieve the aims of the "mind". The "struggle for survival" has become associated with the survival of the self with dangerous implications for biological survival. In such a scenario, it is important to look into the meaning of the self. Such an inquiry points out that meta-awareness is the distinguishing feature of human beings and the separative self with insatiable wants and associated negative emotions does not necessarily result from it.

Conflation between being human and having a free-floating self is due to lack of understanding what is distinctive of human beings. The biological capacity of meta-awareness is what distinguishes humans, and this need not result in the free-floating self-conception. It appears to be the case that such a self-conception is ingrained in most human beings because of lack of sufficient meta-awareness. Thus any attempt towards reducing the "wants" by enhancing awareness can be understood as developing towards being more human.

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Chapter 7
Consciousness, Memory and Dreams in *Kashyapa Samhita*

Malavika Kapur

Ayurveda represents knowledge of life and is basically a medical science. There are eight branches and these are: *Kumarabratya* (obstetrics, gynaecology and paediatrics), *Kayachikitsa* (internal medicine), *Shalya Hartrka* (surgery), *Visha Tantra* (toxicology), *Shalakya Tantra* (ear, nose and throat – ENT), *Bhuta Tantra* (demonology/psychological therapies), *Agada Tantra* (preventive medicine) and *Rasayana Tantra* (rejuvenation).

Ayurveda is attributed to *Brahma* for the protection of all living beings of the universe. He gave it to *Ashwins* who gave it to *Indra*, who subsequently gave it to the four sages, *Kashyapa*, *Vashistha*, *Atri* and *Bhrigu.* They passed it on to their sons and disciples. *Kashyapa Samhita* is the sole paediatric text (ed. P.V. Tewari 2002) and the only ancient treatise that bears an alternate name, after the scribe, "*Vriddajivakiya Tantra*". The concept of the mother and the infant as a single unit is promoted in this treatise of women's diseases and child care. The text is supposed to have been scribed by a 5-year-old prodigy named Jivaka between 5th and 12th centuries.

Apart from theory and practice of medicine, the treatise is a veritable mine of myths, legends, religion, deities, demons and sages. It contains information on weights and measures, cities and countries, units of time, seasons, metals and minerals, flora and fauna, food and drug preparations, rituals and rites of passage and so on. It also contains codes of conduct for the healers, teachers and pupils (Kapur and Mukundan 2002). Of the above, only three strands are teased out for this chapter. It needs to be highlighted that the concept of "self" is conspicuously absent in this paediatric text as much of the data is based on the observation and not on introspection. These are consciousness, memory and dreams.

Of the above three topics, consciousness and memory are inseparable in addition to intellect. However, dreams have special significance in *Kashyapa Samhita.*

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*,
DOI 10.1007/978-81-322-1587-5_7, © Springer India 2014

7.1 Evolution of Consciousness

From *Avyakta* (primordial unmanifest) emerges *Mahat* (intellect), from *Mahat* is *Ahankara* (ego), from *Ahankara* is *Akasha* and the eight *bhuta prakritis* (basic physical constitution) and five *indriyas* (sense organs) and the sixth being *manas* or mind. Eyes, ears and mind deal with remoteness and while nose, tongue and skin function at proximity.

At around the time of conception, both partners are advised on diet, rituals and other activities. Once the woman becomes pregnant, the mode of life to be adopted is instructed to her. She is advised on wearing garments and ornaments that are intact and auspicious, having recommended diet and observing rituals. In essence, the advocacy is for experiencing positive aspects of life and avoiding negative events, people and attitudes. All these precautions are to be taken to protect the foetus and provide it with congenial intrauterine environment.

7.1.1 Foetal Development and Consciousness

First Month: The unification of *Shukra* (sperms), *Sonita* (ovum) and *Atma* (self) occurs. The term *Atma* in this context may defy a definition.

Second Month: The embryo takes rounded, elongated or oval shape depending on the gender.

Third Month: All the body parts manifest simultaneously in due order the foetus quivers, achieves *consciousness* and *feels pain*. The *mind* manifests itself more than the sense organs.

Fourth Month: The foetus attains stability and becomes free of abnormalities.

Fifth Month: There is an increase in flesh and flow of blood.

Sixth Month: There is an increase in strength, complexion and *ojas* (vital power).

Seventh Month: It becomes complete in respect of all *dhatus* and body parts along with optimal levels of *vata*, *pitta* and *kapha.*

Eighth Month: Foetus is unstable due to the exchange of *ojas* between the foetus and the mother.

Ninth Month: The foetus possessing *Satvik* nature remembers all the deeds of previous birth as well as the sorrow and pain of the intrauterine life. When associated with *rajas* and *tamas*, it does not remember anything after being born.

The implication of above description is that the foetus carries the memory of earlier births but also of the intrauterine state. Thus consciousness and memory appear to merge fairly early in foetal development. While consciousness emerges at the third month, memory is viewed as a reservoir of knowledge across generations.

From the perspective of contemporary paediatrics, the fact that the foetus is aware of its environment is a new discovery. A few decades earlier in the paediatric practice, the newborns were presumed to have no pain sensation and minor surgical procedures were performed without the help of anaesthesia. In the beginning of the century, even famous psychologists like William James famously described the newborn's mind as "blooming buzzing confusion", while *Kashyapa's* description of the foetus and the newborn is a splendid example of latest notions in developmental psychology.

7.2 Memory

In *Kaumarabhrathya*, in relation to memory, following the birth, there are several treatments for promoting memory as well as intellect in the infant. These are initiated soon after birth. The newborn is made to lick ground gold as a part of the *Jatakarma* ritual. Further, it is recommended that the same may be carried out in a routine fashion along with several other herbs and roots. Most of the treatments such as that of *Satavari* and *Satapushpa* promote all aspects of health. There is also a mention of conditions such as fever can produce confusion in memory and consciousness. Thus memory, intellect and longevity are seen in combination and can be promoted through treatments.

The above notions however cannot be compared to modern neuropsychological basis of infant memory as most of the studies deal only with adult memory.

7.3 Dreams

In *Kashyapa Samhita*, the prognosis of disease is an important component as in any school of medicine. However, apart from clinical and physical features of the diseases, dreams too have an important role in prognosis. Dreams have a unique place in *Kashyapa Samhita.* A healer depends on the dream narratives of the child, the mother (or the wet nurse) and the healer himself. The dreams are often vivid and premonitory. The predictions are made of possible fatal or serious illness or recovery. The dreams that are not premonitory are (the translated definition reads as [verse 23.2–24]) "fruitless dreams". These are dreams which are (of the subjects) desired, imagined, seen, experienced, heard, likely to happen in future, short, long, seen during the day and due to *doshas* as narrated in the *nidhana – sthana* are useless (have no effect). Here the various reasons for dream content are narrated and declared as nonsignificant. The "fruitful dreams" (verse 25–26.1) are previously unseen, untold, unimagined and unuttered, for which no action can be held responsible, and are complete to the end. In *Kashyapa Samhita*, detailed descriptions of premonitory dreams of serious and fatal diseases are given.

In *Kashyapa Samhita*, minor and major illnesses of childhood are described. The group of serious and often fatal disorders is termed *balarogas* or *balagrahas* as they are attributed to seizure by the *grahas.*

These are supernatural or demonic forces. Kumar (1994) interestingly draws parallels between the *graharogas* and contemporary paediatric diagnosis. Symptoms of seizure by *Skanda* are similar to that of polio, *Skandapasmara* is epilepsy, and *Naigamesha (Mesha)* is meningitis. On the other hand, *Putana*, *Shitaputana*, *Andhaputana* and *Revati* are manifested in diarrhoea/dehydration and vitamin deficiency. Symptom of *Pitragraha* is respiratory infection, while *Swagraha* is rabies. *Shuskharevati* (abdominal tuberculosis) is Koch's abdomen. *Shakuni* is impetigo (blisters with fever) and *Mukhamandika* is Indian childhood cirrhosis.

Qualitative analysis of some of the descriptions of Kashyapa Samhita (pp. 153–157) of the premonitory and prognosticatory dreams is described, albeit briefly, in the following section. The dreamer may be an adult, the physician himself, the mother or/and the child, child or/and the wet nurse. The prognosis could be death or seizure by the *balagrahas.*

Dreams of bad prognosis are indicative of seizure by the *grahas.*

(a) Dreams predicting death are: destruction of the famous mountains, falling of luminous objects, extinguishing of burning fire, falling of house or trees and entering caves or forests.

    Dreams predicting imminence of death are: naked black women with shaven head and red eyes, holding a stick; a premonitory dream on the night of death; and seeing a black woman with long breasts and long finger nails, wearing discoloured clothes and flowers.

    The above death-related dreams indicate the time frame of nearing of death and black woman as the symbol of approaching death.

(b) Dreams of seizure by the *grahas*: Dreams are either seen by the mother or the child or relate to actions performed by them. Given below are the descriptions of dreams premonitory of seizure by the various *grahas.* For example:

    (i) In *Skanda* (polio), seizure mother/child see themselves in red clothes, carrying red articles, child being anointed with red sandal paste, seeing falling flag or bell, sleeping on bed smeared with blood, and seen to be riding and child riding a peacock, cock, goat or sheep.
    (ii) In *Skandapasmara* (epilepsy), the mother is seen adorned with red flowers and clothes, anointed with red sandal paste or dancing with the *bhootas* (spirits).
    (iii) In *Skandapita*, the wet nurse dreams of reaching a forest of red lotus and the wet nurse adorning herself and the child in red clothes and garlands.
    (iv) When the wet nurse dreams of entering the forest of red flowers or fire, or she dreams of the child being burnt by fire, it indicates the seizure by *Pundarika.*
    (v) Prior to the seizure by *Revati* (anaemia), dreams of drowning of the child in the sea or tank are seen.
    (vi) Prior to the seizure by *Shuskharevati* (Koch's abdomen), the mother or child dreams of a dry well or riverbed.
    (vii) Prior to the seizure by *Shakuni* (impetigo), the mother or child sees carnivorous birds.

(viii) Prior to the seizure by *Mukhamandika* (cirrhosis), the child dreams of being bitten by birds flying downwards (the child dies immediately) or the child dreams of wearing yellow clothes and flashily adorned.

(ix) During the seizure by *Putana* (dehydration), the child or the mother dreams of planets, moon or stars.

(x) When all the dreams described above may be present, the seizure is by *Naigamesha.*

Dreams that prognosticate fever are: The child dies due to bites of insects, scorpion or snake, and the child is carried by the dogs, donkey or bad animals towards southerly direction or having shaven the head. The above dreams indicate death due to fever.

Dreams of good prognosis or auspicious dreams: While bad dreams predict death to a patient, it is doubtful if it occurs in a healthy person. However, a religious person is spared and is thus protected. Auspicious dreams are described below, while the opposite descriptions are true of inauspicious dreams.

The dreams could consist of viewing or in actions. Viewing may involve Brahmins in good health wearing clean clothes and sacred flowers, sun, moon, five pious men/Brahmins, white flowers, mirrors and seeing cow or fish or one's own blood.

Action may consist of climbing a palace, tree and mountain; riding elephant, cow, bull or human being; riding a chariot drawn by cows or horse; travelling east or north; weeping; drinking water; getting up after a fall; defeating enemies or crossing mud, well, cave, etc.

Together, the above indicate non-severity of the illness, and it is possible to cure them by the physicians using appropriate drugs and pacificator rituals. For example, the person should take a bath; offer oblations to fire; offer fire-coloured mustard seeds, ghee and dill; and recite *Savithri*, to become pious and be free of all sins and diseases.

7.4 Implications

The notions of consciousness and memory during the foetal development in the contemporary paediatric knowledge is of recent origin, whereas only a few decades back the foetus was viewed as incapable of experiencing pain or feelings. However, the view that individual's memory spans across births is perhaps a product of belief in reincarnation. Memory, however, is tied to the specific individual psyche across birth and not someone else's. Perhaps this could be examined further in the context of human genome research.

Dreams, on the other hand, as ordinary and non-predictive in *Kashyapa Samhita*, is a very interesting categorization. Much of the work of Freud and others falls into the former category by the nature of description, while predictive dreams fall into the realm of parapsychology. Unlike in *Kashyapa Samhita*, none have used dreams in medical prognosis.

Freud (1975) called dreams the royal road to the unconscious. Dreams have an important place in the psychoanalytic theories both for interpretation and for its use in therapy. Freud described the dream processes as consisting of condensation, displacement and symbolization as revealed by their manifest and latent contents. On the other hand, Jung (1993) went beyond the individual wish fulfilment and tapping unconscious reservoirs and spoke of universal archetypes and a shared basis of dreams. Farady (1972) saw the dreams as remainder, working, clairvoyant, seeing through people and precognitive in nature and used prospective dreams in therapy. O' Flaherty (1984) did a brilliant analysis of dreams as viewed in the West and the East, highlighting that in the traditional Hindu thought, the dream was not accidental experience or a by-product and that it played an important role in human experience. It is to be however noted that Kleitman in 1953 as highlighted by Farady (1972) into the forefront with REM and NONREM EEG patterns associated with dreams, firmly grounding the dreams to physiology of the brain.

Kashyapa, on the other hand, emphasized the universality of dreams in prediction of well-being/health and ill health. Dreamer only received the content pool that was universal and his state of being, in turn, had the predictive quality. This interpretation is at variance with the Western dream theories. Thus dreams are linked to the physiology of the body, yet are incapable of predicting its status. While Western practitioners of dream analysis used it for therapy, *Kashyapa* recommended pacificatory rituals by the dreamer to overcome the possibility of negative prognosis.

To summarize, consciousness emerges at the third month of the foetal development. Memory reaches beyond one's birth and is seen as an essential component of the mind, the intellect. The presence of memory across generations is a product of *Sattva.* On the other hand, dreams are seen as a possibility of prediction into future and with universal meanings of the Western thinkers. Only Jung suggested the universality of dreams.

Where do these insights lead us? Some speculations are in order:

(i) Can the study of consciousness at the foetal stage throw light on the emergence of human mind?
(ii) Can the interaction between the maternal states of body and mind and the foetus be empirically studied?
(iii) Is the consciousness of the foetus similar to the other basic life forms in the evolutionary ladder?
(iv) Is the foetal consciousness is a prototype of the cosmos *(akasha)*?
(v) Can memory be transmitted across generations as alluded to in *Kashyapa Samhita*?
(vi) Is there a relationship between such transmitted memory and *Sattva*?
(vii) Can memory be enhanced through treatments suggested in *Ayurveda*?
(viii) Are there dreams that are universal across individuals and cultures?
(ix) Can dreams truly predict health status of the person?
(x) Do healers need prerequisite qualities such as *Satvik* temperament (bearer of knowledge of previous births)?

(xi) Do dreams regarding health of the patient are truly predictive?
(xii) Does a bond between a mother and the child be understood – in terms of inheritance of acquired characteristics, dreams, etc.?

Could the above speculations be empirically examined?

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Chapter 8
Experientially Acquired Knowledge of the Self in a Nonhuman Primate

Anindya Sinha

8.1 Introduction

Empirical studies on the cognitive abilities of nonhuman primates and their underlying mechanisms developed primarily because we assume that their intelligence and, if one may use the term, minds are most like our own. Through our understanding of them, we would possibly one day understand what it is like to be essentially human. However, this view that they are most like us also coexists in our minds with the equally pervasive idea that nonhuman primates differ fundamentally from us because they lack sophisticated language, and may, thus, also lack some of the capacities necessary for reasoning and abstract thought. Given our current understanding of the cognitive abilities of many primates, including the possible existence of rudimentary semantic communication in some species (Cheney and Seyfarth 1990; Tomasello and Call 1997), however, it is possible that comparative studies on primate taxa may yet throw light on the nature and evolution of different human cognitive abilities, including consciousness (Griffin 2001).

A feature that commonly characterizes most primates, including monkeys, apes and humans, is the presence of a complex society in which individuals spend most of their lives. Extensive social interactions among individuals of different ages, sexes, dominance ranks and kinship are typical of many of these societies (Smuts et al. 1987; Mitani et al. 2012). The development and maintenance of such complex social relationships – each different in its own way – are believed to have placed unusual

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*, DOI 10.1007/978-81-322-1587-5_8,

demands and selected for enhanced cognitive abilities in individuals living in such societies (Chance and Mead 1953; Jolly 1966; Humphrey 1976). An important component of such social cognition is the social knowledge that individual primates might possess with regard to certain attributes of other individuals that they regularly interact with within their social group. In addition to the obvious recognition of each animal as a distinct individual, the possible attributes that such knowledge might encompass could include, amongst others, knowledge of the dominance ranks of other individuals and an awareness of the social bonds between other members of the group – both factors that seem to influence much of the social behaviour observed in primate societies. As such societies are typically characterized by both competition and cooperation, it becomes possibly even more important that each individual is able to consistently evaluate its own position in the prevailing rank hierarchy and social affiliative networks, and thus obtain knowledge of one's own self.

8.2 Social Knowledge in Nonhuman Primates

Several earlier observational and experimental studies have clearly shown that individual baboons (Kummer 1968; Bachmann and Kummer 1980; Smuts 1985; Cheney et al. 1995; Cheney and Seyfarth 1999), macaques (Judge 1982; Datta 1983; Ogawa 1995; Sinha 1998; Silk 1999), vervet monkeys (Cheney and Seyfarth 1980, 1986, 1989) and chimpanzees (de Waal and van Roosmalen 1979; de Waal 1982) are knowledgeable about the relationships of their social companions; such knowledge seems to be usually acquired by observing the social interactions of other individuals. What is not entirely clear from the previous studies, however, is the nature of inferences that allows such knowledge to be acquired. Does an individual evaluate the social bonding between each of the interacting pairs of individuals relative to itself? Or, is it simply aware of the extent of the affiliative relationships enjoyed by another group member without specifically remembering each and every pair bond? At a more functional level, what is the relative importance of the frequency of affiliative interactions as opposed to the time spent in these interactions for such an assessment?

In an early experimental study that attempted to understand how nonhuman primates conceptualize social relationships, Bachmann and Kummer (1980) showed that a male hamadryas baboon (*Papio hamadryas*) was less likely to challenge a female possessed by another male, the stronger her affiliation with her companion. Hamadryas baboon males were thus apparently able to assess the social choice of females, but the experiment could not exclude the possibility that the entire relationship was read from the behaviour of only one of the group members. In other words, it is still not clear whether an individual can conceptualize the multiple relationships of a potential adversary, information that cannot obviously be obtained on the basis of the behaviour of a single individual alone. Extending this problem further, if knowledge about the social relationships of a number of group members can be simultaneously acquired, is an individual able to integrate information about all interactants when involved in a complex social interaction with more than one partner?

Yet another important functional aspect of knowledge acquisition and use involves the specific aspect of an attribute that an individual evaluates as it takes a particular decision. When a female macaque female acts on her knowledge of the dominance ranks of her social companions, for example, does she take into account their absolute ranks independent of her own, or does she evaluate their respective positions in the dominance hierarchy relative to her own particular rank?

8.3 What Do Bonnet Macaques Know?

Our insights into the social knowledge, including knowledge of one's own self, in nonhuman primates come from behavioural observations on the adult females of a wild troop of bonnet macaques inhabiting dry deciduous scrubland and mixed forests around Bangalore City in southern India (Sinha 1998).

We documented a particular kind of a competitive interaction for access to grooming partners between adult females – allogrooming supplants – in which a dominant female displaces one member of a pair of grooming females, both subordinate to her. There were 75 such observed triadic interactions, and in 63 of these (84 % of the cases, or the "usual" cases), the more subordinate of the two individuals that were approached (henceforth referred to as "subordinate") retreated even before the dominant female (the "dominant") could reach them. In the remaining 12 instances (16 % of the cases, or the "exceptional" cases), however, the more dominant member of the dyad (the "intermediate") moved away. As the majority of these supplants consisted of the subordinate individual retreating, it is plausible that such females prefer to avoid two higher-ranking individuals in such situations. Assuming that this is indeed true, what factors could have motivated the intermediate individual to retreat in the exceptional cases?

The proportion of retreats exhibited by the intermediate and subordinate individuals during these triadic interactions was not different from what would be expected on the basis of their behaviour during dyadic approaches, thus ruling out the simple hypothesis that retreats during grooming supplants could be guided by the outcome of simple one-to-one interactions that are much more frequent between pairs of adult females (Sinha 1998). The outcome of behavioural interactions between adult female cercopithecine primates often depends on the respective positions that they occupy in the dominance hierarchy. In addition, inter-individual aggression is invariably directed down the hierarchy and usually serves to reinforce the dominance status of each female (Smuts et al. 1987). Could grooming females being supplanted decide to remain in place or retreat on the basis of their dominance ranks? Rank difference between the specific dominant, intermediate and subordinate individuals involved, considered in pairs, did not differ significantly across the usual and the exceptional cases. Aggressive interactions initiated by the dominant females towards their intermediate and subordinate counterparts, examined across the entire observation period, also could not explain the behavioural difference of the supplanted females in the two situations (Sinha 1998).

Could the intermediate individual in the exceptional cases be avoiding the approaching dominant female since she is aware of a preference of the latter for the subordinate individual as a social partner? The dominant females did not appear to discriminate between the subordinate and the intermediate individuals as grooming partners with regard to time spent in grooming them respectively, either in the usual or in the exceptional cases (Sinha 1998). This would make it unlikely that, in the exceptional cases, the intermediates retreated because of a preference of the dominant females for the subordinates over them.

To summarize, the proportion of times that a subordinate female remains in place during an allogrooming supplant is not affected by her dominance rank, rank differences with the approaching female and her grooming companion, or the agonistic relationships between these individuals. Her response during these triadic allogrooming supplants also does not appear to be influenced by her corresponding behaviour when approached by dominant females during dyadic interactions.

8.4 Knowledge of Social Relationships

A different perspective to the decision-making process during triadic supplants could involve the act of not retreating performed by the subordinate female. When the identities of all the subordinate individuals involved in these 75 interactions were examined, a significant positive correlation was observed between their indices of social attractiveness (defined as the reciprocal of the coefficients of variation for allogrooming duration received from all other females in the troop) and their propensity not to retreat when approached, measured as the proportion of all approaches received (as the subordinate member of the triad) in which they were not supplanted (Sinha 1998). The reciprocal of the coefficient of variation (mean/standard deviation) of the allogrooming that an adult female receives from other females can be maximized by increasing values of the mean, decreasing values of the standard deviation or a combination of both factors. High values of this measure thus represent the consistency with which an individual is preferred as a grooming partner by other females and was, therefore, be used as an index of social attractiveness of that particular individual. Such indices were computed in terms of both, the frequency and the duration of allogrooming received by these individuals.

The above interpretation, therefore, implies that the subordinate member of a supplanted dyad was less likely to retreat, on being approached by a dominant female, when she was more socially attractive than her dominant grooming partner. This relationship, however, held only when social attractiveness was considered in terms of allogrooming time received by these individuals but not with respect to the frequency of grooming received by them. Moreover, no relationship could be discerned between the propensity to remain in place when approached and social attractiveness for the intermediate females of the triads, either for grooming time or frequency received (Sinha 1998). Extensive bootstrapping simulations by random sampling of subordinate females from those involved in the 75 observed supplants confirmed that the observed correlation coefficient of the proportion of times that a subordinate female did not retreat when approached and her social attractiveness in terms of allogrooming duration was indeed significantly different from that expected by chance alone (Sinha 1998). This, therefore, leads us to the conclusion that the intermediate female (that is, the dominant partner of the dyad) may actually be aware of the social attractiveness of the individual that she is currently with, and accordingly tend to retreat when approached by a still more dominant female.

It must be pointed out that the female macaques in our study troop did not appear to recognize and/or react to the social bonds that apparently exist between particular pairs of females (Sinha, unpublished observations). This is borne out by the fact that in the exceptional instances where the intermediate individuals retreated, the approaching dominant females did not appear to discriminate in directing grooming towards the subordinate and the intermediate individuals either with regard to the frequency of initiated events or the subsequent duration of grooming given to them. What is illuminating, however, is that these females nevertheless appeared to be responding to the social attractiveness of their partners as evaluated by the uniformity with which the latter received grooming from the other troop members. It is not only the mean grooming time received by the target individual nor the variation in the number of troop members who groom her that are independently being taken into account, but a combination of both factors.

Bachmann and Kummer's (1980) classic study on the hamadryas baboon was one of the earliest attempts to demonstrate that primates may be aware of the social relationships of others and take decisions on the basis of such knowledge. Their experiments, however, could not distinguish whether it was indeed the social interactions that were providing cues to the observer or simply the behavioural patterns of either of the two interacting individuals. Our study, however, showed that bonnet macaque females might be aware of the allogrooming that other individuals might be receiving from different members of the group. Knowledge of this kind, encompassing the multiple social relationships of target individuals, clearly needs to be acquired from observations of the actual social interactions of all the individuals involved in these relationships. It is very unlikely that the macaque females are simply reacting to the behavioural cues being provided by each observed individual in the troop.

In order to react to particular social relationships between pairs of group members, an individual would have to memorize the pattern of interactions among each pair. Observation and memorization could suffice in small primate groups that are relatively stable over time but would obviously place increasingly difficult cognitive demands on an individual either as the group size increases or its composition changes (see also Cheney and Seyfarth 1986). An alternative strategy that bonnet macaque females seem to have evolved is to obtain an impression of the social attractiveness of another individual with regard to its affinity to the other group members without specifically remembering each and every pairwise interaction.

Such an ability would obviously appear to make the task of evaluating one's own position in the group's social network much less cognitively demanding.

But what do individuals actually observe and memorize? Whenever dominant females in the allogrooming dyad took a decision to move away, they appeared to do so primarily on the basis of the consistency with which the other females in the troop spent grooming time with her subordinate partner. It is interesting that the females seemed to be reacting more to the duration of grooming that the other individual received (as measured by the total time spent by her in this activity) than to the actual frequency of the initiated events. This would require that the observer simply scan the target individuals periodically to note whether she is being groomed instead of remembering the actual number of times that an individual has been groomed. Again, this calls for a cognitively simpler mechanism to obtain the desired information. In addition, individuals also apparently need to remember whether different group members are uniformly grooming the target female during these scans.

8.5 Knowledge of Dominance Ranks

When all the 75 cases of competition for allogrooming partners were considered, there was a strong positive correlation between the frequency of approaches a female had received as the intermediate member of the triad and her social attractiveness in terms of grooming frequency received from all the other females in the group. This was in spite of the fact that the intermediate and subordinate individuals in the approached dyads did not differ in their social attractiveness in terms of grooming frequency or duration. In contrast, no relationship could be discerned at all between these parameters and the frequency of approaches received by the subordinate members of the allogrooming dyads. This clearly indicated that individuals who were more socially attractive as grooming companions for the females in the group were approached at comparatively greater rates by more dominant individuals. The important point here is that this did not hold true for the same females if they were the subordinate members in the supplanted dyad. The approaching dominant females, therefore, appeared to be well aware of the relative dominance ranks of the two approached females, both subordinate to her.

Support for the possibility that there could indeed be a preference for the intermediate females came also from the direct observations of 25 instances when a dominant female approached two allogrooming subordinates and proceeded to herself groom one of them. The dominant member of the dyad was preferentially groomed on a significant majority of 20 of these occasions; the subordinate received attention in only five instances. Consequently, these results would argue that the approaching female may be specifically attending to the more dominant member of the approached dyad, and therefore, she must be aware of the relative ranks of the two approached individuals.

The conclusion that an adult female bonnet macaque might indeed be aware of the dominance ranks of the other females in the group was also supported by data from yet another kind of triadic interaction. On 17 occasions, a dominant female approached two of her grooming subordinates and supplanted one of them through aggressive interactions. In 13 of these instances, the more subordinate of the two females was attacked, while the intermediate individual received aggression on the remaining four occasions. Aggression was thus more significantly directed towards the subordinate individual than would be expected if the dominant female were to attack either of the females randomly.

An attempt was made to examine the factors that could motivate approaching females to preferentially exhibit aggression towards more subordinate females when supplanting a member of a grooming dyad (Sinha 1998). The dominant females, involved in these 13 particular interactions, did not show any inherent preference in directing grooming (in terms of either frequency or duration) towards the intermediate individual over that towards the subordinate one over the entire observation period. The intermediate females were also not more socially attractive (in grooming frequency or duration) than were their subordinate companions. Finally, as compared to their intermediate counterparts, the subordinate females had not necessarily received more aggression from these particular dominant individuals in dyadic interactions over the observation period.

Is it nevertheless possible that the dominant female was aware of a differential response made by individuals of different ranks to aggression shown by her during dyadic interactions? The proportion of approaches received by females from more dominant individuals to which they retreated did not, however, correlate with their absolute ranks; dominant females may not thus be able to use such behavioural responses as cues to the relative ranks of their subordinates. There was also not a single instance during the entire observation period when any of the intermediate females, though often close in rank to the dominant individuals, had ever been observed to threaten or attack any of the latter (Sinha unpublished). On the other hand, a surprising result was that dominant females were significantly more likely to attack subordinates of higher rank than those of relatively lower ranks during dyadic interactions (Sinha 1998); this was in complete contrast to their behaviour during triadic interactions. Taken together, these results suggest that the a dominant individual may be well aware of the ranks of two grooming females and may choose to show aggression more towards the subordinate member of the dyad when she has a choice of supplanting one of them. These contrasting behavioural patterns also suggest that females may also choose different strategies depending on the prevailing situation; a more subordinate female is thus attacked only when another female is present.

How do macaque females assess individual ranks? Do they follow a brute force method by which individuals observe and remember dyadic interactions between each and every pair of troop members and then conclude a linear hierarchy? Alternatively, are bonnet macaques capable of inferring linear orders by associative transitivity (Treichler and Van Tilburg 1996)? Such processing of serial information would be advantageous in allowing them to deduce individual ranks in the hierarchy from partial knowledge of agonistic relationships without having to observe interactions between every pair of individuals (for a discussion, see Cheney and Seyfarth 1990). Future studies under controlled conditions in the laboratory may provide an answer to this dichotomy.

8.6 Decision-Making During Allogrooming Supplants

Knowledge of dominance ranks and social attractiveness could thus be important factors that influence the probability that an individual will decide to either retreat or stay back during grooming supplants. It was, of course, clear that neither of these factors, by themselves, were of absolute importance since, in each case, it was not necessarily the dominant or the more attractive individual which failed to retreat. It thus became of interest to understand which of these aspects of an individual's social knowledge of her grooming companion correlate with the decision to retreat during a triadic interaction.

Each member of the 75 approached dyads either retreated or failed to do so; the dependent variable was thus a binary one and could be influenced by a number of independent variables. Logistic regression analysis (Cox 1970; Shanubhogue and Gore 1987) was thus used to determine the factors that may critically influence the decision of a female in a grooming dyad to retreat when approached by a more dominant individual (Sinha 1998). The independent variables that were considered in these analyses included the individual's own dominance rank, rank of the approaching dominant female, rank difference with the approaching female, rank of the grooming companion, rank difference with the grooming companion, the individual's own social attractiveness in terms of the duration of grooming received by her from other females and the rank difference in attractiveness with the grooming companion. Social attractiveness was considered only for duration of grooming received since this measure was found to be important for the macaques' knowledge of allogrooming relationships. Regression was carried out with all these variables taken one at a time as well as with all of them considered together (Sinha 1998). The influence of the absolute dominance rank or social attractiveness was investigated by two slightly different approaches: once by including these variables directly as such and once by including the difference in rank or attractiveness between the two individuals in the set of independent variables.

The first set of models examined the relative influence of the different variables on the probability that any female in an allogrooming dyad would retreat when approached by a more dominant individual (Sinha 1998). Two regression coefficients, namely, those associated with an individual's own dominance rank and with rank difference with the approaching female, were significant. According to this model, therefore, an individual had an increased probability of retreating as its position in the rank hierarchy fell, as it did when the approaching individual was relatively closer to it in rank. In contrast, an alternate model that incorporated the absolute dominance rank of the approaching female, instead of that for rank difference with her, failed to explain the observed patterns of retreats (Sinha 1998). It is important to note here that as these models included decision-making by both the members of the grooming dyad as the dependent variable ($n = 150$, derived from 75 interactions), they would consistently fail to distinguish between the knowledge of one's own rank or attractiveness and that of the corresponding properties of the grooming companion. Knowledge about oneself was, however, preferentially incorporated into the tested models, as it is less cognitively demanding.

To examine more explicitly the combined influence of social attractiveness and dominance rank, the following alternate approach was also explored (Sinha 1998). Models were constructed using, as the binary dependent variable, either the decision of the dominant member of the grooming dyad or that of the more socially attractive one to retreat or not to do so, but maintaining the same independent variables as above. Absolute rank and attractiveness of the grooming companion could also be now legitimately incorporated into these models as independent variables.

Rank difference with both the approaching individual and the allogrooming companion was found to significantly influence the probability of retreat of the more dominant member of the dyad in a particular model described in Sinha (1998). Such an individual was, therefore, more likely to retreat when the approaching female became relatively less dominant to her while the grooming companion became progressively more subordinate. An alternate model that incorporated knowledge of the absolute dominance ranks of the approaching individual and the grooming companion as well as the social attractiveness of the latter instead of their values relative to one's own, however, failed to reveal a significant influence by any of the independent variables.

Why would a dominant female retreat more often when she was with a relatively more subordinate individual? One solution to this problem possibly lies in the strong positive correlation that was observed between the rank difference of the dominant members of the dyads with their subordinate companions and their difference in social attractiveness in terms of grooming duration received (Sinha 1998). Increasingly more subordinate companions were, therefore, relatively more attractive as grooming partners to all the females in the group, and the retreating dominant females may have been aware of this relationship.

Regression models were also constructed to examine the influence of the different independent variables on the probability of the more socially attractive member of the grooming dyad retreating. Either of two alternative models, which surprisingly yielded identical estimates for the respective significant variables, could explain the observed behavioural patterns (Sinha 1998). It was not possible, therefore, to determine which of the two variables – dominance rank of one's companion or rank difference with her – was more important in influencing the behaviour of these individuals. An alternative model that used these two variables alone yielded a good fit with the observed data but failed to assign priority to any of them (Sinha 1998). Rank difference with the approaching female was, however, no longer a significant factor in these models. This last set of models, thus, clearly showed that the more socially attractive member of an allogrooming dyad was more likely to retreat (in spite of her popularity) as her companion became increasingly dominant to her.

To summarize, our logistic regression analysis indicated that the two most important factors that were taken into consideration for a decision to be made to move away or stay on during allogrooming supplants included knowledge of the subject's own dominance rank and her rank difference with the approaching dominant female. A model that incorporated the absolute rank of the latter failed to explain the observed behavioural patterns. Individuals, therefore, clearly appear to be aware not only of their own positions in the rank hierarchy but also of that of the other females in the troop. What is more interesting, however, is that this knowledge of another individual's dominance rank seems to be acquired only relative to one's own; a female knows of her rank difference with another female but does not appear to be aware of the absolute position of her adversary in the rank hierarchy. This finding reinforces the view that social knowledge of primates might primarily be of an egotistical nature in that knowledge of another individual's attributes is best acquired and conceptualized in terms of the subject's own attributes. Knowledge of the absolute is also likely to be more cognitively demanding than knowledge of the relative, especially that based on the self. Relative knowledge of this kind can be easily obtained when the subject actively interacts with another individual; its acquisition does not necessarily require that she observe and memorize social interactions between other individuals and which do not involve her.

Rank difference with the approaching female and with the grooming companion appeared to be important motivating factors when the more dominant member of an allogrooming dyad decided to retreat on being approached. Individuals are thus clearly able to simultaneously process information about all their interacting companions and then use this knowledge effectively during complex social interactions. The computations involved in this particular situation were further complicated by the fact that the intermediate female in a grooming supplant chose to retreat as the approaching individual became relatively less dominant to her while her grooming companion was comparatively more subordinate. Females in the study troop became increasingly socially attractive to others as they occupied progressively lower positions in the dominance hierarchy. A possible reason, therefore, for the intermediate female retreating in spite of being more dominant was the increasing attractiveness of her grooming companion. Again, the more socially attractive individual in the grooming dyad decided to leave only when her companion became progressively more dominant to her. Taken together, it seems evident that high dominance ranks of individuals can compensate for their lower attractiveness and vice versa during grooming supplants.

Finally, our findings suggest that individuals appear to be capable of not only integrating information about both their partners but seem to be simultaneously accessing different domains of their knowledge – those for dominance ranks and for social relationships – while making a decision; such knowledge is thus functionally integrative. Surprisingly, however, the logistic regression models failed to ascribe direct significance to knowledge of social attractiveness, either of one's own or of that of others, in the decision-making process (Sinha 1998). Is it then possible that information about social bonds is acquired in terms of their correlated dominance ranks? If this is true, it would suggest that, unlike in humans, knowledge in this nonhuman species is hierarchically organized. Certain categories or domains of knowledge could thus be much more easily accessible than others to individuals, and these domains could be preferentially used for the storage of related information from other categories.

8.7 Experiential Knowledge of the Self in Primates

An important observation in this study was that individual macaques seem to be knowledgeable about the general social attractiveness of particular females in terms of the allogrooming that they receive from other individuals, rather than remember specific pairwise affiliative relationships (Sinha 1998). As mentioned earlier, they also appear to know the relative dominance rank of each adult female in the troop – a clear example of recognition and knowledge of the individual attributes of one's group members. What is most relevant and significant for this chapter, however, is that the decision to retreat or remain behind during allogrooming supplants depended on the absolute position of the actor in the dominance hierarchy – the more subordinate an individual, the more likely she was to retreat. Clearly then, each female bonnet macaque has knowledge of some of her own individual attributes – knowledge that she has acquired through her own direct interactions with her group members.

What does the acquisition and application of such experientially acquired knowledge of oneself suggest of self-awareness and the concept of the self in nonhuman species like bonnet macaques? Although traditionally considered an exclusive domain of humans, the nature of the self in other species and its appearance in our species has, more recently, begun to attract serious academic attention (Gilbert et al. 1995; Leary and Buttermore 2003; Sedikides and Skowronski 2003). These psychologists have clearly recognized an essential biological continuity of the self across species and its natural history over evolutionary timescales. In their comprehensive treatise on the evolution of the symbolic self, defined as the ability to both consider oneself as an object of one's own reflection and to store the products of such reflections, abstract and/or language based, in memory, Sedikides and Skowronski (1997, 2003) distinguish between three aspects of the self: subjective self-awareness, objective self-awareness and symbolic self-awareness.

Subjective self-awareness, the cognitive capacity of an organism to differentiate between itself and its socioecological environment, allows an individual to engage in some form of self-regulation (a process where systemic parts coordinate the action of one another; Von Bertalanffy 1967) as well as perceive, interpret and change its environment through self-initiated action. It is crucial to note here that subjective self-awareness does not imply that cognitive representations of the individual's attributes are constructed and stored in memory (Sedikides and Skowronski 1997); there is only a "crude" differentiation between the organism and its environment. This differentiation is, however, essential for survival and, along with self-regulation and response to environmental stimuli, has been considered to be implicit or nonconscious (Damasio 1994). The processing of complex visual and auditory stimuli, cognitive representation of the physical and social environment, counting, remembering, categorization, communication – both with one another and with predators – the use and manufacture of tools and the development of effective problem-solving strategies (Gallistel 1989; Ristau 1991; Snowdon 1991) have all been considered attributes of subjective self-awareness. These cognitive abilities *do not*, however, assume a cognitive representation of self and can be successfully executed in the absence of such a representation (Sedikides and Skowronski 1997).

Objective self-awareness, in contrast, has been variously defined (reviewed in Sedikides and Skowronski 1997) as an individual's cognitive capacity to "become the object of its own attention" (Gallup 1992), to be aware of its "own state of mind" (Cheney and Seyfarth 1992) and "to know it knows, to remember it remembers" (Lewis 1992). The presence of objective self-awareness implies the presence of a primitive cognitive representation of the self, also referred to as the "objectified self" (Sedikides and Skowronski 1997). Consequently, objective self-awareness allows for self-referential behaviour, enabling individuals to use their own knowledge to model the knowledge of other individuals, anticipate what other individuals might do in certain situations by attributing motives or intentions to them and influence other individuals by intervening in their behaviour. It has been explicitly suggested that species without objective self-awareness should not exhibit such abilities and only the great apes, particularly orangutans, chimpanzees, bonobos and humans, amongst primates are objectively self-aware (Sedikides and Skowronski 1997). Finally, the reflective capacity afforded by objective self-awareness is believed to occur at an explicit or conscious level and is able to regulate and variously control subjective self-awareness (Bargh 1984; Lewis 1992; Damasio 1994; Sedikides and Skowronski 1997).

Symbolic self-awareness, a unique capacity of adult humans alone, refers to both the language-mediated and abstract representation of certain attributes of the self and the use of this representation to function effectively in affective, motivational and behavioural domains (Sedikides and Skowronski 1997, 2003). A close examination of the psychological basis of the human self suggests three closely related and occasionally functionally interrelated capacities: representational, executive and reflexive (Sedikides and Skowronski 2003). The representational capacity is able to acquire, maintain and organize self-relevant information, both concrete and abstract, and which can depict the past, present or future. These representations can also include metacognition (a comprehension of how others perceive one's behaviour), information about dyadic relationships, one's position within the group or about intragroup dynamics and intergroup relations (Sedikides and Skowronski 2003). The executive ability allows the symbolic self to regulate its relationship with its socioecological environment, primarily through the processes of valuation (protecting and enhancing the self), learning (improving the skills and abilities of the self) and homeostasis (seeking and endorsing information consistent with the self; Sedikides and Skowronski 2003). The third, reflexive, capacity of the self enables it to respond flexibly and dynamically to environmental changes by accessing and activating or deactivating different components of the stored self-knowledge. Furthermore, Sedikides and Skowronski (2003) note that an interaction between the above three capacities of the self allows an individual to "process information in a way that is detached from the immediate environment, travel mentally in time, imagine and contemplate the future, simulate the consequences of one's own actions, and take preparatory steps for what might come as well as reparative measures for what has come".

To return to our discovery of the ability of bonnet macaques to represent some of their own attributes, including their respective positions in the dominance hierarchy prevailing in the group, it could be speculated whether such representation characterizes subjective or objective self-awareness in this species. Although, as mentioned above, objective self-awareness has been hypothesized to exist only in the great apes, two lines of evidence from our results (Sinha 1998, 2003) could argue for the development of an objectified self in these macaques (sensu stricto Sedikides and Skowronski 1997).

First, the integrative nature of the knowledge acquired and organized by individual macaques allows them to simultaneously access information on the dominance ranks of more than one interacting individual and use these representations to aid social decision-making, as shown above for allogrooming supplants. The sophistication that characterizes the nature of such knowledge, rarely documented earlier in nonhuman primates, surely provides a convincing case for objective self-awareness in this species, far beyond what has been postulated to define subjective self-awareness (Sedikides and Skowronski 1997).

Second, our observation of the dominant member of the grooming dyad being more likely to retreat when her grooming partner was socially attractive led us to argue that these females behaved as if they were guided by a "belief" that the approaching individual was targeting their subordinate, but usually more socially attractive, companion (Sinha 2003). Bonnet macaques thus seem to be capable of attributing motives to other individuals within their social matrix, suggesting that they may be able to develop beliefs about such motives. In other words, it would appear that this decision to retreat was taken on the basis of a belief that a highly socially attractive individual was more likely, in general, to be the preferred target for affiliative interactions, even if she held a relatively low position in the dominance hierarchy. That such a belief might indeed be valid is supported by our earlier observation that there was a strong positive correlation between the number of approaches that the dominant female of the allogrooming dyad received from other females and her social attractiveness (Sinha 1998). The nature of this belief and the attribution of a corresponding motive to the approaching individual also seem to be rather pragmatic, as female bonnet macaques evaluate social attractiveness of an individual on the basis of the levels of allogrooming received and the consistency with which such grooming is received from other females in the troop. We would like to strongly point out that the attribution of such motives or intentions to other individuals is a definitive hallmark of objective self-awareness, which usually enables organisms to model the behaviour of other organisms on the basis of their own knowledge and, in the process, anticipate how these individuals might act in certain situations by attributing intentions to them (Sedikides and Skowronski 1997).

8.8 Mental Representation of Individual Attributes

Although the egotistical, integrative and hierarchical nature of the knowledge acquired, organized, memorized and applied during social decision-making by individual bonnet macaques must obviously call for some form of fairly sophisticated mental representation of particular individuals, including themselves, in association with certain specific properties, what remains unclear is how such information is exactly categorized and coded for in the non-verbal cognitive architecture of the macaque mind. Although there have been extensive studies on category formation and some of its underlying cognitive mechanisms with respect to physical objects or features (reviewed, for example, in Zayan and Vauclair 1998), the formation of social categories, particularly with regard to conspecific individuals, remains largely unstudied in nonhuman species.

In general, there are two kinds of social categorizations that social species like bonnet macaques may have achieved: recognition of conspecific individuals with identification of particular individuals and the representation of transitivity in social hierarchies.

An essential cognitive requirement for any individual would be to differentiate between members of different species, especially between conspecific and heterospecific individuals, and often between different categories of conspecifics such as dominant and subordinate members of its own social group or between related kin and non-related members of the group. In a classic study on two captive long-tailed macaque individuals, Verena Dasser showed that the subject individuals were able to distinguish photographic slides of familiar individuals from their own social group from those of unfamiliar members of another group and between slides of familiar individuals dominant or subordinate to other group members and, presumably, to themselves as well (Dasser 1987). Remarkably, she further showed that these individuals were capable of distinguishing between mother-infant pairs and other unrelated adult female-infant pairs in their social group as also differentiate between adult sister and non-sister pairs in the group (Dasser 1988). This study on social recognition thus clearly demonstrates the capacity of macaques to abstract certain general classes of social relationships (mother-offspring or sisters) within their social group although, admittedly, it is not evident whether they were able to form a social concept of these relationships in general, that is, beyond their own familiar social group. Thus, do macaques form conceptual categories of the social bonds that exist between conspecific individuals in general, including dominant-subordinate relationships? Our study individuals appeared to distinguish between different classes of dominant and subordinate individuals, relative to their own social rank, within their group. But were they able to form abstract categories of dominance and subordination that would allow them to recognize such individuals when they observed unfamiliar social groups? Neither Dasser's studies on captive long-tailed macaques nor ours on wild bonnet macaques have tested for such a capacity – and this is a crucial step that needs to be taken in the future before we can conclusively argue for the ability of these species to form truly abstract concepts of social relationships as we do.

A second capability that needs to be investigated is whether individual macaques can conceptualize a linear, transitive, hierarchical order as exemplified by a social dominance hierarchy that typically prevails within their social group. Dasser showed that her long-tailed macaque subjects correctly recognized the dominance-subordination relationships that existed in the group and the identity of the various group members, the slides of which were presented to them (Dasser 1987, unpublished; summarized in Zayan 1994 and Vauclair 1996). The macaques had thus formed and had access to an empirical concept of the asymmetry that characterizes a dominance hierarchy. It is also apparent that such a mental representation went, beyond the simple memory of pairwise interactions of the group members, a salient finding of our own study on bonnet macaques as well (Sinha 1998). There is, however, no evidence, in either study, of the macaques having formed an abstract concept of asymmetric dominance relationships that could be generalized even across unfamiliar individuals, as discussed above, with regard to the conceptualization of social relationships as well. There is also no support from Dasser's studies of individuals being able to generate a social transitive order or to represent social transitivity as a conceptual category that would generally apply to dominance-subordination relationships. It is instructive that in our study too, logistic regression analyses clearly failed to provide any evidence of bonnet macaques knowing the absolute dominance ranks of their group members – a possible correlate of being able to assign all interacting individuals to specific positions in a dominance rank order. They were able to assign ranks to these individuals in relation to themselves and knew the dominant-subordinate positions of interacting pairs of females. It has been argued that a cognitive process that underlies a truly perceptive inference of social transitivity should be able to anticipate the most likely outcome of a third dominance-subordination contest on the basis of visually acquired, remembered information on the status of two conspecifics in combination with the observer's own dominance or subordination experience with at least one of the conspecifics (Zayan and Vauclair 1998). The authors also suggest that short-term recognition of the visually and/or socially familiar individuals too must be involved in the prediction of the transitive outcome, while long-term individual recognition should strengthen the stability of the knowledge of linear dominance in groups of socially interacting individuals.

An alternate cognitive mechanism has been put forward by Cheney and Seyfarth (1990), who suggest that, instead of transitive inference, individual primates may have the capacity of associative transitivity, by virtue of which they may be able to internally represent the sequential order among a series of individuals; the ordering would require a simple prior association between two particular individuals, say A and C, which become related but not according to a relational rule common to the antecedent pairs of stimuli, here A – B and B – C. Individuals could thus consistently form representations of the relationships between individuals that interact relatively frequently. For example, if an individual Z is dominated at very high rates by all the individuals in the group while an individual A dominates all these individuals, the ability to deduce associative transitivity would recognize the clear prevailing asymmetry between individuals A and Z and spontaneously conclude that A would most probably dominate Z. No true deductive inference is necessary to represent such a transitive link. Unfortunately, there has not been any clear demonstration yet of nonhuman species being able to mentally construct and categorize a linear dominance hierarchy on a perceptive basis or on a purely conceptual one.

It is nevertheless important to reiterate here that our study individuals appeared to be able to conceptualize the dominant-subordinate relationships of their group members relative to themselves but it remains unclear how they were able to achieve this mechanistically. Was there a form of visual behaviour matching that they were able to accomplish and generalize, at least within their own group? Moreover, during triadic interactions, the integrative property of the bonnet macaque's knowledge system allowed her to respond appropriately to the relative dominance ranks of the two other interacting individuals. It is striking, therefore, that whatever may have been the stored imagery of the individual attributes of the two females she was interacting with, it was possible for her, as discussed above, to access both these stored resources and integrate them when finally making a socially complex decision.

8.9 Experiential Knowledge in the Socioecological World

It is noteworthy that an elaborate example of tool manufacture and use by a wild female bonnet macaque from the same study troop, that we had documented earlier, indicated the possibility that the individual was able to perceive the underlying causality of her actions and also form a mental model of the tool to which she could repeatedly refer (Sinha 1997). In the course of our long-term study on the ecology, demography and behaviour of wild bonnet macaques in the Mudumalai Wildlife Sanctuary (see Sinha et al. 2005 for details), we later observed yet another complex behaviour on the banks of the River Moyar in June 2004. Two young adult males (from a group of five bachelor males) systematically collected and washed wild mangoes that floated down the river, prior to consuming them. On one such occasion, one of these males misplaced a mango that he was washing and conducted a very directed search for it by feeling the shallow river floor close to the bank with his left hand. In addition to providing evidence for a planned, goal-driven action, this observation suggests that individual macaques appear to know the shape, feel or texture of a food item such as a mango, once again strong evidence for a capacity to characterize the physical properties of objects and remember them through subjective self-awareness.

In conclusion, the ability to form mental representations, generated by direct personal experience, appears to underlie the bonnet macaque's interactions with both the mechanical as well as the social components of her immediate environment. This suggests a rather early evolutionary origin for fairly sophisticated cognitive capabilities, characterized by an objectified self with limited regulatory control over more subjective levels of self-awareness, in cercopithecine primates, pre-dating those of the great apes. The nature of the objective self-awareness displayed by bonnet macaque, however, appears to be unusual in terms of the features believed to typify this kind of self-awareness (Zayan and Vauclair 1998). While individual macaques seem to be remarkably adept at acquiring fairly comprehensive and exact knowledge of the positions of different individuals in the dominance hierarchy relative to themselves, they may not be able to rank them in a linear transitive order or form abstractions of such a hierarchy. Individuals may also be able to attribute motives or intentions to the group members they interact with although they may occasionally hold erroneous beliefs and fail to project their experiences while predicting the behavioural motivations of other individuals (Sinha 2003). Finally, female bonnet macaques may be capable of accessing and integrating information on the dominance ranks of two (and more?) individuals while making a social decision during interactions with these individuals – a major advancement over simple one-on-one decision-making driven by associative learning paradigms, which have long been considered typical of most nonhuman species. We must, therefore, conclude this chapter with the speculation that bonnet macaques might represent an intermediate stage in the evolution of self-awareness in animals, beginning with the subjective awareness that characterizes most, if not all, species and culminating in the most sophisticated form of symbolic self-awareness that appears to be the hallmark of the human species alone.

Acknowledgements This work was supported by a research grant on Generativity in Cognitive Networks from the Cognitive Science Research Initiative of the Department of Science and Technology of the Government of India. I would like to thank Filippo Aureli, Niranjan Joshi, Kaberi Kar Gupta, Madhusudan Katti, Arun Venkataraman, Frans de Waal and members of the Tuesday and Wednesday Groups for critical discussions that shaped this work. I am grateful to Samir Acharya, Patralika Chatterjee and Abhijit Chatterjee for valuable logistic support, to Madhav Gadgil for the original discussion that began this work, to Milind Watve who first suggested that I learn about coefficients of variation and to Dhruba Naug who painstakingly wrote all the computer programs for the original analysis. Finally, I would like to express my sincere gratitude to Niranjan Joshi and Kakoli Mukhopadhyay for their constant enthusiasm, support and positive criticism throughout my academic life in Bangalore.

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Chapter 9
Executive Functions as a Path to Understanding Nonhuman Consciousness: Looking Under the Light

Shreejata Gupta and Anindya Sinha

9.1 Introduction

The human mind has traditionally been considered unique, surpassing, both qualitatively and quantitatively, the mental capacities of other animals. In this sense, the cognitive abilities of humans, unlike the anatomical, morphological and physiological attributes of the species, arguably fall out of the conventional evolutionary continuity observed across the animal kingdom (but see Sinha 1999a). This discrepancy, however, is possibly a direct result of the perspective most widely adopted in comparative cognitive science. More often than not, we define complex cognitive behaviours in terms of those expressed in humans, and consequently, our attempts to establish exactly the same structural and functional attributes of cognitive systems in other species fail. Such a top-down approach has, therefore, been unable to provide any meaningful insights in our evolutionary understanding of cognition.

Consciousness is an excellent example of this kind of a problem. Humans are generally considered unique in being conscious, and our familiar top-down approach suggests an absence of this apparently unusual attribute in nonhuman animals. In this chapter, we argue that consciousness, perhaps, is a process akin to any other behavioural manifestation and is probably not an indivisible entity, as was

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*, DOI 10.1007/978-81-322-1587-5_9, © Springer India 2014

remarkably pointed out in the classic, oft neglected, paper by William James (1904). A similar approach was recently adopted in comparative cognitive science in an effort to dissociate a complex behaviour into its constituents and then test the presence of these unitary building blocks across taxa (de Waal and Ferrari 2010). We review the existing literature in human and nonhuman consciousness studies, and aim to establish a paradigm in which particular behavioural components of consciousness can be identified and tested across human and nonhuman species to unravel the biological and evolutionary bases of this phenomenon. Such an approach, we propose, will elucidate the shared features of consciousness across taxa and broaden our understanding of the distinct levels of complexity in consciousness that have arisen and manifest effectively in different species.

9.2 The Problem with Nonhuman Consciousness

9.2.1 A Definitional Problem

Scholars have identified various categories of consciousness in humans; these include access, phenomenal, self-, subjective, transitive and narrative consciousness, among a myriad others (Nagel 1974; Rosenthal 1986; Dennett 1991; Block 1995; Carruthers 2000). This list, however, is not exhaustive, and multiple alternative terms, which often overlap with one another, have been proposed to characterize rather similar phenomena, typically involved in the manifestation of consciousness. As problematic as it may appear, these crowds of terms, variously described by philosophers, psychologists, cognitive scientists and neurobiologists to define and typify consciousness, have only served to mystify and render elusive a succinct understanding of the phenomenon. Moreover, most definitions of consciousness appear to be specifically formulated on the basis of human attributes, stressing on states of self-awareness and experiences of mental events that are potentially reportable to others only through the medium of linguistic communication (Gray 2007; Kandel et al. 2008). This perhaps is a reflection of the incredible influence of consciousness on our lives and thoughts, being the "perception of what passes in a *man's* own world" (Locke 1690).

We, however, now notice a rather pleasant change in the more recent evolutionary approaches towards an understanding of consciousness. Novel definitions, including words and phrases potentially more inclusive of other life forms, suggest that consciousness is an emergent property of biological complexity, which has evolved from "nonconscious precursors" to its extant form in humans (Seager 2007; see also Sinha 1999a). Thus, instead of assuming consciousness to be a "mysterious" and "unique" attribute that qualifies humans alone, it is definitely more logical to begin a scientific enquiry into consciousness in the light of the biological continuity that pervades extant living forms. In order to achieve this, at the very outset, we need an all-inclusive definition that outlines the phenomenon of consciousness in basic terms (see, for example, Sinha 1999b). For example, we could consider consciousness as a state of being aware of the surrounding world (Natsoulas 1983). This can possibly be construed to be the most fundamental form of consciousness, which can then further incorporate different levels of complexity, manifest in the form of more sophisticated behaviours (Posner and Rothbart 1998). Echoing the thoughts of some contemporary philosophers, we thus propose breaking down the concept of consciousness into its simplest possible units. Once we have a strong base, we can then build up a concept of consciousness by adding subsequent blocks of complexity that we encounter as we study different living forms (Searle 1998; Churchland 2002). Such a nonhuman-centric approach will, one hopes, not only enable us to address the functional existence of consciousness, in its varied behavioural manifestations, in different taxa but also pave the way for a better understanding of the processes that have led to the evolution of specific cognitive abilities in these species.

9.2.2 An Approach Problem

As briefly mentioned earlier, an important problem that our search for nonhuman consciousness must surmount is that of the top-down approach taken by consciousness studies, with virtually all investigations beginning with humans. We typically identify various kinds of consciousness in ourselves, where consciousness perhaps expresses itself in its most sophisticated forms. Later, we move on to establish exactly the same expressions in other taxa, most of the times hitting a blind alley. It will potentially be more productive to identify the processes underlying the different behavioural manifestations of consciousness and attempt to find analogous or homologous structures in other life forms than to expect the replica of the human expressions in them (de Waal and Ferrari 2010). Analogous processes are those which produce similar traits across taxa that have evolved independently, whereas homologous processes are shared by ancestry or common descent.

Research on nonhuman and human primates, for example, has revealed homologous brain areas responsible for face recognition, a capacity that we share by ancestry (Tsao et al. 2008; Parr et al. 2009). Neuroscientists could potentially follow a similar approach, looking for neural correlates that signify processes underlying our shared consciousness capabilities; the basic assumption in such an exercise is not to consider the human nervous system as being unique in its conscious states. Such a claim is obviously problematic from the perspective of our scientifically established biological foundations. It would be far more logical and parsimonious to assume that simple manifestations of consciousness have appeared in other life forms and serve as evolutionary precursors for full-blown human consciousness. Nervous systems of all taxa, therefore, possibly have the capacity to produce conscious experience in every brain, however rudimentary they might be (Crick and Koch 1998, 2000, 2003). To follow this hypothesis further, we need to begin with brain structures that are comparatively less complex, both structurally and functionally, in terms of their neural connections, as opposed to human brains, and progressively factor in the complexity seen in our own neural and brain systems. Such an approach had, in fact, been formulated from the latter part of the 18th century and early 19th century onwards and great efforts made to understand the neural correlates of consciousness, with an implicit assumption that all living creatures have consciousness-like capacities (Metzinger 2000; Searle 2002; Baars 2002) and that consciousness is an emergent property of neural activities that follow evolutionary principles (Dehaene and Naccache 2001). Some of the early experiments to determine the neural correlates of consciousness in nonhumans were conducted on macaques, rodents and cats and similar functionalities then tested in humans to verify the common basis of consciousness, thus following a functional bottom-up approach (Tong et al. 1998). These early studies were remarkable in assuming that every nonhuman behaviour was just not a stimulus–response process or a conditioned reflex, and such a simplistic view could never explain the mystery of evolution of consciousness.

In this connection, one must mention the pioneering experiments conducted on humans with visual cortex lesions, which showed that awareness is directly linked to our visual stimuli. These experiments suggested that when an object is presented in the "blind" visual field of blindsight patients, they have no conscious awareness of the object (Weiskrantz 1997). The same experiments, when replicated in macaques with segments of their visual cortex lesioned, yielded virtually identical results (Cowey and Stoerig 1995, 1997). When presented with a conditioned stimulus in their blindsight field, the subject monkeys did not press a button to receive their reward, as they had been trained to do, suggesting that individuals had to be visually aware of the object to decide their next move. They were, thus, not acting on simple, learned reflex actions to receive food as their reward.

It can, therefore, be speculated that comparative studies on consciousness and its various aspects will ultimately reveal a conglomeration of both analogous and homologous structures that give rise to similar behavioural manifestations of the phenomenon across different taxa. Like any other biological feature, consciousness too ought to follow a gradient of increasing complexity correlated with the levels of structural advancements along the evolutionary scale. There must be certain relationships between the brain size of an organism or the number of neuronal connections in particular brain systems with the degree of consciousness that it possesses. Although neuroscientists are yet to demarcate the exact number of neurons necessary to produce any of the defined states of consciousness, capacities like language definitely add to the complexity and nature of consciousness expressed in humans, distinguishing it from those of nonhumans (Roth 2000). It is possibly undeniable that, like in many other cognitive functions, humans probably represent the pinnacle of conscious manifestations. This, however, does not take away from the fact that there are similar functions displayed by other species. In order to successfully conduct such comparative studies, one has to necessarily adopt a functional bottom-up approach towards mental capacities in animals, attempts that which promise to reveal mechanisms underlying cognitive convergence across species over evolutionary timescales.

9.2.3 The Aspectual Problem

A philosophical assumption that seems to be implicit in all discussions over whether nonhuman species are even able to recognize mental states, as a basic first step towards the construction of more elaborate consciousness paradigms, or simply perform behaviour analysis (as, e.g. in conditioned learning) is that the scientific principle of parsimony is violated when mind-reading is invoked in non-verbal nonhuman primates (Sinha 2013). Such an assumption perhaps owes its origin to the subtle influences that biblical traditions and Cartesian philosophy seem to have had on Western scientific ideology, which has, often implicitly, as discussed above, valued the inherent superiority of man over all other forms of life. Although outside the scope of this chapter, it is important to stress here that it is perhaps now time to re-evaluate such an assumption and accept the open-minded possibility that nonhumans may indeed possess cognitive and mentalistic capacities; rigorous scientific methods can then be employed to investigate whether such capacities are indeed present, as hypothesized, in these taxa.

There still continues to be a persistent problem, however, when we delve deeper into different, more complex, aspects of consciousness. Barring the various names that have been proposed and have multiplied over time, the problem can be vaguely classified into the “soft” and “hard” problems of consciousness (Block 1995; Block et al. 1997). The soft problem deals primarily with issues related to access consciousness, which includes, within its scope, discriminatory abilities, reportability of mental states, focus of attention and control of behaviour (Long and Kelley 2010). This problem potentially can be addressed in nonhumans as well, provided we are able to look beyond human attributes and think in terms of relatively simple behavioural manifestations of complex mental processes. Reportability of mental states, for example, takes for granted an ability of language-oriented expression. If we broaden this assumption to include any form of communicative expression, however, we might be in a position to integrate species other than humans alone into such a scheme. Neurobiologists have taken refuge in formulating proxies of such reportability in clever ways. If brain imaging studies, for example, suggest that similar brain areas are active in both humans and nonhumans during comparable tasks that require conscious experience, at least in humans, it may be possible to deduce that nonhuman brains have structural and functional capacities similar to those of humans in this regard (Baars 2002). Moreover, very similar brain responses to virtually identical stimuli presented to both human and nonhuman brains, along with effective reportability by nonhuman species through non-lingual means, support such findings (Logothetis 1999; Kanwisher 2001).

In contrast, the hard problem, as the name suggests, is more difficult to deal with in nonhuman taxa, as it is even in humans. This problem concerns phenomenal consciousness or the subjective nature of experience. Leaving aside the question of whether we can ever understand “what is it like to be a bat” (Nagel 1974), the explanation of qualia in humans too continues to remain a mystery. In spite of the remarkable advantage of having that most evolved tool of individual expression – language – we are, most of the time, at a loss to convey our perception of the redness of a rose to our friends. An understanding of nonhuman phenomenal consciousness, thus, appears to remain a distant dream today, as was insightfully pointed out by von Uexküll (1934) in his classic conceptualization of each species' *umwelt*, a study that has profoundly influenced our understanding of animal cognitive ethology.

In this essay, we mostly confine ourselves to the soft problem of consciousness and try to tease apart the various ways we can potentially address the problem of nonhuman access consciousness. Access consciousness, in general, can be subdivided into two further categories: primary or core consciousness, which provides individuals with a notion of the extant self, and extended or higher-order consciousness, which offers an understanding of the past and the future (Tononi et al. 1998; Damasio 2000). Scholars are generally of the opinion that primary consciousness pervades all forms of life, whereas higher-order consciousness is a graded phenomenon, but none are exclusively human (Damasio 2000).

9.3 Access Consciousness and Its Relation to Executive Functions

Certain dimensions of access consciousness include behavioural manifestations such as the use of reasoning and control of actions (Block 1995). Although this categorization was originally purely designed to explain the cognitive basis of human behaviour, such behaviours have also been observed in a range of nonhuman species during social interactions in specific socioecological environments. Conscious access is critically correlated with activity in the frontoparietal networks of the brain, apart from the perceptual networks (Sergent et al. 2005). Significantly enough, the frontoparietal region of the brain is again associated with another group of functions, which maps on to conscious access phenomena. These functions, which are called executive functions, are a group of complex cognitive processes that aid in the execution of novel tasks, flexible decision making among alternatives, working memory, detection of errors, and the regulation of mental states and subsequently, actions (Posner and Rothbart 1998; Stuss and Alexander 2000; Hughes 2002a). It is also possible that the frontal lobe networks, which mostly constitute executive functions, are also primarily related to emotional, motivational, social and personality development in individuals, giving rise to a sense of self-awareness or consciousness (Picton and Stuss 1994; Adolphs et al. 1995). Social development is clearly and directly linked to the development of executive functioning, as is suggested by research in child development in a two-way process. Executive functions develop with inputs from the social environment and social skills effectively appear in conjunction with advancement in executive functions (Luria 1973; Denkla 1996; Hughes 2002a, b; Blakemore and Choudhury 2006). This intricate link of executive functions and access consciousness opens up multiple doors that can lead to a much better understanding of nonhuman consciousness: (i) there is now more direct evidence of the biological and evolutionary connectivity of consciousness across taxa in terms of analogous brain areas, (ii) consciousness is a graded concept that potentially increases in complexity with development of neural structures across species as well as within individuals of the same species, and (iii) consciousness is an emergent property that can be more effectively analysed in terms of its simpler constituent behavioural manifestations, such as the components of executive functions.

9.4 Executive Functions in Human and Nonhuman Species

Executive functioning in humans and its direct correlates to activity in the frontal cortex of the brain were initially discovered as by-products of investigations of patients with brain injury, as early as in the 19th century (Harlow 1868). Systematic explorations of frontal functions or executive functions, however, accelerated mostly in the late 20th century, particularly with reference to processes underlying human cognition (Miller et al. 1960; Luria 1969). These investigations also focussed on war veterans with brain injuries and the behavioural modifications that appeared in them as an effect of such damage. This approach was eventually applied to individuals born with psychiatric spectrum diseases such as autism. Soon enough, behavioural variations could be predicted in people depending on the area of the brain damaged and research in this field gained momentum in order to evaluate the functional importance of the frontal lobe (DeKosky and Scheff 1990). Tests were also designed to assess executive functioning scales in individuals, even in those without any apparent anatomical damage (see Royall et al. 2002). The results obtained from these different studies, taken together, clearly suggest that executive functions form the building blocks of self-awareness, awareness of the world, or in other words, access consciousness, as seen in humans. Neurobiological investigations continue even today to identify the different functional sections of the frontal lobe and to distinguish the separate function of each of these parts (Royall et al. 2002). What is becoming increasingly evident, nevertheless, is the intricate nature of the processes as well as their interactions and correlations that underlie our higher cognitive abilities, including the different manifestations of conscious phenomena. We are, nonetheless, still far from pinpointing a single particular neural correlate for consciousness, although it has been controversially debated whether it is just a mere matter of time before this is achieved.

Research on executive functions has eventually began to examine other nonhuman species. In fact, our understanding of the structure-function relationships within the prefrontal cortex stems virtually exclusively from animal model systems such as rodents and monkeys (Chudasama 2011). The discovery of anatomical homologies between the frontal cortex of humans and those of other species has increasingly encouraged comparative research to identify similarities and dissimilarities in the executive functions of these different species. This has not only opened up the possibility of study designs that involve more invasive approaches, unsuitable for human subjects, but also allowed for a better evolutionary understanding of the neurobiological processes involved. Experiments on rodents, for example, have revealed functions of specific regions of the brain, including memory, attention and behavioural flexibility, that are all remarkably similar, both structurally and functionally, to those in humans (Kesner and Churchwell 2011).

Neural correlates and mechanisms aside, various expressions of social behaviour in nonhuman species reflect the involvement of underlying executive functions in their daily life. Decision making, for example, is one of the core expressions of executive functioning, wherein a combination of processes such as discrimination between options, appropriate reasoning based on past experience and regulation of one's own actions are in constant dynamic equilibrium. Various species, ranging from honeybees to chimpanzees, make decisions on a regular basis, an indication of the underlying frontal functions at play (Conradt and Roper 2005). To complement these observations, the neural mechanisms underlying decision making in primates have been traced back to neural networks primarily situated in the frontal cortex and basal ganglia (Seed et al. 2011). Other social interactions that involve decision making on the basis of prior knowledge of the interacting individuals, regulation of behaviours on the basis of one's own position and those of others in the dominance hierarchy, and solutions to novel problems using flexible reasoning have been reported quite frequently across taxa, including fish, birds, cetaceans and primates (see, e.g. Sinha, Chap. 8, this volume). It is, thus, evident that neural mechanisms in brain areas that correlate to those involved in human consciousness occur across species and are amply manifested in their myriad behavioural interactions. Contrary to the widely held view that human consciousness is unique, therefore, it may be possible to argue that behavioural expressions, which reflect conscious experience, vary considerably across species, perhaps reaching their peak in humans and that these differences fine-tuned by evolution to different extents, are perhaps more of degree than of kind. Such a hypothesis, however, imperatively awaits verification, an exercise that is likely to be of crucial importance not only for cognitive ethology in the coming years but perhaps even more significantly, for future negotiations in human-animal relationships.

One of the most fundamental insights that we obtain during this entire exercise of trying to understand access consciousness through its underlying neural mechanisms, such as executive functions, is that the concept of "core consciousness" and "extended consciousness" as two distinct phenomena, proposed by Damasio (2000), gradually disappears. It can now be clearly hypothesized that extended consciousness is only possible if one possesses core consciousness and that the development of core consciousness, which serves to develop ideas about one's own position in the greater world, goes hand in hand with the development of extended consciousness. An understanding of past experiences gives way to the decisions made in the present and in the future and, in this way, generates further knowledge about oneself and its dynamic relationships with the surrounding world.

Let us examine an example from the animal world in some detail. When we observe scrub jays caching seeds and returning to the same sites to retrieve them during food shortage, we have clear observational evidence of episodic memory in action, thus establishing the presence of extended consciousness in this avian species (Clayton and Dickinson 1998). The jays can also, remarkably, distinguish between the nature of the different food items cached, remember the duration after which a particular kind of food perishes, and retrieve them accordingly (Clayton et al. 2000, 2001, 2003). For example, when a scrub jay caches a certain kind of larva, she seems to know that the larvae will only be edible for 4 days and she visits this food cache within this period of time. When she has cached peanuts, however, she revisits them relatively much later, as peanuts remains edible for longer durations of time than do the larvae. It is illuminating to note that this capability may indeed be widespread across the animal kingdom; episodic memory, very similar to that of the jays and long believed to be the sole reserve of humans, has been reported in primates (Wagenaar 1986; Menzel 1999; Schwartz et al. 2002) as also the neural mechanisms underlying the retrieval of such memory in both human (Burianova et al. 2010) and nonhuman primates (Hasegawa 2000).

A question that remains open in this connection is whether animals can traverse in time while referring to episodic memories, as humans can, an ability that once again comes under the purview of phenomenal consciousness. Although there have been quite a few studies that have documented planning for the future through naturalistic observations in both birds (spontaneous meta-tool use by New Caledonian crows, Taylor et al. 2007, 2010a, b) and primates (cooperative hunting by wild chimpanzees, Boesch 2002; deceptive stone-throwing by a zoo chimpanzee, Osvath and Karvonen 2012), these have often been considered to constitute circumstantial evidence alone. Experimental attempts to examine, under controlled conditions, whether nonhumans have access to their own memories and whether they are aware of their own awareness of events or objects around them are, however, rare.

In an elegant memory-task experiment conducted on two rhesus macaques, the subjects were asked to press a button if they recognized previously experienced visual patterns (Hampton 2001). The macaques had to press one button to agree to take the test and were subsequently shown four patterns from which they had to choose the familiar one. Each correct choice was followed by a reward. The experiment thus incorporated two levels of knowledge reporting by the monkeys. In the first step, the subjects reported the absence or presence of a specific memory, while in the next, they provided evidence of having actually recognized the pattern. What is significant is that, after a certain time period, the monkeys did not agree to continue the choice experiment at the first step itself, in spite of the presence of a preferred food, thus self-reporting the absence of a memory trace. Macaques, therefore, appear to be capable of accessing their own memory and proceed further in a set task, depending on the status of their own knowledge (Hampton 2001). It is perhaps time that more sophisticated experiments are designed to establish unambiguously that nonhumans also possess phenomenal consciousness and are capable of recollecting their own memories, as do humans, but also explore the differences in this capacity among these species. Although one must recognize the difficulty of recognizing true phenomenal consciousness in non-verbal species, it may be more problematic to completely deny its presence, even if limited in its scope, in nonhuman beings. One of the raging questions in this field is whether phenomenal consciousness is indeed a product of access consciousness, but notwithstanding this debate, we must keep an open mind as to the occurrence of subjective experience, in all its nuances, in animals. The need of the day is really the right tools to tap into them (Block 1995).

9.5 The Missing Link in Animal Consciousness

Let us now, for a moment, concentrate on access consciousness and leave aside the ambiguous reality of phenomenal consciousness. We have a fairly clear understanding of different aspects of access consciousness in humans. We have also been able to pin down the neural correlates, such as executive functions, of phenomena related to access consciousness. Executive functions can, thus, be considered good proxies for access consciousness, in order to study it better, in humans. Scholars are now comfortable relating the two terms and attributing conscious access to the frontal cortex of the human brain (Sergent et al. 2005). In due course of these scientific enquiries, research on frontal lobe functions has gradually expanded to nonhuman species. Interestingly, the findings suggest human-like functions in comparable brain areas of nonhumans, giving rise to very similar behavioural manifestations. The fundamental proof of the presence of executive functions in nonhumans, in their various behavioural expressions, is the prominent flexibility that these species display across a wide range of socioecological interactions. The ability to choose between options and form a decision on the basis of those available testifies to the fact that nonhuman individuals are aware of the various options that are accessible to them in the first place. Flexible innovative behavioural solutions are now common across widely differing taxa. Tool making, for example, requires insight into the problem, creating a mental map of the possible solutions, abstracting a particular tool to solve the problem at hand appropriately – often by using unrelated objects – and executing the task successfully; all these essential steps in the process require all the attributes of executive functions, as discussed above. Tool making has now been reported from fish, birds, elephants, macaques and apes at various levels of complexity, both in the wild as well as in captivity (Hinde and Fisher 1951; Goodall 1964; Sinha 1997; Hart et al. 2001; Matsuzawa 2001; Tonooka 2001; Chapell and Kacelnik 2002; Laland and van Bergen 2003). In primate communication, to cite another example, there are reports of innovative use of gestures and calls as well as the integration of pre-existing forms to produce new sequences of communicative signals to achieve a novel task (Cartmill and Byrne 2007; Crockford et al. 2004; Laidre 2008; Ouattara et al. 2009).

From a variety of behavioural manifestations, many strikingly innovative, to their underlying neural correlates, nonhuman primates, in particular, appear to display executive functional processes in different situations, thus narrowing the gap between our and their cognitive abilities. Theoretically then, we are now confident of drawing parallels between executive functions and consciousness in humans and extending this relationship to nonhuman species to which we are evolutionarily linked. In reality, however, even the description of consciousness-related mechanisms in nonhuman taxa does not necessarily evoke the same conclusions as it does for humans. This is possibly, as pointed out above, a legacy of the dubious Morgan's cannon that proposes simplified explanations to all animal behaviour instead of invoking higher-order capacities such as the mind or mental states (Morgan 1903). We seem to be "scientifically" destined to think about complex animal behaviours only in terms of associative learning or other "simpler" mechanisms instead of evoking more cognitive and occasionally mentalistic categories such as consciousness; this is, of course, never a problem in the case of humans. Animals, therefore, continue to be mere Cartesian automata as compared to the "uniquely" endowed humans. Is it not time to rethink and understand afresh, both sensibly and scientifically?

9.6 Conclusion

Studies on nonhuman consciousness have always been hindered by certain constraints, a major one of them being the lack of a non-anthropocentric definition of the phenomenon. This issue, however, is intricately related to the usual top-down approach adopted in such studies. It is crucial for us to realize that consciousness is an emergent biological phenomenon, and as with all other comparative studies in biology, we must begin to understand this phenomenon as it manifests in relatively simpler organisms and work towards more complex forms, in order to unravel its evolutionary history over relevant timescales. A second important hurdle at this point is that it may be methodologically extremely difficult to establish the occurrence of certain forms of consciousness, as, for example, phenomenal consciousness, in nonhuman species. Insightful empirical and observational approaches may need to be developed, if at all possible, to discover whether non-verbal species have access to their mental states or can introspect; but if these fail, let us at least consider the definite possibility that these individuals do have internal worlds, which provide meaning to their lives, just as ours do for us.

Current advancements in empirical science have considerably broadened the horizons of our understanding of higher mental phenomena. With major revolutions in comparative psychology and cognition during the latter part of the 20th century, we have become more accepting of the fact that processes observed in humans can potentially be extended to other species in more contexts than one and *vice versa*. Specific neurological and physiological correlates of consciousness, which have been argued to represent conscious experience and which have now been scientifically established to be similar across humans and nonhumans, should be analysed even more carefully. Although it is true that causal connections cannot be concluded easily in such complex systems, the behavioural attributes of consciousness that are correlated to these underlying processes in humans must be considered possible in nonhuman species with similar underlying processes as well, subject, of course, to further rigorous validation. Emotional behaviour, for example, has been proven to have homologous or analogous brain areas in all species, thus strengthening Damasio's notion of emotionality and consciousness being actively functionally connected (Damasio 1999).

In this connection, it is heartening to note the recent declaration by a group of cognitive scientists, psychologists and philosophers that every life form should be assumed to possess consciousness at simplest levels, given the similarities in behaviour and their neural correlates among humans and nonhumans (Low et al. 2012). This declaration reiterates, rather strongly, that the inability of nonhumans to communicate through verbal language (which is also true for certain humans) should not be held against them to insist that they are nonconscious beings. It points out that mammalian and avian brain circuitries appear to be far more homologous than previously discovered or suggested; it is also true that there is now increasing interest to examine similar brain and behavioural networks in other so-called "lower" species. The Declaration emphatically concludes that "non-human animals have the neuroanatomical, neurochemical, and neurophysiological substrates of conscious states along with the capacity to exhibit intentional behaviours".

It has been believed that the mind and its different states are emergent properties of various processes in the brain and that their existence can be inferentially retrieved from the behaviour of humans and of other species (Hebb 1958). What we would like to fundamentally argue here is that it is perhaps time that we look beyond the singularity that the phenomenon of consciousness has traditionally been considered to represent. We urgently need more bottom-up approaches of empirically identifying the building blocks of conscious phenomena, and we suggest executive functions to be excellent candidates in this regard. A close examination of the processes underlying these and other functions, which have been implicated in the generation of conscious phenomena, as well as their structural and functional interactions in different taxa perhaps holds the greatest potential of ever understanding what consciousness truly is and how it evolved gradually over time to reach that pinnacle represented by our own conscious states and activities. Let us actively and finally return consciousness to nature.

Acknowledgements Shreejata Gupta would like to thank the National Institute of Advanced Studies, Bangalore, for a doctoral fellowship, while Anindya Sinha acknowledges a research grant on Generativity in Cognitive Networks from the Cognitive Science Research Initiative of the Department of Science and Technology of the Government of India. Both of us would like to sincerely express our gratitude to Shobini L. Rao for the original idea that inspired this work as well as for her erudition and infectious enthusiasm.

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Chapter 10
Self, Identity and Culture

Shridhar Sharma

10.1 Introduction

"Identity" is an umbrella term used throughout the social sciences to describe a person's conception and expression of individuality. It is a complex multidimensional concept with several components. Self and identity remain topics of high interest not only for philosophers but for those across the social sciences – psychologists, sociologists and anthropologists. Interestingly, professional search engines (the Web of Science, PsycINFO) yield tens of thousands of articles in which self, self-concept or identity are included as keywords. In philosophy, the term identity, from Latin: *identitas* ("sameness"), is the exact sameness of things. It originally referred to a set of definitive characteristics that made a person "a natural self" or a "real self" preserved over time. The concept of sameness has given rise to the general concept of identity, as in personal identity and social identity. Identity thus becomes people's source of meaning and experience. An experience is what happens to a person or what that person lives through. Identity is an integrated image of himself or herself as a unique person, which often includes ethnic identity, while the etymology of identity deals only with the nature of the self and not one's experiences, which lead to certain behaviours. Self and identity researchers have long believed that the self is both a product of situations and a shaper of behaviour in situations. Making sense of oneself – who one is, was and may become and therefore the path one should take in the world – is a core self-project. Self and identity theories accordingly assume that people care about themselves, want to know who they are, and can use this self-knowledge to make sense of the world. Self and identity are predicted to influence

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*,
DOI 10.1007/978-81-322-1587-5_10, © Springer India 2014

what people are motivated to do, how they think and make sense of themselves and others, the actions they take and their feelings and ability to control or regulate themselves (Baumeister 1998; Brewer 1991; Brown 1998; Oyserman 2007).

Further, self and identity are sometimes used interchangeably and other times used to refer to different things. Also, what self and identity refer to differs both across and within publications. This ambiguity extends to whether self or identity is singular or plural – selves, identities and self-concepts. Relevant reviews highlighting these issues from a sociological perspective (Owens et al. 2010), from a social identity perspective (Brewer 1991; Ellmers et al. 2002) and from a social and personality psychology perspective (Baumeister 1998; Swann and Bosson 2010) provide useful information and insight to the subject.

10.2 Self

The aim in this chapter is not to review all the issues but to clarify the basic concepts. In common discourse, the term "self" is often used to refer to a warm sense or a warm feeling that something is "about me" or "about us". Reflecting on oneself is both a common activity and a mental treat. It requires that there is an "I" that can consider an object that is "me". The term *self* includes both the actor who thinks ("I am thinking") and the object of thinking ("about me"). Moreover, the actor is, both, able to think and is aware of doing so. As the philosopher Rene Descartes had asserted, "I think, therefore I am", awareness of having thoughts matters.

Another way to denote these three aspects (thinking, being aware of thinking and taking the self as an object for thinking) is to use the term *reflexive capacity*. Rather than attempt to distinguish between the mental content (*me*) and the aspects of the mental capacity of thinking (*I*), modern use of the term self includes all these elements (Baumeister 1998; Owens et al. 2010).

10.3 Identity

Erikson (1951) developed a widely used model of identity development which focuses on development of identity via exploration and commitment. Erikson uses the term "identity" in ways synonymous with what others have termed self-concept. However, the term identity can also be conceptualized as a way of making sense of some aspect or part of self-concept (Abrams 1999; Hogg 2006; Stryker and Burke 2000; Tajfel and Turner 2004). For example, one can have a religious identity which contains relevant content and goals – what to do, what to value and how to behave.

Since Erikson's (1959, 1968) writings on identity formation and Marcia's (1966) further explanations of identity status model, scholars have emphasized identity as a developmental process. It is also a common assumption that identity formation is a universal feature of human experience. A *psychological identity* relates to self-image (a person's mental model of his or herself), self-esteem and individuality. The term "identity" also refers to the capacity for self-reflection and the awareness of self. Like sociology places some explanatory weight on the concept of role behaviour, including group behaviour, accordingly the notion of *identity negotiation* may arise from the learning of social roles through personal experience (Colte 1996). Thus, there is identity of the individual, of groups and the identity of societies, which are constantly communicating with each other. Psychologists most commonly use the term "identity" to describe *personal identity*, or the idiosyncratic things that make a person unique. Erikson's (1963, 1968) framework rests upon a distinction among the psychological sense of continuity, known as the *ego identity* (sometimes identified simply as "the self"), while the personal idiosyncrasies that separate one person from the next, known as the *personal identity,* and the collection of social roles that a person might play are known as either the *social identity* or the *cultural identity*.

Erikson (1968) further explored identity development and observed that "Identity crisis is the failure to achieve ego identity during adolescence". The stage of psychosocial development in which identity crisis may occur is called the Identity Cohesion versus Role Confusion stage. During this stage of adolescence, we are faced with physical growth, biological and sexual maturation, and integrating our ideas of ourselves and about what others thinks of us. As a part of the development process, we form our self-image and endure the task of resolving the crisis of our basic ego identity. Successful resolution of the crisis depends on one's progress through previous developmental stages, centring on issues such as trust, autonomy, initiative and guidance. Those who emerge from this stage with a strong sense of identity are well equipped to face adulthood with confidence and certainty. Erikson (1980) in his later writings observed that "Those who fail to achieve a cohesive identity – who experience an identity crisis – will exhibit a confusion of roles", not knowing who they are, where they belong, or where they want to go. This sort of unresolved crisis leaves individuals struggling to "find themselves". They may go on to seek a negative identity. Pathological identity development through alienation of oneself may even involve crime or drugs or the inability to make defining choices about the future. So, the basic strength that should develop during adolescence is fidelity, which emerges from a cohesive ego identity. Erikson described those going through an identity crisis as exhibiting confusion. They often seem to have no idea who or what they are, where they belong or where they want to go. They may withdraw from normal life, not taking action or acting as they usually would at work, in their marriage or at school. Erikson felt that in addition to family, peers have a strong impact on the development of ego identity during adolescence. He believed that association with negative groups such as cults or fanatics could actually restrict the developing ego during this fragile time.

Thus, identity formation is the process of the development of the distinct personality of an individual regarded as a persisting entity (known as personal continuity) in a particular stage of life in which individual characteristics are possessed by which a person is recognized or known (such as the establishment of a reputation). It is the process which defines individuals to others and themselves.

Pieces of the entity's actual identity include a sense of continuity, a sense of uniqueness from others and a sense of affiliation. Identity formation also leads to a number of issues of personal identity and an identity where the individual has some sort of comprehension of him or herself as a discrete, separate entity. This may be through individuation, whereby the undifferentiated individual tends to become unique or undergoes stages through which differentiated facets of a person's life tend toward becoming a more indivisible whole.

Some authors make a clear distinction between Self and Identity (Markus and Kitayama 1991). There are many theories about "self" and "self-concept" and related ideas: self-image, body image and self-esteem.

10.4 Self-Concept

Self-concepts are basically cognitive *structures* that can include content, attitudes or evaluative judgments and are used to make sense of the world, focus attention on one's goals and protect one's sense of basic worth (Oyserman and Markus 1998). Thus, if the self is an "I" that thinks and a "me" that is the content of those thoughts, one important part of this "me" content involves mental concepts or ideas of who one is, was and will become. These mental concepts are the content of self-concept. While we focus on the structural aspect of self-concept (e.g. individualistic, collectivistic, proximal immersed, distal other), much of the literature focuses on content and evaluative judgement, asking what people describe when they describe themselves and how positively they evaluate themselves. This focus on content plus evaluative judgement is quite common in research on children and adolescents and typically involves close-ended rating scales in a series of domain (e.g. physical appearance, athletic ability, emotional stability, peer relationships, family relationships). However, content can be studied separately from evaluative judgement, often with open-ended probes asking people to describe their current, ideal and self-concepts or their desired and undesired possible selves (Oyserman and Fryberg 2006).

Self-concepts also differ in how they are structured. People may organize and structure their self-concepts around some domains which others commonly use to make sense of them.

People may thus have multiple self-concepts, with some better organized and articulated than others. People can consider themselves from a number of perspectives – individualistic "me" self, the collectivistic "us" self, the temporally near "now" self, the temporally distal "future" self, the immersed "mind's eye" self and the observer's "eyes of others" self.

The self is typically defined as the realization of your being separate from all others, being a separate entity. Different people have different perceptions about the self. One person may look inwards, so that all external parameters are perceived to lie on the periphery and acquire substance only when they are internalized. Another may perceive the self as something formed and guided by the external parameters, that is, society, cultural inheritance and the prevalent ideologies in a group. He may approve and disapprove of them. From the vantage point of self-psychology, there are two areas of interest: the processes by which a self is formed (the "I"), and the actual content of the schemata which compose the self-concept (the "Me") (Kanagawa et al. 2001; English and Chen 2007). Relating the self-concept to self-esteem – the differences between complex and simple ways of organizing self-knowledge and the links between those organizing principles and the processing of information are interrelated. The acquired "self" continually changes since birth as a result of mental and physical growth of experiences in one's immediate environment and of experiences associated with society at large. Self-concepts are qualities present in oneself.

Self-identity is the result of a series of involved steps over a long period of time which could be described in various stages (Sigelman 1999). Step I is an interweaving of one's inherent human nature and one's ongoing acquired nature. Step II is selecting aspects out of Step I, interpreting one's experiences and *"feeling" one's interactions* with people in building a system of values. A system of values consists of one's most cherished immaterial concepts of worth and most prized material aspirations of value. Both categories are extremely influential in determining one's decisions on life-shaping issues. Step III is prioritizing Step II values into a philosophy of life, with the archetype being its core – its top value. Step IV is moulding one's identity character traits out of one's philosophy of life. Step V, under the strong influence of monitored feedback from interactions with the outside world, is designing one's personality out of one's character. Step VI is producing work product offspring from one's character and personality. These interrelated steps help in the development of self-identity.

Fidelity is another trait, which is known to encompass sincerity, genuineness and a sense of duty in our relationships with other people. Ammon (1982) a German Psychoanalyst also emphasized this for the development of human identity and stated that "The person develops identity with the group. The group content integrates the person and the identity differentiates the person outside of the group" (Ammon 1982). As such there is close proximity of person with group. Thus identity is described as "a subjective sense as well as an observable quality of personal sameness and continuity, paired with some belief in the sameness and continuity of some shared world image". Then it will be possible for a person to have healthy contact and to be empathetic and will be able to resolve day-to-day conflicts easily. In this way the self both exists within society and is influenced by society, because socially defined and shared meanings are incorporated into ones prototype or identity standards (Thoits Peggy and Virshup 1997).

10.5 Self and Identity Are Social Products

Self and identity theories converge in grounding self and identity in social and cultural context. Contextual effects on the self may be distal – parenting practices, schooling, the culture, the time and place in which one lives and the experiences one has had early in life. Contextual effects on the self also may be proximal – the psychological implications of the immediate situations one is in (Oyserman and Markus 1993, 1998; Tajfel and Turner 2004). Models differ in what context refers to. Some focus on macro-level contexts especially the historical epoch, society and culture within which one lives. Finally, context may be more micro-level, the day-by-day, moment-to-moment situations one experiences because of these structures and institutions.

Understanding that what we call ethnic "identity" may not be a universal, but just one particular, modern, way of socially organizing. The social psychology of attachment to a locality or a group is a powerful phenomenon, but it is also a complex one, with different possible modes of articulation and different consequent implications for people's sense of self and of existential well-being in the context of their religion, social status and national identity.

10.6 Culture and Identity

Culture is socially transmitted knowledge shared by same group of people, everything that people have, think, communicate and do as members of society including the non-biological means of human adaptation. Hence, all cultures are made up of ideas, values and attitudes and patterned ways of behaving (Choi and Choi 2002; Berry 2007). Culture is thus defined as "That complex which includes knowledge, belief, art, morals, law, customs and any other capabilities and habits acquired by man as a member of society". Culture is a collective programming of the mind that distinguishes the member of one group or category of people from another. Cultural identity involves at its core a sense of attachment or commitment to a cultural group and is thus both a cultural and psychological phenomenon (Bhugra and Bhui 2007).

It is necessary to state that culture is learned and it is not inborn. We learn what the symbols stand for and are not born with cultures. We learn it from our parents, surroundings and friends through enculturation.

All cultures are dynamic. They are ever changing and, nonstatic – referred to as cultural evolution. Many cultures today are very different from what they were, say, 100 years ago. But with the passage of time, cultures do change (Kirmayer and Minas 2000). This cultural change can come from outside (domination of other culture) or inside (women entering work force and education). Culture change is a complex process and includes both, by invention and diffusion, invention (internal)-new thing or ideas or diffusion (external)-spreading of cultural elements from one culture to another. In recent times modern communication is enhancing this process at a greater speed.

That our individuality is socially produced is by now a known truth; but the obverse of that truth needs yet to be repeated more often – the shape of our sociality, and so of the society we share, depends in turn on the way in which the task of "individualization" is framed up and responded. "Individualization" consists in transforming human "identity" from a "given" into a "task" – and identity has now become like a prism through which we perceive.

The human self exists at the interface between body and the social system. Social and cultural systems define identities, and the human acquires selfhood in order to function in these systems. Self begins with the physical body, with acting and choosing as a unity, and as a point of reference distinct from others, and it acquires meaningful content by participating in the social system. The self is not contained in the brain, but rather the human brain learns to operate a self.

10.7 Self and Sickness

Relationships between the self and sickness have not been investigated adequately with reference to their influence. What is the relation between theories of self, particularly identity theory, and the schizophrenic process? Schizophrenia is an illness – one that may overtake and redefine the identity of the person. Schizophrenia is a disorder that by definition affects individual perception and cognition and compromises social identity and functioning. The changes wrought by schizophrenia affect the self in a broad context, encompassing such things as self-concepts, self-awareness, self-functioning and self-career. Thus, schizophrenia erodes and undermines the organization and functioning of the self, and because of this, schizophrenia and self/subjectivity are integrally linked.

A fundamental assumption in identity theory is that a person's self includes a hierarchically organized set of identities. When an individual's set of identities is limited in range and/or diffusely organized, he or she is thought to be at risk for schizophrenia. Identity and coping with mental illness is a problem because chronicity is conceived of loss of self and positive social roles and identity. This is an interesting area and needs to be researched further.

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Part II
Self and First-Person Phenomenology

Chapter 11
Consciousness and First-Person Phenomenology: First Steps Towards an Experiential Phenomenological Writing and Reading (EWR)

Natalie Depraz

11.1 Introduction

For most phenomenological philosophers such a question will appear pointless in virtue of its obviousness. What would be a phenomenological approach that would not be a first-person one? Phenomenology is in the first person or is not. Tautological proposition, taken-for-granted question: the answer is in the question, which is rhetorical.

And what? Are we actually there? The obvious argumentation of the philosopher is the following: as soon as the transcendental I is mentioned, we have to do with a first person proper. Since Husserl's phenomenology is exemplarily the science of a unique object, the subject, understood as the functional core of emergent lived experiences (which are to be experienced and described), phenomenology is ipso facto a first-person investigation.

I would like here to question such a common view. In order to do so, I will (1) put into question the equivalence between the "transcendental I" and a first-person experiential instance. While refusing Emile Benvéniste's linguistic assertion, according to which "the one who says 'I' is an 'I'" ("qui dit Je *est* Je") (1966), while claiming the necessity of a *radical* first-person experience (first contended by P. Vermersch (2012a, b)), I will show that the only way to equate phenomenology and a radically first-person approach is to demonstrate that Husserl's phenomenology is mostly a third-person phenomenology. In order to contend such a view, I will examine first accounts drawn from Husserl's *Ideas* I, *Lectures about passive synthesis* (1913/1982) and from Sartre's *The Transcendence of the Ego* (1934/1991): sorting out the ambivalence of the phenomenological (here Husserlian and Sartrian) posture, its thrusts and limitations, I will be able to suggest a few experiential criteria of a first-person phenomenology. My contention will be to explore the

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*,
DOI 10.1007/978-81-322-1587-5_11,

lived experience of the philosopher/phenomenologist while she or he is writing and reading in order to experientially check her or his lived disposition: does she or he "see" what she or he reads? What she or he writes? How is she or he related to his/her concepts, arguments, descriptions, examples? To what extend does she or he embody her or his writing and reading? Unfolding the first steps of my first-person phenomenological approach, *experiential reading and writing* (ERW) will give me the opportunity to share with the audience the experiential quality of our experiential embodiment as phenomenological researchers.

Here are the steps I will take: (1) To what extent is the transcendental I a third-person phenomenological concept? (2) The *experiential* criteria of a *first-person* phenomenology: parting from an exclusive focus on the "I". (3) A first-person phenomenology requires an experiential praxis.

11.2 How Is the Transcendental I a Phenomenological Third-Person Concept?

11.2.1 The Three Components of a Third-Person Concept Applied to the "I"

I would like to develop here the following contention: the transcendental ego is a "third person". In order to do so, I will distinguish three criteria: (1) a metaphysical, (2) an epistemological and (3) a grammatical/linguistic. At the metaphysical level, it appears that the subject is considered as an object, or at least "objectified"; at the epistemological level, it is identified as an invariant ideal structure; at the linguistic grammatical level, it is given in the function of the non-person.

—the metaphysical component: the subject is necessary and universal, i.e. "generic", hence objectified (on the basis of a transcendental idealism).

In the *Cartesian Meditations* (1931/1960)*,* particularly in the fourth meditation, Husserl develops what he calls an "egology", that is, a science of the ego. Phenomenology is then defined as the science of a "unique" object, the "subject". For the founder of phenomenology, such an assertion is revolutionary: it paves the way for a new emerging approach that does justice to subjectivity in a central way. It parallelly stresses the scientificity of its mode of access while putting to the fore the unicity of subjectivity. Here is the basis of a new philosophy rigorously founded on lived experience.

However, Husserl will have to face the general criticism of his closest disciples and followers on this very theme: Heidegger to begin with, his direct disciple, for whom the transcendental ego remains "Cartesian", that is, a pole of apodictic certainty still too closed on itself, too subjective, opposed to the "being-in-the-world" (in German: *Dasein*), a being opened up to the world; Levinas then follows the author of *Being and Time* about the too cognitive character of the Husserlian conception of the subject: he adds to it an ethical component which is absent in Heidegger. Such an objectivation of the subject is itself counter-ethical, the subject being treated as an "object". For the author of Totality and Infinity, it first refers to the other person, but it also concerns myself as subject. Both early criticisms either from the ontological or from the ethical side will be developed and modulated by Sartre's, who makes a distinction in *The Transcendence of the Ego* and then in *Being and Nothingness* between the ego, a character playing a part in the world, and the "Pour soi", a presence to myself and to the world. Ricœur on his turn clearly distinguishes in a Kantian way in *Soi-mêmecommeunautre* (Ricœur 1990) the numerical and quantitative "idem-identity" of the things and the "ipse-identity" of the persons, which intrinsically includes the inner alterity proper to the persons. Beyond the stress of each author, the common goal of the "post-Husserlians" lies in freeing the ego from the object while letting emerge its ontological, existential, ethical and moral depth. What remains in the final instance is the criterion of the "third person", that is, the definition of the subject from its objectivation onwards.

With this common criticism the subject changes its name: *Dasein*, face, "Pour soi" and "ipse". All these names indicate an opening towards the existence, the presence and the alterity, which is contained by the word "ego", the exclusive meaning of which being the "I", its identity, its closure. In that respect, on one side, the intentionality as the orienting directedness of the subject towards the objects and their spatial horizontality is not enough as an opening towards the world. On the other side, these more existential or ethical—less cognitive—names remain theoretical themes and do not reveal an experiential first-person access to the concrete reality of the individual existence or of the ethical attitude of the subject. In short, the "third person" may be more widespread than we think it is in the philosophical phenomenology. It might well be that it is not limited to Husserl's cognitive stress in Husserl but that it is also at work in the theoretical contentions of ethicists and ontologists.

—the epistemological component: the ego is an "eidos"-ego, that is, a mathematically inspired ideal invariant structure.

A second feature characteristic of the Husserlian ego is its invariant structure, that is, a universal and necessary pole. While loosely using the Platonician vocabulary, Husserl talks of "eidos-ego", that is, the ego as "essence". "Invariant" is a synonym coming from the mathematician building of the author: it stresses the structure and the dynamics rather than the content or the substance and clearly shows that Husserl does not furnish the word "eidos" with an ontological weight.

By describing the ego as an invariant essence, Husserl puts aside every conception of the subject as a particular "I" characterized by its provisionary and transitional inner states, thus "contingents". Such a criticism is at work as soon as the Second *Logical Investigation* and then in the *Phenomenological Psychology* (1925) in the terms of a "psychological empiricism", which result atomistic and associative: as such it is not able to provide a rigorous objectivity and changes the lived experience into a private feeling. As a contrast, Husserl puts to the fore an a priori ideal conception of the structure of the ego, but the latter is not "independent" of the experience like with Kant; it is the result of a dynamics of intrasubjective and intersubjective variations inherent of the multiplicity of the inner facts of the life of a given subject or of the possible sharing of an inner fact by a plurality of different subjects. The goal of the founder of phenomenology lies here in the ability of the so-called eidetics, the science of the invariant essence of the ego, to free the ego from the atomic isolated individual while unearthing its structural relational depth. It paves the way for the second characteristic feature of the "third person": the eidetic a priori invariant.

Nevertheless, the eidos-ego is not a mere invariant a priori of the subjectivity: it relies on a process of variation of multiple empirical egos, which has nothing to do with a generalizing induction; an experiential texture is to be found in the structural invariant that belongs to the specified varying lived experience; from here onwards just one step has to be made in order to let resonate the intersubjectivity inherent in the varying ego. If Husserl's relationship to the empirical approach understood as an atomism of material facts is clearly critical, his proximity with an experiential empiricism attests to his care for the concrete experience of singular subjects. Namely, the varying proceeding of the invariant ego indicates that the eidetic level of experience is not a sufficient criterion for identifying the eidos-ego to the third person. It also frees a first-person dimension of a specified experience.

—the grammatical component and the phenomenological writing at work: the "I" is a "he", that is, a "non-person", equivalent to a "man".

If you look closer at some phenomenological texts that brings the "I" to the fore, thus talking of the "I" as a central theme, a multiplicity of modalities of speech arise: in Husserl's *Ideas* I (1913), in his manuscripts dedicated to the passive synthesis (1918–1926) and in Sartre's *The Transcendence of the Ego* (1934), for example, you find a plurality of modalities of speech, which go from the "major" "non-person" posture (infinitive, impersonal, "we", generic "I") to the "minor" "first person"; for example, Husserl comes back to his personal experience as a teacher. In between we have certain modes of address to the reader in the second person of the singular ("you, reader!") or of the plural ("You!").[1] In these passages where the "I" is present, two main tendencies appear; on one side, the "I" is rejected as an "empirical I", that is, as a particular private individual that talks about its private states, hence a rhetoric of the non-person, which is meant to universalize the assertion. On the other side, nonetheless, the I is related to his personal experience, anchored in specific lived experiences, where Husserl's "I" is embodied in concrete situations, for example, writing at his table in his room. Let's take a few examples of the variety of the settings of the "I" in Husserl and Sartre in order to show such an embodied presence of the I.

A first example drawn from the §33 in the manuscripts about passive synthesis deals with the way an object may affect a receptive subject. Here it is:

[1]On this matter, see the distinction between eight different modes of speech in Depraz (2011).

> While taking an evening stroll on the Loretto Heights a string of lights in the Rhine valley suddenly flashes in our horizon; it immediately becomes prominent affectively and unitarily without, incidentally, the allure having therefore to an attentive turning toward. That in one stroke the string of lights affects us as a whole is obviously due to the pre-affective lawful regularities of the formation of unity. (Husserl 2001 [202])

The situation that is described by the phenomenologist is accurate enough, refers to a specified spatiotemporal framework (the moment, an evening walk or stroll; the place, Loretto Heights) and, on the top of it, corresponds to a fact that is an event: "... a string of lights suddenly flashes ..., it immediately becomes prominent ... in one stroke, the string of lights affects us ...".

All the same, the example remains generic because of it conditional mode ("while taking an evening stroll...") and non-specified. In short such a situation is not an individual one and is not individuated: it is a habit, because the lighting, the prominence and the affection may have happened a couple of times; nothing is said about the uniqueness of the event. In that respect, the first person of the plural ("our horizon affects us") (Husserl 2001 [202]) attests to the generality of the "I", that is, to the non-specification of the example, what is besides typical with Husserl (Husserl 1913/1982 [97–127]).

A second interesting example can be drawn from the First Book of *Ideas* (1913). Even if Husserl very rarely thematizes his use of first-person sentences,[2] he regularly writes in the first person. Here is one example among others: "I did not invent the universal concept of object, I just use dit as it is claimed by all assertions of pure logic, and I also indicated that it is necessary concept for principal reasons. Consequently it is also important for the scientific language in general". More broadly, the phenomenologist uses the personal pronoun I. Beyond the use of the grammatical first person, what is at work is the inner lived experience of the subject experimenting what she lives. Interestingly there is an affinity between the inner lived experience and the expressive meaning, which follows up what was obtained during the Section I about the link between language and experience. Now, the "first-person" attitude is put to work through the consciousness I have of what I do. Interestingly, Husserl straightaway questions the following expression: "what means: I am aware of it?" Of course, the description suggested by the phenomenologist is minimal; it is a sheer awareness of the things, an immediate experience of what happens to me and a sensory-embodied intuition of my relationship to events that the author dares to express in a direct sensory way: "through the view, the touch,

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[2]See the unique occurrence of the expression "in the first person", "In der Ichrede" (what is called an "apax"), which is translated by P. Ricœur in French by the expression "à la première personne": "At the beginning of our analyses, we will talk with the viewpoint of the man as he or she lives naturally, conceiving ideas, judging, feeling, willing 'according to the antural attitude'; we will clarify the meaning of the latter expression in the course of sheer meditations that we will undertake in the first person" ("Au début de nos analyses, nous nousplacerons au point de vue de l'hommetelqu'ilvitnaturellement, formant des représentations, jugeant, sentant, voulant 'selonl'attitudenaturelle'; nous éluciderons le sens de cettedernière expressions au cours de simples méditationsque nous poursuivrons à la première personne").

the hearing, etc., along the different modes of sensory perception, bodily things are merely here for me ...". Whereas the sheer awareness is given to me in a *passive* way, my attention to it opens up a willful activity that grafts to the first presence: "I can let my attention wander away from the writing table which was just now seen and noticed, out through the unseen parts of the room which are behind my back, to the veranda, into the garden, to the children in the arbor, etc., to all the Objects I directly 'know of' as being there and here in the surroundings of which there is also consciousness".

A third example is to be found in Sartre's ten first pages of *The Transcendence of the Ego* (Sartre 1991), where he indicates various settings of the I.[3] The different uses of the "I" are quite multifarious, heterogeneous: either we have to do with settings of fictive examples or with uses of first-person lived examples, which are written in a generic way, or with the putting forward of the I of the enunciation, of course different from the substantified transcendental I (the "I"), each time embedded in the speech situation.

In short, we run the risk of confusing the "first person" and the speech of the private individual Husserl or Sartre, hence the universalizing protection of a non-person. Such a tension remains open for the phenomenologist. Sometimes we also observe a move between the speech of the presently living enouncing I and the settled living in the past or fictive I. To conclude, the Ego in the third person is an objectified I; it is structurally invariant and anonymous: a generic I. It is everybody and nobody, everywhere and nowhere. So, beyond the linguistic distinction between the anonymity of the non-person and the individuation of the first person, such a quick account of a few extracts seems to globally do justice to S. Chauvier, who talks of the "la substantivationé garante du pronom de la première personne" (Chauvier 2009 [118]).

[3]"Somebody, after saying with anger: 'I hate you', recovers by saying: 'it is not true, I do not hate you, I am sayin that because I am angry ... ("quelqu'un, après avoirditdans la colère: 'je tedéteste', se reprend et dit: 'cen'est pas vrai, je ne tedéteste pas, je dis çadans la colère'); "I feel repulsion for Peter, and I think that I shall hate him forever"("J'ai de la répulsion pour Pierre, et je penseque je le haïraitoujours"; "if my inner state changes into a reflexive one, I am looking at myself while I am doing something in the sense of you say of somebody that he or she listeing to him or herself while talking" ("simonétat se transforme en étatréfléchi, me voilà en train de me regarderagirau sensoùl'ondit de quelqu'unqu'ils'écouteparler"; "when I am running after a tram ... there is no I. There is the consciousness of the tram-trying-to-be-caught" ("quand je cours après untramway ...,iln'y a pas de Je. Il y a conscience du tramway-devant-être-rejoint"; "For example, I was immersed a moment ago into my reading. I will try to recall the circumstances of my reading, my attitude, the sentences I was reading. I will thus make relive not only such external details, but a certain depth of irreflectiveconsciounsness" ("Par exemple, j'étaisabsorbé tout à l'heuredans ma lecture. Je vaischercher à me rappeler les circonstances de ma lecture, mon attitude, les lignesque je lisais. Je vaisainsiressusciter non seulementcesdétailsextérieursmaisunecertaineépaisseur de conscience irréfléchie ... " ;"we talked about the factual necessity of the 'cogito', et such an expression seems to me quite adequate" ("on a parlé de la 'nécessité de fait' du cogito, et cetteexpression me paraîttrèsjuste".

11.2.2 As a Consequence: The Generic Transcendental I Is Not a Singular Experiential Instance

In order to discuss this assertion, I will start from the Kantian-inspired discontinuity between the structural transcendental level and the experiential empirical level. My leading thread in such a framework is the following: I will show that “the one who says ‘I’ is not (necessarily nor always) an ‘I’” (“qui dit ‘Je’ n’est pas (nécessairementnitoujours) Je”). I will lead me to partially invalidate Benvéniste’s proposition, which is enounced in his *Problems of General Linguistics*: “the one who is an ‘ego’ says ‘I’” (“est ego qui dit ego”) (Benvéniste 1966 [259–260]).[4] In that respect, at least two possibilities emerge as immediate counterexamples against such an assertion:

1. Telling “I” amounts to talking about the I in general, as if it was a concept. It does not tell “I” in the sense of an experiential embodied situated working instance.
2. Telling “I” (as a generic philosophical instance of the argumentative discourse) is never talking about “I” as a personal speech. In Sartre, for example, “when I am running after the tram, when I am watching the clock, when I get immersed into the contemplating of a portrait, there is no ‘I’. There is the consciousness of the tram-having-to-be-reached”. Such an “I” is a formal instance, deprived of any concrete embodiment.

Benvéniste’s assertion however is not completely nonvalid. Some cases lead us to partially validate it:

- Telling “I” may in some conditions refer to a concrete experiential instance. Here is again an example taken from Sartre: “I was immersed then into my reading. I will try to recall the circonstances of my reading, my attitude, the lines I was reading. I will then resuscitate non onlythese external but a certain depth of unreflected consciousness”. Such a quotation reveals the situation of the I of a philosopher who lives in an individuated spatiotemporal context. What is the linguistic grammatical criterion of it? Here, for example, the time-indexical “then”, which necessarily indicates a unique moment relating the present moment where such an I expresses itself and what it lived soon before.
- Telling “I” necessarily refers to a kind of “first person”, which is not only grammatical as a personal pronoun, but is irreducible to the mode of being of the thing. Kant first makes a distinction in his theory of morality between the self-end which is the person and the tool object which is the thing; Husserl in his turn exemplarily puts to the fore the mode of being of the lived experience, which is un-amountable to the mode of absorption proper to the object and constitutes the lever of the reductive method. Let’s quote him again:

[4]Such an argument is literarily taken again by Chauvier (2001), but he also modulated it in his article from 2009.

> I can let my attention wander away from the writing table which was just now seen and noticed, out through the unseen parts of the room which are behind my back, to the veranda, into the garden, to the children in the arbor, etc., to all the Objects I directly 'know of' as being there and here in the surroundings of which there is also consciousness.

11.2.3 Provisionary Conclusion

In order not to make any confusion between the first person "I" and the private speech of the particular individual Husserl or Sartre, the only "garde-fou" is to universalize the I as a non-person, to make of it a generic transcendental I (see Chauvier 2009). The consequence of it is a critical stance against E. Benvéniste (1966): "the one who says 'I' is not necessarily and always an 'I'". Here are two counterexamples showing that the "I" is generic, that is, an unembodied "empty shell": "I can let my attention wander away from the writing table . . . " (Husserl 1913/1982 §27); "when I am running after the tram . . . ., there is no I. here is the consciousness of the tram-having-to-be-caught".

As a transition from one step to the other, sometimes the "I" of Husserl or Sartre is not an empty shell but an experiential working I. Here are two examples of such a situation: "I did not invent the universal concept of the "objet", I just used it as it is required in any statement of the pure logic" (*Ideas* I, §22); "I was immersed then into my reading. I will try to recall the circonstances of my reading, my attitude, the lines I was reading. I will then resuscitate non onlythese external but a certain depth of unreflected consciousness" (Sartre 1991).

11.3 Experiential Criteria of a First-Person Phenomenology: Parting from an Exclusive Focus on the "I"

Let's try to identify according to which criteria a phenomenology may rightly be said to be a "first-person" phenomenology.

11.3.1 What I Is a "First-Person" I?

It is neither a private particular I nor an objective neutral third-person I but a genuine first-person-embodied and first-person-related I. How is it possible? Here are two possible criteria (negative and positive): (1) the "I" follows the mode of being of a subject versus the mode of being of a thing according to the Kantian distinction between end and means. Such a criterion is ethically laden but remains theoretical; (2) the "I" occurs in an embodied speech within a specified situation and time: it gives way to an experiential individuation (Vermersch 1994). Let us unfold now these two criteria of the first person, the former being phenomenological methodical, the latter more precisely experiential.

11.3.1.1 The Phenomenological Criterion of the Mode of Being of the Lived Experience

The negative quality of such a criterion lies in identifying what the first-person subject is not. In the first place it is opposed to the mode of being of the thing. Such an argument is typical in philosophical phenomenology: it consists in distinguishing between the mode of givenness of the subject (immanent, lived, inner, immediate, transparent) and the mode of givenness of the thing-object (transcendent, external, mediate). It allows to be sure that you do not mix the subject with a thing, what Kant earlier stressed in his theory of morality while putting to the fore the person as a goal itself and distinguishing it from the thing, which is a means for a goal that is extrinsic to it, and what Levinas more recently will notice while being careful by contrasting the experience of the other with any process of objectification. Such an argument is typically ethical: it stresses the absolute value of the autonomous person, as a contrast with the heteronomy of the thing.

Such a criterion remains limited, for it only describes structurally and negatively the first-person subject. Moreover, such a criterion is not whole satisfying because it is paradoxical: it offers a third-person approach of the first person! This is not the least disturbing if you precisely pretend to explore the first-person perspective. Talking about the first person, building a theory of it is self-contradictory with the theme at work, the first person, which requires to be coherently treated in a first-person way: it is necessary to show how it experientially operates. Here is the exclusive coherence of the first-person approach (Zahavi 2006).[5]

11.3.1.2 The Experiential Criterium of the "Embodied Speech"

Putting forward such an experiential criterion proceeds from the insufficiency of the I taken alone: the latter needs to be sustained by a singular spatiotemporal situation and embedded in a speech context. John Perry's exclusive stance, which defines the "I" as an "essential indexical", appears too radical: I may say "I" and my speech remains unembodied, not linked to a specified personal situation. So the exclusive primacy of the linguistic criterion of the grammatical or functional "I" results problematic (Perry 1993).

It is the reason why it cannot be the sole criterion nor being given the primacy, although it may be complementary with some other first-person criteria. In his introduction to the introspective technics of "debriefing interview", P. Vermersch

[5]See my critical review in *Alter* n° 17, 2009, pp. 271–280.

stresses the absolute necessity of embodying the "I" via its concrete tools of indexicalization that attest to the unicity of the situation. Thanks to a rigorous methodology, it is possible to identify simple but important practical procedures in order to check that you do not speak "in general" nor "think" about a moment but truly express it while actually "reliving" it. In order to so, it is necessary first to identify a unique moment, a place that is different from any other, that really corresponds to my very situation and second to come back to this situation while living again as many details as possible of it. Such a reliving is not a remembering in the Husserlian sense of the word, for the memory that is used then is not cognitive, that is, intellectual or voluntary. I do not effortfully search for a remembrance of a particular moment; I spontaneously let it come back to me without endeavouring to find it again while concentrating myself: I only open myself in order to be able to welcome it; in short, I become receptive to what I then lived in order to be in a disposition to live it again, what gives way to an intense lived experience of such a situation, more dense and more true than the present one. Such a lived recall has been named "concrete",[6] or it is sometimes identified with Proust's organic memory or again with the working memory in psychology; the third step lies in repeating such a concrete reliving a number of times in order to discover new aspects of it, which were not noticed with the first reliving (Vermersch 2012).

11.3.1.3 The Risk of Identifying the First Person Only with the "I": Philosophical Arguments

The I alone cannot be the criterium of the first person. Philosophical arguments for such a stance, together with the experiential arguments above, follow as such: (1) the criticism of solipsism that isolates and separates is a typical argument against a too narrow philosophy of the "I", which does not do justice to the concrete modalities of the relationship with the other (listening, care and empathy); (2) the reflexive tendency, which leads to a self-closure and a repetition, is also refused, in contrast with the importance of the modes of openness to the world au monde (presence, welcome and receptivity); and (3) the exclusive criterion of the lived evidence as a lever of the truth, which illicitly creates the myth of the only truth of the perceived/felt, has long been criticized by the phenomenologists themselves, in favour of a plural mode of givenness of the meaning through symbolization, imagination and mythic representations.

[6] About concrete memory, see Gusdorf (1951).

11.3.2 What I Is a "First-Person" Non-I?

Separating the "I" from the first person may seem dared, even impossible. How is it possible to have a first-person approach without using an "I"? It is however not only possible but crucial. I will here show various radically first-person experiential postures that clearly do without any "I".

So after having unfolded some philosophical arguments against the exclusiveness of the I, solipsism, reflexivity and truth as lived evidence, here are three stances for an "I-less" first-person experience: (a) the practice of decentring oneself (letting go, tonglen in Buddhism) (Depraz et al. 2003), (b) the bodily relational reference (Merleau-Ponty 1945; Berger 2006) and (c) the process of emergence of thoughts in me without me (Husserl 2001).

11.3.2.1 On Becoming Aware: A Critical Diagnosis

The joint work *On Becoming Aware* (Depraz et al. 2003) suggests a double entry into the first-person approach: on one side a reflexive path, where the I is a motor operator of the becoming aware process, and on the other side a practical path, where the process of letting go is given a primacy upon the reflexive aspect and gives way to a decentring and an anchorage into the hic and nunc situation, one unique place and moment of a sheer presence to what happens. If I am still conscious of being there (and to exposed to the anonymity of being), such a mode of presence rather opens up a global feeling of inhabiting a given situation, which enables such a situated consciousness not to be linked to an I in the same way as one sticks to an identity that separates me from the others. Literally, I stop sticking to what I usually tend to be spontaneously attached: my goods, my professional and familial goals. In Pascal we very early find an exemplary criticism of the I, which leads to the hypothesis according to which the I is nothing else than its qualities (Pascal 1671/2006). In Shantideva (1997), we encounter a practice of compassion where the I and the other build a relationship of "equalizing" and of "exchanging" where every primacy of the one or of the other disappears and then leads the practitioner to sit in a mode of undivided presence to what happens. "I" therefore becomes a word that I can refer to everybody and that does not belong to me as such: I *feel* the suffering of the other; I *am* the other who suffers. Such an experience of nondivision between me and the other creates a relationship beneath me and the other and makes of such a relationship something itself unreal.

11.3.2.2 The Crucial Role of the Lived Body: A First Person Without Any I (The Immediate Relational Embodied Lived Experience)

Such a nonegoic presence to what happens anchors in my lived body as a solid and reliable guide. Contrary to Descartes' stance, according to which my sensory abilities deceive me, I will contend with Spinoza that one never knows what a lived body is able to do: there is a genuine power of the lived body. The latter indeed has a self-knowledge that corresponds to an inner cartography made of all kinds of somatic indications that consciousness alone ignores. Among the phenomenologists of the 20th century, we find many promotors of the inner truth of the lived body—Merleau-Ponty to begin with and exemplarily:

> … when I sit at my typewriter, a motor space opens up beneath my hands in which I am about to 'play' what I have read … the organist … gets the measure of the instrument with his body, incorporates within himself the different directions and dimensions, settles into the organ … so direct a relation is established that the organist's body and his instrument are merelythe medium of this relationship. (Merleau-Ponty 1945/1962 [144–145])

The phenomenologist describes here a mode of relationship with the lived body where the "I" is first an actor, "when I sit at my typewriter, … a motor space opens up beneath my hands in which I am about to 'play' what I have read", then recedes in favour of the "he", "the organist … gets the measure of the instrument with his body, incorporates within himself the different directions and dimensions", as if "the first person" could easily switch from the "I" to the "he", insofar as such a "he" is "embodied" into a qualitative lived space made of "directions" and is one with the object: "he settles into the organ …". So the "first person" is the very immediate articulation between the organ player and her instrument without any need of an enunciation I. In short, anonymity (the non-person) is relational, that is, deeply relational: "… so direct a relation is established that the organist's body and his instrument are merely the medium of this relationship".

In the framework of some research works that are conducted nowadays by practitioners, such a Merleau-Pontian "conscience corporelle irréfléchie" which does without any I while involving a deeper embodiment of a relational-being body is called a "felt meaning" (Gendlin 1997) or a "mouvement interne", an archaic sensory feeling which is less linked to kinaesthetic or proprioceptive feelings than to tonicity, bodily material, bones and flux (Bois and Berger 1990; Berger 2009).

11.3.2.3 The Emergence of Thoughts Within Me Without Myself

Husserl describes quite carefully the genesis of a sensory perceptive field that is a receptive situated I-less fields. In *Experience and Judgement* (1939/1973), he calls such nonegoic presence "a field of passive pre-givenness" in order to underline the absence of any operating subject in such a perceptive zone and the existence of an experiential dynamics that precedes any appearing of a structured object. In short, such a moment and place refer to an indistinctive phenomenality of the experiential meaning, where the object does not affect the subject yet nor the subject reacts to the stimulation of the object.

Processes therefore go through me without myself. I do not control anything any longer, and my main activity is one of openness, without any egoic seize. The unveiling of such nonegoic experiential dynamics was very well described in a recent empirical joint work dedicated to the listening to sounds. Identifying the presence of three different phases which are three attentional dispositions enables to make the difference between (1) the source of the sound, (2) the sound as such (as object) and (3) the feeling of the sound phenomenon. Noticing the origin of the sound, its source, corresponds to our immediate attitude. I hear a noise; I immediately try to know what it is; I will answer the question of my interviewer, "what is it?" by objectively identifying the source of the sound: "it is a motorbike in the night". But I may also draw my attention on the sound itself and become interested in its physical properties (its intensity, its height: it is an acute sound, it lasts a long time resonating, etc.; finally, I may concentrate on the organic feeling of the hearing, which provides a sensory undivided experience prior to the subject/object distinction, before the moment where I say "I" and where the object is built as a constructed unity (Petitmengin et al. 2009).

11.3.3 The "First Person": Neither "I" nor "Non-I" (Beneath the Division ... the Intersubjectivity)

Choosing means separating. Now it is important to integrate and to relate. From the private (which separates) to the intimate (which relates), the relational level is the indication of a contact (Depraz 2009a). We therefore experience a transition from the second person (you as opposed to I) to the second persons as a relational integrated dynamics of plural link (Depraz& Mauriac 2004). Beneath individual entities that are distinctive one from the other, the deeper self is inherently relational.[7] Here it is important to make a clear distinction between a "second person" (where still prevails the dual face-to-face relationship) and the "second persons" (which mainly gives way to the plural relational dimension of the link) (Depraz 2012). Moreover the first person may reveal at best through a situation, a concrete spatiotemporal framework where the "I" as a personal pronoun may be absent but the operative embodiment major. Such an I-less first-person presence is to be found in a whole set of paragraphs in *Ideas* I (Husserl 1913/1982), where a multiplicity of quite detailed examples emerge, be they visual (stereoscopic or pictorial: Dresden's paintings museum): most of the time the "I" is absent, and the embodiment is made of contextual indications.

11.4 A First-Person Phenomenology Requires an Experiential Praxis

In the end the different components of a first-person phenomenology (personal pronoun I, presence of the lived body, embeddedness into a concrete spatiotemporal situation) really operate as soon as they are practically experienced. It is the reason

[7] About the idea of self-alterity, see Depraz (1995, Sect. II).

why nothing is better than the first-person narration of a specified lived situation. In the following I will describe a working first-person method while giving back the various experiential steps (A) and then suggesting an analysis itself experiential of the chosen example (B).[8]

My specific challenge here lies in joining two practices: (1) the "explicitation interview" (Vermersch 2012a, b) and (2) the "experiential reading and writing" (ERW), which is the method I personally promote. Why both? My hypothesis is one of mutual generation: if you use only an experiential introspection, you stick to an empirical method with inductive generalization, but if you only rely on philosophical phenomenology, what you get is a priori concepts and you never reach experience. What is therefore needed is to cross both approaches.

11.4.1 The Explicitation Interview

It is broadly made of four steps: (1) I choose a specified individuated spatiotemporal situation proper to the experiencing person, not in the manner of "if I meet such person in the street" but "yesterday I met Maxime the technician of the audio-visual service at the university". Such a first step is crucial: it is the experiential condition of possibility without which no embodied first-person access is possible; (2) once such a unique situation identified, I evoke (in the technical meaning of "reliving" = embodily relating) such a situation with as many details as possible: "it was late, I was in a hurry, he was quite welcoming and efficient". It is not willful distanced remembering; it is meant to be genuinely relived in order to recreate a strong lived link with such a moment; (3) I describe my experience while coming back to it as many times as necessary. I immerse myself in each time finer experiential segments, which may be described more and more precisely: reiterated descriptions enrich and detail the sequences (in at least three phases); (4) I reorganize the real temporality of the different descriptive phases, first unfolded in the time of the explicitation(s).

11.4.1.1 The Choice of a Referential Experience

What are the main criteria of such a choice? First the example must refer to a unique lived situation, anchored in a unique place and time. I therefore will not say "if I meet a person in the street" but "yesterday, I met the technician of the audio-visual team at the university . . . ". It is neither a generic example nor a typical example that would refer to a structural situation. Second the chosen example is not the illustration or the a posteriori application of a general concept, but it will be the motor of an analysis where the heuristic component goes hand in hand with the care for generating novelty.

[8] About such an experiential praxis, see Depraz (2009b).

Another aspect of the choice lies in its necessity: why this example more than another? In a certain sense, the example is contingent: I choose one moment within a meditation session at Dechen Chöling, where I experienced a rupture between what I was able to experience at the very moment and the talk that was parallelly given about that very experience (Depraz 2009b). Why this example? Its necessity mainly lies in the feeling of its urgency for me, of its crucial character for my life and my existential situation at the moment. The inner lived criterion that leads me to give it a primacy upon many possible others is its fitness and genuineness.

11.4.1.2 An "Evocation" Method

Once the example is chosen, it is necessary to settle in an evocation posture. What does it mean? The word "evocation" daily means a vague and indeterminate reference to an object: "I talked about [*j'aiévoqué*] this with my friend". But here "evocation" has a technical meaning: it keeps from the indeterminacy the unwilling component of an experience that emerged without my having decided to live it. Settling in such an experiential situated posture amounts to living it again and becoming receptive to the emergence of details that I spontaneously did not identify then. In this respect, the first criterion of "evocation" is the attitude of reliving in the sense of Gusdorf's unwilling concrete memory, in contrast with Husserl's deliberate remembering (*Wiedererinnerung*). Second the "evocation" is both global and structured: the asked inner work in order to enter into such a reliving state lies in concretely embodying the experience with its somatic, emotional, temporal and intersubjective components. These different components are not necessarily present for me in an explicit way: it is therefore important to detect their actual presence in my singular experience. Third, the "evocation" posture involves remaining in sustained contact with the example, in order to diminish the risks of imaginative reconstruction which are quite frequent when you are requested to come back to a past experience, even close from my present situation. The idea is to try not to be tempted to invent details that I did not live but that I like to imagine having lived. It is quite easy: you do not even realize it most of the time. It is important to be experientially quite vigilant by being suspicious about any image and word that would replace the genuine living perception.

11.4.1.3 Describing Through Repeated Self-Explicitations

Once the state of "evocation" is maintained, a kind of relived verbalization may emerge. Besides, these both times are not necessarily successive; they may cross each other, in the sense that I may begin to describe the experience I relive and, while remaining in such a reliving state, gradually let emerge other experiential features that I will speak out later. In the framework of an explicitation interview, both times, experiential and descriptive, are often disjointed, even though I might be compelled to interrupt my verbalization in the course of an explicitation interview because I lost the contact with my experience, and then reimmerse, thanks to my interviewer guiding me. In a self-explicitation, which is more compelling insofar as I at the same time the guide for myself and the subject of the explicitation, I will produce a first description while remaining in a state of "evocation"; then the procedure lies in taking advantage upon the verbal segments that were already expressed while reading them again in order to use them as helping supports in order to reimmerse into the experiential content of the experience. In that respect, self-explicitation is a more difficult and compelling experiential technics: I cannot rely on the help of a guidance through noninductive questions; I therefore am not provided with an experiential cartography which enables me to know where to look for in my experience; I am compelled to ask questions to myself, in the form of a spontaneous self-guidance, while using my first description as a guide and looking for the experiential holes within it. Rather than counting on the questions of my guide who helps me coming back to my experience through his/her questions, I will use my own textual production as a means of multifarious reiterations. Intrasubjectivity is here my best guide: the variations of my experiential posture in time make of the first person help me to deepen my own experience, which is not a happening at all.[9]

11.4.1.4 Temporal Reconstruction

A phase of reconstruction of the experience follows the first three steps. Indeed the time of explicitation does not map the real time of experience. For example, when I explicitate my experience, I often let emerge its beginning and end. In contrast with the event that is chosen as a reference point (in my example, the rupture I experienced between what I was able to experience at the very moment and the talk that was parallelly given about that very experience), the "evocation"

[9]I first discovered and settled for myself such a technic of self-explicitation during 2005–2006. When I met Vermersch in 1997, he made me discover the explicitation interview, but I was ill at ease with his "so-called" noninductive questions. I lacked confidence and felt intrusion. I could not go into an interview of this kind at that time. Coming back to it 8 years later, I discovered that what I needed was to do it myself for myself. I started with a specified situation of meditation in Dechen Chöling and was able to self-explicitate it by coming back to my first description and reading it again to begin with in order to provide myself with an experiential impulse meant to recreate the embodied contact with the first-person situation (not without many inner difficulties that are mentioned in the article that was published on the basis of it: Depraz 2009b). As a matter of fact, my first experience with the technics of explicitation was a self-explicitation: it gave me the confidence to go further and then to follow a workshop with Claire Petitmengin in 2011 as an introduction to the technics of the explicitation interview. So my own path was atypical: I first self-explicitate, then could go through explicitation interviews I am now leading with students in the framework of a research programme (ANR), *Emphiline* (2012–2015), based at the Husserl Archives as the pilot team, about the notion of surprise. [I personally decided to keep the translation of this psychology technics with the expression "explicitation interview", because the French word "explication" has the scientific and philosophical meaning of "giving reasons/causes of a phenomenon", whereas "explicitating" means "letting appear the pre-conscious experiential texture of the phenomenon".]

brings me back to what happened for me "just before" and to the aftermath, to the effects. The time of my experience seems to be structured with these three cells (event, just before, aftermath), and each rehearsal/reiteration makes me discover new intermediary temporal phases; for example, what happened just before the "just before"? So the various intermediary moments are unearthed in the course of the different evoked self-explicitations.

It means that the time of the lived experience maps the "real-time" experience. In order to be able to proceed to the analysis of the reference experience, it is needed to reorganize the temporal segments while reordering them according to the real time of the experience. For example, I will insert a segment that will have been explicitate "later on" between the reference instant and the segment that was first indicated as occurring "just after". In short, the time of the lived experience (its segmentation, its sequentiality) is not the same as the one of the explicitation time that gradually gives rise to this lived experience, which lets emerge finer and finer strata of lived experience "in between" the moments first noticed.

Once the link with my lived experience created, maintained, deepened and organized, it is necessary to proceed to the analysis of such a descriptive experiential material. It is possible to distinguish three different postures of the subject relating to his analysis activity, that is, three ways of dealing with the relation between empiricity and philosophy: (1) the standard posture is Vermersch's, for methodological coherence methodology, he dissociates the first person experiencing and describing and the third person analysing. While doing so, he seeks to do justice to the scientificity of the introspective method, while his experiential approach, also as a radically first-person approach, leads him to oppose to the philosophical phenomenological approach that he considers as non-specified, which is abstract. Now, if the subject of the analysis is a third-person subject, we have to do with the general characteristic of the philosophical subject: if such a contention is coherent with an a priori philosophical approach of the experience, we may doubt that it is with an experiential phenomenology. In short, my idea is that Vermersch faces in the end an epistemological contradiction; (2) Petitmengin's position is not so standard, but may be less contradictory: refusing any third-person philosophical approach and sticking to a first-person experiential inductive leading to "generic structures" provide a clear experiential coherence, but it may create a philosophical deficience. While extracting generic categories directly from the experiential variables enables to keep the experiential dimension within the analytic process itself. Through the appeal to expressions directly drawn from the first-person interview, the contact with the experiential reference is assured through and through. Indeed, these expressions and segments of sentences were used by the person while describing her own experience in the first person: these are mentioned each time an emergent category is identified and kept with it in order to provide the concrete embodied context of the category.

My idea is to take seriously such an experiential level of relatedness to the singular experience, not only at the evocation embodied level, at the first-person descriptive one, but also at the level of the analysis of my description. It enables to produce an "experiential analysis", that is, an analysis that proceeds from an attitude of the researcher always in contact with her reference experience. The question being: how can I check the ability of the “first-person” researcher to remain each time in contact with her reference experience while keeping the scientific posture of the researcher? Do we have to build a kind of attentional plasticity that makes it possible to move from the “third-person” posture to the “first-person” one without any ruptures?

11.5 Experiential Reading and Writing

Here is the challenge: using the experiential explicitation technics of embodily relating to oneself while dealing with texts and concepts, that is, producing an “experiential analysis”. The goal being: observing my way of relating to myself reading and writing as a philosopher and researcher. Do I—and if yes, how do I—“see” what I read and what I write? What is my mode of experientially being in touch with concepts and argumentation? How does the philosopher experientially relate to her writing?

11.5.1 Experiential Reading

My contention is the following: (1) suggesting a double reading, first conceptual (in the third person), then experiential (in the first person). Here is an example of the contrast between both:

> While taking an evening stroll on the Loretto Heights a string of lights in the Rhine Valley suddenly flashes in our horizon; it immediately becomes prominent affectively and unitarily without, incidentally, the allure having therefore to an attentive turning toward. That in one stroke the string of lights affects us as a whole is obviously due to the pre-affective lawful regularities of the formation of unity. (Husserl 2001 §33[202])

What is on bold character is experiential, what is not potentially conceptual; (2) letting emerge an embodied understanding, which is usually implicit, by finding out within yourself a personal situation which corresponds in structure with the conceptual features of the situation of the text but is endowed with your personal content.

I have been doing this exploratory work for the past few years at the University of Rouen in the framework of a Research Master seminar entitled “Practical Phenomenology and Applied Psychology”, with this leading thread of the meaning of an “embodied understanding”. When I read a text, my first criterion in order to enter into it is the understanding I may get of it: it may be intellectual and reason oriented and rely on the inner logic of the writing, its arguments and reasons; it may also be experiential and trigger in the reader an inner certainty that might express itself that way—“I see what it is about”, “I see what you mean”, and “it is suggestive for me". You will then speak of an "embodied understanding", that is, such a mode of relationship to the text that I may be able if I draw my attention towards it contact a singular experience, situation and event that I lived and which resonates with what is relived through the text. With regard to a philosophical text, the reference to a singular experience often does not emerge explicitly in the mind of the reader; it is there, at my disposal, in a preconscious modality, and will not be activated most of the time, for it is not even consciously identified by the reader. My idea with the experiential reading and writing research programme (ERW) is to let emerge such an experiential reference in the very course of the reading and to create a context of reading that realizes the embodiment of the understanding of the text.

In order to do so, the first instruction is to proceed to a first reading that I call "conceptual": it identifies the main a priori concepts of the text, the reasoning that prevails and the critical arguments against other authors. Such a reading is broadly "hermeneutical": it allows me to see by contrast other aspects of the text to which I would not have done justice otherwise. In short, a first contrast appears, which let emerge another level of reading, called "experiential" or again "practical". What are the textual (verbal and linguistic) indications from which may arise an experiential material? I will distinguish three verbal sources of such experiential information: (a) the use of personal pronouns (I, we, he, man) and their meaning and (b) the use of examples, be they illustrations of a contention or motor leader of an analysis. They may be allusive, detailed, and they may play the part of real effects or have an heuristic meaning, (c) the discursive mode that is chosen: I may describe a situation, or they may be generic assertions, hypothesis and statements about past or contemporary theories. So it is possible to check precisely if the writing is directly in embodied contact with the experience.

Such a double reading, if you practised it, for example, about the §12 of the Phenomenology of the Consciousness of Internal Time (Husserl 1991 [33]) and about the §33 of the *Analyses Concerning Passive and Active Synthesis* (Husserl 2001 [202]), lets emerge a priori and experiential concepts, which are led by the reference to a singular lived experience, here a sound experience, linked to an exemplification process: from the viewpoint of the conceptual reading, "retention", "impression" and "living present" provide an a priori cartography, joint to the a priori hypothesis that leads the analysis, the sound object is an intrinsic temporal object; besides, the progressive argumentation goes from (a) a binary oppositive logic where the retention is distinguished from the physical intensity (resonance), along with a dynamics of blurring, of darkening that takes up again the irreversibility of the diminishing sensory impact to (b) a dynamics of spreading and of retroacting of the sound affection, through which the "living" and "fresh" retention (Husserl's adjectives) amounts to an affective force that is characterized by the possibility of a coming back to the initial intensity and to the sound growth through the attentional awakening and through repeated wake-ups.

In contrast, from the viewpoint of an experiential reading, the §12 of the *On the Phenomenology of the Consciousness of Internal Time* (Husserl 1991 [33]) unfolds in an impersonal way and shows a mainly generic example: "a violon sound".

We find above all reported sentences: "it is said that", situated in a dual logic that functions with hypothesis ("it is possible that") and by prescriptions ("it must"). Conclusion: the modality of the discourse is nearly exclusively conceptual, and the experiential only arises from the generic example. In the §33 taken from the *Analyses Concerning Passive and Active Synthesis*, if we find many examples of sound, of melody and of various noises, there are also many impersonal discursive thetic and hypothetic forms and mainly generic subjective instances ("we") or in the third person ("the I"), anyway very few in the first person. Of course, multimodality is crucial here, namely, the intricacy of visual perception and the tactile living freshness of the retention, together with the involvement of affection, of pleasure and displeasure. One may therefore ask: how is the description embodied? Actually, it is not where one should expect it: it lies in the precision and the details of the semantic dynamics of it. The descriptive language is concrete indeed: (1) blurring and darkening of the intensity of the sound; (2) contrast, continuity and fusion of the phases; (3) retroactive awakening, together wake-ups, retro-irradiating, associative awakening and growing allure; or, again, (4) gradual vitality, graduality of the physical intensity, in short, a sound lived experience different from a physical resonance or a zero consciousness as opposed to a physical nothingness.

11.5.2 Experiential Writing

Starting from such an experiential cartography of the sound, from its dynamics, its features and its concrete semantics, it is possible to extract the structural features of an example from which I could discover in myself a singular experience to evoke, to maintain and then to describe. Let us mention two of them. Describing my personal experience of the lights gradually emerging from the night on the opposite coast of the Leman Lake in Switzerland on my arrival at the beginning of July this year 2012 directly echoes for Husserl's description of his "evening stroll on the Loretto Heights":

> ... a string of lights in the Rhine valley suddenly flashes in [his] horizon; it immediately becomes prominent affectively and unitarily without, incidentally, the allure having therefore to an attentive turning toward. That in one stroke the string of lights affects [me] as a whole is obviously dueto the pre-affective lawful regularities of the formation of unity. (Husserl 2001 [202])

Or, to take another first-person example of mine, the description of the sound of its retro-propagation and of its lived affective growth in me resonates within me with the experience I had last Tuesday evening while I came back from my oriental loud music course: on the way back the lungaria melody intensely came back to me with an increasing vitality, though I had no deliberate memory of it any longer. Now, such an experience of affective increasing growth of my memory counterstates the standard intrinsic weakening of the sound experience and of its physical resonance in time.

The next step is “experiential writing”: after having evoked such a moment, I will maintain its living presence in myself, then describe it while proceeding to a repeated self-explicitation of it. The final step: I will isolate descriptive experiential categories that may then be compared to the a priori concepts suggested by Husserl and enrich, confirm or contradict the initial phenomenological description. Such a cross-comparison between the third-person description (philosophical) and my first-person experiential one creates a mutual generation between the experiential and the philosophical writing.

Regarding this very example, I can three common features, (a) a stroll, (b) a visual kinaesthetic perception and (c) the dynamics of affection and attention, and two contrasted features: (a) the Husserlian temporality of affection is “sudden”, “immediate” and “in one stroke”; it is a “flash”, whereas it is gradual and constant in my example; (b) the emotionality of the situation in my example is made of beauty, of an archaic feeling of nostalgia, whereas there is no emotional component for Husserl.

11.6 Provisionary Conclusion

What is the benefit of a first person experiencing? Looking from within enables you to embody your understanding of a phenomenological text so as to become aware of your experiential personal roots in your process of understanding: it makes your understanding “yours”, more solid and more genuine. On the contrary, sticking to the results of a priori arguments do not allow you to make them yourself; you remain outside of it, like in show. Going through the first-person experiential process is the only way to write and to categorize while genuinely knowing what you do and not as a second-hand activity: as long as I hear from a film without having seen it, it might be difficult to really talk about it.

What is the benefit of confronting a third-person philosophical text?—Looking from within such a conceptual architecture is like entering the fabrication process of a metal: you see better your own limitations and where you are; also it undoes some illusions you may have about where you are in your knowledge of yourself and of others. The first-person viewpoint being a situated and embodied viewpoint and not a viewpoint of nowhere like the third-person one, which allows to talk about everything but also about nothing, if you go through a conceptual so-called third-person experience from within, in the first person, you may be able to measure its limits (that is, my own limitations), to better see where I am, to undo the omnipotence and omniscience, that is, the illusion of self-knowledge.

In short, a first-person phenomenology is deeply ethical: some features of such ethics are suggested by Husserl himself in *Ideas* I, §96 (Husserl 1913/1982): (a) faithfulness to the given and its expression, (b) provisional fragility of a description, (c) confidence in what is obtained, (d) gradual progression through exercising and (e) inner freedom through attentional vigilance.

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Chapter 12
Self and Neurophenomenology: Gift and Responsibility

Philip Clayton

> How do you perceive space? How is perception different from memory, or dreaming-consciousness, or fantasy?... Does consciousness have a formal structure independently of its contents?... How do [you] understand what another person is thinking? (Gallagher and Varela 2003: 99)[1]

Nobody has the slightest idea how anything material could be conscious. Nobody even knows what it would be like to have the slightest idea about how anything material could be conscious. So much for the philosophy of consciousness (Sutherland 2001).

Many of us writing for this volume are fascinated by these questions. But to what discipline should one turn to find the answers? Are they questions about neurology or about philosophy? To make progress, do you ask doctors and scientists, or philosophers and spiritual practitioners?

At the conference that gave rise to this volume, one repeatedly observed a de facto competition between two distinct camps. It's the same de facto competition that has arisen at countless conferences over the last 15 years. One should not ignore this tension or pretend it does not exist, for it provides the key to important new insights.

In order to make progress on the unresolved questions of mind and consciousness, I will focus attention on one central topic: neurophenomenology. Clearly, the term seeks to draw together cognitive neuroscience and phenomenology. Phenomenology is the study of the-mental-life-as-experienced: the thinker, the thinking and the content of thought (Latin: *cogito*, *cogitans*, *cogitations*). Other

[1] I have changed the text from first to second person.

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*,
DOI 10.1007/978-81-322-1587-5_12,

essays in this volume offer presentations of important phenomenological work in both Eastern and Western philosophical traditions.

Scientists frequently respond that phenomenology is exactly the *wrong* discipline to pair with cognitive neuroscience. For phenomenology is based on the essential nature of the first-person perspective. In Husserl's classic formulation, phenomenology "brackets out" the "natural attitude" toward the world—and that includes bracketing out the theories of the natural sciences as well. Phenomenologists such as Husserl, Heidegger and Merleau-Ponty have argued that one is able to "see" the essential features of inner experience, i.e. generalizable features of thinkers and their thoughts (Husserl called this seeing "eidetic intuition"). And Indian meditators agree on many essential features of what is seen when we are "looking within".

The neurosciences, by contrast, research brain structures and functions. Their goal is still to explain cognitive and affective experiences. But the explanations are usually given in terms of anatomical structures and patterns of neural firings. The only potential answers that are considered seriously are those that are determined by objective experimental methods, which produce results that can be verified by any other expert in the field. Given these differences, is it any wonder that there is frequently a massive gulf between these two approaches?

Many want this gulf to go away, and many are the proposals for a unity of the two sides. The sharpness of the differences has led numerous scholars to propose some sort of equivalence between the two sides—between phenomenological or spiritual descriptions of consciousness on the one side and scientific descriptions of cognition on the other. We should be sceptical of claims to have achieved unity, however. At most, I suggest the language from the one side converges toward the language of the other in the way that an asymptotic curve converges toward the y-axis without actually striking it. Many authors claim to have established a final convergence. But we should no more rush to embrace their claims of success than we should identify an asymptote with the y-axis.

Now consider what happens when you apply this asymptotic relationship to the concept of neurophenomenology. I suggest that this concept both *offers a gift* and *recognizes a responsibility*. The *gift* is the ability to avoid a reducing-away of lived experience. Our goal must be to allow for the validity both of the individual quest for personal knowledge on the one hand and the quest for scientific knowledge on the other. But the gift comes with a *responsibility*. It is our responsibility to acknowledge the difference between the kinds of tests that are scientific and the kinds of reasons that are not.

12.1 Constraints from the Side of the Neurosciences

We cannot address the apparently asymptotic relationship between neuroscientific studies and consciousness studies until we are honest about these differences. And yet it has been hard for traditional philosophers to acknowledge any constraints on the mental life. For that reason, it is important to explore a few examples of neural constraints on phenomenal experience, if only as a sort of “boot camp” for more phenomenologically oriented readers.

One well-known example is Huntington’s disease. The cause of this disease is a genetic mutation on chromosome 4. As a result of the mutation, one specific sequence of three nucleotides (cytosine, adenine and guanine) is repeated 36–120 times, instead of the normal 10–28 times (Collins 1999). The mutated genetic sequence produces a variant form of the protein huntingtin, which is toxic to neurons in the brain. As neurons begin to degenerate, patients show symptoms of jerky movements, dementia and personality change. Specifically, patients may become irritable, disinhibited, forgetful and anxious. In later phases of the disease, speech may deteriorate, and patients show high rates of depression and suicide (Walker 2007).

Other examples show even more specific correlations between physical changes in the brain and cognitive functions. Oliver Sacks, the noted neurologist, documented a case in which a lesion on the left occipital and temporal lobes resulted in a patient being unable to recognize objects (visual agnosia). Although the patient’s memory and his capacity for abstract thought were as sound as ever, he began to confuse his foot with his shoe, was unable to recognize family members in photographs and even tried to pick up his wife’s head thinking that it was his hat (Sacks 1985). In another case, a patient named Howard Engel had a stroke that damaged the left visual cortex and the splenium of the corpus callosum, which sends information about visual data to the language areas of the brain. Although Engel retained his vision, when he looked at a page of writing, he saw only jumbled text. He was left with alexia or “word blindness” (Canada 2010).

V. S. Ramachandran describes a similar case in which the patient had suffered an injury to the right parietal lobe. Although he soon regained most of his cognitive skills, he remained under the delusion that both of his parents were imposters. Ramachandran suggests that connections from face-processing areas in the temporal lobe to the limbic system had been damaged, preventing the brain from feeling an emotional connection to a familiar face (Hirstein and Ramachandran 1997).

In other examples, cognitive changes can be temporarily induced by stimulating specific areas of the brain. Akinetopsia is a condition usually caused by damage to the posterior side of the visual cortex; its major symptom is an inability to perceive motion. Patients describe moving objects as appearing stationary, although in successive, discontinuous positions. Beckers and Zeki found that magnetic stimulation of the V5 area of the brain can temporarily induce this same condition in otherwise healthy patients (Beckers and Zeki 1995).

Physical changes to the brain can affect not only motor and language functions, but also more fundamental personality traits such as creativity and spirituality. Consider the case of Tommy McHugh, a former builder, who suffered a near-fatal brain haemorrhage in 2001. Since that time, he has felt an insatiable urge to make art, whether in the form of painting, poetry, writing or sculpting. He now spends hours every day on his art and says that he feels unable to stop himself from doing so (Fugate 2010).

Even more dramatically, note that religious and spiritual dimensions of the human personality can increasingly be linked to physical brain states. Dr. Cosimo Urgesi and his colleagues at the University of Udine measured a personality trait they labelled "self-transcendence", which they have attempted to establish as a quantitative measure of spiritual feeling in humans. Self-transcendence, they argue, includes a diminished sense of self and an increased sense of personal unity with the universe as a whole. According to Urgesi, "Damage to posterior parietal areas induced unusually fast changes of a stable personality dimension related to transcendental self-referential awareness. Thus, dysfunctional parietal neural activity may underpin altered spiritual and religious attitudes and behaviors". Urgesi believes his study will suggest new treatments for certain personality disorders (Cell Press 2010).

A similar study by Johnstone and Glass (2008) found that people with damage to the right parietal region of the brain report statistically higher levels of spirituality. The right parietal lobe is the area of the brain responsible for distinguishing oneself from one's environment and self-awareness. The data led Johnstone and Glass to hypothesize that "individuals may experience transcendence (feelings of universal unity, decreased sense of the self) by minimizing right parietal functions through conscious effort, as in meditation, or reduced ability, as in injury" (Johnstone and Glass 2008: 868). They note that this hypothesis is consistent with reports of individuals who seem to "lose themselves" in meditation or prayer.

New studies on the drug psilocybin have confirmed that religious or mystical experiences can be chemically induced. Researchers at Johns Hopkins recently conducted a rigorous study in which psilocybin was administered to 36 individuals. Over 60 % of the subjects reported experiences that met the criteria for a "full mystical experience". One-third rated their experience as the single most significant religious experience of their life, and two-thirds ranked the experience among the top five most significant (Johns Hopkins Media Relations and Public Affairs 2006). For many of the participants, the experience led to positive changes in behaviour and attitude lasting for months after the experiment. Although researchers are unsure exactly how psilocybin interacts with the brain, it is clear that mystical experiences can be consistently induced with the drug.

12.2 Interim Conclusions

At this point we must ask: do these sorts of cases demonstrate that consciousness is a mere epiphenomenon? Do these data prove that there is no causal role for human consciousness? Such conclusions, though they appear frequently in the literature, do not follow from the data. As Karl Pribram notes:

> [T]here are limits to understanding achieved solely through the observation and experimental analysis of behavior. These limits are especially apparent when problems other than

> overt behavior are addressed, problems related to thought or to decisional processes, to appetitive and other motivational mechanisms, to emotions and feelings, and even to images and perception. (Pribram 1981: 142)

One can of course concentrate his attention exclusively on computational questions. But it simply does not follow that consciousness therefore *reduces to* computation. David Woodruff Smith reminds us, "Not all conscious activity is computation; feeling dizzy is not computing. Perhaps, as neuroscience suggests, a certain form of computation is part of the neural activity that implements every state of consciousness. But that is a different matter, a gray matter" (Smith 1999: 101). Without doubt, there are cognitive functions that can be explained primarily in neuroscientific terms. Yet, there are also important experiential qualities that resist such explanation. "We can establish that a certain function is accompanied by a certain experience", Dan Zahavi recognizes, "but we have no idea why that happens, and regardless of how closely we scrutinize the neural mechanisms, we don't seem to be getting any closer to an answer" (Zahavi 2003: 63).

The most important single reason that many mental processes elude neuroscientific reduction is that they manifest *an irreducibly personal component*. As Woodruff Smith emphasizes, "What makes an experience conscious ... is the combination of qualitative character and reflexivity, which takes its place within the intentionality of the conscious experience" (Smith 1999: 100). Every experiencing subject is immediately aware of the "felt" dimension of her existence. Philosophers have been able to show that this dimension of experience is essential to an adequate definition of personhood. No one has summarized this insight more succinctly than Dan Zahavi: "This first-personal givenness of experiential phenomena is not something quite incidental to their being, a mere varnish that the experiences could lack without ceasing to be experiences. On the contrary, it is this first-personal givenness that makes the experience subjective" (Zahavi 2003: 80).

12.3 The Resources of Neurophenomenology

The term "neurophenomenology" was coined in an important 1992 collection edited by Laughlin, McManus and d'Aquili, *Brain, Symbol and Experience: Toward a Neurophenomenology of Consciousness.* But it was through the brilliant influence of the neuroscientist Francisco Varela that this approach grew into one of the most productive research programmes in the history of the field. Varela's definition remains normative:

> Neuro-phenomenology is the name I am using here to designate a quest to marry modern cognitive science and a disciplined approach to human experience, thus placing myself within a lineage of the continental tradition of phenomenology. My claim is that the so-called hard problem...can only be addressed productively by gathering a research community armed with new pragmatic tools enabling them to develop a science of

> consciousness . . . . Instead of finding “extra ingredients” to account for how consciousness emerges from matter and brain, my proposal reframes the question to that of finding meaningful bridges between two “irreducible” phenomenal domains. In this sense neurophenomenology is a potential solution to the hard problem by casting in an entirely different light on what “hard” means. (Varela 1996: 330, 340)

Varela rightly resists the standard attempts at dominance: neuroscientists who wish to reduce consciousness to its neural correlates and philosophers and mystics who insist that they alone have access to the true story. By contrast, Varela allows the two “phenomenal domains” to stand in their difference, honouring the experience of both, as in a good marriage. Each partner in this new pursuit of knowledge brings the tools that he or she has mastered and the insights to which they give rise—but not in such a way that the insights of the other are obscured. Does it not seem obvious that much more knowledge is available by this means than we will obtain when the two sides battle, or even eliminate, each other?

Francisco Varela’s most effective co-worker is the Canadian philosopher Evan Thompson. After Varela’s untimely death in 2001, Thompson deepened and extended his insights with the rigour of a professional philosopher. One can detect his more nuanced programme of research:

> We believe that subjective experience is partially constituted by its being at once underdetermined or uncontrolled by external influences (inner plasticity), and also self-determining or self-controlling (inner purposiveness). It is this dual subjective sense of inner plasticity and inner purposiveness that we mean to indicate with the term “spontaneity” as applied to conscious experience. (Thompson 2003: 137)

The key to successful neurophenomenology lies in the insight that we cannot close the explanatory gap. Many have claimed to have vanquished the other partner in this shared project, leaving their own field of work as the only important resource. But in every case they have ended up silencing data and methods that are necessary for comprehending consciousness, thereby short-circuiting the process. Neurophenomenology is based on the premise that neither side can capture the flag by itself. It offers a radically different model, as Evan Thompson notes:

> At a more abstract conceptual level, neurophenomenology aims not to close the explanatory gap (in the sense of conceptual or ontological reduction), *but rather to bridge the gap by establishing dynamic reciprocal constraints between subjective experience and neurobiology.* (Thompson et al. 2005: 89, emphasis added)

Too often holistic answers have been given where careful work in neurology was needed. When we should have been doing the empirical work in cognitive science, studying the neural correlates of consciousness, sometimes we philosophers and meditators substituted our own experiences and analyses. Conversely, the so-called neurophilosophers in recent years have made the equivalent mistake from their side, pretending that their descriptions of brain anatomy and neural firings answer all philosophical questions. But in many cases they have “answered” the philosophical questions merely by eliminating them.

12.4 Beyond the Stalemate: Constraints from Science and from the Experienced Self

This is the point at which much of the discussion stands today. In response, I have argued, following Varela, that phenomenology and cognitive neuroscience need to be pursued in such a way that they are “mutually constraining”. Accepting mutual constraint means several things. From the science side, it means acknowledging neural constraints, as in the examples that I supplied above. From the consciousness side, it means acknowledging that there are cases where brain functions are constrained by the self—by that person that you take yourself to be, together with your values and sense of identity and purposes.

In the end, I suspect these two kinds of constraints—the constraints on the mental life and the constraints on the brain—will turn out to be not fully symmetrical. The brain processes in the examples we considered above provide a *sufficient causal explanation* for the observed changes in the mental life. By contrast, it is not clear that the “experienced self” as such is the direct and sufficient causal explanation for neurological processes. Of course, that may well be how *we*, as everyday agents in the world, conceive the mind-brain relationship. But reality may turn out to be somewhat more complex than we have imagined it to be.

Let us first consider the evidence for constraints from the side of the experienced self. Consider, for example, the research of Andrew Newberg. Newberg found that the brain states of people speaking in tongues were significantly different from brain states during other activities. According to Newberg, speaking in tongues affected especially the frontal lobes and left caudate. The frontal lobes, usually involved in the active control of behaviour, showed less activity when the subject was speaking in tongues. The left caudate, responsible for motor and emotional control, was also less active (Newberg et al. 2006). Both of these results support the subjects’ own descriptions of the experience.

In another study, d’Aquili and Newberg measured the brain states of experienced Tibetan monks as they meditated. Brain images were taken both before and during meditation. They found increased activity in the frontal lobes, associated with concentration, but decreased activity in the parietal lobes, which are responsible for our orientation in space and time (Newberg et al. 2001).

More recently, studies have found that taking up meditation practices, even for short periods of time, can actually increase the concentration of grey matter in the brain. Sixteen subjects who were new to meditation participated in an 8-week mindfulness-based stress reduction (MBSR) training programme. MRI scans showed an increase of grey matter in areas associated with learning and memory processes, emotion regulation, self-referential processing, and perspective taking. The authors of the study conclude that “The adult nervous system has the capacity for plasticity, and the structure of the brain can change in response to training” (Hölzel et al. 2011: 42).

Religious beliefs can also affect the way that the brain heals after an injury. According to Wayne State researcher Brigid Waldron-Perrine, a subject's sense of religious well-being or connection to a higher power was a strong predictor of the outcome of rehabilitation after a brain injury. "Remarkably", the authors write, "this sense of connectedness to a higher power was more strongly predictive than were a nonreligious sense of meaning and purpose in life or engagement in religious activities, per se. These findings indicate that an individual's sense of spirituality is considerably related to rehabilitation outcome". The effects were significant both in the subjects' subjective feeling about the rehabilitation process and the objective outcome (Waldron-Perrine et al. 2011: 113).

12.5 Implications of Neurophenomenology

Scientific breakthroughs—developments in brain imaging, neurochemistry, neurosurgery and pharmaceuticals—have opened up a new era for the study of brains and mind. We can now pursue powerful correlational studies that were impossible just a few years ago. Neurophenomenology is the framework that best formulates and guides this emerging research programme.

As we've seen, constraints arise in two different directions. In the first type of cases we looked at, a brain change is the independent variable and the subject's changed experience is the dependent variable. In the meditation case, the spiritual practice is the independent variable and the changes in the firing patterns are the dependent variable. As I noted earlier, part of the reason that first-person and third-person studies are asymptotic is that the set of brain-constraint cases is different than the set of "mind"-constraint cases. Brain-constraint cases produce one set of theories, and "mind"-constraint cases produce a very different set of theories, for example, philosophical and spiritual explanations.

I suggest that the strongest work comes when one adds an additional requirement: *whenever you do theoretical work on consciousness based on the neural correlates of consciousness, do it with the phenomenological cases in mind. And whenever you do phenomenological work or philosophy or meditation, do it with the scientific-empirical data in mind*. Only in this way does one really achieve mutual constraint. That is, only in this way does one really achieve bidirectional testing—testing in both directions—because one is thereby able to achieve an "overlap set" of the two fields. The field of consciousness studies is best served if we don't let the competing philosophical commitments get in the way of the correlational studies that remain to be done—in both directions.

A number of scientists and philosophers have already begun to urge the field in this direction. Recall, for example, the core methodological principle of Francisco Varela:

> One thing is clear: the specific nature of the mutual constraints [of first- and third-person methodologies] is far from a simple empirical correspondenceor a categorical

> isomorphism... It is an active link, where effects of constraint and modification can circulate effectively, modifying both partners in a fruitful and complementary way. (Varela 1999: 306)

Writing from the perspective of a philosopher, Sangeetha Menon (2011: 101) notes correctly that "The self and brain mutually reinforce at all times. We might say that to delimit the connections to wholly neurological, mental, or spiritual domains perhaps is putting the cart behind the horse. Perhaps, the truth about each lies in its interactions with the other". Dr. B.V. Sreekantan's chapter in the present volume makes a similar call for scholars to be patient about with dualisms that we have not yet resolved. He gives eight different examples of dualisms that stymied physicists and were later resolved theoretically and verified experimentally, examples that can be followed in the order of increasing complexity. In interdisciplinary approaches to consciousness, likewise, we face unresolved conflicts. To be truly interdisciplinary, we must seek real, mutual constraints between mind-language and brain-language, acknowledging that the data currently underdetermine the choice among the theoretical possibilities. Put differently, work is genuinely interdisciplinary only when we can show the influences in *both* directions—from brains to lived experience and from subjective selves to brains, however indirect or mediated these connections may be.

12.6 Reframing the Big Questions: Self, Consciousness and Spirituality

What results may we achieve with this method? As I noted at the beginning, this approach both *offers a gift* and *recognizes a responsibility*. The gift part is clear: the approach reinforces the language of phenomenal experience; it encourages philosophical reflection; and it preserves a role for the spiritual traditions. At the same time, it becomes our responsibility to acknowledge the difference between the kinds of tests that are scientific and the kinds of reasons that are not—and to keep *both* in mind.

In closing, then, let us look at some examples of enduring philosophical questions to see what impact neurophenomenology may have on them. One can begin to see the distinctions between approaches that work with the principle of "mutual constraint" and those that do not.

12.6.1 Self, Soul and Mind

Ah, such massive differences across the traditions! For a Christian, the goal of the self is to pattern one's life on the model of Jesus Christ, who is held to be God incarnate, God-become-man. For a Muslim, the goal is to live as God's viceregent on earth, ruling over the animals and gaining knowledge of Him through Holy

Qur'an and through the world. And what is "the self" for Vedanta? Famously, there are *dozens* of different views of the self in Vedanta: materialist views, dualist views, advaita and vishishtadvaita—the list goes on and on. In fact, if one includes the particular view of each scholar and guru, one encounters hundreds, even thousands, of views of the self.

Further, each practitioner will bring her own particular experiences, and each experience contributes to the particular way that she experiences selfhood. We might say, following the Western phenomenologists, that each self brings its own *Lebenswelt*, its own thought-and-life-world. *Any* of them can be taken as the independent variable, and we can study the empirical and lifestyle effects of each set of beliefs and practices. Indeed, is this not what each and every serious meditator does in his or her own practice?

This, then, is the gift: the invitation to celebrate the variety of beliefs about selves, souls and spirits. It's a rich ecosystem of experiences, beliefs, rituals and actions, with each individual person bringing his or her unique views. At the same time, our responsibility is to acknowledge the *difference* between those views that are subject to real scientific testing and those that are not. Interdisciplinary work requires us to know and to acknowledge the difference.

The results help advance the neurosciences as well as the philosophy of religion, but they do not by themselves resolve the tensions that remain between these two fields.

12.6.2 Consciousness

This volume, and others like it, offers a vast variety of claims about consciousness. Authors argue that consciousness is "internal representation", "the process of constructing a world", "highly ordered reflection and response", "self-reference", "the coherence maker" and "an ocean". Multiple (incompatible) claims are made: "consciousness is primary and mass is a derivative"; "consciousness was there from the beginning (reflexive monism)"; "consciousness is what matters to us ultimately"; "consciousness is what provides meaning"; "consciousness is the appearance of a world"; "consciousness is self"; "consciousness is 'not'"; "consciousness is active"; and "consciousness is passive".

Again here, we face two options: make phenomenal consciousness the independent variable or also allow studies that allow it to be a dependent variable. In the first approach, meditators change their conscious experience, and then scientists (or their followers) look for behavioural and neurological changes. In the second approach, one follows the causal line from the brain to its effects on consciousness.

Let me put the point differently. We face many different kinds of questions about consciousness. The great philosophers and yogis will continue to disagree about the ultimate nature of consciousness. But we *can* learn more about the bidirectional relations between bodies, brains and conscious experiences. And we can agree on what consciousness allows us to do. As the neuroscientist Antonio Damasio writes at the end of his fascinating new book, *Self Comes to Mind: Constructing the Conscious Brain*:

> And what is the ultimate gift of consciousness to humanity? . . . This greatest of all gifts depends, once again, on the intersection of the self and memory. Memory, tempered by personal feeling, is what allows humans to imagine both individual well-being and the compounded well-being of a whole society, and to invent the ways and means of achieving and magnifying that well-being. Memory is responsible for ceaselessly placing the self in an evanescent here and now . . . . (Damasio 2010: 296–297)

12.6.3 Spiritual Experiences

The spiritual traditions are devoted to bringing about inner states and external actions that they value. Frequently cited across the traditions are empathy and compassion. Both include recognition of the other, of her value and of her interests. Again here, two different directions are involved. Can a lifestyle devoted to a specific set of values change the brain? Yes. Does biology constrain what we tend to value? Yes. (Does it determine it? No.)

So what does all of this say about spiritual experiences that arise across the world's religious traditions and outside of them as well? We are not compelled to accept reductive approaches to spiritual experiences, any more than to any other mental experiences; the so-called neurophilosophers have failed to compel us to mandatory reductions of this sort. Nevertheless, as we have seen, to be involved in interdisciplinary research and scientific testing does bring with it certain requirements. It is well worth it to pay these costs for the benefits of knowledge that they bring.

12.7 Conclusion

The pages of this volume are devoted to the project of "looking within". The authors manifest the shared conviction that there is a common internal or spiritual domain that can be explored. It is to this domain that phenomenology is dedicated. Of the urgency of this inquiry there can be no doubt. As Laughlin, McManus and d'Aquili write in their introduction, "All of science . . . is in a crisis of self-reflection . . . . It will begin to subside only when science begins to recognize its source within the unfolding tapestry of sentient awareness and consciousness in the universe. In other words, the crisis will become resolved only when science becomes phenomenologically mature" (Laughlin et al. 1992: xi).

I have linked neurophenomenology to the study of bidirectional correlations. If this correlational method works, we have what we, or at least most of us, have been looking for. We have the excitement of phenomenological exploration. We have the phenomenal givens of consciousness. We have the reality of the inner self with its "me-ness", its values and its sense of enduring identity. We have encouragement for the spiritual quest. Finally, as long as these first-person methods do not try to usurp the place and methods of science, we have the excitement of scientific research and the unique status of its results.

In the entire world, one thinks of Americans as the most wasteful: they take far more for themselves than the world has to give, consuming too many resources and creating too much waste and pollution, so that there is not enough to go around. The cohabitation of the scientific quest and the spiritual quest is possible as long as neither side approaches their work the way many Americans approach their lifestyles. As long as researchers on each side focus on their unique contributions, they need not be in conflict. But if they claim *all* knowledge for themselves and try to leave nothing for the other side, in the way that many Americans do, they create a "zero sum game", such that one must win and the other must lose. But, as we have seen, it is not necessary to play that game. Our challenge today is for each side to pursue the most rigorous knowledge that its methods allow while at the same time honouring the gifts that the other has to offer.

Acknowledgements I gratefully acknowledge the professional research support of my doctoral student, Justin Heinzekehr. Soon-to-be Dr. Heinzekehr collected and documented many of the neurological examples, prepared the visual materials for the conference presentation and did extensive work on adapting the conference paper for publication in its present form. Warm thanks are due to him for his hard work and professional expertise.

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Chapter 13
The Inside-Outside Story of Consciousness: A Phenomenological Exploration

Nilanjana Sanyal

Human being is the most precious living creature in this planet, the concern for whose well-being is the tune of the era. The lack of consciousness regarding self-contents as well as contents of realization beyond the existential concrete experiences is preventing us from enjoying the paths of deeper understanding of life and hence creating "existential crisis" for us. Modern science speaks to us of an extraordinary range of interrelations. Biologists are beginning to uncover the fantastic and complex dance of genes that creates personality and identity, a dance that stretches far into the past and shows that each so-called identity is composed of a swirl of different influences. Physicists have introduced us to the world of quantum particles. Neuropsychology is trying to open up the treasure of mirror neurons in explaining our mental orientations. Psychologists are trying multidimensionally to explain behaviour in its conscious and not that conscious spheres. Phenomenology seems to be a reasoned inquiry which discovers the inherent essences of apparent experiences. It seeks through systematic reflection to determine the essential properties and structures of consciousness and conscious experience. At this juncture, my discussion is going to cover the inside-outside story of consciousness from a phenomenological angle of interpretation.

The world's physical aspect, that is, what it is like to be something, eludes us completely and always be like that because the confusion reigns in what it means to know and to be a "self" that knows. Scientists speak of sensorial experiences. But they seem to be frustrated over the fact of not being able to decipher what experience is. They seem to be oblivious to the fact that they do not know what it is to be "physical". Experience seems to be physical, but the knowledge of experiences seems to be intangibly psychological. The query is where lies the link between

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*, DOI 10.1007/978-81-322-1587-5_13, © Springer India 2014

these two dimensions of conscious experience and what are the basic components of the experience—the self or anything else? The idea of inside-outside story of consciousness begets here. To unfold the story, at the outset, the self seems to be a mystery with its implicit and explicit components that needs clear revelation in psychological perspective. At its core, "self" is not the organism, and it is not physical. It seems to be an intangible emergent property of information processing. It mediates the response of the organism to stimulation from the organism's environment and thus represents itself as the agent of the organism. Anyway, being the experiencing agent, its structural and functional components are expected to offer wide vistas of understanding in the areas of philosophy as well as psychology.

Primarily the self is the experiencer, and the self experiences that entails is the concept of "existence".

13.1 Social Forms of Self-Consciousness

Psychology, the scientific form of openness into existence and beyond existence experiential processes, is trying to strike the right chord of the mind—the concept of "consciousness" of the "self" to engrave the real pitch of subjective individuality amidst so many objectivities to link "thy" self with "thine". This is to have full enrichment of emotionality to guide cognition and conation in right direction to enjoy the flow of life to its brim and escape wraths of sufferance. Hence the need to probe into the processes of consciousness and to draw their implications in life.

Phenomenology, being a specific conceptual wing of psychology, introduces "semiotic" dimension in analysis of "consciousness". Unlike cognitive, neurobiological or so to say behaviouristic modes, phenomenology holds the view that mind is the goal of body. The existence of one's body is fact; the feeling that one's body is just the vessel for the mental processes or rather, the experiences is the truth.

The experiences belong to the realm of "consciousness"—the experiencer being the self. A focus on embodied self-experience inevitably leads to a decisive widening of the discussion. The "externality" of embodiment puts one, his actions, in the public sphere. Self-consciousness involves not only an ability to make reflective judgements about our own beliefs and desires but also includes a sense of embodied agency. This embodiment brings intersubjectivity and sociality into the picture, draws attention to the question of how certain forms of self-consciousness are intersubjectively mediated and may depend on one's social relations to others (Ricoeur 1950). This kind of self-consciousness is also the occasion for a self-alienation. "My experience of the other is at the same time an experience that involves my own self-consciousness, a self-consciousness in which I am pre-reflectively aware that I am an object for another. This experience can further motivate a reflective, self-consciousness, as I consider how I must appear to the other" (Ricoeur 1950, p. 282).

The concept has been represented in the following schematic diagram (Fig. 13.1):

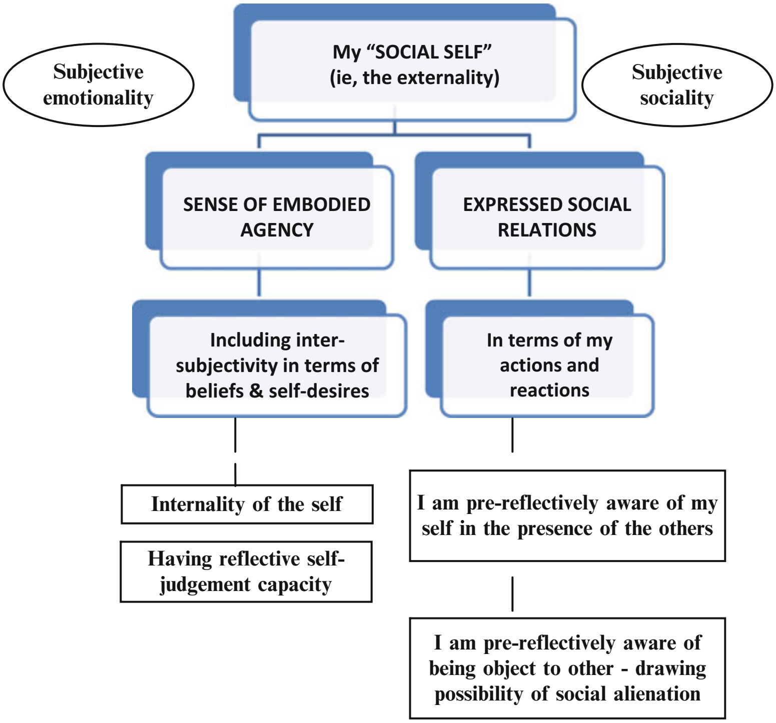

Fig. 13.1 The ingredients of functional self

13.2 Functional Folds in Variations of Consciousness

To draw the implications of consciousness in our wider spectrum of life, the existence and character components of consciousness need little more elaboration. Such elaborations are expected to reveal the basic "feel" of consciousness, once again in phenomenological parlance of conception and analysis. Within the folds of experience, different varieties of consciousness can be conceived:

Awakeness—This is an ability to process information about the world and deal with it in a rational fashion. This is having a focal point in consciousness and being aware of it cognitively.

Introspection—This access to one's mental states is an important component of the everyday concept of consciousness. This is the process by which we can become aware of the contents of our internal states. For example, our dreams with their contents or where we can consciously locate a source of emotional distress that was vague earlier.

Reportability—This is our ability to report the contents of our mental states. It presupposes the ability to introspect but is more constrained than that ability, as it presupposes a capacity for language.

Self-consciousness—This refers to our ability to think about ourselves and our awareness of our existence as individuals and of our distinctness from others.

Attention—We are conscious of something when we pay our attention to it, that is, when a significant portion of cognitive resource is devoted to dealing with the relevant information. There is a central point and peripheral point in our attention process. Contents of central points generate clear consciousness.

Voluntary control—A behavioural act is conscious, when that act is performed deliberately, that is, where the action is caused in the appropriate way by an element of prior thought.

Knowledge—Someone is conscious of a fact precisely when they know the fact.

13.3 The Inside-Outside Aspect of Consciousness

Although these concepts have a psychological core, i.e. having logicality as well as self-drawn feeling tones, they are associated with phenomenal states also. To have a glimpse of this phenomenal angle to consciousness, the character aspect of consciousness is elaborated in the following fashion. In Sartre's (1971) opinion consciousness is present to itself; it is self-predatory. Consciousness is "itself" transcendent, to the extent then that it has an "itself"; consciousness as reflectively known "remains in the same place, indefinitely absorbed, devoured and yet indefinitely intact, wholly digested and yet wholly outside, as indigestible as stone . . . the "digested indigestible" . . . " (p. 739). Consciousness is thus the "identity of appearance and existence" (Sartre, p. 17). It is pure "appearance" in the sense that it exists only to the degree to which it appears. To whatever extent it appears, it appears exactly *as it is*. It cannot appear in alternative ways.

In the transcendence, Sartre (1972) attempts to reconcile the utter transparency of consciousness with its presence to reflection by positioning the two, respectively, in the arms of an ostensible distinction between the "inside" and the "outside" of consciousness. Granted that "an absolute interiority never has an outside" (p. 84), the psychic, "the transcendent object of reflective consciousness" (p. 71), is its outside. Consciousness could not be intrinsically "empty" and transparent. There is expected the layer of apperceptive mass: the genetic root of consciousness. So, the outside has invaded inside. Reflection, though it retrieves the surface glare, would nonetheless be incapable of apprehending consciousness "itself". To see consciousness (itself) is to see through it. Reflective consciousness effaces "itself" in the face of pre-reflective consciousness of the world. Only one "face", one manifestation, remains for both. The (ostensibly) "two" cannot be distinguished. The transparent is not an intuitive presence but rather the condition for the phenomenal capacity of being-in-itself.

But whatever may be the experience and character part of consciousness, to fathom the depth of consciousness and draw the same energy for further advancements in life, there needs to be an "experiencer", the firsthand, first-personal experiencer, the "self". To unfold the functional impact of consciousness, its relation to its agent, the self and the selfhood, needs to be established.

13.4 Self: The Conscious Experiencer

Self is an entity marked by reflexive consciousness, interpersonal rates and reputation and executive function. Without these bindings the concept of self becomes meaningless. Self begins when awareness turns around in a circle and offers some realization or absorption of meaning from life context itself. In its characteristic folds:

- Reflexive consciousness gives awareness to the self (our actions).
- Interpersonal strings add meaning in "self's life in extensive social contacts (feeling aspects in life).
- The executive platter serves self as an entity that makes choices and decisions, which finally initiates action and takes responsibility (the intellectuality or cognitive aspect of subjective self).

These features together orient the self towards consciousness regarding external and specially regarding internal reality. The relatedness of self to consciousness seems to be the most important infrastructure of the individual self to initiate the process of improving the "stay quality" in the world being enriched in internal realization capability. Focusing our experiencing gaze on our own physical life necessarily takes place as "*reflection*", as a turning about a glance which has previously been directed elsewhere. Every experience can be subject to such reflection, as can indeed every manner in which we occupy ourselves with any real or ideal object, for instance, thinking, in the modes of feeling and will, valuing and striving. The phenomenological reversal of our gaze shows that this "being directed" is really an immanent essential feature of the respective experiences involved—they are "intentional" experiences. Consciousness of something is not an empty holding of something; every phenomenon has its own total form of intention. In fact, the idea of a phenomenological psychology encompasses the whole range of tasks arising out of the experience of self and the experience of the other founded on it.

13.5 Experience Happens to the "Experiencer": Consciousness Involves a Self-Appearance

On the phenomenological view, a minimal form of self-consciousness is a constant structural feature of conscious experience. Experience happens for the experiencing subject in an immediate way, and as part of this immediacy, it is implicitly marked as "my experience". For the phenomenologists, this immediate and first-personal givenness of experiential phenomena must be accounted for in terms of a pre-reflective self-consciousness. The notion of pre-reflective self-awareness is related to the idea that experiences have a subjective "feel" to them, a certain phenomenal quality of "what it is like" or what it "feels" like to have them. In the most basic sense of the term, self-consciousness is not something that comes about the moment one attentively inspects or reflectively introspects one's experiences; rather the process seems to have its embeddedness in pre-reflective consciousness.

The reflective self-consciousness is a higher-order cognition. Pre-reflective self-awareness is an ongoing and more primary self-consciousness. Consciousness always involves a self-appearance. Experience is always self-manifesting. Pre-reflective self-consciousness is not simply a quality added to the experience, an accessory; rather, it constitutes the very mode of being of the experience.

Reflective self-consciousness is an explicit, conceptual and objectifying awareness that takes a lower-order consciousness as its attentional theme. In phenomenology, it is called inner perception as contrasted with outer. The self is there before all reflection. Reflection is only a mode of self-apprehension, but not the mode of primary self-disclosure (Heidegger 1989, p. 226). One advantage of the phenomenological view is that it is capable of accounting for psychological self-identity, that is, the experience of self-identity through time, without actually having to project the self as a separate entity over and above the stream of consciousness. Pre-reflective self-awareness is thus distinctly different from explicit self-consciousness.

Pre-reflective contents are hints, cues of understandings, insights into—but not—the real thing. It is a "feel" rather than cognition or knowledge. The moment self becomes aware of it, it earns the quality of reflection—because it is reflected to me.

In pre-reflective self-awareness, one is not confronted with a thematic or explicit awareness of the experience as belonging to oneself. Rather the dealing is with a nonobservational, nonobjectifying self-acquaintance. Basically, the notion of pre-reflective self-awareness is related to the idea that experiences have a subjective "feel" to them, a certain (phenomenal) quality of "what it is like" or what it "feels" like to have them. It is a case for perceptual experiences, experiences of desiring, feeling and thinking. All the experiences are characterized by a feeling of "mineness". As James (1890) put it, all experience is "personal". This first-person "givenness" entails an implicit experiential self-reference.

13.6 Self-Consciousness in Its Internality and Externality

Within the perspective of pre-reflective self-consciousness, evidences from developmental psychology and ecological psychology suggest that there is a primitive, proprioceptive form of self-consciousness already in place from birth. This primitive self-awareness precedes the mastery of language and the ability to form conceptually informed judgements, and it may serve as a basis for more advanced types of self-consciousness (Neisser 1988). Selfhood emerges within infant-adult interaction (Butterworth 1995, 1999). Selfhood is thus a process that emerges from social interaction and is sustained by cultural signifiers and practices. But the process itself exists prior to culture. Semiosis is a fundamental aspect of the way the living world works. In fact human selfhood depends on the human form of consciousness being conditioned by the symbols that are assimilated from the cultural milieu. However, consciousness qua awareness existed prior to the appearance of this milieu and arose along with the evolution of all living beings. And since the key to human selfhood is the capacity to use symbols, answers are framed in the language of semiotics. General theories of signs are thus called semiotics. In brief, "the self" is a semiotic process. In its functional dimension the interpreter encounters the sign, and the object is produced. This process involves components both inside and outside the individual. The internalization of this process is assumed to create the human sense of self. What is internalized initially derives from the actions and gestures of human social interaction. At later stages in the development of the individual, cultural symbols such as speech and writing also become important.

The notion of self-consciousness has been the subject of a rich and complex analysis in the phenomenological tradition. The recognition of the existence of a primitive form of pre-reflective self-consciousness is an important starting point for an understanding of more elaborate forms of self-consciousness that are concept and language dependent. Phenomenological analyses show these processes to be more than purely mental or cognitive events since they integrally involve embodiment and intersubjective dimensions.

13.7 Temporality in Self-Consciousness

According to Husserl's analysis, pre-reflective experience of any sort (perception, memory, imagination etc.) has a common *temporal structure* such that any moment of experience contains a retentional reference to past moments of experience, a current openness (primal impression) to what is present and an anticipation of the moments of experience that are just about to happen (Gallagher 1997). The retentional structure of experience does not simply disappear at the next moment but is kept in an intentional currency and constitutes a coherency that stretches over an experienced temporal duration. Reflective self-consciousness, which takes pre-reflective experience as its object, is itself (like any conscious experience) characterized by the same temporal structure. As a reflecting subject, "I" never fully coincide with myself. When I reflect, there is always something about my experience which will evade my reflective grasp: the very moment itself.

13.8 Bodily Self-Awareness

Pre-reflective self-awareness is both embodied and embedded in the world (Husserl 1973, p. 57). The body provides not only the egocentric *spatial framework* for orientation towards the world but also the constitutive contribution of its mobility. Perception does not involve a passive reception, but an active exploration of the environment. The implicit self-awareness of the actual and possible movements of one's body helps shape the experience that one has of the world. In fact, bodily self-awareness is not an awareness of the body in isolation from the world; it is embedded in action and perception. The body is revealed to us in our experience of the world in self-consciousness.

A developmental analysis reveals many links between the conceptual self and its preconceptual underpinnings. A symbolic form of self permits a conception of self as unique and supports reflective self-awareness and a private perspective. It is the primacy of the ecological aspect of self which makes the mental experience of self, to the introspective adult so real.

13.9 Self-Consciousness and Phenomenology

Phenomenology in Husserl's (1952) conception is primarily concerned with systematic reflection on and analysis of the structure of consciousness and the phenomena that appear in acts of consciousness. In its most basic form, phenomenology attempts to create conditions for the objective study of topics usually regarded as subjective, consciousness and the content of conscious experiences such as judgements, perceptions and emotions. Although phenomenology seeks to be scientific, it does not attempt to study consciousness from the perspective of clinical psychology or neurology. Instead, it seeks through systematic reflection to determine the essential properties and structures of consciousness and conscious experience. An important element of phenomenology is "intentionality" or "aboutness", the notion that consciousness is always consciousness of something. The object of consciousness is called the intentional object which is constituted of perception, memory, retention and protention, signification etc. which are called intentionalities for consciousness. Consciousness is directed at the same intentional object in direct perception as it is immediately following retention of this object and the eventual remembering of it.

Intentionality represents an alternative to the representational theory of consciousness, which holds that reality cannot represent an alternative to the representational theory of consciousness, which holds that reality cannot be grasped directly because it is available only through perceptions of reality that are representations of it in the mind. Husserl (1952) countered that consciousness is not "in" the mind but rather conscious of something other than itself (the intentional object), whether the object is a substance or a figment of imagination. Hence the phenomenological method relies on the description of phenomenon as they are given to consciousness in their immediacy.

13.10 Phenomenology in Historical Matrix

Phenomenology has at least three main meanings in philosophical history.

For Hegel (1920–1960), phenomenology is an approach to philosophy that begins with an exploration of phenomena that presents itself to us in conscious experience, as a means to finally grasp the absolute, logical, ontological and metaphysical spirit that is behind phenomena. This has been called "dialectical phenomenology".

For Husserl (1952), phenomenology is the reflective study of the *essence* of consciousness as experienced from the first-person point of view. Phenomenology takes the intuitive experience of phenomena as its starting point and tries to extract from it the essential features of experiences and the essence of what we experience. This has been called transcendental phenomenology.

Heidegger (1986) believed that Husserl's approach overlooked basic structural features of both the subject and object of experience (what he called their "being") and expanded phenomenological inquiry to encompass our understanding and experience of Being itself, thus making phenomenology the *method* of the study of being, *ontology of self.*

In Heidegger's view, then, human being (Dasein) involves what might be called an implicitly sensed "ground," "horizon" or "clearing" which is the context or totality within which experience occurs. This horizon is in a sense the most important aspect of human existence, for it is the very condition or possibility of anything at all appearing or being known. Moreover, it is the only place where the being of either "man" or "world" is disclosed.

A list of thinkers used the term phenomenology in a variety of ways[1]:

F.C. Chetinger (1702–1782)—The study of the divine system of relations.
D. Hue (1711–1776)—A treatise of human nature.
J.H. Lambert (1728–1777)—Theory of appearance underlying empirical knowledge.
I. Kant (1724–1804)—Objects as phenomena are shaped and grasped by human sensibility and understanding.
G.W.F. Hegel (1770–1831)—Knowing phenomena more fully, we can gradually arrive at a consciousness of the absolute and spiritual truth of Divinity.
C. Stumpf (1848–1936)—Used phenomenology to refer to an ontology of sensory contents.
E. Husserl (1859–1938)—Established phenomenology at first as a kind of "descriptive psychology" and later as a transcendental and eidetic science of consciousness.
M. Heidegger (1889–1976)—Attempted to develop a theory of ontology that led him to his original theory of *Dasein*, the non-dualistic human being.

One advantage of the phenomenological view is that it is capable of accommodating for psychological self-identity, that is, the experience of self-identity through time, without actually having to posit the self as a separate entity over and above the stream of consciousness. Although we live through a number of different experiences, the experiencing itself remains a constant in regard to whose experience it is. Only a being with this sense of ownership could go on to form

[1] See www.en.wikipedia.org/wiki/Phenomenology

concepts about herself, consider her own aims, ideals and aspirations as her own, construct stories about herself and plan and execute actions for which she will take responsibility. Self-consciousness is to be understood as an intrinsic feature of the primary experience. Phenomenologists typically argue that the feature that makes a mental state conscious is located within the state itself; it is an intrinsic property of those mental states that have it. Hence, if pre-reflective contents are assumed to be the inside story of self-consciousness, the reflective contents cover the outside façade of self-consciousness. In the context, in contrast to pre-reflective self-consciousness which delivers an implicit sense of self at an experiential or phenomenal level, reflective self-consciousness is an explicit, conceptual and objectifying awareness that takes a lower-order consciousness as its attentional theme. In an overall stance, the notion of self-consciousness has been the subject of a rich and complex analysis in the phenomenological tradition. By ignoring that tradition, contemporary systematic work on the issue may miss out on important insights that in the best of circumstances end up being rediscovered decades or centuries later. The recognition of the existence of a primitive form of pre-reflective self-consciousness is an important starting point for an understanding of more elaborate forms of self-consciousness that are concept and language dependent. Phenomenological analyses show these processes to be more than purely mental or cognitive events since they integrally involve embodiment and intersubjective dimensions.

13.11 Conclusion

Knowing the inside-outside facades of consciousness of self from phenomenological aspect, a state has arrived to draw its implication in higher planes of consciousness in the realm of transcendence. Hoffmeyer (1996) is felt to be quoted here as "This world has always meant something. It just did not know it. Now with the evolution of self-awareness, it knows or rather we know it". Here lies the context of Dasein, the "being" in the highest level of ontology.

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Chapter 14
Self and Empathy

Lakshmi Kuchibhotla and Sangeetha Menon

14.1 Introduction

It is important and imperative in the global context of rapidly developing societies and in the age of interconnectivity that people endeavour to understand each other and forge relationships that move toward garnering healthy psychological resources and capacities. Empathy, without which there is disconnect and isolation, is a process which connects individuals to one another. It seems to dominate much of the processes of the human mind involving shared attitudes, sentiments and emotions. The ability to understand each other is inbuilt into the human system, and this ability to experience the same emotion that others do is useful in many aspects of our life. The German word *Einfühlung* (in-feeling) has been translated as "empathy" which has come to mean "social insight", "interpersonal sensitivity" or "interpersonal judgement".

The interpersonal world of individuals is characterized by the connections made between them, and such networks are often the bridges toward a unified self and one's well-being. The self in psychology has been the essence of personality, and substratum of consciousness, giving to personality its unique and dynamic character. It is the subjective nucleus, representing the inner world of the individual. It is a product of socialized behaviour arising from interaction with others in a human group and a cognitive structure which integrates the various perceptions of an individual and conceived of as the "core" of personality. Much behaviour becomes coherent when understood in terms of the ideal self toward which an individual

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*,
DOI 10.1007/978-81-322-1587-5_14, © Springer India 2014

aspires and his very personal evaluation of how close he sees himself to this ideal. Social interactions involve the self-world mutual processes which contour the dynamics of the self. The inner and outer experiences fuse in an interstitial space leading to empathy, a process, which increments the phenomenal self, expanding openness and enhancement. There is an increasing differentiation between self and the world outside (the other) and an increasing appreciation of the precise circumstances underlying the emotional states of others, where affective resonance develops into empathy (de Waal 2004).

The idea of empathy, the cornerstone of Rogerian person-centred theory and therapy, has spanned several disciplines of study and research especially cognitive science and neuroscience. Key research is being conducted on the basis of the discovery of mirror neurons to explain various facets of the concept of empathy and to establish the neural foundations of this process.

In the following sections we consider the various perspectives of biology, neuroscience, psychology, psychotherapy and Eastern traditional thought that contribute to understanding of empathy, self, well-being and their interactional processes.

14.2 What Does Empathy Imply for the Self?

In psychological research, empathy is the subject's ability to predict how another person will respond to items displaying certain psychological properties (Koss-Chioino 2006). Empathy is viewed as having a cognitive as well as an emotional component. It is important to remain objective about the subjectivity and evaluate meanings, and being empathic means being able to judge what we mean. The emotional aspect involves being aware of and experiencing one's feelings, while the cognitive aspect takes the perspective of the other. It occupies a space that admits both the self and the other.

Steuber (2012a) examines Lipps' (1907) definition of empathy as a resonance phenomenon or a form of inner or mental imitation activated in the perceptual encounter with another person and his activities. He considers it a natural phenomenon to want to mirror another's activities or experiences, thus laying emphasis on the aspects of resonance and projection. Steuber also considers narrativist theories of empathy as those of trying to understand a person's reasons through imaginative perspective taking—seeing the link between the activities narrated and the activities that could or do play a similar role in our lives (Steuber 2012b).

McLeod (2007) considers empathy as a part of an apparatus of the work in understanding the other. Especially referring to the therapeutic process, he states that empathy plays a crucial role in narrative reconstruction, since it is through the telling of stories that the client allows himself or herself to be known and it is through participating in the performance of these stories that the counsellor is able to enter the world of the client. Empathy is not a simple task but is a lengthy and demanding project. It is not merely the effort to be sensitive to the differences between people and their responses to events, but it also implies that in the other exists a complex inner self which can be known.

Mar (2011) views empathy as a heterogeneous construct, an umbrella term that subsumes many processes and related constructs. Zahavi (2012) discusses the possibilities of different types of empathy—a basic face-to-face interpersonal relationship which nourishes direct interpersonal interactions and complex empathy involving levels of social cognitive processes to understand the underlying motives of another's actions (Düringer and Döring 2012).

Breithaupt (2012) suggests that humans are amidst empathic "noise" and they constantly "breathe in" the perspectives of others. He also talks of "self-loss" that evinces due to adopting another's perspective where one "identifies" with a fictional character's narratives or a bystander relates to the pain of a person on the street and gives a heuristic about "hot" and "cold" empathy—which involves "feeling" the experience of another versus making "sense" of the experience of the situation.

According to Goldman (1992), empathy is people's naive heuristic for interpreting, explaining and predicting others. Berenguer (2010) opines that there is a perception of a valued-other-in-need. The conative component drives one toward survival. It is crucial in grasping the intentions and experiences of even fictional characters. Nussbaum (2001, p. 327) discusses empathy to be an imaginative reconstruction of another's experience, whether that experience is happy, pleasant or otherwise. She debates the process of empathy by putting forth points of whether one *is* oneself the sufferer or whether it is one's response that is imagined to be *fused* with that of another sufferer. She surmises that empathy involves the participatory enactment of the situation of the sufferer but is combined with an awareness that one is not the actual sufferer. She considers compassion to be a painful emotion occasioned by the awareness of another person's undeserved misfortune and empathy to be a necessary ingredient of compassion. Psychologists' use of empathy involves cognitive, conative and affective elements—judgements, imagination and reconstruction. Empathy and judgement penetrate into each other. Judgements are made about the person's state and experience and these experiences are evaluated as negative or positive.

Halpern (2001, p. 85, cf. Breithaupt 2012) describes the many facets of empathy as including involuntary copying mechanisms; emotional mimicry; feeling distress when observing the suffering of others; mind reading; deciphering others' thoughts, states or emotions; and "imagining how it feels to experience something", as well as caring for others.

These various features enumerated are intrinsic to the process of empathy which is a shared interactive dynamism of the self and other leading to inclusivity and well-being.

14.3 Self and the Process of Empathy

Empathy is a mutual process. The nature of the process implies two participants—self and other—and the collective process that these two participants must be engaged in an experiential space that allows for the empathizer to be capable of understanding the other's situation and emotions. The other experiences one or more emotions; the empathizer recognizes a similarity in experiences (of the other and self) and there is a concern for the other's well-being. Thus, *understanding, experience and concern for the other* are key constituents of empathy. The necessity for the other and the component of concern establish the interpersonal nature of empathy (Håkansson and Montgomery 2003).

Engelen and Röttger-Rössler (2012) make a claim that empathy is a vicarious emotion because it is a social feeling that consists in feelingly grasping or retracing the present, future or past emotional state of the other. They also highlight the cognitive and the social positions of empathy owing to the "grasping" nature and the formation of social relations.

A psychological contact is made with another person along with a deep awareness of the uniqueness of the other as well as an immersion into the experiences of the other and a grasping of implicit meanings to reveal new meanings. Experiencing as closely as possible what the other is feeling is a hallmark feature of empathy. To build or regain an authentic sense of self, it is essential to grasp the internal frame of reference of the other all the while not losing the sense of one's own self. It is as if one is in another's step yet is apart from it and aware of one's own step too. However, in different cultural perspectives, the boundaries between self and other are dissolved into the larger community or social network. An enmeshing of experiences takes place much more fluidly and the self is redefined in an inclusive manner.

Empathy is the emotional response congruent with the perceived welfare of the other. The well-being of the other is a vital point in case. An imagination of the person's plight as well as its plausible effect is taken into consideration which in turn evokes emotions of sympathy, compassion and tenderness. These evoked feelings are likely to provide various perspectives in approaching a person and situation (e.g. minorities, cancer patients, people with infectious and contagious diseases, etc.). It involves accepting one's own insights and the other's perspective for survival and growth.

Empathizing with one's kin or neighbour promotes mutual aid and cooperation and inhibits injurious behaviour, thereby contributing to biological fitness. Empathy also promotes mutual interpretation and prediction. The interpretive property of empathy may itself be fitness enhancing, since it encourages beneficial social coordination and interpersonal relations. This garnered social support ensures a pooling of resources both psychological-emotional and social and thus better survival.

Empathy studies have dealt with certain conceptual aspects rather than attempt a "true" definition according to Walter (2012) who defines affective empathy and related affective phenomena and cognitive empathy. Affective empathy involves *emotional contagion* which is a spread of similar emotions in the empathizer; *personal distress*, an emotional state elicited by the affective condition of others but self-oriented rather than other-oriented and therefore negative in the context of empathy; and *emotional isomorphism* which elicits not exactly the same emotion as the other is feeling but related ones such as feeling love or pity when the other is in despair. The "other" aspect is cognitive empathy which is an understanding of the other's state without necessarily being in the same affective state. There are numerous ways, then, in which a mechanism for imitating or resonating to the emotional and psychological states of others could be part of an evolutionarily mechanism to ensure stability, growth and survival. Thus, the mechanism of empathy may be a critical aspect of human nature in both its affective and interpretive or cognitive dimensions (Goldman 1992).

Neuroscience research has focused on finding the neural correlates of empathy and a core neural circuitry, with emphasis on the cognitive processes. Decety (2010) posits that the perception of emotion activates in the observer the neural mechanisms that are responsible for the generation of similar emotion. An overlap happens between the experience of an emotional state and the observation of the same state in another individual just as in a mirror activity or shared neural circuits.

The amygdala—an almond-shaped organ in the medial temporal lobe—is crucial for basic emotions. It activates release of hormones, suppression of pain and various responses in the autonomic nervous system that prepare the body for emergencies. Damage to this area impairs recognition of facial expressions (Oatley and Johnson-Laird 2011). Basic emotions underlie complex emotions, which involve mental models of the self and/or others. Hence, individuals cannot experience complex emotions without being aware of the evaluations that produce them. Social implications predictably could mean a deadening of affect and disconnect from the other.

The study of empathy has especially thrown light on the role of mirror neurons in its workings. Mirror neurons formulate links which are neurophysiological in nature. These links connect one's own experiences and that of another individual. Scientists claim that mirror neurons are responsible for the reflective nature of emotions experienced by one another. Mirror neurons discovered in the last decade and a half (Gallese et al. 1996; Rizzolatti and Craighero 2004, cf. Walter 2012) are cells in area F5 of the macaque premotor cortex that are active both when a monkey produces an action (such as reaching or grasping by hand or mouth) and when it observes that action produced by a conspecific. The existence of a mirror neuron system in humans is hypothesized on the basis of studies (such as fMRI) that show similar response patterns in the human premotor and parietal areas homologous to F5 in monkeys.

Preston and Hofelich (2012) describe the biological neural circuits of self-other overlap. They consider self-other overlap as "a phenomenon whereby an observer engages a state similar to that of the target via activation of the observer's personal representations for experiencing the observed state, whether through direct perception or simulation. Self–other overlap occurs at both neural and subjective levels". Those neural circuits are activated upon the observation of another's affective state which are the same as the ones that would be activated if the observer were going through a similar situation.

More research using neurobiology and interfaces with social paradigms are emerging in an attempt to understand the complexities of empathy. Dziobek (2012) argues for newer and ecologically valid measures for the identifications of the neuronal underpinnings of interactions between empathy subprocesses using development of new imaging techniques such as hyperscan fMRI, which allows people to be scanned simultaneously while interacting over the Internet.

Koski and Sterck (2010) detail the cognitive processes in chimpanzees and hypothesize empathic processes analogous with human capacities of empathy. They consider empathic concern in prosocial behaviour as crucial in the evolution of human cooperation, altruism and morality. Reaching out to another in distress or in other situations requires first an ability to grasp the locus of the other, and this ability is the empathic process which also leads to altruistic features of behaviour. A participatory relationship ensures forward movement for both self and other.

The neurobiological understandings explain the process of empathy through basic biological and physiological structures and their complex workings. However, empathy plays salient roles in the reconfiguration of the self and incrementing well-being through crucial psychological dynamics.

14.4 Self and Its Well-Being

In the following section the nature of self and well-being and their interrelations will be discussed. The viable nature of the concept of empathy and the implications of empathy for self-enhancement and well-being will be considered along with Eastern contemplations especially with reference to the Indian epic, the Mahabharata.

Well-being is considered in two modes, the affective and the cognitive. People report experiences of pleasant emotions, or they may refer to satisfaction as a cognitive construct (Bryce and Haworth 2002). The self is the fundamental basis of all human experience. Personality theorists define the self in various ways in the context of its well-being. They delineate certain characteristics which are salient to a particular framework. James, Jung, Freud and others conceptualize "self" in their respective perspectives emphasizing the integration, unity and consistency, representing the positive, creative, growth-seeking and forward-moving quality of human nature.

Rogers (1951, p. 200) in his Person-centred theory and therapy gives primacy to the relationship aspect in building the self. He defined the self as "an organized, consistent conceptual gestalt composed of perceptions of the characteristics of the 'I' or 'me' and the perceptions of relationships of the 'I' or 'me' to others and to various aspects of life, together with the values attached to these perceptions. It is a gestalt which is available to awareness though not necessarily in awareness. It is a fluid and changing gestalt, a process, but at any given moment it is a specific entity". Rogers seems to accord an ontological status to the self. The self is primary in the experiencing organism and the move is toward the real self from the position of the experience. Rogers also hones in on the aspect of congruence—congruence between the phenomenal field and the external world or reality, i.e. the subjective experience and the objective world, as well as the congruence between the experiencing (real) self and the ideal self.

An important characteristic of "self" is unity which leads to coherence. Unifying various aspects of a person is integral to obtaining a coherent structure of different psychological processes. The psychologically united self is a whole by itself and a unique and dynamic system. It refers to the experience of one's own being. It is invisible, implicit and inherent in every experience. The inherent aspect of coherence propels us toward possibilities of self-enhancement.

The self has a propensity to move toward a goal which implies purpose and teleology. The horizons of one's self are ever expanding. One moves in a direction which is most congruent with one's ideas and values to reach this goal. The values are aided by features of compassion, gratitude, empathy, altruism, wisdom, courage, kindness, justice, etc.

The single value driving human life seems to be the goal of realizing the self. It is a process by which one reaches the core. The "self" that one hopes to realize and aspire for also seems to be something that is approached with the help of various accruements such as values. Thus, it is both divergent and convergent. It radiates outward from the centre, the point, implicating itself in all aspects of a person's life, and is also influenced by outward factors. It is the shaper and the shaped, a continuum that is ever flowing. The self is described in terms of its energetic dimensions such as self-concept, self-esteem, self-image, self-valuation etc. Self is also understood as a process and hence transformative by nature. An experiential, inclusive, holistic perspective of individuals is a rich source of information to understand the psychological processes and more importantly the human as a being in oneself.

Well-being of the person is concerned with the larger-than-immediate aspects and the potential for furtherance of one's physical, mental and transcendental planes. It is the well-being of the other which impacts the well-being of the self. The identity and self of an individual appear to be tied intimately to each other. A person's self-definitions have implications for how a person deals with herself, how one interacts with others in a social setting and the position one holds in his or her universe with relation to the other members. The self forms the basis for one's cognitions, emotions and well-being (Pedrotti et al. 2009).

An important aspect of well-being is concerned with the idea of self-esteem. Self-esteem is the regard or value one has for oneself. It involves a high cognitive component since the individual evaluates one's worth or regard. It involves beliefs and emotions too and as such may be considered a holistic aspect of one's self. Self-esteem used as a construct in the last hundred years since James is not only a mechanism to enhance one's regard in relation to others but also a protection from social devaluation and rejection (Leary 1999). The belief that "I am competent" may lead to emotions such as that of pride and subsequent behavioural outcomes are based on these evaluations and affects. Self-esteem evolves throughout our lives through experiences with different situations and people. The social component plays a great role in the development of self-esteem. Self-esteem has been considered important from the point of view of psychological enhancement and therefore well-being.

Is self-enhancement always contributing to well-being? At the outset it seems to be so. Growth and freeing up of categories within oneself expands the horizons, allowing for more of the universal space to pervade us. The terms "greater", "more", "enhancement", etc. may sound comparative and superlative. However, the connotations they provide point to the wellness aspect of being. The transcendental exists already and we are in the quest to unfold and lift the veil to find these elements. The goal is to alter a person's consciousness so as to transcend the limits imposed by the habits that form the person's personality.

Joireman et al. (2002) studied the idea of private self-consciousness (attention directed toward the private aspects of self) and empathy and surmised that the relationship is not a simple and direct one; rather, that private self-consciousness is multidimensional which facilitates as well as impedes empathy. The distinction between self-reflection and self-rumination is pointed out. It is surmised that self-rumination which is more of a preoccupation with one's thoughts and not moving toward connectedness is empathy impeding, whereas self-reflection is facilitative as it connotes openness to experience and a willingness to change by absorbing the positive and accept various dimensions of perspective taking. Self-esteem was positively correlated with empathic concern and perspective taking and negatively correlated with personal distress.

Well-being is an intuitive concept and thus subtle in its tangibility. It is associated with such social qualities as confidence, optimism about the future, a sense of influence over one's own destiny and the social competencies that promote satisfying and supportive relationships with other people—and not simply with an absence of diagnosed illness, disability or dissatisfaction. The holistic approach understands a person as one who is constituted of biological, psychological and spiritual nature, who lives in a society among others in a physical as well as a cultural environment. All these dimensions and factors influence a person's overall state of being. Huber and MacDonald (2012) conclude that spirituality, altruism and empathy are all significantly related to one another. The way in which people think about spiritual "cognitions" rather than mere religiousness is more potently related to empathy.

An experiential, inclusive, holistic perspective of the individual is a rich source of information to understand the psychological processes. Newer understandings open intricate latent aspects which lead to a reframing of the self. Empathy and its related processes move toward sustainable well-being which is associated with utilizing strengths, fostering relationships and working toward socially desirable goals.

14.5 Is Empathy a Viable Sustainable Option?

Psychotherapy is the most immediate situation where empathy plays a foundational role in the expansion of the self. Empathy also has implications for prosocial behaviours and altruistic keenness and in other human resource areas which work toward a cogent, coherent and congruent self.

Empathy leads to both a refraining from wrong action and preserving the principles, as well as proactive processes which nourish and enhance by promoting beneficial acts on part of the individual which are mutually aiding. Absence of empathy makes space for depression, anxiety, poor mental health, isolation and disconnect and loneliness. It impedes psychological and physical recovery and affects one's quality of life and consequently one's well-being (Rousseau 2004). Oatley (2009) analyses that being in the grip of emotions such as resentment and jealousy builds negativity and one loses the ability to identify with others and see them like oneself. One loses as a consequence the ability to empathize. Mere biological similarity among humans may not entail psychological or cognitive similarity that allows us to re-enact another person's thought, especially in case of great cultural differences. It is instead concerned about limitations of our cognitive capacities to actually use our imagination for entertaining another person's thoughts while at the same time setting aside our own well-entrenched views of the world from interfering in the re-enactment process itself. Chiao (2011) argues that culture plays an important role in the development of intergroup empathic conditions and the coevolution of cultural and genetic forces is important in shaping empathic neural responses.

Empathy is a vital element in psychotherapy. Accurate empathy is the capability to accurately infer the specific content of another's thoughts and feelings. Rogers (1980) in his *Way of Being* considers empathy to be a *process* and not a "state" (p. 142). He looks at an empathic way of being as having several facets—entering the private perceptual world of another and becoming thoroughly at home in it and being sensitive, moment by moment, to the changing felt meanings which flow in the other person, to whatever she or he is experiencing. The purpose emphasized is to help the other to focus on her flow of experience and move forward meaningfully and in this process laying one's self aside. Such an empathic attunement forms the way of being and a coherent, cogent self.

The "self" encompasses emotional intimacy relationships, with their emotional connectedness and interdependence. High levels of empathy and receptivity to others are cultivated, and the substructures are oriented toward the ongoing self-creation of one's own self-identity through the exploration and realization of inner potentials in various activities and relationships (Lakshmi 2013). Self-interest priorities have been regarded as nonmoral, while altruistic concerns have been regarded as moral—morality being the highest goal or virtue that one would strive to attain (Badhwar 1993). Altruism as it has been studied through social psychology, economic well-being and through biological disciplines has consequences on the individual's well-being; even though the goal of altruism is the other's welfare, the individual has an increment in one's subjective state of self and well-being. The self is constituted by its evaluative engagements (Nussbaum 2001, p. 300) with areas of the world outside itself.

Batson et al. (2009) claim the "empathy-altruism" hypothesis. They define empathy as "other-oriented emotional response elicited by and congruent with the perceived welfare of someone else". Empathy is seen by them not as a single construct but as a constellation of feelings such as sympathy, tenderness, etc. that are other-oriented. There is a distinct "feeling for" the other. There is also a perception of the other in need and adopting another's perspective. The researchers hypothesize that feeling empathic emotion evokes altruism. When one perceives the other in need, empathic emotion is aroused and this motivates the person to act in such a way that promotes the other's welfare disregarding the self. In a sense, self and emotion fuse and move toward the other infusing in them this very energy and helping the other to improve his psychological state and thus well-being.

There is a meaningful relational experience and not merely a cognitive understanding in empathy. In other understandings of empathy, the individual differences between healer and sufferer are melded into one field of feeling and experience. In discursive empathy (Sinclair and Monk 2006), alternative aspects of narrative and sociocultural dimensions are brought into focus which also involves a sensitivity to the cultural backdrop of both the therapist's and the client's lives. Meaning-making is considered to be a primary process in healing.

For effective psychotherapy and healing, even the "sufferer" is required to be empathically attuned (Dekeyser et al. 2009). Without empathy, one may not be able to grasp the therapist's interventions and consequently may not make the space for healing to occur. The therapist's concerns build the element of trust and openness to experience. Thus, empathy is not a one-way flow of "feeling" toward, but a more interpersonal experience where each person is an active participant in the process of healing and positive action. The ability to share the emotional experience of another, the cognitive capacity to understand it and the ability to simultaneously regulate one's own feelings (Bozarth 2009), or in other words, the capacity to maintain a distinction between self and other's feelings is consistent with the Rogerian postulates of empathy and unconditional positive regard as the cornerstone of psychotherapy.

These aspects expand the possibilities of social cognition as well leading to greater interconnectedness. The therapeutic value of empathetic understanding relates to the counsellor's ability to reflect the experiencing of clients and to encourage and enable clients to become more reflective about their lives. This process opens up possibilities to help the client see a new perspective and experience a deeper level of validation and emotional clarification (Ryback 2001). It is argued that therapist's empathy and meditation promote a self-directed empathy that enhances the interdependence, integration and cohesion of self (Andersen 2005).

A goal of therapy is to restore the sense of "next" and of possibility. Empathy responses can be framed to focus on present aspects of experience or on future-oriented aspects. Research showed that future-oriented empathy responses increased subjects' sense of power and efficacy to solve their problems (Bohart 1993). Themes of personal agency, a redefined sense of self and a renewed sense of being-in-the-world emerge from their therapeutic encounters. Having known therapists' empathy and understanding, clients reported increased self-acceptance and self-empathy. The therapeutic relationship emerges as a model for relationships with self and others as well as a powerful source of personal growth in its own right (Myers 2003).

Therapeutic practices are not confined to clinics alone but find niches in other human interactional spaces too. Empathy does not merely help correct social and psychological deficits to bring people up to a base level of functioning but facilitates transcendence and transformation at the deepest levels to enhance well-being of self and other.

14.6 Self-Enhancement, Self-Transformation and Well-Being

Empathy has implications for social work and mental health realms, apart from the helping professions. The altruistic "sensibilities" determine much of the societal commitment in the helping professions. Most social work interventions are concerned in some form or the other with client deprivation and with the facilitation of an altruistic, social or clinical response to that deprivation; however, thinking with feelings and a translation of thoughts into experience take place leading to increased sense of self and well-being.

Psychological well-being is viewed as not only the absence of mental disorder but also the presence of positive psychological resources, including components of hedonic or subjective well-being (Sin and Lyubomirsky 2009). However, psychological well-being defies any circumscription and goes beyond the parameters of positivity, engagement, purpose and meaning, optimism and trust, and life satisfaction to encompass the inherent potential within our human nature. We harness this potential, to accrue awareness of various states of being, to understand, accept and integrate these states such that we are ever emerging. The emergence of the self is not at variance with the world and others but in harmony with the "other" as one is connected with the macrocosm and the macro is fully present in the micro. Striving for authentic, self-concordant reasons yields greater goal attainment and enhanced well-being. Various studies on self show that self-enhancement is more powerful than preserving the self-same views that people hold (Kwang and Swann 2010) and that transforming selves have implications for learning and happiness and well-being (Tennant 2005). Qualities of courage, wisdom, altruism, empathy, kindness, compassion and other "virtues" traverse the space of the individual and collective/group levels (Seligman 2000).

New perceptions of the self lead to new choice of goals and self-initiated action. In a "helping" or therapeutic setting, new ways of looking at oneself could open up different choices and lead to insights and understandings and thereby action toward a positive realm. Keen (2006) theorizes that emotional contagion comes to the fore in counselling interactions and in storytelling. Emotions are made socially and culturally immediate and bonded into accessible forms. Identification with the characters and the narrative situation, the internal representation and the external of the characters and their consciousness are qualities associated with evoking empathy in the reader. The empathizer traverses the psychological spacesand regions of the characters even depicting physiological responses in accordance with the characters' situations; the empathic connections lead to deeper self-reflection. Titchener (cf. Keen 2006) elaborates in this manner, "we have a natural tendency to feel ourselves into what we perceive or imagine. As we read about a forest, we may, as it were, become the explorer; we feel for ourselves the gloom, the silence, the humidity, the oppression, the sense of lurking danger; everything is strange, but it is to us the strange experience has come". The personal and the social create the terrain for a shift to occur in the contours of one's cognizance. Apart from the cognitive aspect, thus, it is also an experiential process where self-transformation is the focus. Empathy creates an intersubjective space for an intimate relation with each other and self.

When one perceives the other in need, empathic emotion is aroused and this motivates the person to act in such a way that promotes the other's welfare disregarding the self. In a sense, self and emotion fuse and move toward the other helping each other to improve one's psychological state and thus well-being.

The self-well-being dynamics is of a wholesome nature. This is best illustrated in the foundational text of Indian philosophy—the Bhagavad Gita which addresses the cause of conflict intrinsically:

> Wisdom, according to the Gita, is not a product of structural thinking. Wisdom is the end of structural thinking. Only an open mind can make effective enquiry into the matter that involves conflict. What the Gita attempts is not to give a conclusive solution for the conflict, but the dissolution of the conflict itself. For the dissolution of the conflict the mind must be open to all possible questions and answers. (Menon 2008)

A perfect example for understanding self, conflict and empathy nourished well-being is from the context of Eastern narratives, in the Mahabharata.

The Mahabharata, a monumental and seminal epic although said to belong to a particular historic time, transcends time and space with a phenomenological relevance and has pan-cultural implications. The discussion of self and well-being in the Mahabharata, in the context of empathy, takes a deeply psychological context, and the resolution of crises and conflicts is often self-transformative.

Transformation is a multilevel process with a modification of knowledge and this shift, leading to greater understanding ultimately moving the individual self closer to the greater self. The knowledge one acquires while resolving personal crises and conflicts is an experience that increments the self. The expansion of the self provides the inner space which is vital for growth, a movement from the periphery to the core. This centripetal movement inward also impels a centrifugal force outward, the ego moving out while the self cogently coalesces, and is key to the way we define ourselves. And our definitions influence our motives and social acts. The Mahabharata explicates the transcendental and transformational process as a living process and entrenches the relationship between the personal and the perpetual in an expanding process of self-discovery. It brings in the concepts of "the other" and an interactive world, to give a realistic understanding of human self and well-being through not just analysis but also reconstruction which brings insights and greater awareness of the self (Akhilananda 1948).

The primacy of the "other" provides an expansive space for dialogue and interaction. These interactions offer opportunities to touch hidden potentials, characteristics, attributes and experiences in oneself and draw them into the outer realm. The personal is understood only when projected beyond. The Mahabharata elaborates on the *dāna* aspect, the nature of giving. The giver is required to be other-oriented through *empathic* responses and give even before he is asked of. It is important that the recipient's self is not lowered in any way for the act of giving to be considered in the highest possible vein and thus bear fruition. The Mahabharata further teaches that *dāna* is not merely the giving of material things either. The epic claims "truth is the essence of knowledge; self-discipline, the essence of truth".

Giving and sharing are the essence of self-discipline; and self-sacrifice, the essence of giving and sharing"; in the truest sense it is considered as sharing of one's self (*Śānti Parva, 251.11 cf.* Badrinath 2007, p. 547). Giving in the highest form is a giving of oneself. Such an act of "selflessness" must, it seems, only contribute to an enhancement to the highest levels. In relation to the self, *dāna* acquires further subtleties. A form of "spiritual altruism" (Menon 2007) takes precedence not only in giving as understood in the context of the lexical meaning of the term but a "giving" of the self, a move toward selflessness, a "giving" that is unconditional and genuine in the empathic process.

14.7 Conclusion

Empathy although has been the key element and focus of psychotherapy; this quality and experiential attribute is not merely confined to the "clinical" setting but is an intimate participle of the social world we inhabit. The emotional space that we occupy in the other's realm draws out our own experiences which expand our sense of self.

Compassion makes the self more inclusive. Other emotions such as envy, disgust, shame, etc. draw boundaries and reduce the space of the self to include and accept. Empathy opens one to newer experiences, incorporating several different points of view. This also leads to reconfigurations of the self to see several dimensions and not merely imitating but "becoming". Adjustments happen at profound levels and an attitude of acceptance envelopes the person. Selflessness, love and compassion have a therapeutic value and are ultimate sources of human happiness, and the need for them lies at the core of our empathic-altruistic being. The expansion of self and inclusiveness has ramifications in the social sphere and in the core human development.

The integration of the self and its positive perceptions and experiences contribute to the sense of well-being. The value of attributing meaning to something beyond and larger than the individual self itself is elevating and plays a vital role in discovering the hidden potentials. Self-transformation arises from the acute sensitivity for the other person and the world around and thereby for oneself.

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Chapter 15
Adapted Self in the Context of Disability: An Ecological, Embodied Perspective

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15.1 Concept and Scope of the Self

What is the self? Is it the product of sociocultural constructs or biological processes? How do physical disorders or disabilities affect the normal working of the self? The legitimacy of the concept of the self has been debated in a multitude of disciplines. Some argue that the self is illusory, produced by the interface of various brain subsystems and modules (Dennett 1991; Wegner 2002; Metzinger 2003. Cf. Dan Zahavi 2005, p. 1). Some have argued that the self is evolutionarily, sociohistorically and developmentally constituted (Kashima et al. 2002). The concept of the self has not been unequivocal and has different connotations across different disciplines.

By self is commonly meant the being of a person, that which distinguishes a person from others. Self unifies diverse experiences, survives through changes and gives the person his or her identity. The self has a social aspect which is embodied and which emerges from social interactions. At the turn of the 21st century, there was a significant scientific interest in consciousness. Self-consciousness became a concept taken up by neuroscience. Taking a phenomenological angle, we understand that the "I" remains fairly constant across time and space; it is the author and narrator of thoughts, actions and experiences; and it is distinct from the environment. Selfhood is an integral and fundamental part of our conscious lives. The self and its many aspects play an important role in regulating our lives and is vital for psychosocial stability and balance.

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*,
DOI 10.1007/978-81-322-1587-5_15, © Springer India 2014

Several thinkers across history have contributed to the notion and concept of the self. In philosophy, Locke's notions about the self reflected his take on the realms of religion, science, politics and social life. Locke's approach to the self is reflected in his rejection of "innate ideas" in which he indicates the mind as *"tabula rasa"* (Seigel 2005, p. 42) or blank slate as it comes into the world. He emphasized the importance of experiences in fashioning thoughts and ideas. Locke believed that humans actively use reason. The mind works on impressions and ideas based on sense experience to evolve complex concepts which can lead to understanding or error. Locke believed that the use of rationality could eliminate errors. Being a rationalist and empiricist, Locke believed that people were shaped by the world around them, but people were also free to determine their own thoughts and actions.

Hume is one of those philosophers who denied the existence of a self. Locating his ideas in the book *A Treatise on Human Nature* (1739), he rejects the claim of "some philosophers, who imagine we are every moment intimately conscious of what we call our SELF; that we feel its existence and its continuance in existence; and are certain, beyond the evidence of a demonstration, both of its perfect identity and simplicity" (Seigel 2005, p. 125). According to Hume, we can never have such a thing as the self because all our ideas are products of sense impressions and so-called real ideas are derived from some particular impressions.

Despite the affirmation or denial of the self by philosophers, the basis of selfhood in Western culture has been identified along three basic dimensions of the self – the bodily (corporeal or material), the relational and reflective. The bodily dimension refers to the physical aspect of the individual. At this level, our self is embodied and shaped by the body's physical needs. The relational dimension is shaped by our sociocultural interactions as a member of society. The interactions that give us our collective identity shape our selves. The reflective dimension indicates the self as an active agent, directing thoughts and actions. It derives from our capacity to make the world and ourselves an object of active reflection. Bodily selfhood implies an image of the self that is independent of time and place, relational selfhood marks the individual's existence as part of a sociocultural setup, and reflective selfhood gives the idea of independence from contexts implying the contemplative nature of the self. Despite this being a rough scheme, the various dimensions pave the way for understanding the concept of self in a whole fashion.

Researchers in contemporary psychology consider that the idea of the self has originated from William James, founder of modern psychology in America. James' contributions to the study of self and consciousness were shadowed because of the dominance of behaviourism. With the decline of behaviourism, self and consciousness were revived in mainstream psychology in the mid-1970s. In the first half of the 20th century, significant contributions to the study of self and ego were made by Charles Horton Cooley (1922), George Herbert Mead (1934, 1925/1968) and Sigmund Freud (1923/1961). Gordon Allport (1943) also made significant contributions to the literature on the self.

James' definition of the self is inclusive. He differentiates between the "I" and "Me" where "I" is the self-as-subject and "Me" is the self-as-object. The "Me" is further divided into the spiritual Me, social Me and material Me. The material Me refers to all bodily possessions. The social Me refers to the many social roles we take on in our lives. The spiritual Me as defined by James, "a man's inner or subjective being, his psychic faculties or dispositions, taken concretely; not the bare principle of personal Unity, or 'pure' Ego" (James 1966/1983, p. 283). The Jamesian "pure ego" is not to be confused with the spiritual Me; it is the experiencing subject as against the objects of experience. The difficulty in James' theory is due to the so-called unity of the "I", the self-as-subject as against the multiple manifestations of the "Me" – thoughts and many social selves. As James puts it, harmonizing the unity of the "I" with the multiple "Me" is a puzzling issue for psychology.

Cooley and Mead added the social dimension to the concept of the self. According to Cooley, the sense of "I" becomes meaningful only when there is the correlative sense of "you, he, she or they" (Cooley 1922, p. 182). The self and the other share a dialectical relationship. The self and the other go along together. Like Cooley, Mead emphasizes the social context of the self. A person acquires self-definition during the process of socialization (Cooley 1922; Mead 1934).

Freud's conception of the ego and id added a distinct dimension to the concept of the self. His model states that the id is the container of primal impulses, passions and energies which operates on the pleasure principle. The ego is given the task of protecting the individual, controlling the body's drives and passions and enabling the working of rationale and reason. The ego accounts for cognition and conation, while the id involves affect (Freud 1923/1961).

Gordon Allport's (1943) view of the functions of the self is useful to understand the different workings of the self. According to him the self functions as (1) a knower, (2) an object of knowledge, (3) primitive selfishness, (4) dominance drive, (5) passive organization of mental processes, (6) a "fighter for ends", (7) a behavioural system and (8) a subjective organization of culture.

Apart from the basic selfhood motivated solely by material comforts, the adult self undergoes transformation and cultivation under the impact of society and individual choice. "The mature self is cognitively and socially constructed" (Paranjape 2000, p. 82). The self serves multiple functions. We have a self because we are actively engaged in trying to make sense of our lives. In this respect, the self is not a passive event. The self is an active agent – the origin of motivation, behaviour and action (Preston and Wegner 2005, p. 103). The agentive nature of the self is indicated by the many metaphors used – knower, doer, narrator, speaker, maker, etc. (Bamberg et al. 2007, p. 12). We need this sense of self in our lives to make sense of the world of experiences and for a sense of continuity in time-space (Hardcastle 2008, p. 112). As human beings we conceptualize ourselves because of our self-reflective capacity. In this sense, the self can be understood as a reflective awareness of being-in-the-world which includes past and future. The importance of a wholesome self is seen in the context of disability where the self is vital to adjustment and adaptation.

15.2 Selfhood and Disability

How does the self function and work in the experiential context of disability? Does disability have any impact on the development and experience of the self? We wish to suggest that disability and selfhood are in a dialogical relation and result in a specialized function of the self: “adapted self”.

While adaptation is common across all living species, it acquires a new dimension in the context of disabilities. The Merriam-Webster dictionary (Adaptation 2012) gives three definitions of adaptation. The research takes the following two definitions as important to its line of inquiry:

1. Adaptation is the act or process of adapting: the state of being adapted.
2. Adaptation is adjustment to environmental conditions as:
   (a) Adjustment of a sense organ to the intensity or quality of stimulation
   (b) Modification of an organism or its parts that makes it more fit for existence under the conditions of its environment

From the above two definitions, it is clear that adaptation is a process of adjusting to an altered situation in order to fit with the conditions of the environment. Adaptation is an important element of the disability experience whether the disability is congenital or acquired. Adaptation takes place on two levels: biological and sociocultural and psychological. At the biological level, adaptation is required to adjust to an altered physical and mental situation which could be a lack or loss of function. Given that the disabled are often forced to contend with unfriendly structural environments, biological adaptation is neither easy nor simple. At the sociocultural level, adaptation is far more complex given that contemporary societies tend to disable people at the sociocultural and psycho-emotional levels. It is unrealistic to imagine or project a utopian society where disabled populations do not face structural, sociocultural and psycho-emotional barriers. Though the social model of disability shifts the onus from the individual to the society, much of the many-level adaptations come from the individual. We wish to posit that adaptation is a holistic concept which involves the self and the society in tandem and focuses on how the ecological self (Neisser 1993) is the primary basis for the “adapted self” enabling the disabled subject in the process of “adjustment and adaptation”. We use guidelines from Merleau-Ponty’s phenomenology of perception wherein the embodied self is a primal experience.

15.3 Conceptualizing the “Adapted Self”

Everywhere in the world, self starts with body

(Baumeister 1999, p. 2).

Through a cognitive analysis, Neisser (1988, 1993. Cf. Schmuckler 1995) lists out five sources of self-knowledge available to people in the development and function of the self. Each of these sources specifies a different aspect and function of the self. The five sources are (Schmuckler 1995):

(a) The ecological self which defines the relationship between the individual physical body and the physical environment.
(b) The interpersonal self which is again present from infancy (similar to Mead and Cooley's social self, Paranjape 2000) and defines the relationships between the individual and his/her human interactions and exchanges in society.
(c) The extended/remembering self is based mainly on memories accruing to the individual embedded[1] in experiential contexts.
(d) The private self appears in the course of psychosocial development when children first realize that some of their experiences are not shared with others.
(e) The conceptual self is again embedded in the social context and consists of self-concepts accruing to the individual cueing off from contextual experiences.

While all of the above aspects go into the making of the "adapted self", we focus on the first of these selves – the ecological self – and posit that this function forms the basis of an "adapted self" in the context of disability. James J. Gibson (1966. Cf. Neisser 1993) was the first to posit that perceiving the self is concomitant with perceiving the environment. Perception is not simply ecological but also social which is why the first two selves – ecological and interpersonal – are categorized as perceptual selves. Both the ecological and interpersonal selves appear in infancy and are the foundations upon which other aspects of the self are built up. The ecological and interpersonal selves are not dependent on recollection, imagination, construction or conceptualization (Neisser 1993). These are the perceived aspects of the self.

Neisser clarifies that the five selves he specifies are not homunculi but come together to act as one whole person with agency and autonomy. In this respect, the ecological self is in tune with contemporary philosophy (Dennett 1991. Cf. Neisser 1993) and developments in neuroscience (Churchland and Sejnowski 1992. Cf. Neisser 1993). The ecological self is the physical individual in an environment and capable of agency and autonomy. "Such agents perceive themselves, among other things: where they are, how they are moving, what they are doing, and what they might do, whether a given action is their own or not" (Neisser 1993).

The chapter is interested in Neisser's development of the ecological self (self-perception) as he explains it with reference to the sources of information feeding into it. What we suggest is that the body is primary and important for adaptation, meaning-making, perception and in the later development of the self. As Merleau-Ponty (1962. p. 92. Cf. Welsh 2007) puts it, "the lived body is a horizon latent in all

[1]The terms embed, embedding and embedded are frequently used in disability studies in the context of the physical body to indicate the corporeal moorings of physical/sensory disabilities.

our experience and itself ever-present and anterior to every determining thought". It is the body which first allows for experiences of perception. All people share an intuitive sense of the embodied self as separate and distinct from other individual bodies (Mauss 1985[1938] Cf. Scheper-Hughes and Lock 1987). The body has an innate capacity for adjustments, adaptations and self-healing. However difficult or uncomfortable a physical illness/disability is, the body inevitably and invariably finds ways and means to adjust and adapt. A disability, whether congenital or acquired, later in life implies the adaptation of a different "destination and map" (Frank 1997) as against the normal body/previously normal body.

The "adapted self" and its experience and contents are purely phenomenological – the lived experiences of disability vary from individual to individual yet correlate with the common theme of adaptation, embodiment and physical embeddings. The narratives used in this chapter are conscious recounting and recollections of the body and its vicissitudes. In a way narrating the corporeal body is also a tool for self-healing that allows the subject to realize his/her own body, providing the reaffirmation of new constructs, new maps and destinations. The personal voices embedded in the narratives in a way take charge/control of the body through the narrative voice. The body becomes the narrative voice. The narrative is not *about* the body but rather told *through* the body (Frank 1997, p 3) implying a strong sense of embodiment and a phenomenological experience of body perception.

15.4 Embodiment and the Ecological Self

According to Merleau-Ponty, the body makes possible the perception of all other objects in the world. It is the essential precondition for all other perceptions. It allows for perception of spatiality, motility, senses and all other objects in the physical environment. For example, I know I am in a square room, I am aware of my finger movements as I type, I am aware of the whiteness of the computer screen and I know that the computer has a rectangular dimension. All these perceptions are unconscious but brought to the conscious mind through the reflexive self. The body provides the centre for perception of all other objects. Our first experience of selfhood comes from embodiment – the body. "Our body, to the extent that it moves itself about, that is, to the extent that it is inseparable from a view of the world and is that view itself brought into existence, is the condition of possibility, not only of the geometrical synthesis, but of all expressive operations and all acquired views which constitute the cultural world" (Merleau-Ponty 1962, p. 388. Cf. Welsh 2007).

In developmental literature, the embodied self has been posited as a model of our earliest experiences of the self. This dovetails both with the concept of ecological self and minimal self. Selfhood essentially requires that one needs to be aware of his/her situation in the world as being embodied in time and space. There is enough experimental data to suggest that the human infant enters the world with a pre-structure of the embodied/ecological self. Experiments have demonstrated that infants constantly attune their bodies to the environment. Welsh (2007) cites instances of experiments relating to infant posture adjustments (Butterworth and Cicchetti 1978. Cf. Welsh 2007).

Embodiment in disability can be explained in terms of two parameters: "control" and "body-relatedness". Frank (1997) discusses two other terms – "other-relatedness" and "desire". The ecological self is discussed in terms of the sources feeding into it. This basic self is not an "abstract, disengaged ego" (Fuchs 2012), but it is embedded in the lived body in a lived world. Traditionally phenomenologists distinguish between the body that one pre-reflectively lives in – the subject body (*Leib*) – and the physical body that one perceives or is perceived by others, the object body (*Korper*). The body normally operates in a tacit manner – something that is a given. However, it becomes the object of attention and consciousness when there is an embodied disturbance be it a disability or illness. Given that the physical body is directly related to action, cognition and building up an overall sense of self, it is interesting to investigate how a blurring or a loss of function impact the body-self[2] and how the body itself adapts and realigns itself to altered conditions.

Any disability – physical or sensory – is essentially a disruption of certain aspects of physical/sensory embodiment, of the "normal" body. Disabilities invariably imply blurring or total loss of a physical/sensory function. In such cases, what happens to control and body-relatedness? How do disturbed bodies regain a total/partial loss of control and how does the body-self relate back to the disturbed body? Finally how does the body-self adapt to a disruption of embodiment?

This study uses two micro-narratives collected in the form of informal conversations with disabled people. Subject 4[3] is visually impaired from birth. The frame of references like colours, shapes and forms that we take for granted is not available to her in any way. Concepts like light/dark, beautiful/ugly have no real meaning for her. She makes it clear that being blind from birth, she had to make adjustments and adaptations from the beginning and so her situation is different from someone who becomes blind at a later age. Total blindness is a complete loss of control in terms of a loss of visual perception and loss of control of the life course in terms of dependency. In this position, Subject 4 has had to take advantage of and hone her other sensory inputs in order to make up for this loss of vision. For example, she has a keen sense of where the source of sound is coming from, so if someone talks to her without facing her, she senses it instantly. She immediately perceives if the talker has his/her face turned away from hers. One would imagine that a total loss of vision leads to an intense loss of control in the lives of those impaired. However, this is proved otherwise by Subject 4 though the concept of "normal" embodiment has been disrupted. Her sense of control in a physical body devoid of vision is a

[2]The paper uses the term body-self to refer to a grounding of the concept of self in the physical body, hence the term body-self. Far from the self being a purely psychological, mental entity, it is embedded in a corporeal framework.

[3]Micro-life narratives were collected by the researcher in the form of informal conversations. The participants have given full consent to use the narratives for academic research withholding names.

keen example of adaptation at different levels – corporeal, social and psychological. She is able to perform effectively and efficiently in the academic and professional sphere. Currently she works for a nationalized bank in the HR division and uses assistive software to function as visual aids. Control lost in the body can be made up through external devices that perform the visual function. She uses a screen reader on her cell phone which reads out messages and the name of the sender. In almost all cases of disability, external aids are able to make up for the blurred/loss of function. This enables the subject to regain at least some sense of control indirectly through a device. In Subject 4's case, audio is her main sensory perception making up for the loss of vision. All her devices have been configured to give audio outputs – computer, cell phone, watch and calculator. She is able to manage independently and has received mobility training from the National Association of the Blind. However, she resents the red and white cane and says she can manage on her own without this. She has adapted to cooking using a microwave. Because the buttons on the control panel are not tactile, she has used her ingenuity and stuck on *bindis*[4] over the buttons, and this gives her the clue about the function of each button. She also knows the arrangement of the buttons so she knows which button is related to which function. She has assumed remarkable control over her body in whatever parameters she has been given.

Subject 9's situation pertains to loss of lower limb functioning after an accident in her 20s. Looking at the body's continuum in her case from being a fully functional body to blurring of locomotor functions and the process of adaptation, unlearning and relearning in her case. Loss of control in her case was a major disruptive force in her life. The body was no longer the body once she knew and controlled. The same body which had obeyed her brain commands of locomotion refused to obey anymore leaving her frustrated initially. With the passing days she slowly adapted to her "new" body reconciling the fact that she has to function within whatever controls the body is now left with. She is currently a wheelchair user and this has enabled her mobility to a large extent. While she cannot control locomotion in her lower limbs, she can control the wheelchair to "act" as her new locomotor assistant. Again a case of a device acting in place of the natural function that is disturbed. Subject 9's loss of control not only relates to the corporeal body but also to the life map which had to change course to adapt to a new way of living which entailed a new way of moving about, sometimes restrictive and frustrating; a shift in career path; and most importantly a radical shift in her way of thinking. The psychological control that one loses over the life map is as devastating as a loss of body control. The individual psyche has to remould itself to fit an altered body condition. Life condition changes also follow such events as in the case of Subject 9. She is currently the head of an organization engaged in access audits something that is her life passion to help people with disabilities negotiate with ease through making the built-in environment accessible. While at some levels, the loss of control still remains, for example, she cannot negotiate train steps and sometimes bus steps

[4]Forehead decoration worn in India at the centre of the forehead near the eyebrows.

and also finds it extremely difficult to negotiate unfriendly restrooms, a new sense of control at other levels like her dexterity in negotiating her wheelchair, using a car, using a kitchen that has been altered to her needs bolsters the psyche and keeps her resilient. Clearly Subject 9 has exercised her agentive autonomy to rise above the disruption of physical embodiment. In both cases of Subject 4 and 9, the lack/loss of control over the body is compensated with the person consciously choosing to focus on what her body is capable of doing rather than what her body cannot do/no longer function.

The next question is the connection/body relatedness between the body-self and the state of disrupted embodiment. Contrary to previous notions of the self as a purely mental/psychological entity, recent history has seen many authors and theorists talk about the notion of the self embedded in the physical body which is what can be referred to as the body-self as it relates to the embedded body. How does the self in the context of physical/sensory disability relate to the body? Is there a dissociation/association or alternating relatedness to the body? The body-self is actually to be taken on a continuum with the physical body. There cannot be a situation when the body-self totally disengages with the physical body even in the case of the severest disability; for example, in Jonathan Cole's *Still Lives,* he writes that though post- a spinal cord injury, the body is "absented, insentient and unmoving, yet has to be looked after because it no longer functions automatically. People, I presumed, have to attend to their bodies in a wholly new way" (Cole 2004, p. 5). What it essentially entails is a reconfiguring of the connections between the body-self and the disrupted physical body. Robert Murphy writes in the *Body Silent*, "my former sense of embodiment remained taken for granted ... my [new, Cole 2004] sense of re-embodiment is problematic negative and conscious..... Consuming consciousness of handicap even invades one's dreams" (Cf. Cole 2004). Again he writes that his relation to his body and others altered in new ways ranging from his own knowledge of his body to his psychological integrity (Cf. Cole 2004).

Body-self–body relatedness is a great powerhouse of self-healing in the context of physical/sensory disabilities. This connection-reconnection is based on self-acceptance of the body as it currently functions with whatever lack/loss. Through the micro-narratives of Subject 4 and 9, we glean that adaptation begins with self-acceptance and body relatedness. If one disengages/dissociates from the physical body's condition, one is hardly in a position to discover meaningful connections or find new way of doing things. Subject 4's engagement with her body is positive and meaningful and the example she gives is her impeccable dress sense despite the fact that society does not expect a visually challenged person to be well turned out. Though colours mean nothing to her, her keen social self has been instrumental in gathering feedback from her personal and social interactions about the colours that suit her and look good on her. She usually takes someone with her and with his/her help picks out clothes that suit her and colour coordinates even her accessories. For her looking good is also about physical and psychological well-being and engaging with the body meaningfully. Being blind doesn't entail that one should not be well turned out. Similarly Subject 9 after an initial period of depression and self-pity was able to meaningfully reconnect and accept the changed body. Her reworking of her career and profession and remodelling of the physical environment at her home are ways of relating in new ways to the body – to accepting the lack and instead finding new ways of keeping the body comfortable.

Body control and body relatedness are in a way related to the body image in a conscious/unconscious manner relating to the attitudes/perceptions one has regarding one's own body. If I see my body as an enemy, as a betrayer that has let me down, there is little chance of my being able to relate/control it. Disengagement and perceptions of total loss of control act as barriers to successful adaptation. The adapted self is built on the strength of regaining whatever control remains and body relatedness.

15.5 Sources of Information in the Ecological Self

Taking off from James Gibson (1966. Cf. Neisser 1993), Neisser bases his theorization of the ecological self from the perceptual systems that pick up information. According to Neisser, perception is not constructive or interpretative or inferential. There is a directness involved in perceiving the self in relation to the physical environment. For example, vision gives us a picture that is veridical in the time-space matrix. Neisser (1988. Cf. Bermúdez 1998) talks about two ways by which egoreception is conjoined with the perception of environment. "Egoreception accompanies exteroception, like the other side of a coin. . . . . One perceives the environment and coperceives oneself" (Gibson 1966, p. 126). There are two parts to egoreception: one, there is the *optical flow* relaying information about the physical body's *movemen*t in the time-space environment, and two, what a person perceives is actually *affordances* of action which according to Neisser involves the person as an active *agent* able to perceive the different possible actions in the given time-space. The focus is on the person as *agent* than a mere mover. When the subject moves, she is receiving an *optical array of information* about her own movement, the different possible movements, environmental information, her own direction, speed, etc. The self-perception within the body and gained through the body is termed body-sense (Bermúdez 1998, p. 154). Receptors present across skin, muscles, tendons and joints operating in tandem with the vestibular system make up the proprioceptive information regarding body position and movement critical to acting and orienting oneself in the physical environment. The proprioceptive system informs about the self in relation to body posture, movement and physical environment. Proprioception enables awareness of the body in physical space.

The different sources of information feeding into the ecological self are acceleration, vision, occlusion, kinaesthetic proprioception, vestibular proprioception, visceral proprioception, touch, hearing and affordances.

Vision is an important source for the ecological self. Movement of the subject always produces a *systematic optic flow* which enables the subject to see his/her path of motion in the environment. Gibson mentions that every animal has a field of view unique to its own body. The self is keenly present in visual perception and gives a structure and field of view to the subject. As the subject moves through the environment, the visual information is constantly changing. What then becomes of visually challenged subjects when there is the loss of an important source of information? In the case of visually challenged subjects like Subject 4, the lack of vision is made up by conscious/unconscious tuning up of the other sources like kinaesthetic and vestibular proprioception, touch and hearing. As the subject moves through the environment, she picks up information about her movement, path of motion and spatial position through the proprioceptive senses. Though one might use the Gibsonian argument about the equal importance of exteroceptive and proprioceptive senses, it is equally important to take cognizance of the fact that an impairment of one consciously/unconsciously leads to a heightening of the other senses. Thus Subject 4 is able to instantly mark out the direction from which she is spoken to and whether the voice is clear (the speaker is facing her) or muffled (the speaker is away from her). Subject 4 makes use of the *acoustic array* which is available through reflected sound. Thus she knows whether a room is filled with furniture or fairly spacious, and so she is able to sense where the chair/table is located. Subject 4 depends on touch and hearing in a heightened capacity to make up for visual skills. Thus she narrates her experience with the microwave buttons and gives examples of the audio software she uses for her cell phone, computer, calculator, etc.

Another feedback mechanism what the mediLexicon defines is facial vision: "sensing the proximity of objects by the nerves of the face, presumed in the case of the blind and also in sighted people who are blindfolded or in darkness". In 1749, Diderot recorded the "amazing ability" (Cf. Supa et al. 1944) of a blind acquaintance who was effectively able to perceive the presence of objects and also accurately judge the distance from him.[5] Facial vision is also said to be responsible for the avoidance of obstacles in visually challenged people. Facial vision has a long experimental history and in the micro-narrative of Subject 4, she clarifies that she is able to perform efficiently at domestic chores because of her ability to gauge distances of objects and avoid obstacles. Facial vision/echolocation provides visually challenged people with a "mental map" of the proximate immediate environment. John M. Hull in his book *Touching the Rock: An Experience of Blindness* talks about sensing obstacles neither with sight or sound. He talks of echolocation skill as something deeply embedded in the body as a backup skill kicking in when the visual sense is completely suppressed. He writes:

> The experience itself is quite extraordinary, and I cannot compare it with anything else I have ever known. It is like a sense of physical pressure. One wants to put up a hand to protect oneself, so intense is the awareness. One shrinks from whatever it is. It seems to be characterized by a certain stillness in the atmosphere. Where one should perceive the

[5]D. Diderot, Letter on the blind, 1749, Early Philosophical Works, trans. by M. Jourdain, 1916, 68–141 (Cf. Supa et al. 1944).

> movement of air and a certain openness, somehow one becomes aware of a stillness, and intensity instead of an emptiness, a sense of vague solidity. The exact source of the sensation is difficult to locate. It seems to be the head, yet often it seems to extend to the shoulders and even the arms. Awareness is greater when the environment is less polluted by sound, and in the silence of my late evening walk home, I am more intensely aware of it. In a crowded noisy street, the experience is less noticeable, and if I am travelling on somebody's elbow, I never seem to notice the experience at all. Presumably, I just switch off whatever it is. (Hull 1990, p. 27)

In the case of Subject 9, her loss of functionality in the lower limbs led to conscious and nonconscious adaptations in her kinaesthetic and vestibular proprioceptive senses. Her experience of the body in the physical environment went through a drastic change from fully functional to dysfunctional lower limbs. Using a wheelchair obviously entails a postural change the baseline state being the sitting position as against previous modes of standing and walking. She experiences a probable change in her sense of body in motion (in a wheelchair) and movement. A change in a sense of weight is obvious taking into account the wheelchair posture. Subject 9 experiences a sense of passive movement as against her sense of active movement in her "normal" body. In narratives of most wheelchair users, there is a probable change in his/her experience of balance from the wheelchair position especially when one has to change directions and make a turn. The body has to make certain shifts in relation to the wheelchair. From lowering the body to adjusting the sitting state and again lifting oneself out of the wheelchair, all these actions entail conscious and nonconscious adaptations. From movement, motion, posture, weight and balance, Subject 9 has experienced all of these adaptations with her proprioceptive abilities providing feedback on her body-physical environment relation.

What we wish to highlight in relation to the feedback sources of the ecological self is the Gibsonian notion of affordances (Bermúdez 1998) which is especially relevant in the context of physical/sensory disability adaptations. According to Gibson: "At any given moment the environment affords a host of possibilities: I could grasp that object, sit on that chair, walk through that door. These are examples of *affordances:* relations of possibility between actors and the environments..." In the context of Subject 4 or 9, all available affordances are relative to the physical/sensory impairment and co-constituted in tandem with the environment. For example, however brightly lit a space may be, Subject 4 cannot perceive it. Similarly, however accessible a space may be fitted with ramps and so on, Subject 9 cannot bend and pick up an object lying on the floor. Again an environment fitted to meet the needs of Subject 4 and 9 can enable *affordances* too. A wide doorway will provide an *affordance* of easy entry into a space for Subject 9 or a street paved with tactile blocks will provide an *affordance* of easy negotiation for Subject 4. *Affordances* then are also body-centric, depending on the body perception in relation to the environment. Thus to apply the Gibsonian notion in these cases, *affordances* are co-constituted by *affordances* from the physical body as well as the physical environment.

15.6 Conclusion

The sources of information feeding into the ecological self and the *affordances* render the ecological self as a doer and an agent. Regardless of the disability and its intensity, the ecological self is still capable of remoulding itself to fit with the givens of the physical body and the environment, making adaptive shifts in action (whether mobility or vision impaired) and acting in the capacity of an agentive subject engaging in meaningful action in the parameters of the body and physical environment. The ecological self reconciling with issues of embodiment (control and body relatedness) goes into the making and structuring of the adapted self. Thus, we wish to present the adapted self in the following description resultant of our study: The self (conscious and nonconscious—functioning as an organizing structure) being in a dialogic relationship with the physical body, physical environment and society and which has made physical-structural, sociocultural and psycho-emotional adaptations in order to adapt to experiences of impairment and disability.

Thus the "adapted self" can be conceptually modelled in the context of the body and environment (see Fig. 15.1).

Conceptual model of the adapted self in the context of the physical body and environment

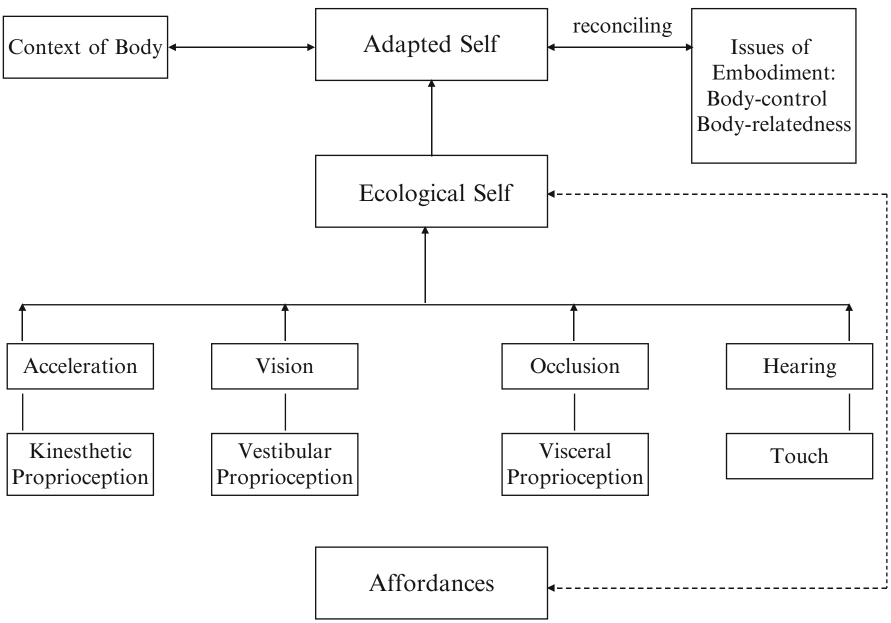

Fig. 15.1 A conceptual model of the "adapted self" in the context of the physical body (reconciling issues of embodiment) and environment receiving inputs from the ecological self which in turn is fed into by various sources. The ecological self embedded in the physical environment is aware of the affordances available at any point in the time-space matrix

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Chapter 16
Self and Transformative Experiences: Three Indian Philosophers on Consciousness

Sangeetha Menon

In this chapter I will bring in a discussion that is primarily philosophical with allusions to psychological traits and present a distinctive style of approach and analysis engaged in by three philosophers from India to understand the structure of experience and the possibility of transformation. These philosophers are Sankaracharya, Tunchettu Ramanujan Ezuttacchan and Sri Narayana Guru.

The guiding features of this discussion will be centred on the following aspects of the self:

(a) First-person and "self"-oriented analysis of experience
(b) Phenomenology of body
(c) Construction of a psycho-spiritual narrative that highlights the ontology of the self

16.1 The Puzzle of Experience

Questions we ask about consciousness are based on the nature of experience, whether it is a waking or dream state, memory, pain (physical and mental), etc. The primacy of consciousness is debated at various disciplinary forums. Debates on the primacy (or non-primacy) of consciousness focus on the immediacy of a localized experience and not on the ontology of an "enduring" experiencer. The contentious topic is whether many discrete experiences contribute to the continuous "experience" of the I-consciousness or each experience is a "holonic" expression of the I-consciousness (Menon 2002). Common practices using isolated disciplinary methods, which are also fashionably called reductive, analyse consciousness based

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*,
DOI 10.1007/978-81-322-1587-5_16, © Springer India 2014

on segregated information about behaviour, neural events and processes. Hence defining experience is a matter of locating neural correlates, which in turn explain ways in which neural information is processed.

The distinctive feature of such an epistemological structure is that it ignores or sidelines the essential aspect of “being conscious” or “consciousness”, namely, the “person”. The puzzles that arise from first-person experiences are approached by responses that are guided by third-person information and representation in non-human animals and artificial systems.

Consequently, there is a gap between the problematic of conscious experience and the method to address it, which I call as the “harder problem” (Menon 2001). The discussion that is led by the three philosophers presented in this chapter focuses on the “harder problem” of consciousness, namely, the living person with a characteristic mind and system of beliefs and values. Is there a scope to understand consciousness via media of experiences that have the potential to change a person and contribute to his or her well-being? For possible responses to this question, let us bring in the three stalwarts of philosophy from India.

16.2 Philosophy, Self and Its Transcendence

Adi Sankaracharya, Tunchettu Ramanujan Ezuttacchan, and Sri Narayana Guru[1] are three philosophers from Kerala[2] whose distinctive styles of approach towards understanding “experience” are pertinent towards contributing to the current dialogues on “consciousness”. Belonging to three different periods of history and social setup, they conceived an epistemology directive to personal growth, holistic living and self-healing. The therapeutic value of reflective analysis and self-oriented integration of understanding are given more importance than its cognitive counterpart, in their philosophical methods. The reference for the starting premises and concluding findings is the “person” and his or her experience and the situation he or she is in. The route taken is from the situation of the person (as “given”) to the reorientation and reorganization of his or her response based on transpersonal experiences. Hence, the style of discourse adopted in their presentations can be described as more metaphorical and less hierarchical.

We will discuss three specific texts authored by the three philosophers: *Atmabodha* (AB) by Adi Sankaracharya, *Harinama Kirtanam* (HK) by Ezuttacchan and *Atmopadesa Satakam* (AS) by Sri Narayana Guru.[3]

[1] Adi Sankaracharya (8th c. AD) founded the school of Advaita Vedanta. Tunchettu Ramanujan Ezuttacchan (16th c. AD) is known as the father of Malayalam (native language of Kerala) poetry. He developed a unique idiom combining the vernacular and Sanskrit words in his writings. Sri Narayana Guru (19th c. AD) was both a social reformer of his times and a philosopher on the lines of Advaita Vedanta.

[2] Kerala is the southernmost state of India.

[3] *Atmabodha* is called a “*prakarana grantha*”, (primary text) authored by Sankaracharya, consisting of 68 verses in Sanskrit. *Harinama Kirtanam* is a poem written by Ezuttacchan which later became

16.2.1 Self and the "Other"

The contemporary epistemological setting starts from, if not leads to, what is *to be meant* by "consciousness". The line of thinking in the three texts takes an altogether different lead. The setting is of not the "meaning" or "knowledge" to be achieved or arrived at but the reorganization of the basic structures of experience (namely, "I", *aham*,[4] and the "other", *idam*) from the most intimate point of view which is of "my-self".

How different is knowledge about the "Self" from other kinds of knowledge? *Atmabodha* initiates the discussion with an introduction to this question. The knowledge about the Self[5] is different from other kinds of knowledge by being the only means for the liberation of the person (AB: 2). What exactly is meant by "liberation"? Is it an experience in space and time like any other experience or is it a special cognition? *Moksa* (liberation) is not explained in direct terms by Sankaracharya. The student is encouraged to analyse the metaphysical status of the "present" and "given" experience which is dualistic (*raga dvesati sankulah*) (AB: 6) but originating from the experiencer. The "other" which is the basic epistemological component of experience appears to have an independent existence when "I" mistake my identity to be defined by the "other". When "I" awake to my true "Self" from the slumber of identity/identities, it is found that the existence of the "other" no more defines my existence. The "other" corresponds to the responses (likes and dislikes) and basic attitudes (identity and difference) by which we relate to objects, people and events. Hence the analysis of the basic epistemological component of experience, namely, duality, is presented from the point of view of the experiencer.

16.2.2 Responding from Self

The "otherness" directed from the object of experience is not an intrinsic nature of my-Self but the epistemological component which generates meaning through a relationship between my-self and the object of experience. Hence it cannot be

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a household name in Kerala for its simple rendering and philosophical depth. *Atmopadesa Satakam* is a set of hundred verses (in Malayalam) and is considered to be the masterpiece of Sri Narayana Guru. The original text is cited from the translations in (1987), (1996), and (2000) respectively of the works of Sankaracharya, Narayana Guru and Ezuttacchan.

[4]For easy reading, common spellings are used for Sanskrit and Malayalam verses without diacritical marks.

[5]In this chapter, I make two different mentions of "self": *self* implies the bodily limited psychological entity defined by memories. *Self* implies pure consciousness, which is inclusive and not limited or defined by a particular experience or cognition, and is the ontological basis of "self".

removed as long as it is experienced. Also, it cannot be removed by another act or experience (AB: 3) or another kind of knowledge. The Self will illumine by itself like the sun when the clouds disappear (AB: 4). Here, the emphasis is not on the object of experience, or the way one relates to that object, but the "self" which is defined and perpetuated during the "othering" process.

What is urged for is a redefinition of the relationship with the object from the point of view of the Self which has an ontological value and is the foundation of all cognitive processes (*sarva adhistanam advayam*) (AB: 7). Just as "I" do not hurry to segregate separate existence of the bubbles when "I" see them arise, exist and dissolve in the water, the existence of the "other" is to be understood as non-separate from the existence of "my-Self" and the relationship as noncausal and nonhierarchical (AB: 13).

We relate with objects, events and people based on an estimate of the value of these by themselves and the meaning we give them based on our previous experiences of similar situations. The identity we form is a cumulative product of the relationships and responses we make. The distinctive way in which we respond to situations and the identity we form of ourselves are mutually influenced.

The big forest of self-identities (*kodum kadu dambha mayam*) (HK: 50) is populated and defined by our responses to situations. When our responses arise from the basic duality of "me" and "mine", that further validates the independent existence of "otherness". The "otherness" intimately experienced can disappear only if the "forest of self-identities" we have formed based on the duality of "me" and "mine" (HK: 29) is burnt and the redefinition of the Self takes place. According to Ezuttacchan, not only the self-created forest is to be burnt, but also it should be watered by the rains of divine grace so that the burnt forest becomes the perfect soil bed for fresh sprouts (HK: 51). The formation of self-identity or unique ways in which we respond to situations is not discredited. The encouragement is to stay on the foundation of an integral Self which is not dissected by the self-identity defined by the "other", which is the "me" and "mine" duality. Since duality does not have an ontological status but is only cognitive, the expectation of the seeker is that let Self-knowledge happen to "me" while "I" am placed in the interactive world (HK: 53).

16.3 Self as the "Eye of the Eye of the Eye"

Ezuttacchan makes an interesting reference to the self through an interesting metaphorical expression. He says that "I should be able to know that I am the eye of the eye of the eye" (HK: 4). We cognize the physical dimension of objects and events through the information we get about them through our physical eyes. We get to know about their indirect and intrinsic features through psychological interactions with them. We get to know about the way we know and interact with them by knowing ourself, by self-reflection. To have the knowledge about the Self, which makes possible the two degrees of cognition, is primarily important because Self-knowledge alone has an ontological nature while the other two (physical and psychological knowing) are cognitive. All cognitive processes spring forth from the ontological foundation of Self, and all identity formation, to converge to the foundational recess of Self. The travel is cyclic than linear. The experience of alienation and search for identity starts from the moment knowing the other is given an ontological value (HK: 2).

Sri Narayana Guru follows a similar route to emphasize the place of the Self. He says that to know that which is beyond the usual kind of knowledge and which is expressed in the relationship of knower and known, what is necessary is practice of self-reflection by inwardly directing the five sense organs which are otherwise directed towards the "other" (AS: 1). That which is supposed to be the channel for the knowledge of the "other" could also be responsible for the knowledge of that which makes possible the knowledge about the "other" and the self-identity. The physical organs and ordinary cognitive processes are dislodged of their physical and unidirectional function, namely, to give knowledge of the "other", and are attributed a meta-metacognitive function of converging to the Self.

Self-knowledge is not another kind of knowledge and is not gained by a cognitive process, according to these philosophers. The hierarchy of cognitive processes and functions are ruled out in the case of the knowledge of the Self. This is to reiterate that Self-knowledge is not the knowledge of something hitherto non-existent or existed in disjunction. Our habitual categories of thinking are unidirectional, linear, and hierarchical. Such categories of thinking cannot cause transcendence in our thinking. Knowledge of the "other" which is the hallmark of all knowledge could take place only in a cognitive platform of thinking. What is argued here is that Self-knowledge is not a new piece of knowledge but a reorientation of experience by redirecting it from the Self than from the cognitive structures.

16.3.1 The Trans-Physical Body

The goal of defining and placing consciousness in a locale is founded on the experience of consciousness. Sankaracharya in *Atmabodha* begins with the prologue that the text on "Self-Knowledge" (AB: 1) is prescribed for those who lead active lives and integrate their life experiences,[6] those who have already achieved emotional maturity and thus peaceful; and for those who are desirous of experiencing pure freedom.

The phenomenological discussion in this text starts from the body, the immediate medium of experience, itself (AB: 12). The body is defined as that which perishes in time (*sariram*) and that which is the instrument for experience (*bhoga ayatanam*). The experience for which the body is the instrument is well spelt out as pleasure (*sukha*) and pain (*dukha*). This definition of the body is definitely trans-physical.

[6]The translations of the Sanskrit words/expressions are of the author.

Further elaboration on the details of the body—“instruments of experience”—shows that “*sarira*” is a complex concept used to denote various levels of experience. The immediate locus and unifier of experience is a sense of “body-feeling” relating to physiological functions. But experience cannot be understood if its scope is limited to empirical terms, though they are the immediate and most visible for any objective representation. The combination of five breaths (*panca prana*),[7] mind, intellect, ten sense and motor organs constitute the subtle part of the body (*sukshmangam*) which is the instrument of experience (AB: 13).[8] The explanation for the “body” continues to what is technically termed as the “causal body” (*karana upadhi*) though at this point Acarya uses another term, *upadhi*, for denoting another part of the body-complex (AB: 14).[9] The continuous and beginningless absence of Self-knowledge is the causal part of the body-complex. The only descriptions for a non-existent “entity” such as “absence of Self-knowledge” are that it is beginningless and indescribable.

Two ideas are important here: The first is that the definition of the “instrument for experience” is complex and trans-physical. The second is that the absence of a particular cognition (Self-knowledge) is a vital component of what constitutes the complex of “instrument of experience”. The question is that in the case of “the absence of the absence of Self-knowledge”, will I cease to have any kind of experiences and will my “instrument for experience” be impaired?

The current empirical discussions on consciousness are mostly directed by ideas about physical location, specific and coordinated neural firings and functions of cortical areas, all of which relate to a key physical centre called the “brain”. It almost looks like that the beginning and end of the understanding of consciousness has to happen in the “brain”. The “brain fixation” is diminished to some extent in the discussions on “mirror neurons”[10] which implicates the complexity and non-linearity involved. It is to be asked why the “brain” has to be seen as the primary locus of a phenomenon (experience) which is neither brain-centred nor localized. It is also to be asked whether in the process of understanding the immediate first-person representation of consciousness, namely, experience, there is a mix-up of the “cause of experience” and the “instrument of experience”. The “instrument of experience” (*bhoga ayatanam*) is a key phenomenological concept still alien to current dialogues that favour neural correlates of consciousness.

An interesting component of the body-complex is the presence of a cognitive entity in absentia. This concept is interesting in that it is the beginning of the cognitive leap to be needed to cross the structural linearity in our conceptual

[7]The five “prana” are *prana*, *apana*, *samana*, *vyana* and *udana*, controlling sense perceptions, excretory functions, digestive functions, circulatory functions and growth, respectively.

[8]*suksmangam bhoga sadhanam*

[9]*anadi avidya anirvacya karanopadhih ucyate*
upadhitritayatanyam atmanam avadharayet

[10]“Mirror neurons” are neural structures that are active during sensations and emotions both in one’s experience and also when they are perceived in others.

thinking. How the absence of the absence of Self-knowledge ("absence of Self-knowledge" is *atma ajnana*, and "absence of absence of Self-knowledge" is *atma jnana*) happens is a subject dealt in detail in the text. This discussion entails the understanding of "experience" from a psychological perspective. The meaning of experience is greatly contributed by the response and psychological attitudes we develop towards a particular situation and event. The shift in the meaning of experience by the change in the kind of responses and attitudes transcends the basic presentation of any experience such as duality. Therefore the "absence of the absence of Self-knowledge" is not another kind of knowledge to "remove" all kinds of experiences, but to integrate the divided experience into a continuous whole. Self-knowledge is not annihilative of differences, but is integrative of divisions, giving a better and fuller perspective of the otherwise segregated experience.

16.4 Self and Experience

Self is not experienced as something extraneous and separated in time and space. So as to transcend our habitual cognitive methods of finding a meaning through identity or difference, the experience of the Self is described not as an event in time. It is described in juxtaposition with the analysis of the content of experiences. The description of the "other" coalesces into the description of the transcendental in *Atmopadesa Satakam*. According to Sri Narayana Guru, the subject of inquiry has to involve a hand-in-hand analysis of the content of experience as well as the analyst. The process of inquiry itself has to transform into the fruit of inquiry, and not culminating at some point of time and space for a concluded piece of knowledge or a localized experience (AS: 2).

The basic duality involved in any experience cannot be transcended by another kind of experience until the major experiential component in an experience is factored into the content of experience for analysis. The given content of experience is something other than the one who understands it or experiences it. For Self-knowledge, the self defined by the other, who identifies with the experiencer, also has to become a cognitive component. The process of knowing, the object of knowledge, and the knower of the object all have to be meditated on as the one expression of Truth (AS: 4). The process is cognitive but at some point transcends the habitual linearity in modes of thinking.

The ultimate state of transcendence sought for by Ezuttacchan also follows a similar route (HK: 41). He prays that let his mind become the host of the divine so as to transcend the basic duality in experience such as "me" (*njan ennum*) and the "divine" (*esvaran ennum*). The experience of the Self or the transcendental is not a linear experience. Also, an "ordinary" experience by itself is not contradictory to the experience of the divine, since the experience of the divine is not another experience. The experience of the divine or transcendental is a shift in identity, and that is why it is the knowledge of the Self. The cognitive processes are instrumental to the experience of the "other". The same cognitive setup is to be also instrumental for the experience of the transcendental. Ezuttacchan uses the term "*cetas*" to denote the instrument which presents the experience of duality and also qualifies it as the prospective seat of the divine to bring about the experience of the transcendental. The profoundest statement he makes is: "If at all the experience of 'I am this' has to be there, let the 'this' include everything in the creation" (HK: 3).

According to Sankaracharya, *Brahman* is that space because of which the "other" is possible (*akhilam vastu vyavaharah tadanvitah*) and which permeates everything (*sarvagatam*) (AB: 59). The presence of *Brahman* in the "other", however, is not conceived in the conventional fashion of how we relate with the transactional world. Brahman is neither subtle nor gross (*ananu asthulam*) (AB: 60); short nor long (*ahrsvam adhirgham*); not born, not changing (*ajam avyayam*); and without a particular form, quality, colour and name for description (*arupa guna varna akhyam*). The essential meaning of any content of cognition is the transcendental (HK: 47). But the nature of our cognitive setup, as we engage in dualistic reasoning, is not the appropriate setup for knowing and experiencing the essential meaning of all experience (HK: 28). By engaging with the usual triad categories of thinking, we will not be able to experience the transcendental (AS: 14). How could a different set of categories of thinking be employed? The alternative employed by the three philosophers is the use of metaphors and imageries so as to cause sudden shifts in the patterns and linear structures of thinking.

What is discussed by the three philosophers as Self-experience is not another kind of experience or another kind of identity for the experiencer, but a shift in the meaning given to the content of experience and Self-identity.

16.4.1 Me and the Other

The duality experienced is on a cognitive level and hence cannot be changed by another kind of experience but only by redesigning the cognitive process. Absence of Self-knowledge cannot be removed by another experience since Self-knowledge is not another experience nor is it in conflict with any experience. It cannot be caused in time by a cognitive act. Absence of Self-knowledge can be removed only by the presence of Self-knowledge just as in the case of light being able to remove however dense the darkness is. Just as the sun reveals by itself when the clouds move away, the Self presents itself when the self-identities defined by the experience of the "other" are disassociated with. Because of the proximity of a crystal to a coloured object, the crystal could be seen as coloured though we understand that the colour is not an inherent property of the crystal. Similar is the case when we experience our self as defined by the other and having the qualities of the "other" because of the proximity of the Self and the "other" (AB: 15). The two has to be understood distinctly like we separately understand the (functional) distinction between the rice, husk, bran etc. that cover the rice (AB: 16). The meaning of the experience and objects of experience in the dream state is distinguished from the experience and objects of experience in the waking state. The meanings of experience in the two states cannot be confounded (AS: 54). Similarly when experience does not result in the definition of self-identity defined by the "other" but arises from Self-knowledge, the meanings of experience and objects of experience are understood to be of the transactional world of duality (HK: 13). We do sleep and wake up in our lives and experience a beginning and end throughout. But this is not the case with the Self. It is not to be understood to be like a lamp which is lit and eventually burnt off (AS: 5–6).

Duality remains as long as experience is given meaning by the self-identity defined by the "other", just as from far the mother of pearl appears to be silver just because it shares one quality with silver which is luminance (AB: 7). Just as the multiplicity of space is not true and is a quality associated with the specific object, Self is not many and divided into many identities as defined by the "other" (AB: 10). Self-knowledge is not the result of another cognitive act since it is the ontological knowledge, nor can any other knowledge exist without the ontological foundation of Self, just as there is no existence for the wave apart from the water (AS: 19). There is no need of another lit lamp to see an already lit lamp (AB: 29). As long as the rope is mistaken to be the snake, the ensuing emotion of action and related acts will be there (AB: 27). Likewise the fears and emotions characteristic of the relationship with the "other" will continue as long as the identity of the self is mistakenly defined by the "other", the object of experience (AB: 27).

16.4.2 Transcendental Swings

If Self-knowledge is not a specific kind of cognition, and knowing the Self requires only the removal of the absence of self-knowledge, then why is that Self is not always present in all experiences? According to Sankaracharya Self is ontologically present in all experiences and can be reflected only through distinctive yet integral analysis of an experience (AB: 17) The nature of Self-knowledge, in the words of Sri Narayana Guru, is like a thousand suns shining together, tearing away the dense darkness of self-identities (AS: 35). However just as the mirror held against a blind person is dysfunctional, according to Ezuttacchan, the ontological presence of Self is unknown to the self whose identity is defined by its relationships with the objects of experience (HK: 54). Therefore whenever a limited experience projects an identity of the self defined by the "other", the contemplative "I-feeling" should be that "I am everything". All objects of experience, the "other", get integrated into the "I-feeling" that I am the cosmic body, of which "fire is my face, dusks are my clothes, ocean is my stomach, the 14 worlds constitute my heart, laws are day and night" (HK: 60). Ezuttacchan prays that his mind be the place where the Lord would place his swing (HK: 8). The swings of the mind according to the experiences, however, cannot be avoided. Hence let the swings be there, but let those be of the divine to play.

16.4.3 Absence of Absence

The function of Self-knowledge is not to create a schism between the experienced and transcendental world and draw an ontological hierarchy between them. The very transactional and hierarchical notions such as "lower-higher, lesser-greater, self-nonself, ordinary-transcendental" are to be transcended to gain Self-knowledge. The knowledge of the Self is such that the conceptual divide between such hierarchies are given a phenomenological recognition but not an ontological status. Self-knowledge, in order to be the tool for healing, cannot be translated into cognition. It is the ontological foundation from which all responses arise. The self, free from conflicts, caused by the identities, defined by the "other" and heated in the fire of Self-knowledge, shines by itself (AB: 66). The focus for thinking is to be given to the idea of "this" in the experience we have such as "I know this" (AS: 42). The clear distinction between Self-knowledge and any other cognition is that Self-knowledge is not a static third-person representation of an alien existence, namely, "Self", but is a dynamic tool which is both epistemological and phenomenological. The major difference is that Self-knowledge is not caused and not linear but is the ontological foundation for any other cognition to arise and exist.

16.5 Healing and Not Therapy

Ideas about self-transformation and spiritual experiences are presented in concurrence with the ontological position that the division between ordinary and transcendental experience itself is incorrect because of the trans-spatiotemporal nature of Self and transcendence. Healing is not an event caused by the "other" but by the Self. It is Self-healing that happens within the system. Though the experience could be described as therapeutic, the process is not therapy, but Self-healing. Healing is not by cathartic methods but by creating transpersonal ideas, visions, thoughts, experiences, goals, world-views and most importantly self-identity. An array of imageries and metaphors are used which are different, both by kind and order, to create new experiences, to relook the given situation from a new perspective and to respond anew from that perspective. The narrative in the three texts, and the three philosophers, ranges from prayer to visual description and follows a transpersonal style of presentation.

16.5.1 Phenomenology of Self-Knowledge

The phenomenology of Self-knowledge is the most important theme discussed though in a metaphoric manner by the three philosophers. The challenging task for them is to avoid cognitive reduction of the ontological but at the same time to relate it to a world of experiences and life events. The usual casualty in a search for transcendence happens to the conceptualizing and division of experience into "ordinary" and "transcendental". The notion of personal growth is mostly ruled by the idea that change has to happen to the states of minds in another worldly manner. This is not true according to the three philosophers. Transformation and growth of consciousness imply basic attitudinal and self-identity changes and shifts. The concept of healing thus is not a solution to a disease but a state of perfection aimed at by one and all.

The three philosophers attempt to get our focus on a set of descriptions about Self and transcendence which are apparently contradictory. The purpose is to connect the "heart" and the "brain", the phenomenological and the ontological. In *Atmabodha*, Sankaracharya describes the sun of knowledge (*bodha bhanu*), which arises in the sky of heart, that pervades and sustains everything, illumines everything, shines by itself and destroys the darkness of limited self-identities (AB: 67). The experiential nature of Self-knowledge is reiterated when Acarya uses the term "*jnana caksus*" (AB: 65), meaning the eye of knowledge. This description implies that Self-knowledge is not to be identified with a limited cognition, but is phenomenological. Knowledge can be an "eye" only if it is to serve an experiential function. The essential idea driven is that Self-knowledge relates to the identity of the person and not a piece of knowledge for the person. It is for the same reason that Ezuttacchan talks about the "eye of the eye of the eye" (HK: 4), which refers to the physical object of cognition, the cognitive act and the Self. Though the Self is noncausal and hence always present, it is seen (ontologically) only by the "eye" of Self-knowledge; one whose (ontological) vision is obscured by the absence of Self-knowledge does not see it just as the blind cannot see the effulgent sun. According to Sri Narayana Guru, the indivisible truth can be known only by experience, the experience of being Self (AS: 97).

16.5.2 Reconstruction of Experience

The classical approach to spiritual experiences is to disengage from "ordinary" experiences and engage in for "transcendental experiences". The implication in such approaches is that there is a division between, and a travel from, the "ordinary" and the "transcendental" experience. Spiritual experience, according to the three philosophers, is reorienting and thereby reconstructing any experience from the Self's point of view. The difference between an "ordinary" experience and a "spiritual" experience is that in the first case experience is given meaning from the point of view of a limited self and in the latter it is from the point of view of inclusive Self.

16.5.3 Distanceless Travel from the Self to the Self

The three philosophers offer a set of verses to guide the distanceless travel from an ordinary self-oriented experience to a transcendental Self-oriented experience.

Sankaracharya says, “Meditate on that Self (which you are) attaining which there is no greater attainment; there is no greater happiness; there is no greater knowledge” (AB: 54). “Meditate on that Self (which you are) having seen which there is nothing more to be seen; having united with there is no more duality; having known which there is nothing more to be known” (AB: 55). “Meditate on that Self (which you are) which pervades all dimensions, up and down, and all spaces in between; which is pure-existence, pure-knowledge, pure-happiness and non-dual, infinite, without end, without divisions” (AB: 56). “Meditate on that Self (which you are) which is indicated in the Upanishadic scriptures by the method of negation and which is non-dual, non-separate happiness and without divisions” (AB: 57).

The *Atmopadesa Satakam* offers a method of meditative thinking in an attempt to reorient and reconstruct experience from the Self’s point of view. Guru says that the primeval energy which belongs to the self-luminous Self-knowledge is the cause of the “other”. What is needed is continuous reflection to base all cognitive acts on that energy and avoid identity with the Self (AS: 53). The distinct experiences we have in our waking and deep sleep state are borne from the same mother of self (AS: 54). The existence of dreams in sleep and existence of experiences in waking state both owe to the same source and both do not have independent ontology (AS: 55). The duals of birth and death are like the birth and death of waves in ocean (AS: 56). Instead of allowing our self to be defined by the “other”, we should reflect upon the distinction between the ontological status of the Self and the “other” (AS: 58). Experiences are possible because of Self; objects of experience do not have an independent existence apart from the Self; they have a non-separate ontology (AS: 59–61).

The narrative style employed by Ezuttacchan presents the Self as the witness of all experiences. According to him, if at all the identity of the “self” has to be there, let it not be defined by the “other” caused by the transactional notion of mine, but by the ontology of the entirety of the world of experiences.

16.6 Conclusion

The discussions engaged in by Sankaracharya, Tunchettu Ezuttacchan and Sri Narayana Guru focus on the ontology of the Self and the possibilities for human experience that directs Self-healing. Mainstream discussions on “consciousness” mostly focus on how neurophysiological functions coordinate and work together as one single system or how and why a subjective orientation ensues from a neurochemical process. In the first case, the attempt is to reductively explain “consciousness” in terms of functions and localities, and in the second case, the attempt is to make the Self more inclusive. Experience is the common concern and mystery for both the discussions, though it is not the starting point of discussion for the first school. The probable clarity to be made for the first stream of discussion is that the empirical, however complex third-person representations it can lead to, cannot be the same what is personally experienced. Also, the third-person representations cannot evolve to become the experiential. Herein lies the major gap between first-person and third-person approaches to consciousness.

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Part III
Boundaries of the Self and Origins of Consciousness

Chapter 17
Soul, Neurons, Particles or *Mind-at-Large*? Exploring the Boundaries of the Self

Mario Varvoglis

While awaiting execution by the Athenians, some 24 centuries ago, Socrates was visited by his student and friend Crito who, at considerable personal risk, wanted to whisk Socrates out of prison, to a more hospitable environment than Athens. Knowing Socrates' penchant for reasoned debate, Crito put forth a number of respectable arguments as to why escape was justified, even morally required, given the blatant injustice of his being sentenced to death. True to form, Socrates calmly tore apart Crito's arguments, and showed – to his own satisfaction at least – that one cannot respond to an injustice (his conviction to death) with another injustice (disobeying the City's laws). All that being settled, another discussion took place: Socrates was asked to comment on the philosophical position that all causality was purely physical in nature. To this, he replied:

It is as if ... somebody ... in trying to explain the causes of what I am doing now, should assert that I am sitting here because my body is composed of bones and sinews ... And that the sinews, by relaxing and contracting, make me bend my limbs now, and that this is the cause of my sitting here with my legs bent.. Yet the real causes of my sitting here in prison are that the Athenians have decided to condemn me, and that I have decided that ... it is more just if I stay here and undergo the penalty they have imposed on me.

17.1 Four Visions of the Self

17.1.1 The Cartesian Self

In his short speech, Socrates captures some of the key issues about the Self and its relationship to the physical world – affirming that the "I" exists over and above its

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*, DOI 10.1007/978-81-322-1587-5_17, © Springer India 2014

body, is a true agent, is free to decide and takes full responsibility for its actions. This "enlightened commonsense" perspective was certainly part of the Greco-Roman tradition as well as the Christian tradition in which the Self is the Soul. It was further formalized by René Descartes in the 17th century, when he introduced an irreducible distinction between the "private", a-dimensional res cogitans, characterized by volition and perceptual experience, and the "public" res extensa, extended in space and governed by mechanical law. He thus attributed a distinct ontological and epistemic status to the Self and clearly allowed for agency and moral responsibility, over and above physical determinism.

17.1.2 The Neuronal Self

Descartes' interactionist dualism, however, contained the seeds of its own downfall. Once the way was cleared for a "pure" physical universe, stripped of all mental qualities, it became increasingly tempting to think of this universe as a closed system, operating solely on the basis of physical determinism. By the early 19th century, Laplace could affirm that all events are in principle predictable and the future already determined; there simply was no room for mental =>physical causation, as this would involve inexplicable intrusions into a well-oiled, clocklike universe. Hume demoted the Cartesian self to a "bundle" self, with no true unity, while advances in anatomy and psychophysiology reinforced the idea that our first-person sense of being free, conscious agents, is an illusion. As outlined by many neuroscientists and cognitive scientists today (e.g. Edelman, Damasio, Dennett, etc.), the different facets of the self, including consciousness and our sense of identity, are essentially a convenient form of narrative; while all the details have not yet been worked out, eventually every aspect of the self will be found to be rooted in cortical and subcortical circuits that function alone or in conjunction.

17.1.3 The QM Self

However, a number of theorists have expressed doubts that all facets of the self will eventually "reduce" to brain functions. David Chalmers (1996), in particular, has eloquently shown that the raw qualities of subjective experience – qualia – pose a "hard" problem for contemporary neuroscience. He points to an explanatory gap between the physical functions and the experience, between the categorization of electromagnetic waves by the visual system and the raw sense of redness.

One solution here would be to simply accept a form of dualism (*quelle horreur!*). The least offensive, known as epiphenomenalism, accepts that consciousness and subjective experience are indeed irreducible to neural functioning, but of absolutely no causal consequence – they are brute facts of human nature, but harmless. This, of course, preserves the brain's "causal closure" and protects us all from the spectre of "free will" invading our neural universe.

Others, not satisfied with such loose ends and looking for a purely monistic solution, are nevertheless obliged to introduce some "extra ingredient" as Chalmers puts it, over and above the known functions of neurons and neural networks. Perhaps the most intriguing of these approaches are the models inspired by quantum mechanics (QM), which challenge the sacrosanct assumption that neuronal micro- or macro-circuits are the only explanatory units needed to understand brain functioning; they suggest instead a need to dig much deeper – all the way down to the fundamental "building blocks" of nature.

The problem is that these building blocks are quite counterintuitive: they are probabilistic, rather than deterministic; they exhibit totally counterintuitive relations (e.g. superposition of states, nonlocal coherence or entanglement between spatially and temporally removed structures); they inexplicably shift ontological status from an abstract "wave function" to a well-defined state (e.g. with a specific location or spin); and they somehow depend, for this transition, upon a "measurement act" – which itself depends upon the experimenter's decisions.

In short, QM theorists hold that the brain is *not* a "classical" object and that it may be "open" to – indeed, require – consciousness, to move from probabilities to determinism.

Biologists, cognitive psychologists and neuroscientists, accustomed to more "classical" concepts (action potentials, depolarization, feedforward inhibition), have difficulty digesting all this QM talk; like Alice, they find themselves in a Wonderland with very strange rules and entities. Many object that QM is irrelevant to brain functioning, as the odd phenomena it studies are too short-lived, short-ranged and sensitive to the thermodynamics of the environment to survive in the warm wetware of the brain. Others, like Chalmers, question whether this "extra ingredient" can really help us understand subjective experience: the explanatory gap seems just as wide in positing the emergence of qualia from Bose-Einstein condensates, as from neural networks.

On the other hand, it should be noted that the long-assumed constraints on QM phenomena, limiting them to the subatomic world, are increasingly being challenged; we are now discovering that they may play a role at atomic, molecular or even macromolecular levels (e.g. in photosynthesis). Thus, it would seem quite premature to dismiss all possible relevance of micro-processes to brain function; while they may not explain the experience of "redness", they could contribute to our understanding of other aspects of subjectivity. Quantum coherence, for example, could well explain the binding problem and account for the unity and coherence of subjective experience.

17.1.4 The Extended Self

The last "model of the self" I would like to consider breaks with the previous ones, both in its epistemic approach – it draws heavily on first person experience, rather than third person perspectives – and in its ontological priorities. This model claims that understanding the self comes by "elevating" inner experience, through spiritual disciplines and deep mystical states. It also claims that, in so doing, one discovers that the "true" self cannot be identified with any of its contents – sensations, memories, identity or personality – nor with neurological or physical substructures; it is, rather, the immanent theatre of all experience, "pure consciousness":

> During the experience... the ordinary, everyday self is transcended in a dramatic and remarkably consistent way. Specifically, in its place there characteristically emerges a vastly amplified sense of self – a Self – that almost inevitably experiences itself as being in a state of direct contact, or union, or identity with some reality variably conceived as a Universal Self, the One, the Absolute, the Ground of Being, or God. (Kelly and Grosso 2007, pp. 507–508)

To many, no doubt, it seems absurd to even entertain the relevance of mystical experience and their irrational spiritual background, let alone extract a "model" of the self from these. In many psychological or psychiatric contexts, such experiences are rather signs of pathology. Yet I hold that the Extended-self model should be treated as we would any other hypothesis concerning the nature of consciousness. First, irrespective of all debates concerning its validity, there is little doubt that something like an "Extended-self" model *does* exist: it keeps emerging in the reports of those who have lived through a spontaneous mystical experience and is present throughout a wide, transcultural spectrum of spiritual practices or traditions (Hinduism, Taoism, Buddhism, Sufism, Christianity, etc.). Second, there is little doubt that a number of rather profound insights and intuitions about the nature of the mind and reality have emerged out of these experiences and thought systems. A number of "hard" scientists have taken them quite seriously, including some of the most influential theoretical physicists of the 20th century, such as Bohr, Heisenberg, Einstein, Pauli and Schrödinger. Niels Bohr, for example, states:

> For a parallel to the lesson of atomic theory.... We must turn to those kinds of epistemological problems which already thinkers like the Buddha and Lao Tzu have been confronted when trying to harmonize our position as spectators and actors in the great drama of existence. (Capra 1975, p. 18)

Similarly, Werner Heisenberg affirms:

> The great scientific contribution in theoretical physics that has come from Japan since the last war may be an indication of a certain relationship between philosophical ideas in the tradition of the Far East and the philosophical substance of quantum theory. (Capra 1975, p. 18)

Finally, I believe this model merits consideration because empirical research – to which we will turn shortly – supports some of its more "extraordinary" claims: it can be shown that individuals entering non-ordinary states of consciousness somehow obtain information that is inaccessible to the senses.

Table 17.1 Four visions of the Self

The Cartesian self	The Neuronal self
Epistemological approach: subjectivist, analytical; philosophy	*Epistemological approach:* objectivist; empirical neuroscience, cognitivism
Self ontology: circumscribed by the body-brain but ontologically distinct; centre of experience, decision making and agency	*Self ontology*: fully defined by the body and brain; no distinct ontological status, or just epiphenomenal with no top-down role
Brain ontology: "classical", deterministic	*Brain ontology*: "classical", deterministic
The Extended self	The Quantum self
Epistemological approach: experiential, nonanalytical; spiritual philosophy	*Epistemological approach*: objectivist; empirical neuroscience, quantum physics
Self ontology: behind the phenomenal self lies an immanent self, pure consciousness – this is not circumscribed by the body-brain	*Self ontology*: an emergent from microscopic phenomena; but may exhibit true top-down causation
Brain ontology: nonmechanistic, part of a deeply interconnected reality	*Brain ontology*: both mechanistic and probabilistic; nonlocal processes

17.2 Summary

Table 17.1 summarizes this absurdly sketchy review of different visions of the mind and self. In the West, two models have dominated – the Cartesian self, inspired mostly by phenomenological first person perspectives or philosophical analysis and formalized through substance dualism, and the Neuronal self, based on objectivist, third person views and seeking to decompose and "reduce" all aspects of the self to brain structures and functions. While these models are clearly at odds with each other, they do agree on the mechanistic, classical or "Newtonian" nature of physical reality (specifically, the brain).

The other two approaches – the QM self and the Extended self – also differ in terms of their epistemology: the first is objectivist, drawing from the neurosciences and from the formalisms of modern physics, whereas the second is based on the intense phenomenology of mystical experiences and sustained spiritual practice. However, these two models do seem to share some common ontological foundations – namely, a vision of reality that emphasizes interconnectedness and blurs distinctions between the mental and the physical.

17.3 Psi: The Wild Card in the Debate

I now would like to introduce research on a number of phenomena that have, I believe, a unique status in philosophical and scientific discussions of the self:

They are quite well established.

They have major implications for our understanding of the self.
They tend to be ignored by contemporary scholars and scientists.

"Psi", the neutral term used to describe "psychic" phenomena, encompasses a wide range of human experiences which apparently defy rational commonsense, or what the philosopher C. D. Broad saw as "basic limiting principles":

> It is impossible for a person to perceive a physical event or a material thing except by means of sensations which that event or thing produces in his mind . . . It is impossible for an event in a person's mind to produce directly any change in the material world except certain changes in his own brain . . . It is self-evidently impossible that an event should begin to have any effects before it has happened. (Broad 1969, pp. 9–10)

Over the course of 150 years of investigations, the field of parapsychology has produced a very sizable database of case studies and experimental research that collectively challenge each of these "impossibilities". The research addresses apparent instances of telepathy (popularly known as "thought transmission"), clairvoyance (direct knowledge of a distant event), precognition (non-inferential knowledge of a future event), psychokinesis ("mind over matter") and "DMILS" (direct mental influence on living systems).

It is beyond the scope of this paper to provide a thorough review of this research. I have chosen instead to focus on a limited subset of studies: those pointing to anomalous information exchanges between persons (telepathy) and those suggesting temporal anomalies, i.e. an information transfer from the future to the present (precognition). For each, I focus on lines of research (vs. isolated experiments); after describing typical protocols, I turn to the global effects obtained, as found in published metanalyses.

Largely employed in medical research and in the social and behavioural sciences, metanalyses have replaced traditional literature reviews, as they permit a quantitative evaluation of experimental results across a large number of related studies. The coding of methodological weaknesses using explicit criteria reduces subjectivity and databases can be reassessed once purged of flawed studies. Most importantly, global effect sizes (standardized estimates of the degree to which a phenomenon is present) can be derived from the totality of the studies, affording a good sense of how reliable the "real" effect is.

17.3.1 Person-to-Person Connectedness: The Ganzfeld

I woke up with a start, feeling I had had a hard blow on my mouth, and with a distinct sense that I had been cut and was bleeding under my upper lip, and seized my pocket-handkerchief and held it (in a little pushed lump) to the part, as I sat up in bed, and after a few seconds, when I removed it, I was astonished to not to see any blood, and only realized it was impossible anything could have struck me there, as I lay fast asleep in my bed, and so I thought it was only a dream! – but I looked at my watch, and saw it was seven, and finding Arthur (my husband) was not in the room, I concluded (rightly) that he must have gone out on the lake for any early sail, as it was so fine. I then fell asleep. At breakfast (half-past nine) Arthur came in rather late, and I noticed he rather purposely sat further away from me than usual, and every now and then put his pocket handkerchief furtively up to his lip, in the very way I had done. I said "Arthur, why are you doing that?" and added a little anxiously "I know you have hurt yourself! But I will tell you why afterwards." He said, "Well, when I was sailing, a sudden squall came, throwing the tiller suddenly around, and it struck me a bad blow in the mouth, under the upper lip, and it has been bleeding a good deal and won't stop." I then said, "Have you any idea what o'clock it was when it happened?" and he answered, "It must have been about seven". (Gurney et al. 1886, p. 194.)

This anecdote comes from the early case-studies of the Society of Psychical Research, the first scholarly institution to rigorously address the question of psi. Many case collections have been undertaken ever since, often with quite different objectives and methods. Nevertheless, a number of shared patterns have consistently emerged: reported experiences usually involve closely related individuals, who are at different locations at the time of the event; they centre on the unexpected occurrence of an intensely significant event (such as an accident or death); they frequently are perceived during an "altered" state of consciousness such as sleep, dreams, reveries, etc.

When he first initiated academic laboratory research on psi phenomena, in the 1930s, the biologist J. B. Rhine introduced purely quantitative protocols, accompanied by statistical evaluation of results; subjects would contribute many short trials, attempting each time to guess which of several possible geometric symbols was the "target". Starting in the 1960s, however, a number of researchers sought to introduce experimental tasks more closely resembling "natural" psi. One major shift was the creation of open-ended "free-response" tasks, emphasizing the qualitative aspects of the experience over purely quantitative "data collection". Thus, rather than repeatedly guessing simple symbols out of a known universe of possibilities, subjects would attempt to remotely "sense" and describe a single, complex target picture (art reproductions, striking photographs, etc) whose potential attributes are unknown. A second major departure from Rhine's approaches was the introduction of procedures to induce an "altered state of consciousness" in subjects – via meditation, hypnosis, dreaming, relaxation or sensory isolation.

In this presentation, I focus on a telepathy protocol that combines the free-response approach with the induction of an altered state of consciousness. The ganzfeld (meaning "total field", in German) is a sensory attenuation technique induced by acetate covers placed over the eyes (usually, halved ping-pong balls) and headphones with white noise over the ears. It is meant to induce a slightly altered mental state that vaguely resembles the hypnagogic state. The ganzfeld is applied to the "receiver", who, for about 30 min, is asked to "think out loud" and provide a continuous verbal report of his or her ongoing thoughts, feelings and images. Meanwhile, the sender, located in a distant, sound-isolated room, is asked to focus on the randomly selected visual target (an art print or video clip). At the end of the 30-min period, the receiver is taken out of the ganzfeld and shown four images –

one of which is the true target and three of which are decoys. The receiver rates the degree to which each of these matches his or her earlier impressions; if the highest rating is assigned to the actual target, a "hit" is scored for that session. By chance, then, the probability of a "hit" is 1 in 4; evaluation of an experiment's overall results involves a statistical comparison between the hit rate obtained across all sessions and the expected 25 % hit rate.

From its early iterations in the 1970s up through today, this basic protocol has been reproduced in a large number of laboratories. It is probably the most closely scrutinized protocol in parapsychology, with several generations of experiments, metanalyses, critiques, improvements and new experiments. Despite sustained attacks by sceptics, it is commonly considered to be one of the strongest lines of evidence for a "communication anomaly" produced by parapsychology. A turning point was the creation of the "autoganzfeld" in the 1980s (Honorton et al. 1990), which used a computer-controlled protocol and was custom-designed to respond to critiques of earlier experiments. Over a total of 11 experimental series, involving 355 sessions and 241 subjects, the mean hit rate was 34 % ($z = 3.89$, $p = .00005$) and the mean effect size was .29 (Bem and Honorton 1994).

Predictably, of course, the "ganzfeld debate" did not end there. As more and more laboratories became interested in using this protocol, more and more variations on the basic protocol were introduced (e.g. using musical "targets" as opposed to visual ones, testing conditions with no "sender", but only a receiver). The results here were clearly inferior, though two metanalyses assessing these studies differed as to the degree to which results continued to be globally significant (Milton and Wiseman 1999; Storm and Ertel 2001). In a third metanalysis, results between the "new" ganzfelds were compared with the original autoganzfeld; it was found that the effect size achieved by a given experiment was positively correlated with the degree to which it adhered to the original autoganzfeld protocol (Bem et al. 2001).

The most recently published metanalysis is probably the most instructive of all (Storm et al. 2010). The authors compared three kinds of free-response study: those involving the ganzfeld, those involving other altered states of consciousness ("other-induction": dreams, meditation, relaxation or hypnosis) and free-response studies with no altered state induction ("no induction"). Focusing on the recent studies and applying stringent inclusion criteria, the authors obtained a homogeneous set of 29 ganzfeld, 16 "other-induction" and 14 "no-induction" studies. The mean effect size for the ganzfeld was 0.142 (Stouffer $z = 5.48$, $p = 2.13 \times 10^{-8}$), for other-induction studies 0.110 (Stouffer $z = 3.35$, $p = 2.08 \times 10^{-4}$), and for no-induction studies a slightly negative −0.029 (Stouffer $z = 2.29$, $p = .989$). The ganzfeld mean effect size was significantly higher than the noninduction effect size. Additionally, in the ganzfeld studies, selected participants (those who met criteria such as openness to the paranormal, previous participation in psi experiments, regular practice of mental disciplines, etc.) showed significantly superior performance over unselected participants.

Globally, then, after 40 years of use by several dozen laboratories, the ganzfeld approach still holds its own, experimentally demonstrating "connectedness" between two remotely situated individuals.

17.3.2 Future, Present, Past: Precognition and Presentiment

Bartholomew A. Ruggieri, M.D., my friend and hardworking neighbour paediatrician, wrote this memo: "On the afternoon of Sunday, June 2, 1968, I went up to my room to nap. I slept fitfully, from about 2:30 P.M. to 5–5:30 P.M. During this time I dreamed that I was at an upper story window facing Avenue B and Sixth Street in New York City, and saw a 'parade' of mourners approaching as pictured [diagram drawn by Dr. R]. It was more a mass of mourners than a parade. They carried a banner with a religious connotation and ending with the words: '. . . KENNEDY ASSASSINATION.' I know the area very well, having lived my youth there, but to my knowledge I have never lived on Avenue B. I awoke, vividly recalling all the words on the banner, felt I should get up and write them down, but did not do so. I lay in bed and, after a period of drowsiness, again fell asleep. Somehow in my mind I associated this to the imminent assassination of Robert Kennedy (Bobby). The Avenue B would support this. The same evening (6/2/68) sitting at my desk at 9:30 P.M., I phoned Dr. B. E. Schwarz, described the dream, and said I felt Bobby Kennedy would be assassinated on the 6th of June. Note 'Sixth' Street: June is the sixth month". (Schwarz 1980, pp. 247–248)

This case involved two independent witnesses (psychiatrist Berthold Schwarz and his wife, who was told of Dr. Ruggieri's dream on June 2). The dream incorporated realistic elements and symbolic ones (Avenue B for Bobby, 6th avenue for June 6th) that were correctly interpreted before the event. As Schwarz notes, Robert Kennedy was shot on June 5, 1968, but he died on the 6th.

Of course, one can always question the evidential weight of such cases – a seemingly impressive case may be no more than "mere coincidence" or based on tacit knowledge that led to unconscious inferences about the future event. Laboratory experiments circumvent these kinds of issues by focusing on future events that are *randomly* selected from a range of possibilities and thus *intrinsically* unpredictable. In purely quantitative precognition studies, subjects are faced, say, with a four-choice apparatus and repeatedly asked to select the button which they think will light up next. A true random process then selects the actual target button and lights it up; then, the next trial begins. Following a predefined number of trials and sessions, the investigator can analyse results by comparing the expected, "chance" distribution of hits with the actual number obtained.

A metanalysis of all precognition studies conducted between 1935 and 1987, and meeting a number of methodological criteria, was reported by Honorton and Ferrari (1989). It covered 309 studies, involving 62 investigators, 50.000 subjects and nearly 2,000,000 trials. The random systems used ranged from electromechanical card-shuffling systems to hardware Random Number Generators (based on radioactive decay or electronic noise). About a third of these studies were significant, where only 5 % would be expected by chance ($z = 11.41$, $p = 6.3 \times 10^{-25}$); effect sizes were small, but fairly constant across the years, while study quality ratings improved (reflecting the shift to automated protocols). Effect sizes were significantly better in studies using selected vs. unselected subjects, in individual testing rather than group testing and in tests with short time intervals between the guess and the target event. Most interestingly, the results were significantly superior for tests in which subjects received real-time or rapid feedback about their results; when they received no feedback at all, results were null.

These findings suggest that the accuracy of precognition may decline with time and that the experience of feedback may be a key factor in retroactively "triggering" the right response: if there's no sensory perception of the actual "target" event at time T, then there's no precognition at time $T-1$. Precognition, in other words, may be triggered by one's future sensory *experience* of the event, and not by the future event per se.

As in the case of telepathy experiments, precognition studies have not been limited to purely quantitative approaches; a number of "free-response" studies, involving more lifelike situations, have also been explored. The question here is whether individuals can describe an open-ended target before it is randomly selected out of a large range of possibilities. An independent blind-judging process ranks the subject's impressions against several possibilities (the target mixed with decoys), thus allowing statistical assessment of the experiment's overall success.

Radin (2011) summarizes results for the three most substantial experimental series on "precognitive remote perception" (PRP). The first, conducted at Princeton University from 1978 through the late 1990s, involved a total of 653 sessions and resulted in an average effect size of $e = 0.212$ ($z = 5.42$, $p < 3.0 \times 10^{-8}$). The second series, conducted at Stanford Research Institute from 1973 to 1988, was part of the classified government-sponsored intelligence programme known as "Stargate"; a total of 770 PRP trials show an average effect size of $e = 0.209$ (associated with $z = 5.8$, $p < 3.3 \times 10^{-9}$). Finally, the third series – also sponsored by the US government – was conducted at Science Applications International Corporation from 1988 to 1995; over the course of 445 PRP trials, the average effect size was $e = 0.230$ ($z = 4.85$, $p < 6.1 \times 10^{-7}$). As Radin notes, the effect sizes obtained in these three laboratories were very similar; equally important, they were an order of magnitude larger than that obtained with repetitive guessing tasks.

A third class of "temporal anomaly" studies addresses presentiment. Defined as a *"a sense of something about to happen, a foreboding"*, presentiment (pre-feeling) is different from precognition (pre-knowing) in that it often involves no more than a vague sense – usually negative – about the immediate future. Rather than asking subjects to guess future targets or give their impressions about a future target image, presentiment studies use an index of autonomic physiological activity to determine whether the person "senses" the impending arrival of an emotionally charged event.

The subject, seated in front of a computer screen, is connected to sensors that measure, say, heart rate. Every minute or so, a random generator selects one of the two types of images: either neutral (a nice landscape, two children playing) or violent and offensive (somebody being stabbed, an attack dog baring its teeth, etc.). Obviously, the person's physiological reactions *following* exposure correspond to the nature of the target – rather flat, when the image observed was neutral, but with a sharp peak for shocking ones. But what is of interest in presentiment experiments is that physiological activity just *prior* to target exposure *also* shifts in accordance with the nature of the future target – even though the per trial selection of a "neutral" vs. "violent" image is totally random.

In a recent metanalysis, Radin (2011) examines a well-defined subset of 38 presentiment studies, involving a variety of physiological measurements (skin conductance, heart rate, pupil dilation, brain electrical activity or blood oxygenation in the brain), recorded before and after exposure to randomly selected stimuli. The mean effect size across studies was $e = 0.26$ (combined $z = 8.7$, $p < 1 \times 10^{-17}$) showing a strong differential effect between the neutral vs. arousing pictures.

A variant on this general protocol involves implicit behaviour measures, rather than physiological indices. Traditional psychological studies on implicit behaviour show that our choices can be influenced by stimuli we have not consciously perceived. For example, in the "mere exposure" effect, a person asked to choose between two photos that are independently matched on attractiveness will tend to select the one to which she or he has been previously exposed – although this exposure was subliminal. In the presentiment studies, the causal order of events is reversed: the subject first chooses which of the two images she or he prefers and is *then* exposed to the subliminal target. From the standpoint of normal "causal" reasoning, there should be absolutely no exposure effect, since the subject has already made his or her choice. But what has been found in a variety of such experiments is that the subject shows effects similar to the "normal" trials – suggesting, again, that the future event (e.g. exposure to the target) retroactively affects the earlier choices (Bem 2011).

This latter line of research is quite recent; attempted replications are being conducted in different laboratories, and it is still unknown what their track record will turn out to be. Nevertheless, Radin (2011) notes that if we focus just on completed presentiment experiments (using either physiological or implicit behaviour measures), we obtain a total of 82 studies, reported by 23 laboratories from the United States, Italy, Spain, Holland, Austria, Sweden, England, Scotland, Iran, Japan and Australia. Of these, 73 (89 %) report results in the direction predicted by a retrocausal effect ($p = 1.5 \times 10^{13}$).

Taking into account the totality of precognition and presentiment studies reviewed in this section, I believe that the conclusion is inescapable that human-centred temporal anomalies are empirically established.

17.4 Reading the Self Through a Psychic Lens

This has clearly been a very selective review of experimental parapsychology. I have focused exclusively on the ganzfeld and on protocols examining precognition and presentiment while leaving out the rich and substantial spontaneous-case literature as well as several major lines of research. Nevertheless, I hope to have persuaded the reader that the results which *have* been presented are worth considering, when reflecting on models of the self and consciousness. For if it turns out that an objective (and not just metaphorical) "connectedness" between individuals exists – that the thoughts or bodily sensations I have can at times be due to a distant person's experience or intentions – then surely we must question the position that all aspects of the self reduce to an intracranial "narrative". And if it turns out that my current thoughts and decisions are directly affected by future events, and not just the past and present, then we must certainly rethink mechanistic determinism and causal closure in the brain.

17.4.1 How to Deal with Psi I: The "Cheap" Solutions

17.4.1.1 Replication

The most popular approach for dealing with psi phenomena has been to ignore them or dismiss them with the wave of a magic wand. The preferred magic wand has been to argue that there are no replicable parapsychology experiments.

It is quite true that no current parapsychological protocol can be replicated "at will". The laboratory is by no means a hospitable ecosystem for psi phenomena, and we are far from understanding (let alone controlling) all the psychological, physiological and physical variables that are potentially relevant. But as illustrated in a recent article in New Scientist magazine, the replication issue is not an "exclusivity" of psi research:

> Many recent reports have raised the alarm that a shocking amount of the published literature in fields ranging from cancer biology to psychology is not reproducible. Pharmaceuticals company Bayer, for example, recently revealed that it fails to replicate about two-thirds of published studies identifying possible drug targets (*Nature Reviews Drug Discovery*, vol 10, p. 712). Bayer's rival Amgen reported an even higher rate of failure – over the past decade its oncology and haematology researchers could not replicate 47 of 53 highly promising results they examined (*Nature*, vol 483, p 531). Because drug companies scour the scientific literature for promising leads, this is a good way to estimate how much bio-medical research cannot be replicated. The answer: the majority. (Iorns 2012, pp. 24–25)

Parapsychologists have been aware of their own replication issues for decades; because of the elusive nature of their subject matter, they have insisted on the necessity for replication, before even considering that an effect has been demonstrated. In this paper, I have described several lines of research that are at least *moderately* replicable, with comparable effect sizes across different laboratories. I suggest that the data is sufficiently solid and reproducible to allow us to infer that we are confronted with experimentally demonstrated space and time anomalies – even if these cannot be demonstrated each time.

17.4.1.2 Theory

A different sceptical approach is to claim that parapsychology has no theory or model to explain the data; results are "mere anomalies" that will probably go away soon.

There's some truth to this critique as well: the empirical case for psi phenomena is far stronger than the theoretical one. Yet, here too I think we need to qualify things a bit: while parapsychologists have no theory within the dominant mechanistic framework of neuroscience, they *do* have preliminary theories that are coherent with other frameworks. In this sense, the real problem is not so much a lack of theory, as a head-on collision with dominant theory. Donald Hebb, who some consider the father of neuropsychology, states:

> Why do we not accept E.S.P. as a psychological fact? Rhine has offered us enough evidence to have convinced us on any other issue ... I cannot see what other basis my colleagues have for rejecting it ... My own rejection of [Rhine's] views is in a literal sense prejudice.

Hermann von Helmholtz, pioneer in physiological investigations of visual and sound perception, said:

> I cannot believe it. Neither the testimony of all the Fellows of the Royal Society, not even the evidence of my own senses would lead me to believe in the transmission of thought from one person to another independently of the recognized channels of sensation. It is clearly impossible. (both citations in Collins and Pinch 1979, p. 244).

One is tempted to label these reactions as narrow-minded and irrational. But I prefer to think of them as signs of strong commitment to a particular worldview. Scientists like Hebb and Helmholtz understandably feel ill at ease with data that seem totally inconsistent with the framework that has guided their own research. But not all scientists dismiss the data out of hand – instead, they pragmatically seek how to integrate the data within the existing framework. A popular candidate here has been to view psi experiences as an unknown but classical electromagnetic signal, emitting from one person's brain, crossing space and reaching another person's brain (in telepathy). Unfortunately, this model doesn't hold up. Besides a number of important conceptual problems (see Braude 1979), decades of research have failed to reveal any consistent relationship between psi and factors which normally influence signal transmission. Successful telepathy studies have been repeatedly shown independently of distance or barriers between the agent and the receiver (see, e.g. the distant influence studies of Vasiliev 1976), and precognition and presentiment studies definitely exclude any classical form of "signal transmission". From the standpoint of Popper's falsificationism, parapsychology has made great theoretical progress: it has, with near certainty, falsified transmission models.

17.4.2 How to Deal with Psi II: The Data and the Models

Chalmers insists that there can be no "cheap" solutions concerning qualia. I similarly believe that there are no "cheap" solutions with respect to psi phenomena. They demand a willingness to entertain ontologies other than the ones that dominate neuroscience today.

17.4.2.1 Entanglement or Time Symmetries

Entanglement, or nonlocal correlations – what Einstein unhappily referred to as "spooky action at a distance" – would at first sight seem to be a good candidate for phenomena such as telepathy. After all, in principle, even a brief interaction between two individuals would imply that they are sharing entangled photons in their brains – could these be vehicles for "correlations" between their experiences at a later time? Current thinking is that such a mechanism is highly implausible: entanglement, though a natural and widespread phenomenon in micro-reality, is far too short-lived and sensitive to surrounding conditions to survive in the warm wetware of the brain. Our view on this may change: Josephson and Pallikari (1991) suggest that, over billions of years of evolution, biological systems may have developed fine skills for maintaining and using entanglement – far surpassing what we observe in current physics experiments. Be that as it may, for now the jury is out; entanglement has yet to be demonstrated even within the short intracranial distances of the brain – let alone between two remote brains.

A different tack can be adopted by examining the nature of time. The equations of physics – even classical physics – are indifferent to the flow of time: they allow for advanced-wave solutions (effects preceding causes), in addition to the usual retarded-wave solutions. Of course, most physicists would consider this to be a mere mathematical curiosity: we just don't observe advanced waves in nature. Yet, this kind of phenomenon is precisely what we *do* seem to observe in precognition or presentiment. Could it be that advanced waves occur *specifically* in association with brains? Perhaps, as Dick Bierman (2008) suggests, the high brain coherence states associated with consciousness occasionally restore time symmetry – whereby the event at time T triggers not only retarded waves (at $T + 1$, $T + 2$, etc.) but also advanced waves (at $T - 1$, $T - 2$, etc.). The key moment, then, would be the person's sensory observation of the event, retrocausally triggering an earlier precognition or presentiment. This is consistent with a finding mentioned earlier, in the Honorton and Ferrari (1989) metanalysis: success in precognition guessing tasks seems to be conditional on feedback.

Bierman holds that his model is fundamentally physicalist, rather than dualistic, insofar as it derives from well-known equations of physics. This is debatable, I think, given that consciousness plays a rather central role (his model is called "consciousness induced restoration of time symmetries", or CIRTS). But, be that as it may, this model would not please those adhering to more classical frameworks: accepting that current brain states are "open" to future events would wreak havoc to the concept of causal closure.

17.4.2.2 The Self and Its (Quantum) Brain

The Cartesian self – traditional interactionist dualism –shows some potential for integrating psi phenomena, insofar as it clearly distinguishes the laws of the "I", from those applying to physical systems and the brain. In this picture, psi is possible because the self, *res cogitans*, can "reach out" to distant or future information, independently of the usual physical constraints.

Several scientists (Thouless and Wiesner 1948; Beloff 2002; Eccles 1977) have indeed suggested that psi is essentially an exteriorized expression of what goes on all the time *within* the individual. In its normal, internally oriented activity, consciousness "reads out" from specific brain sites information coming through the senses, synthesizes it into a coherent subjective experience and acts upon it by influencing the brain and producing thoughts or motor actions. In the *exteriorized* expression of such interactions, the mind reads out data from a *distant* brain (in telepathy) or from a future state of its brain (in precognition); it also may influence a distant physical system, such as another person's brain (as in DMILS studies: see Schmidt 2012, or Vasiliev 1976).

Psi phenomena, in this approach, are not fundamentally exceptional: they are a "special case" of mind-matter interaction. The "easy" challenge, then, is to specify the circumstances under which the self reaches out to external informational sources, rather than its own brain. The more fundamental issue is the perpetual stumbling block for interactionism: how does an immaterial mind interact with a material system, such as the brain – especially if the latter is supposed to be causally closed?

It seems to me that the best option here would be to explore an alliance between the Cartesian- and Quantum-self models – the latter being far more open to interactionism than the Neuronal-self models. Neuroscientist Sir John Eccles (1977) and physicists Henry Stapp (2005) and Evan Harris Walker (1975, 1984) have all suggested, in different ways, that the brain is a generator of possibilities existing in a superposed state (the wave function) and that the role of the self, in its "top-down" function, is to collapse wave functions into specific states, "biasing" processes toward a particular outcome.

This idea is directly inspired by certain interpretations of the "measurement problem" in physics, which hold that consciousness is the key factor in collapsing the wave function during the measurement act. Indeed, Radin et al (2012) assessed the potential role of consciousness in wave function collapse, using the double-slit experimental setup. Subjects were asked to focus attention either on the double-slit apparatus or away from it. The dependent variable was the ratio of the interference pattern's double-slit to single-slit spectral power. Results were significant: the spectral ratio decreased as predicted ($z = -4.36$, $p = 6 \times 10^{-6}$), whereas the same apparatus in an equal number of control sessions showed no difference in the spectral ratio.

17.4.2.3 Expanding the Self

Experiments that thus combine psi research methods with QM formalisms are quite important; they may help dualism evolve to a more testable conceptual framework. But it is clear that if we are to advance, we need to better define not only the nature of brain processes but also the nature of the self. Parapsychological research strongly indicates that psi phenomena are *not* a function of the rational self dear to Descartes; if anything, the self-aware rational self seems to be an *impediment* to psi. Recognizing this, parapsychologists have invested considerable time and effort trying to access deeper, often unconscious facets of the individual while still extracting results that can be evaluated quantitatively. This can be seen, for example, in the movement from conscious "guessing" tasks in telepathy and precognition experiments, to tasks that are more open ended (free-response tests) or that even bypass conscious participation entirely (presentiment and DMILS experiments).

It seems then we need to entertain more "layered" and complex models of the self, with more life, colour and texture. The works of depth psychologists, such as Freud, Jung and James, are essential, as are the contributions of Frederic Myers, one of the most unjustly neglected scholars of the past century (see Kelly et al. 2007, for an in-depth analysis and update of Myer's psychology). Of equal value are the Extended-self models deriving from "eastern psychologies"; these suggest a fundamental distinction between the personal self that is indeed a construct and "pure consciousness" or "Mind-at-large" as Huxley (1954) calls it. Philosophers sympathetic to such view, such as Henri Bergson and C. D. Broad, suggest that the personal, "biological" self is built around moment-to-moment survival and functions by filtering most information and focusing on the here and now:

> The suggestion is that the function of the brain and nervous system and sense organs is in the main eliminative and not productive. Each person is at each moment capable of remembering all that has ever happened to him and of perceiving everything that is happening everywhere in the universe. The function of the brain and nervous system is to protect us from being overwhelmed and confused by this mass of largely useless and irrelevant knowledge, by shutting out most of what we should otherwise perceive or remember at any moment, and leaving only that very small and special selection which is likely to be practically useful. (C. D. Broad, cited in Huxley 1954, p. 23)

By contrast, mystical experiences, and a wide diversity of spiritual practices, seem to inverse the normal filtering mechanism and thus enhance access to "Mind-at-large".

From a 3rd person perspective, of course, all this is pure metaphor and poetry; such practices, even if positive for the person, amount to no more than subjective, internal experiences. Yet throughout history, these practices have also been associated with exceptional "mind powers" (e.g. the siddhis in Hinduism, miracles in Christianity); the claim is that the expanded mind is not just a metaphor, but that it leads to *objective* effects, beyond the inner world of the practitioner.

This, of course, is a testable claim, at least from a parapsychological perspective. Charles Honorton (1977), inspired by Patanjali's Yoga Sutras, proposed that internal attention states indeed constitute psychophysical "noise reduction" procedures that quiet our usual perceptual and cognitive "chatter" and allow the mind to access subtler forms of information, whether distant or future. He then demonstrated that psi studies involving internal attention states – meditation, hypnosis, dreaming, etc. – yielded superior results than studies involving a "normal" state. The pursuit of the ganzfeld methodology was a direct consequence of this perspective. Thirty years later, examining a totally different experimental database, the forementioned

Storm et al. (2010) metanalysis clearly confirms Honorton's insight: "noise reduction" psi experiments fare significantly better than experiments with no state induction.

After being ostracized for a good part of the 20th century, the problem of consciousness and its relationship to the physical world is back in the focus of science. The challenges are multiple and complex, but thankfully many of them are being addressed through various disciplines – the neurosciences, physics, cognitive psychology, philosophy and more. I believe that parapsychology should be actively included in this noble enterprise; it brings to the fore new challenges that are eminently relevant to the framework in which consciousness research evolves. While results may seem dissonant to other fields, the methods are sound and have been shown to be useful in addressing some fundamental issues. Finally, divergent data are not so bad; history has proven that they are just the kind of challenge that ultimately corrects, expands or deepens our understanding of the world.

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Chapter 18
Is the Source of Awareness Present in the Quantum Vacuum?

Mani Bhaumik

18.1 Introduction

The phenomenon of awareness is common to all animate species. It is also at the core of cognition in any sentient being we consider capable of possessing consciousness. Consciousness is the very window through which we perceive reality and reflect upon the emotions and feelings that colour our lives. It is the vehicle, as well, through which we acquire that cherished knowledge of the physical world, which is embodied in science. Because it is both an *instrument* of perception and a *perceived entity* itself, consciousness is qualitatively very different from anything else we know. We might say awareness is aware of itself and, as such, could be a fundamental element of the universe. Can we then dismiss it as just an emergent property of matter or a mere epiphenomenon arising out of computational processes in our brain?

An abundant number of very eminent scientists have considered consciousness to be indeed fundamental. None other than the godfather of quantum theory, Max Planck (1931: 199) declared, "I regard consciousness as fundamental. I regard matter as derivative from consciousness". The quantum pioneer Erwin Schrödinger (1964) is more explicit in emphasizing that "Consciousness cannot be accounted for in physical terms. For consciousness is absolutely fundamental. It cannot be accounted for in terms of anything else". Schrödinger also found the potential existence of a cosmic awareness and its probable close relationship to our awareness very compelling. He forcefully pointed out the universal nature of consciousness of all human beings in asserting "… inconceivable as it seems to ordinary reason, you—and all other conscious beings as such—are all in all" (Schrödinger 1964: 21). The celebrated neurologist Karl Pribram believes that our individual conscious experience partakes of a larger consciousness.

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*, DOI 10.1007/978-81-322-1587-5_18, © Springer India 2014

The conscious human mind's uncanny ability to understand the laws of nature has presented many legendary scientists with a mystery. Einstein expressed it lucidly when he said, "The most incomprehensible fact about nature is that it is comprehensible". Distinguished mathematician Sir Roger Penrose is bemused by the fact that the universe has developed in obedience to the laws that our consciousness seems designed to grasp. Nobel Laureate Eugene Wigner (1960) referred to the double miracle of the existence of the laws of nature and the human mind's capacity to divine them. Scientists have recently warmed up to what is known as the anthropic principle that would provide a means for bridging these two miracles. A corollary of this principle suggests that the conditions were such at the moment of the inception of our universe as to presage the eventual emergence of intelligent beings like ourselves.

At its beginning, the entire universe was much smaller than an atom and, therefore, subject to the laws of quantum physics. Accordingly, our universe could have begun in many possible ways. If the anthropic principle is factored in, the evolution of conscious beings would be a necessary condition for the beginning of our universe. One of the thoughtful scientists of our time, John Wheeler (1996), is even more emphatic. Based upon his extensive studies of quantum phenomena, he concluded that "In this sense it is incontrovertible that the observer is a participator in genesis". The eminent physicist Freeman Dyson (1979) also finds that "the universe in some sense must have known that we were coming". In other words, the potentiality of consciousness has been present in our universe from the beginning.

In spite of the keen interest and efforts of so many illustrious scientists, the study of the origin and the nature of existence of consciousness is still a scientific work in progress, looking for a breakthrough. Considerable advances have been made recently, particularly through neuroscience, in understanding how consciousness operates in terms of physical activity in the brain. We can see which areas of the brain "light up" when we explore a math problem and which light up when we see a pretty face. These studies tend to regard consciousness to be a result of neural correlates. But the so-called hard problem (Chalmers 1996) of consciousness stems from the fact that we have no clue as to how these physical brain functions give rise to a subjective conscious *experience*.

Physicist Henry Stapp contends that it would be difficult if not impossible "to provide a rational explanation how a physically described brain could produce something so completely unlike itself as a mental event". He insists that "the more rational science based approach to this problem should be based upon the empirically validated quantum mechanical conceptions that naturally incorporates mind, rather than upon the invalidated classical approximation that, as a matter of principle, leaves mind out".

A quality akin to awareness indeed seems natural in quantum phenomena. The legendary double-slit experiment using one electron at a time provides a landmark example. After its passage through a double slit, the electron elects a particular outcome from a range of possibilities when landing on a detector screen. The popular explanation for the appearance of the electron on the screen as a particle is that its wave function decoheres by entanglement with the environment, but this does not tell us why a particular outcome is chosen. Another electron going through the same process can pick out an unpredictable, different outcome. When enough electrons go through the double slit, each one successively picking out its own outcome for landing, a pattern evolves showing the range of possibilities for choice given by Born's rule, as shown in Fig. 18.1. Similar experiments have been performed using photons. The final pattern like Fig. 18.1e appears whether the photons are shot at the double slit all at once or one at a time randomly. This is a striking demonstration of the reality that the final pattern is independent of time spacing of the quantum particle, which would be incomprehensible in terms of classical physics. It strongly suggests there is an immutable underlying entity that is responsible for the ensuing performance.

Thus, a quantum particle, while emerging from the microscopic dimension to our macroscopic domain, acts more like an active agent than inert matter. It would then appear that mind, as manifested by the capacity to make choices, is to some extent inherent in every quantum particle. David Bohm and Basil Hiley (1995: 386) articulate this by their assertion, "It is thus implied that in some sense a rudimentary mind-like quality is present even at the level of particle physics, and that as we go to subtler levels, the mind-like quality becomes stronger and more developed". Freeman Dyson also finds it to be consistent with scientific evidence to think that atoms and humans and a "world-soul" may have minds that differ in degree *but not in kind*.

Consequently, while studies of brain functions are very important for understanding how consciousness works in individual beings, it will be instructive to explore the possibility of a primary cosmic awareness that may be the progenitor of consciousness, a source that evokes awareness in our brain utilizing its unique neural structure. A search for such a universal awareness naturally leads to the ultimate source of everything, which is the quantum vacuum and the quantum field theory (QFT) that deals with it.

18.2 Nature of Reality Portrayed by Quantum Field Theory

QFT has uncovered a fundamental nature of reality, which is radically different from our usual perception. Our customary daily world is very palpable and physical. But QFT asserts this is not the primary reality. The fundamental particles involved at the core of our daily physical reality are only secondary. They are excitations of their respective underlying *abstract* quantum fields, which constitute the primary reality. For example, a physical electron is the excitation of the abstract underlying electron quantum field. This holds for all the fundamental particles, be a boson or a fermion. Thus, QFT substantiates the profoundly counterintuitive departure from our normal perception of reality to reveal that the foundation of our tangible physical world is something totally abstract!

How do we know these abstract quantum fields really exist? Since a quantum system has to be disturbed to observe it, we normally look for their evidence

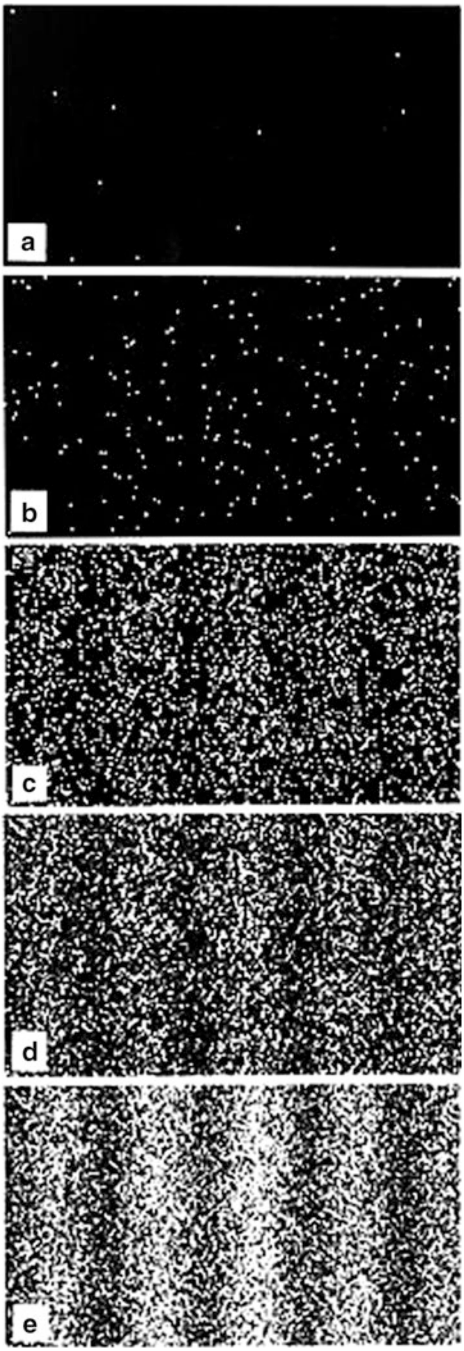

Fig. 18.1 The results of a double-slit experiment performed by Dr. Tanamura using one electron at a time. Images **a** through **e** depict collection of gradually increasing number of electrons on the screen. Numbers of electrons are 10 (**a**), 200 (**b**), 6000 (**c**), 40000 (**d**), 140000 (**e**). Similar results are obtained using a single photon at a time (Source: Wikimedia Commons to Wikipedia: http://en.wikipedia.org/wiki/File:Double-slit_experiment_results_Tanamura_2.jpg)

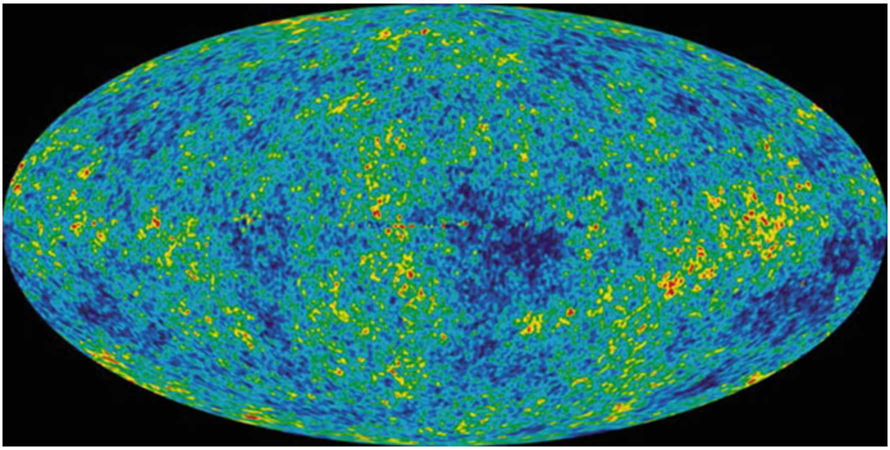

Fig. 18.2 The picture shows the minute temperature inhomogeneities, about 1 part in 100,000, in the cosmic background radiation observed by the WMAP satellite. These inhomogeneities owe their origin to the fluctuations of the quantum field and now believed to provide seeds for forming galaxies, galactic clusters and super clusters

indirectly through their effects such as Casimir effect, Lamb Shift and a host of other phenomena. However, in recent times, a graphic demonstration of their existence seems to have been provided by nature itself in the way of minute temperature inhomogeneities in cosmic microwave background radiation (CMBR) shown in Fig. 18.2. It is now believed that these inhomogeneities in CMBR owe their origin to fluctuations of quantum fields manifesting as wrinkles in spacetime, blown up from their microscopic existence to macroscopic dimensions by a sudden explosive expansion of space in the very early universe, known as inflation. This exceptional depiction is considered to provide compelling evidence of the existence of the abstract quantum fields, in addition to other substantial affirmations of QFT.

By far, the most phenomenal step forward made by QFT is the stunning discovery that the primary source of *everything* in this universe is present in *each element of spacetime*. The quantum fields exist as perturbations of empty space that is otherwise devoid of *anything*, in other words, known as the vacuum. But unlike classical fields, they do not have a particular fixed value, not even zero. According to Heisenberg's uncertainty principle, the quantum fields must always fluctuate. As a result, what was once thought to be desolate empty space is now known as the quantum vacuum, teeming with acts of creation and annihilation of virtual particles by quantum fields and harbouring the source of at least everything physical in each stitch of its fabric throughout this immensely vast universe. In light of this discovery, and the accompanying realization that quantum systems seem to exhibit behaviour akin to awareness, it is incumbent upon us to explore whether or not the source of awareness could also be present in the quantum vacuum.

18.3 Self-Referral of the Immutable Quantum Fields

We know from experimental evidence that the vacuum quantum fields are alive with activity, which has the unique property of being completely spontaneous and unpredictable as to exactly when a particular event will occur cannot be predicted. This is just the slow motion description of events. In actuality, the fields are fluctuating in this manner at mind-boggling speeds with a typical time period of 10^{-24} s or less. In spite of these infinitely dynamic, wild fluctuations, the fields have remained, on an average, *exactly* the same essentially since the beginning of time and throughout the entire universe containing regions, which are too far apart to have any communication even with the speed of light.

While all else in the universe has changed drastically since its beginning, the quantum fields have remained the same across the universe and in each element of spacetime. As seemingly indicated by string theory, when space expands, elements of space actually clone themselves. The cloned elements of space will likely come with their own entire contingent of vacuum fields as well, which would facilitate keeping the value from diminishing during the expansion of space.

According to Narnhofer and Thirring (2012), in quantum field theory, almost everything is entangled. This would be true at least at fundamental dimensions as well as for atomic scales until decoherence by entanglement with the environment takes precedence. As a consequence, the fluctuations of the fields in each element of spacetime are expected to be coherent. Then all the fluctuations of the fields could be coherent throughout the universe by mesoscopic quantum entanglement (Narnhofer and Thirring 2002). *The most intriguing question is what keeps the immutability of the fields intact in each element to begin with*. Does it not suggest the existence of some sort of self-referral scheme that is responsible for maintaining the fidelity of the quantum fields in spite of their frenetic fluctuations, their prodigious dynamism, their spontaneity and unpredictability?

Such a self-referral is an inherent feature of the strongly self-interacting dynamics of the non-Abelian fields. For example, the non-Abelian gluon field strongly responds to its own presence. The electromagnetic fields, at ordinary dimensions, are not known to have significant self-interaction, but the unified electroweak field is non-Abelian. Since the electromagnetic field is an essential component of the electroweak field and their fluctuations are expected to be coherent,[1] the self-interaction of the electroweak field can be imparted to the vacuum fluctuations of the electromagnetic field through quantum entanglement.[2]

The electroweak unification is firmly established theoretically as well as experimentally near 200 Gev, or equivalently, at distances shorter than about 10^{-16} cm. The unification of two such diverse forces has broken the barrier that existed in the mind of the physicists to the unification of all the forces. Most physicists will now agree with physics Nobel Laureate Frank Wilczek (2008) who states, "Nature

[1]Professor Frank Wilczek, private communication by email, 3 July 2011.

[2]Professor Walter Thirring, private communication by email.

seems to be hinting that a unified theory of the fundamental forces is possible". Some promising grand unification theories (GUT) has been constructed that unite the strong and weak nuclear fields with the electromagnetic field.

Observation of neutrino oscillations is considered to provide considerable support to GUTs. Experiments are underway to observe the proton decay that is expected to provide convincing support to such unification. However, the most compelling substantiation comes at this time from the fact that when we extend our laboratory measurements of the strengths of the various forces, they approach parity near Planck's dimensions. According to Frank Wilczek (1999), "From its much inferior strength at accessible energies, gravity ascends to equality with the other interactions at roughly the Planck scale … Even in the absence of a detailed theory we find here a concrete, semi-quantitative indication that all of the basic forces arise from a common source". In addition to the basic forces, the common source is also envisioned to include unification of bosons and fermions facilitated by the presumed existence of super symmetry.

The non-Abelian self-interaction feature of the fields would be much more pronounced at fundamentally shorter distances, where gradually increasing unification of the fields is expected to occur as represented in Fig. 18.3. The robust self-interacting feature resulting from unification near Planck's dimensions can be imparted to ambient dimensions because of quantum entanglement of the fluctuations in each spacetime element. According to Walter Thirring[3], in general, if B and C represent two strongly bound fundamental particles and A is a test particle, then Bell's inequality tells us that the entanglement of A with the complex of B and C is more than the entanglement of A with B plus that of A with C. Applying this for coherent fluctuations of two strongly self-interacting quantum fields B and C near Planck's dimensions, the entanglement of fluctuations of a quantum field A at ambient dimensions with the complex B and C would be more than the entanglement of A with B plus A with C. In other words, the highly self-interacting dynamics of the expected common source near Planck's dimension being *quantum entangled* with the fluctuations of *all* the quantum fields at ordinary dimensions, the strong self-interaction, can be passed on to conventional dimensions. This appears to be a cogent mechanism for how the immutability of the fields can be ensured for all times in spite of their wild fluctuations.

In light of the possibility that the robust self-referral of the Planck scale can be imparted to ordinary dimensions by the entanglement of quantum fluctuations of all fields in a spacetime element, it is suggestive to seek an explanation of the bizarre behaviour of quantum particles. A fundamental particle like a photon or an electron represents a propagating excited state of their respective underlying quantum fields. Since the propagating states also contain vacuum fluctuations, a fundamental particle would be subjected to vacuum fluctuations along with their attendant self-referral imparted by means of entanglement from the Planck scale, thus making the particle cognizant of its quantum activities. Could this be the

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[3]Professor Walter Thirring, private communication by email.

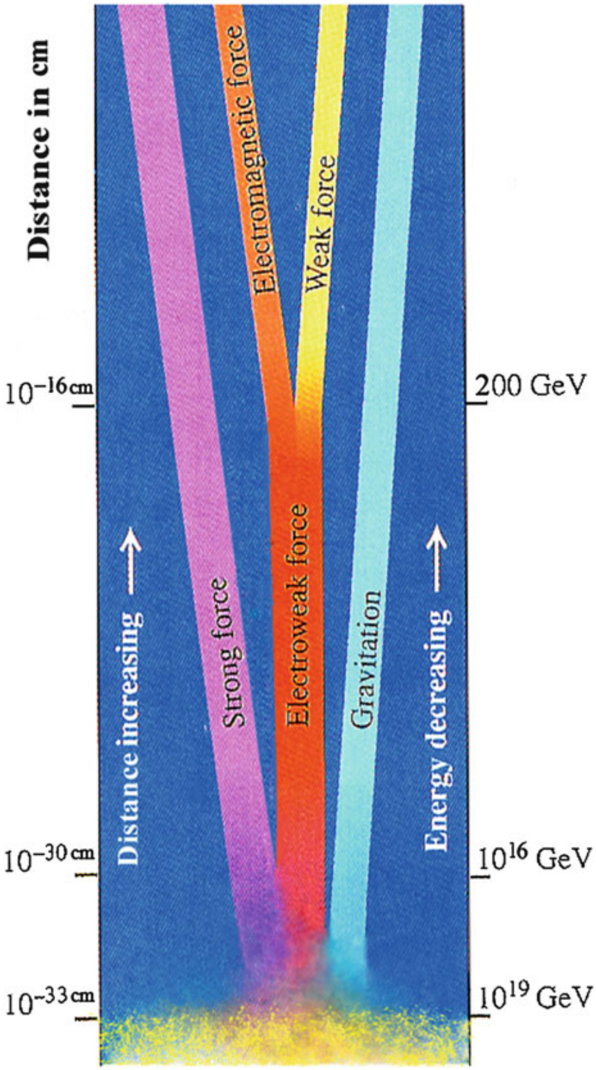

Fig. 18.3 A conceptual diagram showing how the various force fields gradually unite at very high energies, or equivalently, at fundamentally short distances. The super unification of all the force fields as well as the matter fields is presumed to occur near the Planck dimension, aided by super symmetry (Source: Drawing created by the author.)

reason why a quantum particle behaves as an active agent when emerging from the microscopic dimension to land on the screen as shown in the double-slit experiment?

An affirmation of this notion may be found in the "quantum potential" propounded and extensively studied by David Bohm and Basil Hiley using noncommutative geometry and other mathematical edifices. They isolated a part of the Schrödinger equation, which they call the quantum potential that is necessary for conservation of energy of both sides of the equation. Most surprisingly, the energy of the quantum potential does not fall off with distance, a discovery that is presumed to have inspired the concept of quantum non-locality. Hiley maintains further that the quantum potential represents an internal energy with "features akin to a self-organizing potential" indicative of nonseparability as well as participation. Such attributes could originate from the strong self-referral of the vacuum fluctuations conveyed from the Planck scale by quantum entanglement. Also, the internal energy of the quantum potential will remain the same since the values of the quantum fields are same everywhere.

18.4 Source of Universal Awareness

As a consequence of self-interaction, a non-Abelian field responds dynamically to its own presence. This attribute of self-interaction, self-coupling, self-organization or self-referral is also the hallmark of awareness. One could argue that likening awareness to a quantum field responding to its own presence is a bit of a reach. However, the qualitative comparison can be justified if we ponder the fact that physicists really do not know what energy is, much less the far more abstract nature of a quantum field.

When we encounter such a counterintuitive possibility, we sometimes characterize it as incredulous. Eventually, however, we are compelled to yield to a new model, often in spite of our initial disbelief. Such was the case with Newton's theory of gravity, proposing action at a distance without a material connection as well as Einstein's relativity where neither space nor time is absolute. Most of the time, the answer comes by changing the way we think about the question. We might eventually get used to the notion of quantum fields endowed with some form of self-awareness.

At this point it is worth considering a well-argued conjecture advanced by Roger Penrose. Observing the failure of countless attempts over nearly a century to resolve the mystery of the quantum measurement problem, Penrose forcefully argues for the existence of an as yet undiscovered physical process embedded in primary reality that is responsible for the "weird" behaviour of quantum particles. Along with John Wheeler, Penrose also contends that the mysteries of such quantum behaviour and our consciousness are linked. Since quantum properties are part of the fundamental nature of the entire universe, the link would suggest awareness to be an essential aspect of the universe as well. Penrose proposes that our brains have somehow contrived to harness this as yet undiscovered attribute of nature to evoke our own awareness. It would be plausible to consider this unknown attribute to be the awareness aspect that is apparently associated with the quantum fields for keeping their immutability for all times in spite of their fierce fluctuations.

18.5 Complementarity of Existence of Consciousness

Quantum physics has compelled us to accept that two distinct and seemingly contradictory elements of reality can coexist in a complementary way. This represents not merely a paradigm shift in science, but a paradigm shift in thought, and paves the way for us to consider the possibility that the "immaterial" source of what we call awareness could be inseparably entwined with material reality, as exemplified by the self-referral of the quantum fields, which are also the source of everything physical.

Thus, it is credibly indicative that the source of all things physical as well as the attribute of awareness is present in the quantum vacuum in a complementary fashion throughout the universe. It then follows that this cosmic awareness would be a likely origin of our own consciousness, perhaps through some process like resonance or entanglement occurring in our brains.

Penrose and Stuart Hameroff have given a detailed description of the build-up of some large-scale quantum coherence, acting broadly across considerable regions of the brain. It would be only natural for this quantum coherence of the brain to be in accord with the coherence of the universal quantum fields. The awareness inherent universally with the quantum fields can be harnessed by the brain when an objective reduction takes place in its coherent wave function. Penrose and Hameroff offer a logical scheme whereby the concept that our awareness originates from a cosmic awareness, as envisioned by perceptive scholars like Schrödinger, can be anchored in science.

Acknowledgement The author wishes to thank Professor Walter Thirring for many helpful discussions.

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Chapter 19
Cosmological Considerations Relevant to the Origin of Consciousness

Ramanath Cowsik

19.1 Perspectives on Consciousness

The concept of consciousness is elusive and escapes precise definition: In the days of yore mystics and sages, having seen the mesmerizing scene of the mountains and forests reflected in the still mountain lake and noting the almost indistinguishable similarity of the object and the image and then having contemplated deeply on such similarities have remarked that consciousness was a mirror in which reality is reflected. Even though momentarily they were so enraptured and became part of the scene, they were aware at the same time of a distinction between the observer and the observed object. Adi Shankara,[1] the hidden Buddha and philosopher of the 8th century, professed that consciousness is the substratum on which the dynamics of reality are manifest. These preceding remarks are made to point out that the nature of consciousness has been a matter of study for a very long time and to capture some of the essential characteristics of consciousness.

Thus, a sense of the inner self and a distinction between the observer and the observed or, more broadly, the cognition of subject-object and self-non-self distinction seem to characterize consciousness. Occasionally, the imaginary dialogues within one's own mind are stated as one of its characteristics. Since one's own being is also part of reality, Shankara and other philosophers have advanced the thesis that there is an essential underlying unity and that all the duality that we see, like self and nonself distinctions, are akin to ripples on the surface of consciousness.

[1] Adi Shankara, see, e.g. Wikipedia.org/wiki/Adi_Shankara and references therein.

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*,
DOI 10.1007/978-81-322-1587-5_19,

Whether consciousness is an attribute of anything other than humans, that is, even of animals, insects, bacteria, viruses and nonliving entities with progressively lower levels of expression, is much debated upon.

What are we to make of this bewildering diversity of ideas? To me it appears that along with the underlying unity, as noted by Shankara (and by Feynman [see Krauss 2011] in the context of elementary particles being identical in all bodies), there is also present an essential self and nonself discrimination. For example, when a bacterium enters a living animal, it is immediately recognized as a foreign nonself and armies of antibodies[2] are created which destroy it so that the animal survives decay, unlike a dead animal. Similarly, a thorn in the flesh of an animal causes sepsis and is ejected; on the other hand, a skewer in a piece of dead meat causes no such reaction. Furthermore, consciousness imposes a meaningful relationship or order among the external objects or concatenates them into meaningful sequence. For example, a conscious being may observe a set of external objects like a forest, a river, the ground, fire, water, etc. Consciousness is capable of collating them into "There is a blazing forest fire. I must run a 100 yards across the ground and reach the waters of the river to protect myself".

After this discursive review of the nature of consciousness, to proceed further we must extract from it some of its essential aspects, which may serve as a working definition. At a minimum, consciousness establishes a relationship among the objects that are around and, based on priors, generates ability to appropriately respond to stimuli generated by them. Thus, in order that a system exhibit the property of consciousness, it should have the power to perceive, organize and store perceptions as priors to generate the appropriate response to new stimuli. The rest of this essay is devoted to an exploration of the tenets of physics in order to delineate the constraints they place on the system that exhibits the property of consciousness and to find within the modern cosmological scenario the epochs and regions where the conditions conducive to its birth and growth were first established and are present even today for its exuberant manifestation.

But we might ask, what has physics to do with consciousness? The study of consciousness today is the realm of neuroscientists, biologists, philosophers and mystics. On the other hand, physics exposes the realm of what is possible and demarcate it, in a concise way, from what is not possible. The Nobel prize-winning physicist Murray Gell-Mann once remarked half jokingly that what is not forbidden (by the laws of physics) is compulsory! Therefore, without further apology, I will present a physicist's view on: what the conditions necessary for the manifestation and growth of consciousness are and when and where we might find such conditions in our universe. However, one apology is certainly due: I will not be making formal references to the extensive work carried out on the subject of consciousness, which indeed has a long history and is a vibrant field of investigation today. For one, I am not an expert on these developments. Also, the ideas I wish to present are still in their nascent state and as such will be best understood in their relative isolation.

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[2]See, for example, Wikipedia.org/wiki/Antibody

19.2 Concepts in Physics Relevant to the Study of Consciousness

The ideas of physics that we wish to draw upon date back to Newton and have been in continuous development over the past three centuries. They begin with the ideas pertaining to heat, which was recognized by Newton as a form of energy and developed by the end of the 19th century into an elegant self-consistent body of knowledge called thermodynamics (and the kinetic theory of gases) (Porter 1951; Prigogene 1961; Dugdale 1996; Thess 2011). This appeared to be a watershed until around the beginning of the 20th century several discoveries were made that opened up the flood gates of physics. These were the discoveries of X-rays, radioactivity and cosmic rays on the one hand and those of quantum mechanics, special and general relativity on the other which triggered the birth of modern physics. Great strides were also made in observational astronomy. These discoveries triggered the growth of physics and new discoveries came at an ever-increasing speed so that today we have a comprehensive view about the physical world encompassing the very nature of subatomic particles and the whole universe in one consistent picture. It may therefore appear daunting at first to marshal all these ideas to bear on the question of the origins and growth of consciousness. This fear is allayed when we note that the ideas of physics are very simply stated and may be understood intuitively even though it may at times be difficult to follow the long concatenation of analytical steps that are necessary for a physicist to arrive at a specific conclusion. Let us take the plunge.

Among the ideas of physics that we need, those of thermodynamics were the earliest to be developed and are of the greatest importance. These are just four laws:

Zeroth law: Two bodies in thermodynamic equilibrium with a third body are in thermodynamic equilibrium with each other.

This just means that if you dip a ladle into a cauldron of hot water, it will reach the temperature of the water. A second ladle will do the same and the two ladles will be at the same temperature.

First law: Energy is conserved.

If you do work on a system, this energy will distribute itself among all the molecules and will show up as an increase in the temperature of the body and an increase in other forms of energy.

Second law: The *entropy* of isolated systems (i.e. with no energy inflow or outflow) will have a tendency to increase.

Here I have introduced a new word: *entropy*. Before defining this word, we may note the consequences of the second law: When two bodies are brought together and kept insulated, heat flows from the hotter body to the colder one. In this process, we may extract some useful work. On the other hand, we have to do work to transfer heat from a cold body to a body at a higher temperature, for example, we need to supply power to run an air conditioner or a refrigerator. Entropy is defined as the degree of disorder in systems and in thermodynamic equilibrium attains its maximum value. The Nobel prize-winning physicist Schrödinger (1944) pointed out years ago that life processes are distinct from random motions of molecules of a gas in that life is a well-ordered existence and this order is created by extracting work in transferring heat from the Sun to the surroundings of the Earth. In this, the photosynthetic process serves as an intermediary. In order to extract useful work, we need to have systems that are not in thermodynamic equilibrium (Thess 2011). We have dwelt on the second law in some detail, because it is crucial to the understanding of consciousness. I repeat – it requires work to create order, including the order that characterizes consciousness, and the power to generate such work requires a high temperature source not in thermodynamic equilibrium with the entities possessing the property of consciousness.[3] Where and when in this universe did such conditions obtain? Are there other signatures in the universe that point to the relevance of thermodynamic ideas for the physics of such large-scale phenomena? We now turn to address such cosmological questions.

The discovery of X-rays by Roentgen and radioactivity by Becquerel and the quantum ideas of Planck around the turn of the 20th century that heralded the birth of modern physics (Pais 1988) roughly coincided with other developments in physics and astronomy that over several decades led to establishing the basic tenets of modern cosmology. After nearly a century of effort, the standard model of cosmology is in place (Weinberg 1972; Peebles 1993). It started with the recognition that the solar system is located about two thirds away from the centre of a disc-like distribution of stars and gas, of radius $\sim$50,000 light years, called the Milky Way Galaxy. Our galaxy is one of more than 100 billion galaxies, and the whole system is expanding so that as viewed from any galaxy, including our own, the other galaxies would be receding. Such a recession is the cause of the "redshift" of the spectral lines, whereby the observed spectral lines from more distant galaxies are shifted further towards the red as compared to those from sources situated in our laboratories. The observation of the redshift of galaxies immediately led to the idea of an expanding universe, fitting naturally into the solutions to Einstein's equations of general relativity when applied to the universe as a whole. This solution of Einstein's equations invokes the cosmological principle which succinctly codifies the assumption that the universe is homogeneous and isotropic when averaged over large regions.

Let us for a moment imagine the conditions in the universe during earlier epochs. The galaxies will be closer to one another, and the universe will be in a more condensed state of higher density and higher temperature. This suggested the "Big Bang model" of cosmology which envisages the universe having originated in an extremely condensed state of temperature so high that all matter would have evaporated, the nuclei would all have disintegrated, and even the fundamental particles like protons would have dissolved into some primitive fields. At those high temperatures and densities, all processes would proceed very rapidly, populating the

[3]For completeness, note that the "third law" of thermodynamics states that at 0 K (absolute zero temperature on the Kelvin scale), all systems reach their minimum energy level.

universe with particles and antiparticles in equal numbers. Statistical mechanics, a modern offspring of thermodynamics, allows us to calculate such particle densities, which tells us that particles and antiparticles would have equal densities as long as thermodynamics is valid. The Saha equation (Saha 1920) allows us to follow these particle populations through the evolution of the universe as it cools down to its present state (Fig. 19.1 and Table 19.1). This yields the startling result that almost all the matter and antimatter will annihilate each other and we will be left with a universe that contains neither matter nor antimatter at levels needed to make the stars and galaxies. In fact, the surviving fraction is less than one part in a billion of what is seen in the universe. A way out of this difficulty was suggested by Sakharov (1967), who suggested three conditions that are to be met to generate matter in this universe:

1. The evolution of the universe at some very early epoch was so rapid (compared with the rates of reactions) that thermodynamic equilibrium could not be established for a short period of time.
2. Matter–antimatter symmetry is also to be broken.
3. Matter should decay, for that which can be created can also be destroyed.

The following quotation from an early discourse on philosophy in Sanskrit captures succinctly the spirit of the third requirement:

"*Jatasya hi dhruvomrtyuh, dhruvam janma mrtasya ca*"[4]

Recent developments in the theory of particles and fields have been able to implement Sakharov's suggestion to generate the requisite amount of matter in the universe. This underscores the point that, when systems are in thermodynamic equilibrium, nothing of interest happens.

The second cosmological challenge is the formation of large-scale structures like stars and galaxies in the universe (Padmanabhan 1993; Longair 2008). Using the classical ideas, we expect the primordial density distribution in the universe to be highly uniform and any fluctuations in density minuscule compared to those needed for the formation of galaxies and other such large-scale structures. Three aspects of new physics act together to cause the condensation of matter into galaxies:

1. Quantum mechanical effects in the very early universe induce fluctuations in the density of the primordial fields that are significantly larger than those expected on classical grounds.
2. The effects of gravity, which is a long-range force that was neglected in the development of thermodynamics, play a significant role in the growth of these fluctuations in the expanding universe to generate the structures we see today.
3. The particles of dark matter also created in the early universe, being electrically neutral, do not interact with radiation. Accordingly, they start the condensation process and the increased gravity of dark matter pulls the normal particles into their cores.

[4] *Bhagavad Gita*, ch. 2, v. 27.

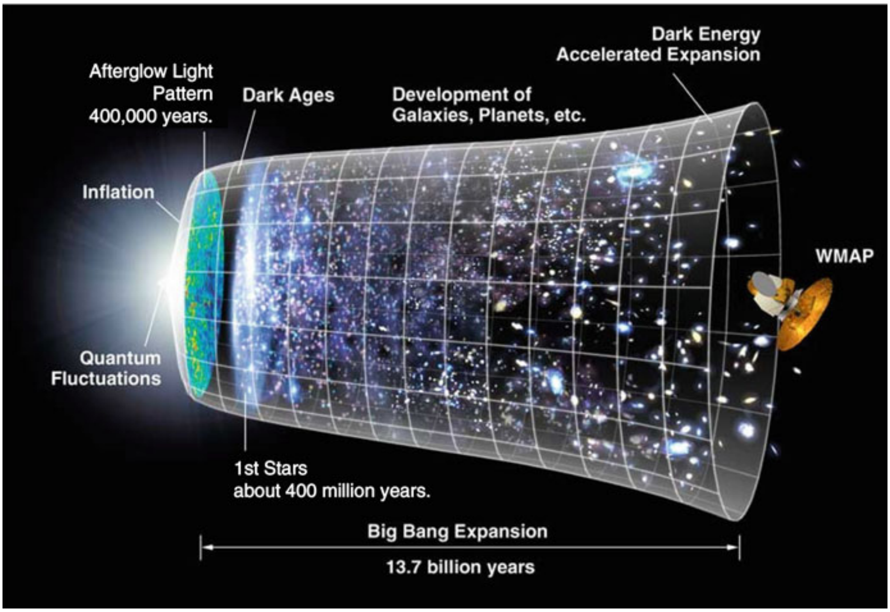

Fig. 19.1 The evolution of the universe from the time of its birth ∼13.7 billion years until the present epoch is captured beautifully in this figure developed by the NASA-WMAP team (Science 1). In the first nanosecond after its birth, the universe created a huge amount of space by a process called inflation, followed by creation of matter in a process that violated baryon number conservation and at a time when the universe expanded so rapidly that thermodynamic equilibrium could not be established. The dark matter was created when the universe was about one microsecond old. When the universe was about 3 min old, about one quarter of the matter was fused to form helium nuclei and the rest remained as protons, the nucleus of the hydrogen atom. The radiations in the universe progressively cooled down and their dominance ended after about 400,000 years. Then there was a long period called the dark ages, lasting ∼400 million years, when there were no stars. But the dark matter was progressively coalescing under self-gravity into clouds and pulling the matter into its cores. When sufficient matter was thus accumulated, it condensed into very massive stars, shining more than a million times brighter than the stars we see in the firmament today. This was the "Cosmic Dawn" that ended the dark ages. This was the very first time from the beginning of the universe that there were sources much hotter than their surroundings, opening up the possibility of useful work being done by transferring heat from these stars to lower temperature regions, which filled the rest of the universe. Moreover, these stars synthesized heavier elements like carbon, nitrogen, oxygen, etc., so very necessary for building molecules of ever-increasing size and complexity that form the essential building blocks of life. This is perhaps the first time in the universe when life and consciousness could have had their origins or grown significantly. Today, after 13 billion years, since the Cosmic Dawn, stars like the Sun in billions of galaxies are capable of supporting growth of life and consciousness

As a consequence of all this, the very first stars formed in the universe some 400 million years after its birth. By the time the universe had evolved to this epoch, the fiery hot radiation that was present in the very early phases would have cooled down to the terahertz domain and the universe would have been dark. The birth of these massive stars changed all that; they were extremely bright, a 1,000 times

Table 19.1 Contents of the present-day universe

Microwave radiation	$(T = 2 \cdot 73\ \mathrm{K})\ \rho_{\mathrm{R}} = 10^{-33}\mathrm{g\ cm^{-3}}\ \Omega_{\mathrm{R}} \approx 10^{-4}$
Atoms	$\rho_{\mathrm{m}} \approx 4 \cdot 10^{-31}\ \mathrm{g\ cm^{-3}}\ \Omega_{\mathrm{m}} \approx 0.004$
Dark matter	$\rho_{\mathrm{DM}} \approx 2 \cdot 2 \times 10^{-30}\ \mathrm{g\ cm^{-3}}\ \Omega_{\mathrm{DM}} \approx 0.22$
Dark energy (now)	$\rho_{\mathrm{DE}} \approx 7 \cdot 4 \times 10^{-30}\ \Omega_{\mathrm{DE}} \approx 0.74$

Note: The universe today contains microwave radiation at $2 \cdot 7$ K, normal matter of about 4 % of the critical mass, dark energy about 22 % of the critical mass and 72 % dark energy which dominates the gravitational dynamics of the universe today. However, as we look at the past epochs, all these forms of energy increase except dark energy. Accordingly, for the first few hundred thousand years, the universe is radiation dominated; then it is dominated by matter and dark matter for the next ten billion years, and it is only in the recent couple of billion years that it is dominated by dark energy

brighter than any in the sky today and thus ended the dark ages in the evolution of the universe. This epoch is poetically called the "Cosmic Dawn" (Cowen 2013), as this was the first light to shine during the evolution of the universe.

This was a crucial event of tremendous significance:

The "Cosmic Dawn" was crucial for the origin of life and consciousness in several ways. This was the first time we had a source of power at a higher temperature than the rest of the universe, which opened up the possibility of extracting work by transferring heat from this hot source to cooler spaces. Equally important is the fact that these massive stars synthesized heavier elements like carbon, nitrogen, oxygen, sulphur, silicon, iron and indeed all the heavy elements through fusion reactions in their cores and dispersed them through violent explosions. These elements are the building blocks for making molecules of increasing complexity, including those that are needed to make up living systems. Thus, we had at hand not only a source of exploitable power but also the necessary ingredients for building up systems that could harness this power for life's functions and for the manifestation of consciousness.

As the universe evolved, the effects of gravity of the dark matter particles created the beautifully expressed elliptical or spiral forms of the galaxies, which thus find themselves embedded in the clouds of dark matter. When galaxies formed, allowing further generations of stars to form within them, literally billions of places in the universe were created where life and consciousness could evolve. These later generations of stars condensed from interstellar clouds of gas which had already been seeded by heavy elements. They burn much more slowly compared to the stars that brought forth the Cosmic Dawn. Furthermore, when these stars formed in the centres of the interstellar clouds of matter, there were minor condensations surrounding them, which were the planetary bodies orbiting the central stars. Thus, the opportunities for the growth of life and consciousness became almost unlimited in the regions surrounding the stars where the high temperature power source could be harvested to perform work by transferring heat energy from the stars to the cooler regions of the universe.

Thus, when viewed from a physicist's perspective, each of the following functionalities of consciousness that requires work to be performed was made possible, at least as far as the laws of thermodynamics were concerned:

(a) Cognition of external objects and interconnecting them in a meaningful way.
(b) Responding to external stimuli in a way dictated by priors, which were built up and stored effectively, collated from past experiences.
(c) Among these, developing the "you" and "non-you" (or "self" and "nonself") discrimination is the most important.

Sorting out, ordering and extracting the key elements from the information that is pouring in from the external world require work to be done, which is possible only when there is a source at a high temperature. For us on this Earth, the Sun serves as this source, and all activities concerned with life and consciousness are powered by it. In absorbing energy (heat) from it at high temperatures ∼6,000 K (Thess 2011) and reradiating it into space at much lower temperatures, sentient existence is made possible – a well-ordered set of molecules which impose order on the innumerable bits of stimuli entering their system and reducing them to a minimal information set. What with the growing understanding of the speed and efficacy of quantum computing, one should not be surprised if quantum computing plays a role in the manifestation of consciousness at a very fundamental or primitive level.

19.3 Summary and Conclusions

We have abstracted from various characteristics of consciousness the essential feature that consciousness imposes a well-defined order on the information or stimuli present in the environment and generates, on the basis of all the antecedents, an appropriate response in which the cognition of the "self" and "nonself" differences plays a crucial role. According to the tenets of physics, imposing any such order requires "work" to be performed. And, in order to be able to do "work" on a system, heat has to be transported from a "source" at high temperature to a "sink" at a lower temperature. When viewed as a whole, such a combination represents a system that is operating away from thermodynamic equilibrium.

Quantum mechanical fluctuations and long-range forces like gravitation lie outside the purview of thermodynamics and as such, these ideas are essential for understanding the origin of matter and the growth of large-scale structure in our universe. Accordingly, it was only 400 million years after the birth of the universe that the first stars came into existence, shining with great luminosity and brining about the "Cosmic Dawn", as well as synthesizing the elements, the building blocks of life. These very first stars, and those stars like the Sun that formed billions of years later on, provide the high temperature source that is essential for consciousness to manifest itself. The same conditions also apply for "life" to be initiated and sustained as well. This may not be a fortuitous coincidence but an essential symbiosis for their origins and evolution. Thus, we see that conditions propitious for the origin of consciousness were first created in the universe 13.3 billions of years ago, which we may take, for all practical purposes, to be from the very beginning of the universe.

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Chapter 20
Reality and Consciousness: Is Quantum Biology the Future of Life Sciences?

B.V. Sreekantan

20.1 Introduction

According to a famous Upanishadic episode going back several thousand years, a sage by name Uddalaka advised his son Shvetaketu, who had just begun his quest for esoteric knowledge, to learn from his master "That by knowing which he will know *Everything*".

This is precisely the challenge before modern science for the past several hundred years. "Everything" in science translates to "the universe", and in the attempts to understand the origin, contents and mechanisms of workings of the universe, science has realized that "as the island of knowledge increases, the shores of ignorance grow faster". In this awkward trend, however, the 20th century has been an exception. Though in this century the scientific knowledge increased enormously because of the technological developments, it has happened at the same time that it has been possible to converge on *that* which, in the opinion of many scientists, can lead to an understanding of the basic reality behind the inanimate part of the universe at least. The hope is that with the enormous developments taking place in life sciences, something similar will happen in the 21st century regarding the animate part too.

20.2 The Physical Universe: Quantum Vacuum

For a long time in the history of mankind, the knowledge of the so-called external world was confined to what could be observed or perceived with our senses—eyes, ears, nose, skin and tongue. This limitation drastically changed with the advent of

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*, DOI 10.1007/978-81-322-1587-5_20, © Springer India 2014

the microscopes and telescopes in the 16th century; in the 20th century, the addition of the accelerators and a variety of telescopes led to the realization that in addition to the world of everyday experience, there is the microworld of atoms, particles and high-energy radiations on the one side and the macroworld of planets, stars, clusters of stars, galaxies, clusters of galaxies, and esoteric objects like quasars, neutron stars, black holes etc. on the other. The 20th century brought in new disciplines like nuclear physics, high-energy physics and elementary particle physics on the one hand and opened up radio, infrared, UV, x-ray, gamma ray and cosmic ray astronomies on the other. The knowledge explosion was truly phenomenal and exponential.

As a precursor to these developments, the 19th century had left a rich legacy of new knowledge through the discovery of the electromagnetic waves, the radioactivity, x-rays, the electron and the proton. These, together with the anomalies in the spectral energy distribution of blackbody radiation, the existence of discrete spectral lines and the constancy of the velocity of light irrespective of the velocity of the source or the observer, had created serious problems to what had been regarded till then as eminently successful Newtonian classical dynamics and Maxwell's electromagnetic theories. It is in this context that drastically new theories in the form of quantum mechanics and special and general theories of relativity had to be brought in, which, apart from removing the cobwebs of 19th century, served the purpose of shedding new light on the spate of perplexing discoveries of the 20th century, many of which had baffled the scientific community. The 20th century started a new trend in scientific research—the close interaction between experimentalists and theorists and the unreserved and necessary utilization of the earlier developments in mathematics—tensors, group theory, etc., in the formulation of novel theories and most importantly recourse to bold interpretations that contradicted many times common sense, but got verified by experiments.

The quantum hypothesis introduced by Max Planck to explain the spectral behaviour of the blackbody radiation as a function of temperature, the explanation of the phenomenon of photoelectric effect by Einstein using the quantum hypothesis, Bohr's atomic theory following Rutherford's discovery of the nucleus through alpha-scattering, the formulation of the special theory of relativity to explain the constancy of the velocity of light and the derivation of the formal relation $E = Mc^2$ by Einstein establishing the equivalence of energy and mass are some of the highlights of the first decades of the 20th century. These had major consequences on the classical ideas of space, time and energy which had been the pillars on which the Newtonian dynamics had been built. The notion of absolute time and absolute space had to be given up. Space and time were fused in to a single concept space-time; rate of flow of time became dependent on the velocity of the moving frame of reference and elongated with respect to a stationary observer. Similarly, the spatial interval contracted with increasing velocity. Though these changes were negligible at small velocities, they became very important at high velocities, particularly as one approached the velocity of light.

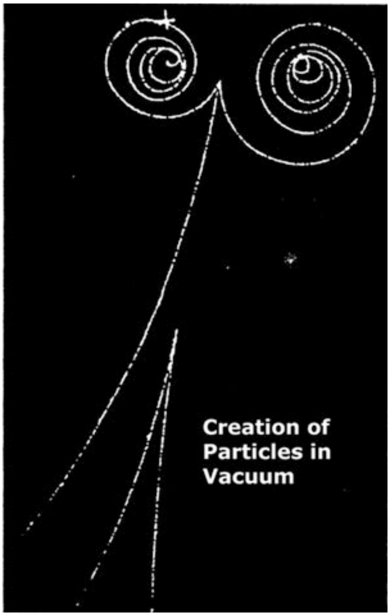

Fig. 20.1 Electron-positron pair production. A high-energy gamma ray coming in from above scatters off an atomic electron, losing some of its energy and producing an energetic recoil electron and an electron-positron pair. The electron and positron paths curve because the chamber is placed in a strong magnetic field. The direction of the curves reveals the signs of the particles' charges (Source:Close 2009)

In the 1930s and 1940s, several other surprising discoveries were made. Systematic studies of cosmic rays which were at the time a mysterious radiation coming from outside the Earth and outside the solar system revealed the presence of entirely new fundamental particles which were characterized by mass intermediate between the proton and the electron but which were extremely unstable and lived for very short intervals of time. In this search for particles in cosmic rays at mountain altitudes and sea level, the first antiparticle of the electron called the "positron" was discovered. This was a major triumph for the relativistic quantum theory of the electron formulated by Dirac, which had predicted the possibility of such a particle. Dirac's prediction of the positron is a supreme example of how bold and unconventional approaches are necessary for scientific advancement. The solutions to the Dirac's relativistic equation for the electron gave both positive and negative energy solutions. The safe practice among physicists till then was to ignore the negative energy solutions since they did not make physical sense and consider only the positive energy solutions. Dirac did not do that. He thought of an alternative, ingenious way of interpreting the negative energy solutions. This was the first occasion when attention of physicists was focused on the possible properties of "vacuum" or "empty space". Dirac said empty space is not empty, but is filled with all the negative energy states of the electron predicted by his theory. When energy is pumped into a small region of space, then one of the negative-energy-state electrons jumps into a positive energy state, and the vacancy that is left by the jumped electron will create a "hole" in the negative energy states and will be equivalent to the positron or the antiparticle of the electron. Figure 20.1 shows the creation of an electron-positron pair by a cosmic ray-produced gamma ray in conformity with Dirac's prediction. The possibility of spontaneous creation of virtual electron-positron pairs subject to Heisenberg's uncertainty relation also became evident.

Following the discovery of the positron, another major discovery was made in 1935 of yet another particle, which turned out to be the penetrating component of cosmic radiation; this particle was given the name mu-meson and was the first unstable particle to be detected with a lifetime of just two microseconds. Thanks to the relativistic elongation of time, the mu-meson could live long enough to travel almost the entire atmosphere and even go through several kilometres underground depending on its energy. It behaved like an electron except for its mass and was thoroughly unexpected at that point of time, so much so one of the Nobel laureates I.I. Rabi said, "who ordered the mu-meson?" The mu-meson did not fit into the theoretical prediction of Yukawa who had proposed a particle that should serve as the exchange force particle that mediated the strong interactions to keep the protons and neutrons bound in the nucleus of atoms. This anomaly of an unwanted particle was solved in 1947 by the discovery of yet another particle, the pi-meson which decayed into a mu-meson and a neutrino in $\sim 10^{-8}$ s. The pi-meson was just the particle that Yukawa had proposed. Subsequent to the discovery of the pi-meson, a host of other particles—K-mesons, hyperons, etc. (see Table 20.1)—were discovered in cosmic radiation. The era of particle physics had dawned. Soon it became clear that these new particles which were picked up as isolated stray particles in the lower atmosphere were actually produced in the collisions of primary cosmic rays coming from outside, with air nuclei of the earth's atmosphere. One such high-energy nuclear collision event recorded in a nuclear emulsion plate in which a large number of secondaries were produced is shown in Fig. 20.2.

The question arises: where were all these secondary particles before collision and how were they brought forth into physical existence?

The production of a large number of secondaries in collision is again another example of the role of quantum mechanical vacuum in the creation of something new that did not exist before in the form seen. The scenario though not visible is as follows:

According to current ideas, the proton (neutron) consists of three elementary particles called quarks held together by the nuclear force particles called gluons. These forces are very strong and operate essentially within a sphere of radius less than 10^{-17} cms and have the property that they become stronger with larger distance between the quarks with the net result that the quarks cannot escape as free particles from within the protons or neutrons. According to the Standard Model of particle physics, all the particles that have been discovered so for nucleons, mesons, hyperons, etc., can be classified under two categories: the hadrons which are strongly interacting particles and the leptons which are weakly interacting (Fig. 20.3). All the particles have an additional property called spin which can have zero, integral or half integral values of $\hbar$, the Planck constant. The value of spin plays an extremely important role in determining the statistical properties of the assembly of particles. Spin is a purely quantum mechanical feature that had not been recognized in classical physics.

Table 20.1 Properties of elementary particles discovered in cosmic ray 1930–1955 (some of the properties listed—spin, lifetime, antiparticle and decay modes—were determined later in accelerator experiments)

Name of particle	Symbol	Strangeness number	Anti particle symbol	Anti particle strangeness number	Mass in terms of m_e	Spin	Change	Life time in seconds	Decay modes
Positron	e^+	0	e^-	0	1	1/2	1	–	–
Muon	μ^-	0	$\mu+$	0	207	1/2	1	2.2×10^{6}	$(e^- \nu_\mu\ \nu_e)$
Pion	π^-	0	π^+	0	273	0	−1	2.6×10^{-8}	$(\mu^- \nu\ \mu)$
	π^0	0	π^0	0	261	0	0	8.0×10^{-17}	$(\gamma\ \gamma)$
Kaon	K^+	+1	K^-	−1	966	0	+1	1.2×10^{-8}	$(\pi^+\pi^0)$, $(\mu^+\nu_\mu)$, $(e^+\pi^0\nu_e)$
	K^0	+1	$\overline{K}_0$	−1	974	0	0	K_s: 9×10^{-11}	$(\pi^+\pi^-)$: $(\pi^0\pi^0)$
								K_L: 5.4×10^{-8}	$(\pi^0\pi^0\pi^0)$, $(\pi^0\pi^1\pi^-)$, $(\pi^-\ e^1\nu_e)$
λ-Hyperon	λ^0	−1	$\overline{\Lambda}_0$	+1	2,183	1/2	0	2.5×10^{-10}	$(P\ \pi^-)$, $(n\ \pi^0)$
Σ-Hyperon	Σ^-	−1	Σ^+	+1	2,328	1/2	+1	8.0×10^{-11}	$(p\ \pi^0)$
	Σ^0	−1	$\overline{\Sigma}^0$	+1	2,334	1/2	0	10^{-14}	$(\Lambda^0\gamma)$
	Σ^{-1}	−1	$\overline{\Sigma}^-$	+1	2,343	1/2	−1	1.5×10^{-10}	$(\eta\ \pi^-)$
Cascade	Ξ^0	−2	Ξ^0	+2	2,573	1/2	0	3.0×10^{-10}	$(\Lambda_0{}^0\ \pi^0)$
Hyperon	Ξ^-	−2	Ξ^{-1}	+2	2,586	1/2	−1	1.7×10^{-10}	$(\Lambda_0\pi^{-1})$

Source: Sreekantan (1998)

Fig. 20.2 A proton or a pi-meson collides with a silver or bromine nucleus of the emulsion and produces six high-energy secondaries and three heavy fragments (Source: Brown et al. 1949: 862)

According to quantum mechanics, each of these quarks, gluons and leptons have associated quantum fields which extend all over the universe. The square of the amplitude of the wave representing the field at any point determines the probability of finding the particle at that point.

If you consider a proton at some point, the probability amplitudes of the three quark waves are high within a sphere of radius $\approx 10^{-17}$ cms and the gluon wave probabilities are also high and the quarks are continuously exchanging the gluons. It is completely a dynamical situation of the various vacuum fields interacting with each other inside this extremely small volume. Naturally, as the proton moves, the corresponding amplitudes of the constituent quark and gluon waves have also to shift. Properties like mass, spin and charge of the proton are determined by the properties of these interactions and the geometrical properties of the space they form. Mathematically, these fields have certain symmetry properties, and according to a famous theorem of Emmy Noether, the symmetry properties are related to the conservation laws—some of these are the old classical physics laws like the conservation of mass, energy and momentum, but there are many new conservation laws that have been recognized which are obeyed by these particles in their interactions.

Originally, it was thought that the particles like the quarks and electrons would have an intrinsic mass associated with them from the time of their formation, similar to Newton's ideas of atoms as hard solid massy spheres. Such ideas of intrinsic mass introduced theoretical difficulties because of symmetry properties of the fields and it became necessary to introduce an additional field called the Higgs field and a new mechanism called Higgs mechanism for giving mass to particles. The

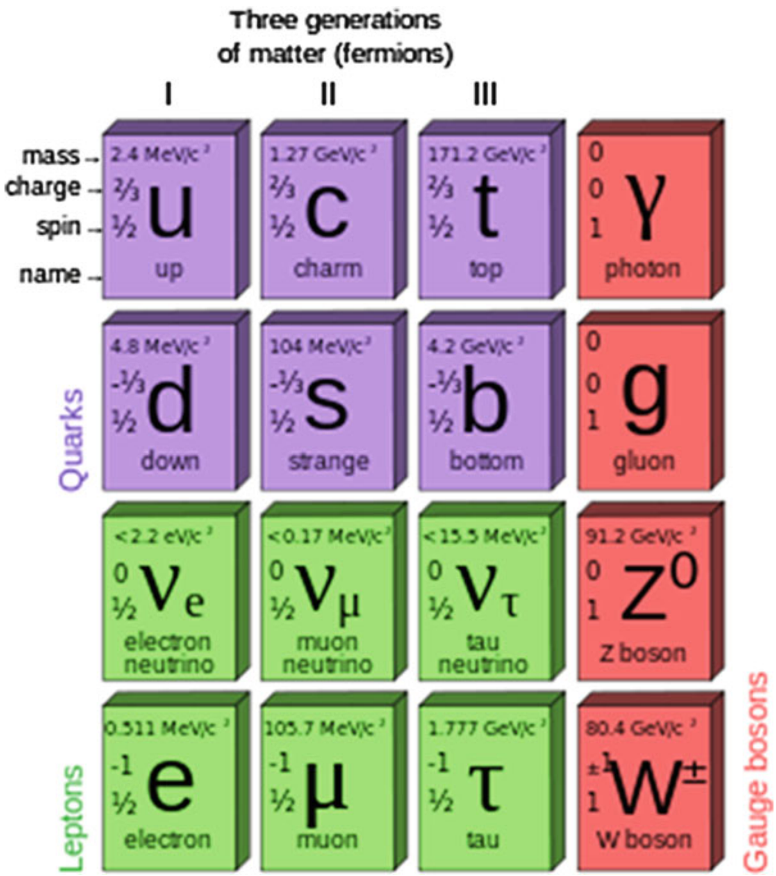

Fig. 20.3 The Standard Model of elementary particles, with gauge bosons in the rightmost column (Source: http://en.wikipedia.org/wiki/Standard_Model, accessed on 17 October 2012)

Higgs mechanism does not give mass in just one interaction. The particle has to be continuously interacting with the Higgs field wherever the particle moved, and therefore it was necessary that the Higgs field had to exist throughout the universe and would have to have a constant value for the particle mass to be invariant and the same everywhere.

The mass giver, Higgs field, also explains another very important feature of the forces of nature.

All the phenomena that are observed in the inanimate part of the universe, which is essentially the concern of physicists today, leaving the animate to biologists, are explained on the basis of four forces, namely, the gravitational force introduced by Newton, the electromagnetic force which is an amalgamation and unification of the electric and magnetic forces achieved by Maxwell, the spontaneous radioactive decay force or weak force and the strong force which is essentially responsible for

Table 20.2 The Standard Model of particle physics (known forces: bosons)

Force	Particle/quantum	Relative strength	Mass (GeV)	Range (m)
Strong nuclear	Gluon	1	0.14 (?)	10^{-15}
Electromagnetic	Photon	7×10^{-3}	None	Infinite
Weak nuclear	W^+, W^- and Z bosons	10^{-5}	80–90	10^{-17}
Gravitation	Graviton (tentative)	6×10^{-39}	None	Infinite

Table 20.3 Quarks (fermions)

Flavour	Generation	Mass (GeV)	Electric charge
Up	First	0.003	+2/3
Down	First	0.006	−1/3
Charm	Second	1.3	+2/3
Strange	Second	0.1	−1/3
Top	Third	175	+2/3
Bottom	Third	4.3	−1/3

the stability of the nuclear matter and also which plays an important role in nuclear interactions, namely, the quark-quark forces. According to current ideas, these four forces act through the exchange of force-carrier particles: gravitations in the case of gravitational force, photons in the case of electromagnetic force, intermediate vector bosons ($w^{\pm}$, z^{o}) in the case of weak forces and gluons in the case of strong forces. As can be seen from Tables 20.2 and 20.3, the strengths of these forces are very different and also the range over which they operate are also very different. The range of the forces is inversely proportional to the mass of the exchange particle. The gravitational and the electromagnetic forces have infinite range and the exchange particles gravitons and photons have no mass. On the contrary, the intermediate vector bosons have a very short range and have very high masses; they essentially act within the nucleon size of $\sim 10^{-17}$ cms. The same is true of quark-quark forces mediated by gluons which have no mass but as already pointed out the quark-quark forces behave differently and become stronger with distance of separation unlike the other forces. All this focuses attention on the fact that within the atom and within the nucleus and even within the proton or neutron, in the space which we thought previously as empty space where the particles could freely move about, is a region of intense activity of the various fields which are really the constituents of quantum vacuum.

Another extremely interesting development that took place in the 20$^{\text{th}}$ century, as higher and higher-energy accelerators became operational, was the discovery that at higher and higher energies as the particles are able to approach closer and closer, the strengths of the two forces—the weak and electromagnetic forces which had very different values at larger distances—start converging. This experimental result led to the idea of electroweak unification and subsequently to the idea of grand unification of all the forces—which implied that all the four different forces were one and the same at extremely short distances ($<10^{-15}$ cms). As we shall see in the next section, the happenings (in terms of particle and force creations) in these extremely small distance scales in the first moments of creation of the universe in the Big Bang cosmology determined the nature of the universe we are in. The Higgs field was also created then and expanded into the whole universe. It played a very important role in separating the single unified force into four different forces and these in turn were responsible for the wide variety of worldly and celestial objects and phenomena that we see in the universe today.

20.3 20th Century Developments in Astronomy, Astrophysics and Cosmology: Role of Quantum Vacuum

We will now discuss briefly those aspects of developments in astronomy, astrophysics and cosmology that have taken place in the 20th century and will focus attention on the role of quantum vacuum at various stages of the evolution of the material universe. With the advent of the two large 100″ and 200″ optical telescopes at Mount Wilson and Mount Palomar in California, the first major discovery was that the small patches of light that were observed, but could not be resolved with smaller telescopes, were actually very large extragalactic objects with hundreds of billions of stars in them. The second startling discovery made with a study of the red shifts of the light from these galaxies by spectroscopes was that they are receding at a rapid pace from each other and most interestingly the velocity of separation increased with larger and larger separation between the galaxies. This particular feature had immediate influence on cosmology whose primary concern was the question of the origin of the universe. A novel proposal was made by Lemaitre, followed by Gamow and others, that perhaps the entire universe with the billions of galaxies seen today was all together once and a violent explosion must have been the cause of the expanding universe. This theory came to be known as the Big Bang theory of creation of the universe. This theory got a big boost in contrast to the "steady-state theory", with two further experimental observations. One was that the observed ratio of hydrogen to helium in the universe was 3:1 exactly as predicted by the Big Bang cosmology and the second was the discovery of the universal 3 K microwave radiation also predicted by the theory. An inflationary stage of rapid expansion at the very beginning of creation of the universe was added by Guth to explain certain features like the extreme isotropy of the universe on a large scale and also to ensure that the vast space of the universe was geometrically flat enough to make it Euclidean in character as it expanded to its present size. A glimpse of the various parameters like the size, density, temperature and the different physical mechanisms that have operated at various stages of the evolution of the universe are illustrated in Fig. 20.4. The inflationary stage is shown in Fig. 20.5.

The first moments of the Big Bang scenario are explained by Weisskopf (1989) as follows:

First, he defines "true vacuum" as empty space, empty of matter and empty of energy, and "false vacuum" as empty of matter, but not of energy. This energy is not of the known form like gravitational or electric but of a new kind of field—type that is encountered in the current theory of radioactive processes. The most

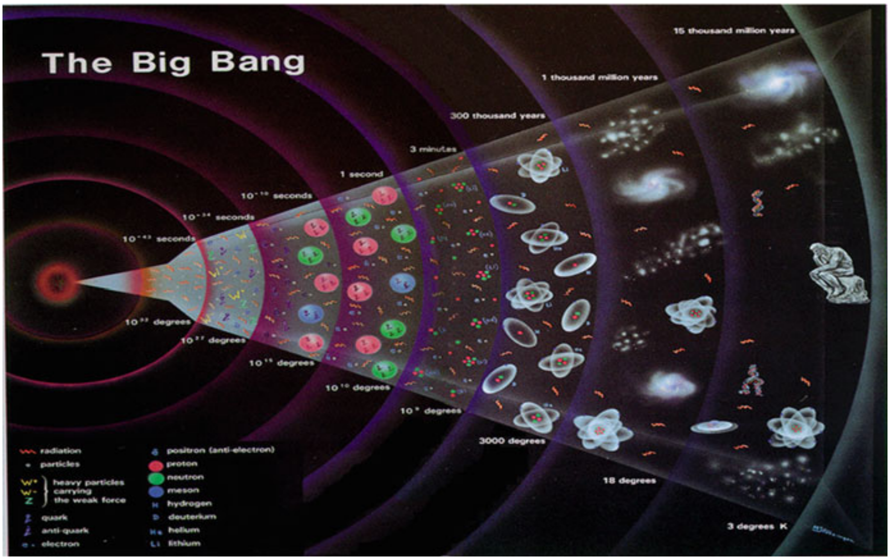

Fig. 20.4 Big Bang to evolution of pondering man—particle, chemical and biological evolutions over a period of 10–15 billion years (Source: Smoot and Davidson 1993)

characteristic feature of the false vacuum follows directly from general theory of relativity according to which a region filled with energy, but no matter is bound to expand suddenly and explosively filling more and more space with false vacuum. Weisskopf says:

> According to the fundamental tenets of this well established theory, there is nothing in nature that remains quiet. Everything including the true vacuum is subject to fluctuations, in particular to energy fluctuations. The field that provides energy to the false vacuum is absent in the true vacuum but not completely. There must be fluctuations of the field. Thus at one moment a small region somewhere in space must have fluctuated into a false vacuum. It would happen rarely, but not excluded. That region almost instantly expands tremendously and creates a large space field with energy according to the properties of false vacuum. This is supposed to be the Big Bang. One might wonder, where the energy comes from that fills the expanding false vacuum.

There is no need to worry about conservation of energy. According to Einstein energy is subject to gravity. The newly created energies interact via gravity that produces Negative Energy so that the net energy remains constant.

When a certain large size is reached the inflationary expansion stops and a true vacuum emerges. But the vast amount of energy contained in the false vacuum shows up in some form. It fills the true vacuum with hot light, quarks-anti-quark pairs, electron-positron pairs, neutrinos etc. In other words with all the stuff that we have described as filling the space at a microsecond after Big Bang. Our universe is born, the slow expansion takes over, the temperature falls, the pre-observable history develops and is followed by observable history.

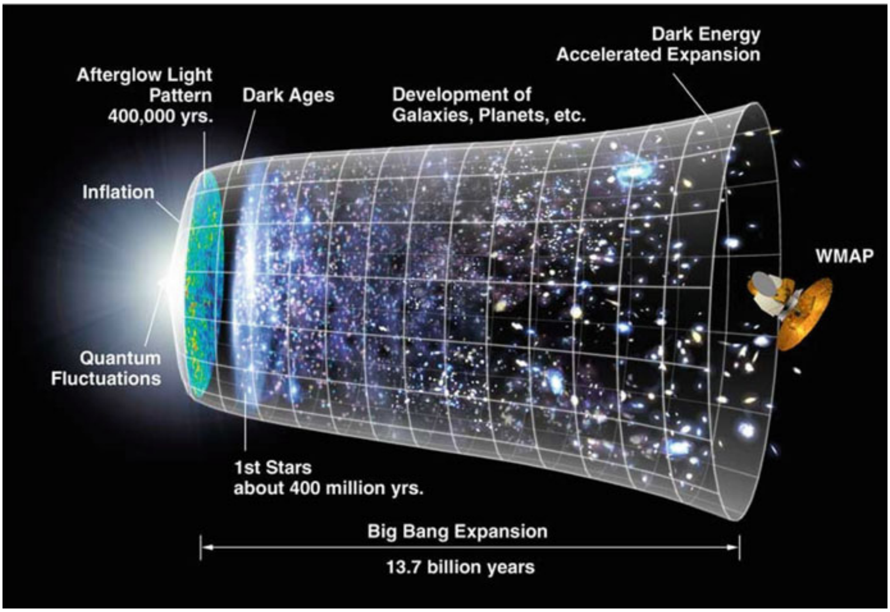

Fig. 20.5 History of the universe from the Big Bang to the present day Note: This is an artist's concept of the universe expansion, where space (including hypothetical non-observable portions of the universe) is represented at each time by the circular sections (Note on the left the dramatic expansion (not to scale) occurring in the inflationary epoch and at the centre the expansion acceleration. The scheme is decorated with WMAP images on the left and with the representation of stars at the appropriate level of development. Source: Created by NASA, http://en.wikipedia.org/wiki/Big_Bang, accessed on 26 June, 2013)

This shows the potentialities of the false and true vacuums with the requisite fields to be able to create the entire universe with all its constituents and forces. Ours is perhaps just one such case. There may be many others with constituents and forces very different from ours.

20.4 Developments in the Life Sciences

The 19th and 20th centuries saw spectacular developments in life sciences too. The recognition of the cell as the unit of life; the role of chromosomes, genes, enzymes and proteins; the discernment of the double helix, structure of DNA and the genome code; and cloning are some of the outstanding achievements in this field. In the 20th century, neurobiology has played a significant role in mapping out and identifying the various cortices for specific functions, the tracing of the entire neurocircuitry with billions of neurons running all over the body from the various sensors to the corresponding cortices, identifying the role of synapses and most importantly figuring out the generation and transmission of the millivolt electrical pulses through the neurons and the role of neurotransmitter chemicals in modulating and transmitting the pulses through the synapses and also in influencing emotions, etc.

However, with all these fantastic developments in place still, it has not been possible to make much headway in throwing light on two most important questions that have remained unanswered for centuries. One is the question of life (When did inanimate matter become animate and what was the mechanism that brought about this transformation?) and the second question is regarding consciousness (What is it? Where is it located? And how does it work?).

These are the questions that have bothered philosophies for not centuries, but for millennia.

Let us analyse the problem of consciousness in some detail.

The modern scientific approach of most of the biologists to the problem of consciousness is summarized, in a sense, by the famous hypothesis of Francis Crick in his book *The Astonishing Hypothesis*, which is:

> Your joys, your sorrows, your memories and your ambitions, your sense of personal identity your free-will are all in fact no more than the behaviour of a vast assembly of nerve cells and their associated molecules. (Crick 1994)

In line with this approach, Fig. 20.6 lists the observations by the neuroscientist of what exactly happens in the brain of an observer, say, of a rose flower and compare and correlate with feelings and thoughts that go on in his or her mind when the observation is made.

What goes in the brain connected to the billion of neurons all over the body is essentially the generations of electrical signals and neurotransmitter chemicals at different locations of the sensors, neural circuitry, synapses, cortices, etc.

What is listed in the RHS of the figure is possible only when the observer is conscious. If their eyes are open, most of the activities on the LHS will be registered by the instruments, and the associated neurotransmitter chemicals will be released (except those causing emotions), unless the absence of consciousness somehow interferes with the physico-chemical processes. We know that in the case of motor action of the body, such an involvement of consciousness is present.

The basic question is how to generate "qualia", an entirely different category of experience from electrical pulses and chemicals, which are essentially different from our everyday laboratory activities. This is the so-called hard problem of consciousness.

In physical sciences too, we had several what may be called "barrier problems", which puzzled scientists for a long time. To give a few glaring examples:

1. The action at a distance problem right from the time of Newton
2. The merging of electric and magnetic fields (phenomena of very different characteristics) into one, the electromagnetic field, and its strange connection to the phenomenon of light
3. The spontaneous emission of radioactive nuclei and decay of elementary particles into other kinds of particles

A (physicalism) ⟵ Rose flower ⟶ B (mentalism)

What happens in the brain and its accessories	*What happens in the mind*
• Formation of "image" of the flower on the retina	• Distinctive perception and recognition of the flower as a rose
• Activation of rods and cones in the retina's various layers	• Evokes sense of beauty — mell of the rose flower
• Generation of action potentials — electrical pulses	• The awareness and recognition of the colour of the flower
• Transmission of pulses through axons in neurons	• The softness and smoothness of petals on touching the same
• Happenings in synapses and dendrites	• Appreciation of symmetry, beauty and aroma
• Releases of neuro transmitter chemicals at various locations	• Earlier happy associations flood the mind
• Activation of cortices	• Emotions triggered
Basically Electrical signals, oscillations, chemicals time sequence. } in various locations	In addition, the mind is able to gauge the size, distance, shape and other physical characteristics as well

Fig. 20.6 Illustration of two kinds of experiences generated in an individual when he looks at a rose flower

4. The equivalence of mass and energy ($E = \pm Mc^2$)
5. Creation of space-time and gravitational force (equivalence)
6. Conversion of gamma rays into electron-positron pair.
7. Creation of new particles in collisions of high-energy particles

In all these examples and in many more, the important feature is that something new was to be created which could not be done in the framework of classical physics.

The answer to all these problems came through relativity and quantum mechanics and with the realization that quantum mechanical processes in the so-called empty space—"quantum vacuum"—are directly involved in the resolution of these issues. When we are bringing in quantum mechanical vacuum into the picture here, we are essentially considering the present ideas in physics that vacuum is not just empty space without matter and without energy but is the seat of the quantum fields corresponding to all the fundamental particles (quarks and leptons) and the force fields (gluons, graviton, $w^{\pm}$, z^{o}); it is the interaction of these fields that are responsible for the creation of all particles that go to make the matter of the universe and also the forces; ultimately these particles and forces are responsible for all the variety of phenomena that we see around us near and far. Earlier, we have explained how creation of several mesons and nucleons and antinucleons take place in high-energy collisions as a result of the processes that go on in the vacuum, when sufficient energy is deposited in an extremely small volume. Even in the traversal of a particle from one point to another, the involvement of the vacuum fields is absolutely necessary. In fact even the innate properties of a particle, for example, the mass of the particle, the continuous interaction of the particle field and the *universal Higgs field*, are necessary.

Ever since the advent of quantum field theories, physicists have been trying to understand the mind-body problem through quantum mechanical formulations of the neuronal processes that neurobiologists have figured out.

There is a two-part review article in the journal *Brain and Cognition* by C.U. Smith (2006, 2009) entitled "The hard problem and the quantum physicists". In the first part, he summarizes the viewpoints of the four founding fathers of quantum physics—Niels Bohr, Erwin Schrödinger, Werner Heisenberg and Wolfgang Pauli—on the relation between quantum mechanics and the mind-body problem and comes to this conclusion:

> In the quantum view it is no longer quite easy to assert that matter is simply inert, unmindful, 'stuff' formed of 'solid, massy, hard, impenetrable particles' . . . . Quantum physics, according to most interpretations is entangled with consciousness from the beginning. If nothing else, the new concepts point to a new way between the horns of the old dilemma: how can a material tissue such as brain be at the some time the substratum of the vivid world of qualia through which we live day by day? A hope for the future is therefore, that a judicious bringing together of quantum mechanical concept of matter with all its implications and evolutionary neurobiology, may help resolve Delbruck question 'How is it possible that mind came into being in an initially lifeless mindless universe?' (Smith 2006)

In the second part, Smith presents a brief summary of the work of J.C. Eccles, Henry Stapp, Roger Penrose, Stuart Hameroff and David Bohn after giving an account of the current status of the neural correlations of consciousness and the advances in our knowledge of synapses.

In conclusion, Smith says:

> Quantum physics as interpreted by the majority of its practitioners, brings the mind back into world. It plays an essential role in the world at the quantum level . . . .
>
> But all these thinkers (with the exception of David Bohm) attempt to tie their quantum physics into the microstructure of the brain . . . . Molecular neurobiologists in particular, are deeply aware of the extreme biochemical complexity of the microstructure and physiology. Quantum effects they argue, if they exist, would be lost in the surging intricately balanced activity of synaptic terminals and axonal cytoskeletons. Furthermore, it is not at all clear how conscious observation, in collapsing wave functions is able to determine which of the many superpositions is realized and hence influence macroscopic behavioral outcome . . . .
>
> Only Bohm seems to escape the Ship Wreck. He more than others calls for a radical revision of the world view. Like Stapp, Penrose and Hameroff he believes that mentality is part of the world and has been so from the beginning: In some sense a rudimentary mind-like quality is present even at the level of particle physics, and that as we go to subtler levels this mind-like quality becomes stronger and more developed. (Smith 2009)

However, majority of neuroscientists are still hoping that the problem will be solved at the molecular level, and all efforts are essentially in that direction even though there is no sign of any breakthrough.

If physicists had stopped their investigations at the level of protons, neutrons and electrons, how would we have known about the microworld of elementary particles and the role of quantum vacuum in all types of physical *creation*? But for the developments in the field of elementary particles both in experimental and theoretical studies, we would have remained baffled at many happenings even in the middle and macro-levels of the universe. No doubt this field of elementary particles beyond the nucleons, electron and photons came into existence through chance discoveries in cosmic ray investigations. It was further helped by the insights of scientists like Dirac in realizing the role of vacuum. Without advances in the field of elementary particles, the verification of the predictions of the theory of relativity would have been difficult. As mentioned earlier, this field benefited considerably by earlier developments in mathematics. Technological developments—electronics, computers, particle detectors, space platforms and accelerators—played a major role in the advances of this field.

We have also seen the role of quantum vacuum in the creation of the universe itself in the Big Bang cosmology and also in the explanation of the expanding accelerating universe in terms of the negative pressure exercised by dark energy, or Higgs field, which has filled the entire universe.

Therefore, does it not stands to reason to think that there could be similar subtle links between life processes and quantum vacuum processes especially since the quantum vacuum is not a closed system with all its component fields fully determined and also animate matter is part of the same universe and was a continuation of material evolution that proceeded? In as much as a mass-giving field like the Higgs had to be made part of the vacuum and this has as we have seen served so many purposes, is it not possible that there could be other new types of fields in the vacuum which could be responsible for life and consciousness, not necessarily those that have resulted in the constitutions of the inanimate world and the inanimate part of the animate world? These fields may have their symmetric properties. To establish the existence of the Higgs boson and the Higgs field, a ten billion dollar accelerator has been constructed, and very elaborate experimental set-ups with computer control for registration and analysis of trillions of events of data are going in at CERN in Geneva and at many other places in the world, as an international effort. The 20^{th}-century researches undoubtedly have led the physicists to "vacuum quantum physics" in search of the substratum that accounts for "everything physical". Maybe the 21^{st} century will lead to bold initiatives in "quantum vacuum biology" in the attempt to solve the most outstanding questions—What is life? What is consciousness?

One of the main objections for quantum processes in living systems was that coherence over fairly long distances and fairly long intervals of time is necessary to understand mechanisms of consciousness, but quantum coherence is only possible at very low temperatures. This objection is overcome in recent years because of increasing evidence of coherence in physical systems and more recently in biological systems too at fairly high temperatures. The two examples that are taken seriously are (1) photosynthesis in plants and (2) the navigation of birds sensing the Earth's magnetic field. The article in *Nature* by Philip Ball (2011) refers to this as "the dawn of quantum biology". The study of these biological systems may lead to the technology of building coherent systems for quantum computing. After all, nature is *all one*.

It is appropriate to end this chapter with an 1887 quotation from Swami Vivekananda:

> This universe has not been created by any extra-cosmic God, nor is it the work of any genius. It is self-creating, self-dissolving, self-manifesting. One infinite existence, the Brahman. *Tattvanasi Shvetaketu*, "that thou art ... Shvetaketu". (Vivekananda 1994, 267)

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Chapter 21
Human Brain Is a Coherent State of the Mind

Benoy Chakraverty

21.1 Introduction

In a recent article (Chakraverty, 2010), I have suggested that the brain be considered as a Hilbert space. In that article, I have introduced a fundamental operator $\hat{S}$, called cognition operator (also referred to as operator of **Self**) whose function is to create bits of information in different cognition channels in this space. This operator, akin to electron or boson operators, was taken to be non-Hermitian. A non-zero average $\left\langle \hat{S} \right\rangle$ was shown to develop as more and more synaptic connectivity occurred between neurons. Since such an average of some non-Hermitian operator is by definition a complex quantity, we designated this quantity as I, that we know as our quintessent macroscopic self. We are not born with it, small babies do not have it until a critical age and normal adults feel its presence throughout their life, the I that decides the actions and seems to signify each individual's core personality.

Hilbert space (Akhhiezer and Glazman, 1961) is an abstract space and seems like a very natural paradigm to designate our mind which is considered to be the seat of abstract ideas and sensations. The idea of the physical Hilbert space goes back to von Neumann (1955) and Omnes (1999) who gave it the properties it needs to have to serve as the backdrop of quantum mechanics, and we can cite a few of these (Shankar, 1985). One can associate with every isolated physical system a definite Hilbert space. The vectors of this space are complex. To distinguish them from real vectors like position or velocity that we identify with an arrow, we designate Hilbert

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*,
DOI 10.1007/978-81-322-1587-5_21, © Springer India 2014

space state vectors by the Dirac ket $|\rangle$. Any arbitrary state vector can be written as a ket $|A\rangle$ which can be expanded in terms of the basis vectors as

$$|A\rangle = \sum_i \langle i|\, A\rangle\, |i\rangle$$

The basis ket vector $|i\rangle$ has its complex conjugate, called the bra $\langle i|$, so that the kets and the bras form a complete orthogonal set. The abstract space (also called linear vector space) is subtended by basis vectors, $|i\rangle$ (kets), which can have finite or infinite dimensions. How does one find or choose these basis vectors? In case of Euclidean space, the three space dimensions are taken to be orthogonal and serve to locate a classical or real vector. No such facility exits for the Hilbert space state vector. The problem was solved by introducing Hermitian (self-adjoint) operators that have a set of eigenvalues which are real; the corresponding eigenvectors form a complete orthonormal set:

$$\hat{O}\, |i\rangle = O\, |i\rangle$$

Here, $\hat{O}$ is a Hermitian operator with a real eigenvalue O. For each operator or measurement O, there can be a host of other independent Hermitian operators or measurements, $\mathcal{M}^{\dagger}, \mathcal{N}^{\dagger}$, etc., that one can perform at the same time on the same physical system implying that $O^{\dagger}$, $\mathcal{M}^{\dagger}, \mathcal{N}^{\dagger}$ commute, and hence the same eigenvectors $|i\rangle$ are also eigenvectors of all these commuting operators. The physicality of this abstract vector space is contained in the requirement that any measurement carried out in this space must give a real value. In this sense, every machine invented by man, whether a thermometer or a robot on Mars or a desk computer, is a *Hermitian machine* designed to perform a real task, to give a real measurement. Standard quantum mechanics carries with it this basic sense of reality attributed to the physical world as something that must remain measurable. However, even in the physical Hilbert space, we have the so-called virtual processes which are by definition not real and carry with them already a premise of "mentality" or of the ghost in the machine. These virtual processes are themselves not measurable although they have far-reaching real effects.

Our objective is to treat information as an arbitrary state vector in the Hilbert space. However, if we restrict ourselves to the physical Hilbert space corresponding to an isolated physical system and its panoply of Hermitian operators which have real eigenvalues and want to apply it to information like entities in our mind, we run immediately into one major difficulty. The brain is an open thermodynamic system and is not isolated from its surrounding, the world. In a dissipative system, the Hermiticity of the quantum operators like a Hermitian Hamiltonian operator $\hat{H}$, which ensures reversibility in time, loses its significance. In addition to that, not every aspect of a bit of information is physically measurable; neither all measurements that one may wish to have is physically realizable in a living brain. The criterion of reality when it refers to cognition in the brain must necessarily include not only objective information which is measurable in principle but also the subjective information, like interpretation, sensation and feeling, that is, all which constitutes the gut reality we live that we express but cannot measure.

Brain does not seem to store just bare information, nor **all and every** information, but only that which is significant, that which furthers the well-being of the individual. The noted neurologist Damasio (2000) demonstrated that every significant information comes with its integral part of feeling or a corresponding subjective part for the information to be significant. When the feeling part is missing, the information loses all its value like the disease called prosopagnosia or face blindness (Ramachandran, 2003); we cannot recognize the face anymore if the neural connection to the feeling region (limbic centre) is nonfunctioning or damaged, even if the visual elements are perfectly intact. Thus, any arbitrary information must have at least two parts, an objective part and a subjective part, and this must be built into the formalism from the very beginning. We can do so if we use a more general Hilbert space with the *help of non-Hermitian operators* to generate our basis vectors for such a space, and this we proceed to do in the next section.

21.2 A Non-physical Hilbert Space: Symmetry Considerations

Extending the concept of physical Hilbert space, we must consider a non-physical Hilbert space that would include nonmeasurable reality. The word non-physical does not mean unphysical. This space is the abstract mental space that we designate by $\mathcal{H}_m$. The Hilbert space $\mathcal{H}_m$ that we want will house state vectors that are information vectors (information is not a vector in the classical sense). Right from the very beginning, we consider a separable Hilbert space, one part of which we call objective (in the sense measurable) and another part subjective. If we call the $\{\mathbf{a}\}$ **vectors** as the information vectors that live in objective space, *a* space (fact space that we shall designate as physical or neural space), and the $\{\mathbf{b}\}$ $vectors$ as those information belonging to subjective space, *b* space (feeling or interpretive space that we shall designate as loosely mental space which is probably extraneuronal), then the enlarged Hilbert space or the abstract mental space is the tensor product:

$$\mathcal{H}_m = \mathcal{H}_a \otimes \mathcal{H}_b$$

One is tempted to assimilate this dual space as one that is engendered by some non-Hermitian Hamiltonian operator $\hat{H}$ (the cap on H marks it as an operator and distinguishes it from the notation of the Hilbert space). Let us not forget that the spectra of the operators $\hat{H}$ and its Hermitian adjoint $\hat{H}^\dagger$ are mirror images of each other. These mirror images are called bra and ket (Dirac, 1958), and they complete each other like Yang and Yin. There are important symmetry considerations of this dual space that we have no necessity to go into in this paper.

We work in general with Hermitian Hamiltonians $\hat{H} = \hat{H}^\dagger$ that require just one set of orthogonal basis vectors to describe the physical Hilbert space. In this case, the bra vector $\langle i|$ is complex conjugate to the ket vector $|i\rangle$, and the mirror images $\langle i|$ and $|i\rangle$ are indistinguishable. But subjective space $\{\mathbf{b}\}$ *vectors* are quite different from the objective space vectors $\{\mathbf{a}\}$. We expect the mirror images to be quite distinguishable. Any non-Hermitian Hamiltonian gives rise automatically to twin eigenvectors and a twin mirror space. There is a further issue that reinforces this conviction; this is the aspect of time. Our life is ruled by passage of time, we have a vivid sensation of past, present and future. And the brain being an open system, ruled by input and dissipation of energy, there is inevitably breakdown of time reversal symmetry. This is not true of physical Hilbert space which is governed by Hermitian Hamiltonians in general, which is suitable for an isolated physical system, hermetically sealed off from the rest of the world, exchanging neither energy nor matter. The eigenvalue of such a Hermitian Hamiltonian is real and a conserved quantity. Because of that, it has time reversal symmetry built in (time reversal symmetry is ensured by the Hermiticity condition $\hat{H}^\dagger = \hat{H}$). In physics, most microscopic events are presumed to have time reversal symmetry. However, in the macroscopic world or biological systems, this symmetry is missing, and the future is very distinct from the past and characterized by the direction of entropy flow which gives the direction of the arrow of time. When the $\hat{H}^\dagger \neq H$, the Hamiltonian is non-Hermitian. Now instead of a single energy eigenvalue, we have two different eigenvectors and two energies one complex conjugate of the other (Morse and Feshbach, 1953). We have the Scrodinger equation:

$$\begin{aligned} \hat{H}\,|a_\alpha\rangle &= \epsilon_\alpha\,|a\rangle \\ \hat{H}^\dagger\,|b_\alpha\rangle &= \epsilon_\alpha^*\,|b\rangle \end{aligned} \tag{21.1}$$

Here α is the label of a cognition channel.

The eigenvectors $|a_\alpha\rangle$ and $|b_\alpha\rangle$ **form a complete biorthogonal system in the enlarged Hilbert space** $\mathcal{H}_m$. The orthonormality and completeness read

$$\begin{aligned} \langle b_\alpha \mid a_\beta\rangle &= \delta_{\alpha\beta} \\ \sum_\alpha |a_\alpha\rangle\langle b_\alpha| = \mathbf{1} &= \sum_\alpha |b_\alpha\rangle\langle a_\alpha| \end{aligned} \tag{21.2}$$

Here $\alpha's$ are the cognition channel index. The projection operators $|a_\alpha\rangle\langle b_\alpha|$ and $|b_\alpha\rangle\langle a_\alpha|$ matrices are not Hermitian in general.

The ensemble of the basis vectors $\{|a_\alpha\rangle\}$ or $\{|b_\alpha\rangle\}$ are not orthogonal, and because of that, no single set can be used to expand an arbitrary state vector, hence the strict necessity to use a biorthogonal basis, exactly like latitude and longitude to locate an arbitrary position on the globe. In terms of the biorthogonal basis vectors, we write the expansion of an arbitrary ket $|z\rangle$ as

$$|z\rangle = \sum_\alpha \langle b_\alpha|\,z\rangle\,|a_\alpha\rangle = \sum_\alpha \langle a_\alpha\,|z\rangle\,|b_\alpha\rangle \tag{21.3}$$

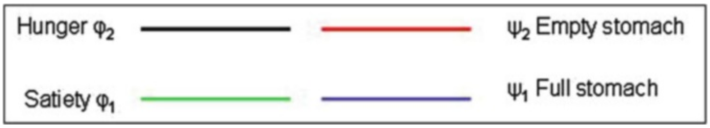


Fig. 21.1 Illustration of entangled biorthogonal vectors

An arbitrary information vector is a completely entangled state; there is no way of extricating physical from the mental. Both of the expansions for $|z\rangle$ have exactly the same information content.

As a simple example of illustrating the fundamental biorthogonality, let us take a 2×2 Hamiltonian that has two energy levels ϵ_1 and ϵ_2 for two possible states of a certain neuron. Let the two states in question refer to a full stomach or empty stomach (Fig. 21.1).

We may suppose the eigenenergy ϵ_1 indicates full stomach, while the value ϵ_2 is the energy label of empty stomach. We may indicate the full stomach by the wave function $|a_1\rangle$ while let the empty stomach get the label $|a_2\rangle$. The description of the stomach (if the organism is healthy) is completed if we associate with the ket $|a_1\rangle$, the mental twin $|b_1\rangle$ denoting the subjective feeling of satiety, while the objective state of empty stomach, with its label $|a_2\rangle$, will have to be associated with the feeling of hunger that we will denote by the ket $|b_2\rangle$. The most general state of the stomach will be written as

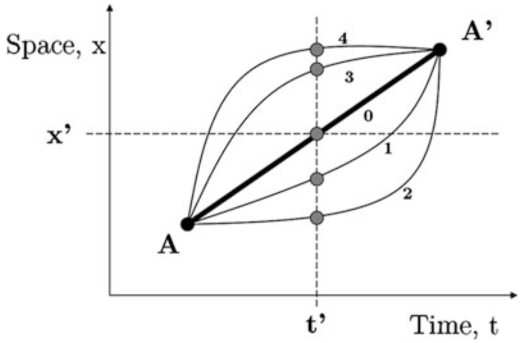
$$|F\rangle = \sum_{i=1,2} \langle b_i|\, F\rangle\, |a_i\rangle = \sum_{i=1,2} \langle b_i|\, F\rangle\, |a_i\rangle$$

This shows the fundamental difference between a non-Hermitian Hamiltonian qubit and a Hermitian one describing a standard qubit. The former gives a meaning to the information, while the later cannot.

21.3 Coherent Brain State: Self-Operator and Cognitive Order Parameter

In this chapter, I am not addressing any neuronal aspects of the brain but presuming that the mental space contains the neurons **but not necessarily limited by it**. I am postulating that the fundamental excitations in the generalized Hilbert "**mental**" space are information particles quantum in nature that live simultaneously in two spaces $\{\mathbf{a}\}$ and $\{\mathbf{b}\}$. Why do we think that fundamental mental excitations are quantum rather than classical? The figure gives the illustration. Suppose an information piece or an elementary excitation travels as in the figure from the point A (x, t) to B (x', t'). If it follows the thick line, which is the line of least action or most probable path, it will follow a classical path. Given the same initial and final

Fig. 21.2 Classical versus quantum behaviour



conditions, it will follow the same definite path again and again. It will behave like a classical particle or like a program in a computer. But suppose it behaves like a quantum particle. Then it can follow any or all of the paths, at any time it can be at any of the place. This can be thought of as an expression of free will, of the central fact that the human mind has the supreme ability to decide and can change a path of action at will that can change a life trajectory. Because these are quantum paths, each path will carry a phase. The total amplitude or probability of the particle starting at A and reaching A' is a sum total of the amplitude of each of this quantum Feynman path. If the phases of these paths are random, there may be complete destructive phase interference and the particle will not travel from A to A' and will remain localized at A. This is Anderson localization (Anderson, 1958). But on the other hand, suppose these paths interfere constructively reinforcing the amplitude of each other, we will have coherent propagation of the excitation which can build up a macroscopic amplitude with a definite phase, and we can call it a coherent state. If such a state can accommodate a macroscopic number of particles (if they are boson like), then it will be called a coherent Glauber state (Glauber, 1963). We thus consider that an information particle is fundamentally quantum in its nature, which carries energy and momentum like any other fundamental excitation (Fig. 21.2).

This is why the brain can achieve with information particles a macroscopic coherent state in the enlarged Hilbert space which is generated by the non-Hermitian creation operator that we have christened in the first paper (Paper 1), the Self Operator $S^{\dagger}$. This self refers to cognitive self, whose job is to produce and preserve information beneficial to the organism, and as the name evokes, it is a pure expression of our individual uniqueness, rooted in our genetic identity. The excitations or particles so created are taken to be boson like. Our objective is to create a coherent brain state out of these particles in every cognition channel α. Such a coherent state, akin to Glauber (1963) state used in quantum optics (Mandel and Wolf, 1995), is macroscopic. It is in fact a classical limit of a quantum state or alternatively can be thought as quantum limit of a classical state, in the sense that in spite of being almost macroscopic, it carries a very definite phase, entertains very definite phase relationship with the coherent states of every cognition channel and thus ensures the global phase coherence in our cognitive system.

The operator $\hat{S}^+$ creates one quanta of excitation or information by operating on the physical vacuum $|0_a\rangle$ corresponding to $\{\mathbf{a}\}$ space that can be written in the Fock number space as

$$\hat{S}^+ |0_a\rangle = |1\rangle$$
$$\hat{S}^+ |1\rangle = \sqrt{2}\,|2\rangle$$
$$\text{etc.}$$

The kets are number states carrying a varied number of information particles created by repeated application of the non-Hermitian operator $\hat{S}^+$ on the vacuum $|0_a\rangle$. The destruction operator $\hat{S}$ is defined so that it destroys vacuum state; there is no further down to go!

$$\hat{S}\,|0_a\rangle = 0$$

A word is in order to make clearer the vacuum state $|0_a\rangle$ in the physical Hilbert space. By definition, this quantum vacuum state is the state where no excitations are present. Excitations or the fundamental particles are created from this vacuum through the action of some suitable creation operator. Actually, what is called a vacuum state is not a state which is empty but a region where some invisible quantum field is present and makes its presence felt when some fundamental excitation arises out of this field. Thus, photons are excitations from the underlying electromagnetic field; similarly, we can define a boson or an electron quantum field as the respective vacua of a boson- or electron-like excitation. The brain is an information space. In the brain, what we are concerned with are excitations which are information like. *The generalized Hilbert space can only be understood as a substratum of some invisible, awareness field where every bit of information carries with it a quantum of awareness. From this imperceptible vacuum, when a suitable operator acts on it, a perceptible information bit will be generated, the fundamental particle carrying awareness, just as a photon carries radiance or an electron carries an electrical charge. This awareness is like an inner quantum number that has no analogue in conventional quantum physics, just as the spin of an electron has no analogue in classical physics. This awareness constitutes the very quintessence of our perception.*

The coherent Glauber state is precisely a quantum state with a very indefinite number of particles in it, a state where particle numbers will be allowed to vary from zero to as many as the system can contain. Primordially, this state is constructed such that it carries the vacuum state all along. Without this quantum vacuum built in right from the very beginning, there is no phase coherence. In any sentence, between a word and the next word, there is an empty space which is the vacuum state; otherwise, the sentence is not intelligible. In a piece of melody, there is silence between one note and the next; otherwise, there is no music. So in every thing that we do, it is the ubiquitous presence of the vacuum state that makes an assembly of information meaningful. Every piece of coherent state is built through repeated application of the $\hat{S}^+$ *operator* on the vacuum state. A typical coherent state $|\psi_\alpha\rangle$ in the cognition channel α is written as

$$|\psi_\alpha\rangle = A \exp \Omega_\alpha^+ \hat{S}^+ |0_a\rangle \tag{21.4}$$

By putting the operator $\hat{S}^+$ in an exponential, we are assuring that its action on the vacuum state will be repeated and the very first term of the $|\psi_\alpha\rangle$ due to the nature of the exponential series is the vacuum itself. In this expression, A is some constant, and Ω_α *is a complex number and is the cognitive order parameter in the* α*-channel*. We shall have, if our brain is to remain coherent and perfectly functional, a coherent state in every cognition channel. The conventional Glauber states have the singular property that they are eigenstates of the destruction operator, with the eigenvalue Ω_α:

$$\hat{S} |\psi_\alpha\rangle = \Omega_\alpha |\psi_\alpha\rangle \tag{21.5}$$

Since S is a destruction operator, it can be assimilated as a measurement operator, and its action on the coherent state gives us the value of the measurement and returns the coherent state intact. Being eigenvectors of an operator which is not Hermitian, the set $\{|\psi_\alpha\rangle\}$ is not orthogonal. The state in one cognition channel α can overlap with that of another cognition channel β, particularly if they are spatially close. This may explain the syndrome of synaesthesia where cognition channels interfere, i.e. one hears a music and sees associated with the musical notes, different colours! Although these coherent states are not orthogonal, they are linearly independent, and we can write the global brain coherent state wave function $|\Psi_B\rangle$ in the physical space of the neurons as the column vector:

$$|\Psi_B\rangle = \begin{pmatrix} |\psi_\alpha\rangle \\ |\psi_\beta\rangle \\ |\psi_\gamma\rangle \\ \text{etc.} \end{pmatrix} \tag{21.6}$$

In conventional Glauber state, the destruction operator S has right eigenvectors, but the creation operator S^+ does not have any:

$$\hat{S}^+ |?\rangle = ?$$

This is because the physical vacuum state $|0_a\rangle$ is the only vacuum state in a closed isolated system governed by a Hermitian Hamiltonian. But this is not the case in our system. We have two distinct spaces, physical $\mathbf{a-space}$ and mental $\mathbf{b-space}$ with respective vacuum $|0_a\rangle$ and $|0_b\rangle$. While the physical vacuum is truly empty of information and the coherent state will have to be built up piece by piece from bottom up by the action of the self-operator $\hat{S}^+$, the so-called mental vacuum state must be on the contrary *full* such that the action of the operator $\hat{S}$ is to cut it up in discrete pieces and put it back from up down together in a coherent state. The conclusion is ineluctable that the mental vacuum state is actually full! Mind holds *in potentia every space-time points (events), whether it has happened or not. It is in a sense a personal notebook of all possible episodic history of each person, a sum total of all Feynman paths irrespective of whether one has taken it or not*:

$$|0_b\rangle = |\mathcal{F}\rangle \tag{21.7}$$

This also gives a succinct description of the operator $\hat{S}^+$ as

$$\hat{S}^+ |\mathcal{F}\rangle = 0$$

There is no further way up to go. This leads us automatically to write the *mental coherent state* in the channel α as

$$|\varphi_\alpha\rangle = B \exp \Omega_\alpha^* \hat{S} |\mathcal{F}\rangle \tag{21.8}$$

Now we can define the right eigenstates of the creation operator $\hat{S}^+$:

$$\hat{S}^+ |\varphi_\alpha\rangle = \Omega_\alpha^* |\varphi_\alpha\rangle \tag{21.9}$$

Similarly, we construct the global coherent state of the brain in the mental space as the column vector:

$$|\Phi_B\rangle = \begin{pmatrix} |\varphi_\alpha\rangle \\ |\varphi_\beta\rangle \\ |\varphi_\gamma\rangle \\ \cdots \end{pmatrix} \tag{21.10}$$

The cognitive identity (matrix) has the spectral decomposition in terms of its cognitive components:

$$\mathbf{1} = \sum_\alpha |\psi_\alpha\rangle \langle\varphi_\alpha| = \sum_\alpha \langle\varphi_\alpha| \langle\psi_\alpha| \tag{21.11}$$

This gives us the eigenvalue equations for the non-Hermitian operators $\hat{S}$ and $\hat{S}^+$:

$$\hat{S} |\psi_\alpha\rangle = \Omega_\alpha |\psi_\alpha\rangle$$
$$\hat{S}^+ |\varphi_\alpha\rangle = \Omega_\alpha^* |\varphi_\alpha\rangle$$

We have the cognitive order parameter Ω_α as a consequence given by the *quantum average* of S:

$$\Omega_\alpha = \langle\varphi_\alpha| \hat{S} |\psi_\alpha\rangle \tag{21.12}$$

$\langle \Phi_\alpha |$ is the bra vector to the ket $|\Psi_\alpha\rangle$ analogous to what we have seen in the last section for the non-Hermitian Hamiltonian $\hat{H}$. Similarly, we have

$$\Omega_\alpha^* = \langle \psi_\alpha | \, \hat{S}^+ \, | \varphi_\alpha \rangle$$

We have in consequence

$$N_\alpha = \Omega_\alpha^* \Omega_\alpha = \left\langle \hat{N} \right\rangle = \left\langle \varphi_\alpha \left| \hat{S}^+ \hat{S} \right| \psi_\alpha \right\rangle$$

Here $\hat{N}$ is the number operator, also called operator of preservation and count bits of information (corresponds to the intensity of the representation) in the cognition channel α. This is the complex cognitive order parameters as

$$\begin{aligned} \Omega_\alpha &= \sqrt{N_\alpha} \exp -i\theta_\alpha \\ \Omega_\alpha^* &= \sqrt{N_\alpha} \exp i\theta_\alpha \end{aligned} \tag{21.13}$$

Here θ_α is the phase angle that makes the constitutive bits of information in a given representation coherent and meaningful. This phase and the number of information particle are conjugate quantities $[N_\alpha, \theta_\alpha] = i$. This gives for the joint variation the well-known uncertainty relation $\partial N_\alpha \partial \theta_\alpha \sim 1$. The lesson here is that the brain needs to build up a macroscopically large information population in a given cognition channel, a population that needs to be fluctuating so that it can achieve a very precise phase.

The overall phase coherence between different cognition channel is given by the global cognitive order parameter:

$$\Omega = \text{trace}\,[\Omega_\alpha] = \sum_\alpha \langle \varphi_\alpha | \, \hat{S} \, | \psi_\alpha \rangle \tag{21.14}$$

Ω is a diagonal matrix in the base of $\{\Phi_\alpha, \Psi_\alpha\}$, and the required sum is just the trace of this matrix.

Now **we take the bold step and call this trace $\mathcal{I}$, our inner decider, the I** *we live with every day. Since the twin non-Hermitian operators $\hat{S}$ & $\hat{S}^+$ are rooted in our genetic identity and represents* **Self**, this $\mathcal{I}$, being the global cognitive order, is the hallmark of our mind intruding into our daily existence. Being a trace, it is invariant in space time. It is both neuronal and extraneuronal. When a cognition channel is altered or blocked due to some neuronal disorder, **I** may be affected in certain parts of the functional space, but the feeling or *sense of wholeness of I remains intact.*

We are not born with a non-zero order parameter Ω or $\mathcal{I}$. Because of intense phase fluctuation, the order parameter remains zero. But the synaptic connections between neurons develop at an astonishing rate from birth onwards (about several million connections per second); focussing of attention and phase coherence

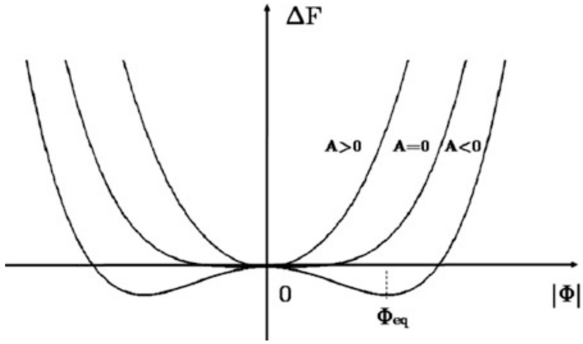


Fig. 21.3 Gibbs free energy as a function of cognitive order parameter

between different cognitive channels tightens and Ω begins to develop. We can write a Ginzburg-Landau free energy function $F(\Omega)$ as a function of Ω, which achieves a minimum value (Fig. 21.3) at around a child about 2 years old. By this time, the speech centres and visual cortex are well formed, and the all important **I** can emerge, as a stable psychic entity. One becomes $I\ am$. This transition has nothing to do with consciousness per se, *which has been always there*:

$$\frac{1}{\text{cognitive response}} = \mathbf{A} = \left(\frac{\partial^2 G(|\langle\Psi\rangle|^2)}{\partial^2 |\langle\Psi\rangle|} \right)$$

As we shall see in the next section, cognitive response to the world is precisely the inverse slope of the curve of $G(\Omega)$ at every Ω and is non-zero even when $\Omega = 0$. The parameter A curvature of the curve tracks synaptic connectivity between neurons and, as it gets more and more numerous, goes from positive to negative (see Fig. 21.3). It is in fact zero (cognitive response is infinity just there) just before a stable cognitive order emerges or a child's I-ness appears, as can be seen from the accompanying figure (where the free energy goes flat).

21.4 Cognitive Response and Consciousness

The problem of consciousness is considered by many modern philosophers as the "hard problem" (Shear, 1997). The well-known Australian philosopher Chalmers (1996) details in a book why it is so hard and also which ones are easy problems; these include an objective study of the brain. In a more modest answer to some of these issues that avoids erudite pitfalls, it is meaningful to *define consciousness as part of cognitive response of the brain to the world*. If we define the ground state of the cognitive system as the $\mathcal{I}$ *field*, it seems sensible to ask what the excited state is like. The excitation comes when external world presents itself and interacts with self-operator (external world includes our own body). In the ground state where world is absent by construction, there is no external world to couple with; there is no consciousness, as a result. The problem is still hard, but we have cleared a small space to work on, and part of the problem becomes more tractable.

In this simple approach, we will couple external world designated by Σ to the fluctuation from the ground state of the $\hat{S}$ global self-operator. We write the fluctuation operator as

$$\hat{\Psi}(x,t) = \hat{S}(x,t) - \Omega \tag{21.15}$$

We define cognitive response χ as response of the brain to perturbation H' due to external world. We use linear response theory (Pines and Nozieres, 1966) and write

$$H'(t') = -g\Sigma(x',t')\Psi^{\dagger}(x,t') + h.c \tag{21.16}$$

Here we presume that world is turned on at time t' very slowly, coupled to the fluctuation operator $\Psi^{\dagger}(x,t')$ with a coupling constant g. For the time being, we omit the spatial index, to keep it simple. This perturbation will give the retarded response:

$$\delta\left\langle\hat{S}(t)\right\rangle = -\frac{i}{\hbar}\int_{-\infty}^{t} dt'\left\langle\left[\hat{\Psi}(t), H'(t')\right]\right\rangle \tag{21.17}$$

This response constitutes awareness of I to the world, and we define it as cognitive perception. Only a small part of this perception is a conscious perception, and we call it our consciousness. *Precisely, consciousness results from that part of the response function which is dissipative or imaginary*. There is a whole part of the response function that we are not conscious of. Because cognitive response is considered to be ruled by causality, with response lagging behind the stimulation in time, we have retarded response function or susceptibility $\chi_R\,(t-t')$ given by

$$\delta\left\langle\hat{\Psi}(t)\right\rangle = \int_{-\infty}^{t} dt'\chi_R\left(t-t'\right)\Sigma(t') \tag{21.18}$$

Here the susceptibility is defined by the commutator:

$$\chi_R\left(t-t'\right) = -\frac{i}{\hbar}\theta(t-t')\left\langle\left[\hat{\Psi}(t), \hat{\Psi}^{\dagger}(t')\right]\right\rangle \tag{21.19}$$

The θ *function*, where $t \succ t'$ assures the causality, causes preceding effect (Fig. 21.4).

Here the cognitive susceptibility is a retarded function (subscript R) given by the operator average:

$$\chi_R\left(t-t'\right) = \left\langle\hat{\Psi}(t)\hat{\Psi}^{\dagger}(t')\right\rangle, t \geq t' \tag{21.20}$$

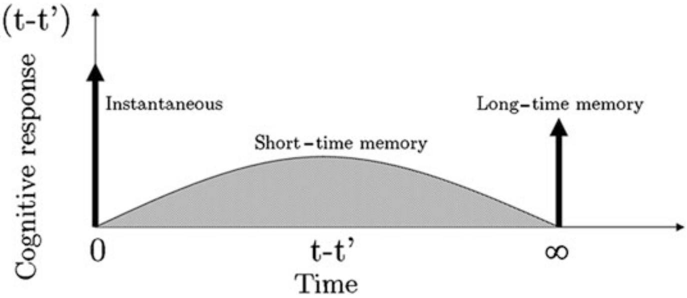


Fig. 21.4 Short- and long-term memory

Its time behaviour is shown in the accompanying figure. Its Fourier transform is

$$\chi_R(\omega) = \int_o^\infty d(t-t')\left\langle \Psi(t)\Psi^\dagger(t')\right\rangle \exp\left[i\omega\left(t-t'\right)\right] \tag{21.21}$$

The causality imposes on the $\chi_R(\omega)$ the Kramers-Kronig relationship, *so that the response is a complex quantity*, having a real and an imaginary part (the two parts are related through Hilbert transform):

$$\chi_R(\omega) = \chi'(\omega) + i\chi''(\omega) \tag{21.22}$$

The imaginary part of the response function $\chi''(\omega)$ monitors *real neuronal excitation* from the ground state. This is the part that would give rise to real sensations, emotion and eventual dissipation of the excitation back into the outside world as heat and sensed by the organism as fatigue. *We define the imaginary part as consciousness*. Since $\chi''(\omega)$ is odd in ω, $\chi''(\omega) = 0$, at $\omega = 0$. This explains why there is no conscious response when the brain is at the free energy minimum. This minimum is situated at $\left\langle \hat{S} \right\rangle = 0$, for a baby ≤ 2 years old, and at $\left\langle \hat{S} \right\rangle = \mathcal{I}$, for all other cases where selfhood has been achieved. We are unconscious at this precise point. Real part of cognitive response $\chi'(\omega)$ is finite of course due to virtual excitations. Conscious perception results only with the *real excitations*. *Subsequent decay of real excitations confers on them a lifetime or the time needed for us to be conscious of an event; the imaginary part consequently has a spectral weight over which the excitation energies are spread out, which we perceive as a conscious experience*. This rainbow hue of spectral spread is sensed by self (even when $\mathcal{I}$ is not yet formed) as a direct perception of the world in all its splendour, called "qualia" of conscious experience (Chalmers, 1996).

The imaginary part related to dissipation during cognitive perception *is what we assert to be conscious*. It includes the emotive part of the response, as the perception manifests itself, through visible emotion, palpable sensation, rapid eye motion or increased heartbeat, skin temperature rise or sudden blips in the EEG signal in the γ frequency region often characteristic of the awake conscious state.

We can write out the total cognitive response rewriting Eq. (21.16) as

$$\left\langle \hat{S}(x,t)\hat{S}^{+}(x',t')\right\rangle = \left\langle \hat{\Psi}(t)\hat{\Psi}^{\dagger}(t')\right\rangle + \langle I^{*}\rangle \langle I\rangle \tag{21.23}$$

Here the first term on the right-hand side is **consciousness of the world**, and the second term is **self-consciousness. The second term is always present, asleep or awake; the self never sleeps**.

21.5 Discussion

This is a good place to say a few words about the **Self**. Self is the ingredient irradiating Indian philosophical tradition, a concept that has come down to us since immemorial past and debated through centuries. In recent times, Francisco Varela (1995) put the issue in terms of the human body and biological terms. He said that we humans are a mesh of selves. We have a genetic self; a biological or ontological self, we seem to be governed by an immunity self whose job is to protect us from bacterial aggression; we have a healing self that takes care of all healing processes. And each time the unique identity of the person is brought to question, the self provides an unambiguous answer. Cognitive self is no exception. It presides over all cognitive functions and helps answer the eternal quest of "know thyself" and formulates the answer "**I am**". **What is new in my approach is that we have promoted self from an idea to that of an operator** and from that of a concept to that of an actor, until player and the play, thinker and the thought, decider and the decision and subject and the object become one and the same. Being a precise mathematical object and also a non-Hermitian operator, it obeys its strict algebra and creates a rich physics and phenomenology of its own. Like the electromagnetic **vector potential**, which escapes direct observation but generates, literally speaking, all the song and light show while itself staying in the dark, so is the self-operator $\hat{S}$ an icon of unchanging reality behind an ever-changing universe. And when it develops, its non-zero macroscopic average **becomes the I** and comes in the forefront of the stage and its true character retains its mantle of anonymity, its full weight of mystery. The great particle theorist Sakurai said about electromagnetic quantum creation, destruction and preservation operators (Sakurai, 1984) that these "*three operators correspond respectively to the Creator (Brahma), the Destroyer (Siva), and the Preserver (Vishnu) in Hindu mythology*." If anything, the operator of cognitive Self $\hat{S}$ fits perfectly this description. *Self creates, self destroys and self also preserves*. Between this trinity, the whole human drama is enacted.

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Chapter 22
Consciousness, Functional Geometry and Internal Representation

Sisir Roy

22.1 Introduction

The proposal for a geometrical interpretation of brain function by Pellionisz and Llinás (1982, 1985) and Llinás (2002) introduced an integrated approach to understanding brain function. It is called "dynamic geometry". Then it was further developed by Roy and Llinás (2008) to include the time dimension along with the spatial dimension and henceforth known as "probabilistic dynamic geometry". The original proposal was based on the assumption that the relationship between the brain and the external world is determined by the ability of the central nervous system (CNS) to construct an internal model of the world accomplished through the interactive relationship between sensory and motor expression. In this model the evolutionary realm provides the backbone for the development of an internal functional geometry space. Almost a century before Mach (1959) investigated this issue in the context of the analysis of sensations and geometry. He emphasized at that time that without co-operation among sensory perceptions, in the sense of inductive reasoning, the understanding of a scientific geometry would be inconceivable. This is consistent with Indian geometry where inductive reasoning is the dominant approach while in the more familiar Greek geometry pure "understanding" (deductive reasoning) dominates.

In the above-mentioned geometric interpretation, the internal space is viewed as isomorphic to the external world allowing successful operational interactions between them, with the possibility of functional prediction necessary for the implementation of even the simplest motor coordination paradigm guided by brain function. Accordingly the nervous system was regarded as a sensory–motor transformation entity that handled sensory input such that well-executed motor

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*,
DOI 10.1007/978-81-322-1587-5_22,

output is delivered back to the external world in a physically acceptable fashion via a plant (the body) that is totally different in kind, shape and functionality to the structure and characteristic of the external world. Consider the unlikely interaction of a living organism and a completely different entity, such as a musical instrument made of brass or wood. The relationship between animate and inanimate objects (an evolutionary event) can be perfectly coordinated despite their having different natures. Such strange fellowship was originally considered to have developed given a metric tensor transformation, via the geometry of abstract spaces. Thus, sensory input, a covariant vector, represents the properties of the external world as measured by the senses. In fact this internalization of the properties of the external world is the central issue in brain research. Plato in his well-known allegory of the prisoners in the cave discussed this kind of issue long before the development of modern brain research. Following Wittgenstein, we can distinguish between the world as the domain of our experience and the world as the domain of things in themselves. In the present approach to brain function, by internalization, we mean the ability of the nervous system to fracture external reality into sets of sensory messages and to simulate such reality in brain reference frames. We have studied this internalization within the framework of probabilistic dynamic geometry (Roy and Llinás 2008) where the weakly chaotic nature of neurons are considered to be responsible for the probabilistic nature of the geometry.

The probabilistic dynamic geometry (henceforth we call simply functional geometry) associated to central nervous system(CNS) is carried out by genetic dispositions and only modulated or more precisely organized due to noise during embryonic development. For example, the tremor (may be physiological or pathological) is unwanted and be called as noise. This tremor has been shown to organize (Roy and Llinás 2012) the topological structure of the neuronal networks. In this paper we shall discuss the role of functional geometry in explaining the various characteristics of consciousness and specifically the subjective property like “qualia”. Various concepts in Indian philosophy including Buddhist one are shown to be much relevant in this context.

It raises the imminent question whether this functional geometry is relevant in the context of brain function only. Planck scale is considered to be the smallest scale of length or time in the physical universe. This comprises of fundamental constants like the speed of light, Planck constant and gravitational constant. The concept of space, time or causality does not exist beyond Planck scale. The intriguing issue is how space, time or causality arises in the physical universe.

Recent developments (Roy 2003) in understanding the physics at the Planck scale clearly indicate the existence of an evolving cellular discrete network at Planck scale which gives rise to continuum space–time at the physical level. So we have two different types of networks: one at the level of the smallest scale of the physical universe, i.e. Planck scale, and the other at the neuronal level. The most important question is how one can build up a correspondence between the external and internal world. This will be discussed at the end. At first we shall discuss the framework of functional geometry associated to CNS in Sect. 22.2. The epistemological issues in the perspective of Indian philosophy will be discussed in Sect. 22.3. Finally the geometry of the external world and its connection to discrete networks at Planck scale will be elicited in Sect. 22.4.

22.2 Functional Geometry and Brain Function

A central question concerning present-day neuroscience is that of understanding the rules for the embedding of "universals" into intrinsic functional space. However, one needs to understand the fundamental structure of this internal space or functional geometry before going into the details of its applications.

They can be stated as follows:

1. For any geometry, one needs to define the "smoothness" property of the manifold. Thus in functional geometry, the existence of derivatives associated with the sensory covariant vector and motor contravariant vector is the prerequisite of the functional manifold, and so a definition of differentiability in the functional space becomes necessary.
2. Non-orthogonal coordinate axes have been considered to be associated with covariant and contravariant vectors based on physiological observations. So one must consider the non-orthogonal frame of references in this type of functional space.
3. The analysis of the contravariant character of the forces exerted by the muscles that such a geometry must accommodate includes an overcomplete set of possible dynamic configurations associated with a non-orthogonal frame of reference leading to similar motor execution. Accordingly, the CNS must calculate an inverse solution via the mathematical indeterminacy inherent in the CNS in a manner similar to that implemented in Moore–Penrose-based generalized inverse solutions.
4. The motion of an object in the external world does not engender simultaneity of space and time in its counterpart functional space because the conduction speeds through various axons are different for a given stimulus.

Let us consider the possible geometrical structures for the CNS. To define any metric tensor, one needs to address a well-defined distance function that satisfies all the axioms of metric tensors. From a global point of view, the anatomy of the brain does not present a smooth and linear representation of the external world. So a distance function must be constructed which can be defined as functionally isotropic. In fact, the multidimensional spaces of the CNS are, for the most part, not definable in well-known geometries such as Euclidean or Riemannian spaces. Indeed, if we consider, for instance the olfactory space with more than 10,000 different categories, we find that this space is defined by the chemical and biochemical properties of the odorant substance. This, in turn, can only be defined by the requirements of the organism. Accordingly, unlike Euclidean or Riemannian spaces, this olfactory space cannot be defined independently of the measurement instruments. The present author along with Llinás constructed a probabilistic metric space as the internal space considering the chaotic nature of neurons. The chaotic nature of neuronal oscillation gives rise to probabilistic nature.

We shall now discuss various issues related to functioning of the brain and the geometry of the internal world.

22.2.1 Issue of Simultaneity

The issue of simultaneity between the event in the external world and the event in the internal event is of fundamental significance in cognitive world. The delay in conduction speeds along different axons and the integration time for individual neuronal elements in the circuit are both of the same order of magnitude as the temporal quanta. Recent neurophysiological observations indicate that quanta of time exist for both motor execution and sensory perception. The latter is of the order of 10–14 ms and is associated with gamma band (40 Hz) oscillatory activity in the brain. Again, the delay in conduction speeds along different axons and the integration time for individual neuronal elements in the circuit are both of the same order of magnitude as the temporal quanta. So, in spite of such delays, the concept of simultaneity of the external event will be considered valid for functional space. We call it as operational definition of simultaneity. In the present context, the operational definition has been used to study one event at a certain place and particular instant of time in the external world as cogitated by the brain as a single entity. Here, the simultaneity is between the event in the external world and the event in the internal world.

22.2.2 The Brain as a Self-Referential System

In vitro recordings from neurons in the inferior olivary nucleus demonstrated, for the first time, that phase reset in neuronal intrinsic oscillations (Leznik et al. 2002) differs from typical oscillatory systems. Here, the phase reset is controlled by input parameters and does not depend on the time moment, i.e. the initial phase, when the input is received. In this sense, the phase reset is self-referential and ignores the history of the system. Makarenko and Llinás (1998) and Kazantsev (2003) proposed a mathematical model using a set of non-linear differential equations to describe the self-referential phase reset (Kazantsev et al. (2004)). The main motivation of this modelling was to implement phase resetting into a motor control system based on a dynamics theory, 40 Hz oscillations and the quanta of time.

22.2.3 The "Prediction Imperative" as the Basis for Self-Awareness

The nervous system evolved such that multicellular creatures that move in a purposeful fashion, i.e. nonrandomly, have a clear selective advantage. To accomplish such "intelligent movement", the nervous system evolved a set of strategic and tactical rules, a key element of such being prediction: the ability to anticipate the outcome of a given action on the basis of incoming sensory stimuli and previously learned experiences or inherited instincts. This ability to predict the outcome of future events is, arguably, the most universal and significant of all global brain functions. In a recent paper (Llinás and Roy 2009), we have addressed the issue on how such predictive function may originate from the dynamic properties of neuronal networks. The possibility of using the concept of functional geometry associated with neuronal network properties to understand the predictive properties of the brain was initially proposed in the late 1970s and early 1980s (Pellionisz and Llinás 1979, 1985). The spatio-temporal nature and this metric property have been addressed more recently from a dynamic rather than as a linear connectivity matrix transformation, under the term dynamic geometry, where the metric is considered to be statistical in nature (Roy and Llinás 2008). For the nervous system to predict, it must perform a rapid comparison of the sensory-referred properties of the external world with a separate internal sensorimotor representation of those properties. For the prediction to be usefully realized, the nervous system must then transform into or use this premotor solution in finely timed and executed movements. Once a pattern of neuronal activity acquires internal significance (sensory content gains and internal context), the brain generates a strategy of what to do next, i.e. another pattern of neural activity. This strategy can be considered an internal representation of what is to come, a prediction imperative, in order to become actualized in the external world.

22.3 Prediction and "Self"

While prediction is localized in the CNS, but it is a distributed function and does not have a single location within the brain. What is the repository of predictive function? The answer lies in what we call the self, i.e. the self is the centralization of the predictive imperative (Llinás and Roy 2009). The self is not born out of the realm of consciousness—only the noticing of it is (i.e. self-awareness). Thus, according to this view, the self can exist without awareness of its existence. That is, even in our case of individuals capable of self-awareness, such awareness is not necessarily present. As an example, consider one's response to fire in one's bedroom. The thought will be "fire, run!", not "fire, I will now run". Given that prediction may be considered the ultimate and most pervasive of all brain functions, one may ask how this function is grounded such that there evolved only one predictive organ. Intuitively, one can imagine the timing mismatches that would occur if there were more than one set of prediction making judgment calls for a given organism's interaction with the world; it would be most disadvantageous for the head to predict one thing and the tail to predict another! For optimum efficiency, it would seem that prediction must function to provide an unwavering residency and functional connectedness: it must somehow be centralized to the myriad interplays of the brain's strategies of interaction with the external world. We know this centralization of prediction as the abstraction we call the "self".

The above results in modern brain research raise a lot of epistemological issues which are discussed in the context of Indian philosophy for many centuries.

22.4 Epistemological Issues

For convenience, we shall discuss the specific concepts as discussed above in the context of internal geometry and the related epistemological issues as discussed in the context of Indian philosophy, for example:

(a) Simultaneity in neuroscience and representationalism in Indian philosophy
(b) Sakarvada and functional geometry
(c) Self-awareness and Indian philosophy
(d) Functional geometry and qualia
(e) Neuronal basis of consciousness

22.4.1 Perception and Representationalism

The brain or specifically CNS internalizes the external world through sensory organs. Perception (pratyaksa) is normally described as the knowledge acquired by the senses. However, philosophers discussed perceptions not only as sensory perceptions. Post-Cartesian philosophers classified the perceptual experience in three different classes:

(a) Direct realism
(b) Representationalism
(c) Phenomenalism

Although these three different classes are not necessarily mutually exclusive, the Indian and Western scholars think of them as different strategies. In fact the issue is what are the relations between the perceptual objects and the physical objects in the external world. The representationalist explains it in terms of representation caused by the external object. Lock's representationalism is well known in the Western world. His ideas can be summarized as "It is evident that the mind knows no thing immediately, but only by the intervention of the ideas it has of them . . . .. The mind

.....perceives nothing but its own ideas". However, one needs to analyse critically the ideas propounded by Lock. For example, the problem of time gap between object and perception is worthy of discussion since it is one of the challenging problems in neuroscience too. It is known as the issue of "simultaneity" in neuroscience. Object at particular instant in the external world causes a time delay due to various conduction speeds along axons and hence the imperceptibility of external objects. It is argued that as and when the brain perceives the object no longer exists due to time gap, hence they can be inferred or postulated. The premise is that the perception must be simultaneous with the objects. For Buddhist philosophers, the issue is discussed from a different perspective: since the perception and the object are both momentary, they can never be simultaneous. Then the problem is how we apprehend things when they cease to exist.

Dharmakirti and his followers proposed conflicting solutions which indicate the difficulties in representationalist and causal theory. On the other hand, the neuroscientists solved the problem considering the operational definition of simultaneity (Roy and Llinás 2008) where the brain is a kind of instrument whose resolution time is exactly of the order of the time gap and hence simultaneity retains.

Among Indian schools (non-Buddhist), Nyaya offers a view which is typically of direct realism, i.e. perception does not need mediation. They considered perception as two stage process: a nonconceptual (nirvikalpa) perception of the object arises first and then a conceptual (savikalpa) perception arises. Both are considered as valid cognition. Buddhists think nonconceptual perceptions only are valid. Advaita Vedanta position on perception seems to agree, spirit, with the Buddhists, but their reasons are completely different than Buddhists.

22.4.2 Sakarvada and Functional Geometry

There are two fundamental divisions in Indian philosophy regarding cognition and its aspect. One who argues that cognition does not apprehend its object nakedly but through an aspect is known as "sakarvadin" who belongs to Samkhya, Vedanta and Sautrantika–Yogacara schools.

The other who proposes that there is no intermediary is known as Nirakarvadin. Here, consciousness is considered as amorphous and does not change with its object. According to Nirakarvadin, the existence of intermediary does not allow us to see external objects as such but their representations only. For "sakarvadin" an aspect is a mark or reflection of the object in consciousness. The nature of the aspect can be explained in the following way: "It is the cognitive object-form that determines knowledge as capturing the object. This object-form assures me that I know the object. As long as the form of the object remains confined in the external thing it can not be looked upon as given to knowledge. But when the external object confers its form upon cognition , it (the form) becomes cognitive object-form which alone finally helps in manifesting the object as known to the knower" (Bandyopadhaya 1959).

According to the functional geometric approach, functional states of the brain are being modulated by external stimulus like modulation of a musical instrument. The functional states consist of infinite number of forms or patters. As soon as the form of an external object stimulates the functional states of the brain or CNS, a particular form or pattern arises and eventually stabilized.

22.4.3 Self-Awareness and Ancient Wisdom

The theories of self-awareness in Indian traditions (which also include Buddhist one) can be mainly divided into two broad categories:

(a) Reflectionist or other-illumination (paraprakasa) theories
(b) Reflexivist or self-illumination (svaprakasa) theories

Both Brahmanical and Buddhist schools debated over the nature and existence of "self" for many centuries. Brahmanical schools accept the existence of "atman" (as permanent and imperishable), while Buddhists reject the concept of "atman" and took reductionist account of persons. In the framework of functional geometry, we have already discussed self as prediction imperative, and no single location is found in the brain responsible for prediction. A distributed function is shown to be associated to the prediction. Self is shown to be the centralization of predictive imperative. Here, the motricity plays a key role in prediction imperative and hence in case of self-awareness. According to this view, plants do not have self-awareness since they do not have movement. The functional state of the brain or the geometry associated to CNS gives rise to predictive imperative and hence what we call "self".

In Buddhist philosophy, the term "svasamvedana" or in Tibetan "rang rig" is similar to the term "self-awareness" which is usually understood consciousness aware in some sense of itself rather than consciousness aware of a Self or "atman". Sometimes it is also translated as "reflexive awareness" or "the reflexive nature of awareness". Paul Williams (2000) made a critical study on the reflexive nature of awareness in Madhyamaka perspective. According to Buddhist scholar Dignaaga, the self-awareness is the result of the perceptual situation, the "praamanaphala". Another Buddhist scholar Dharmapaala seems to follow Dignaaga and made a distinction between the subjective aspect and the resultant self-awareness.

22.4.4 Functional Geometry and Qualia

Qualia refer to the quality of entities. Quine used the term to denote the feeling character of sensation. We use the term "qualia" to denote subjective experience of any type generated by the nervous system like love, redness of the colour etc. There are two similar beliefs concerning the nature of qualia as follows:

(a) Qualia represent epiphenomena that are not necessary for the acquisition of consciousness.
(b) Being the basis of consciousness, qualia appeared only in the highest life forms, suggesting that qualia are a recently evolved central function that is present in only the more advanced brains.

In the context of functional geometry since sensations themselves are geometric, electrically triggered events, qualia represent the ultimate bottom line and cannot be reduced further. The main issue is whether the geometry or electrically triggered events of neurons can explain the "subjective experience" or "qualia" or we need something transcending neurological substrate of neurons.

The present author does not know the similar term of qualia neither in Buddhist nor in Brahmanical thoughts. It would be interesting to look into similar terms in our ancient traditions and get insights.

22.4.5 Neuronal Basis for Consciousness

Given that neurons have evolved into performing different and specified functions capable of representing fragments of reality then how does the brain manage to make a singular, useful construct from these pieces? This has been described as "binding" problem. Recently Llinás and his collaborators proposed that thalamocortical interconnectivity plays central role in global brain function. The study of the interaction between specific and non-specific thalamic loops suggests that thalamus represents a hub from which any site in the cortex can communicate with any other site. It is also shown that the functional states which characterize human cognition are generated due to the large-scale temporal coincidence of specific and non-specific thalamic activity.

22.5 Functional Geometry and External World

The birth of quantum mechanics in the early 20$^{\text{th}}$ century shattered our idea that it is possible to describe our physical world with one physical law. The world on large scales—the motion of terrestrial objects like planets, stars and galaxies—down to our day-to-day world is explained with the help of Newtonian mechanics. But as we move to smaller scales regarding the behaviour of the objects with small masses like electrons, protons and photons, one needs to employ quantum theory. So we have two different types of physical law that are valid at two different levels of physical world. However, the popular belief among physicists is that if we really understand quantum theory, it is possible to use it to describe large-scale phenomena, i.e. what we call classical world. In practice, however, we use either classical physics or quantum physics.

Let us now look at the scales that we deal with in the physical world. The time and length scales at the bottom are known as Planck time and the Planck length, respectively. Planck time is 10 to the power (−43) s, and Planck length is of the order of 10 to the power (−33) cm, i.e. shortest length in this physical universe. Now when one needs to combine both Planck time and Planck length, it is necessary to consider both quantum theory and general relativity. Quantum theory is valid for small length scales, and general relativity is valid for large time and length scales. As soon as both quantum theory and general relativity are brought together, one needs to consider both the Planck length and Planck time. For example, if we need to describe the physics of black holes or the universe at the big bang, it is necessary to consider both quantum theory and general relativity. But, the attempt to combine quantum formalism with general relativity leads to catastrophe, rather than the harmony observed in nature. Physicists do not have a satisfactory model of the physical world at the Planck scale. In our search for such a model, our working hypothesis is that the continuum concepts of ordinary physics and/or mathematics can be reconstructed from more primordial pregeometric (basically discrete) concepts, which are prevalent at Planck scale. Here, geometry emerges from a purely relational picture a la Leibniz. In particular, the underlying substratum of our physical world or, more specifically, the space–time (quantum) vacuum can be viewed as a cellular network. Requardt and Roy (henceforth known as RR model) developed a model of such cellular networks which can be regarded as complex dynamical systems or statistical/stochastic frameworks, but in a purely geometric sense, they are evolving graphs. RR model is essentially a two-level system, comprising two dynamical cellular networks. Here, macroscopic space–time or its underlying mesoscopic substratum emerges from a more fundamental concept, a fluctuating cellular network around the Planck scale.

The microscopic level, QX, is a dynamical cellular network of nodes and bonds. The macroscopic level, ST, that self-organizes from QX is another cellular network of nodes called supernodes and bonds called superbonds. The supernodes of ST are cliques of the underlying graphs of QX. The system of RR ends with a metric space, that is, geometric space endowed with a ruler for measuring distances between points. Now we will briefly describe the condensation process (Abraham and Roy 2010) by which the ST (space–time) network is derived from the QX (quantum vacuum) network. This process creates the ST universe from the submicroscopic QX network, which is fluctuating in its own micro-time scale, outside of ordinary space and time.

With each micro-time tick of the network clock, the QX network is updated. We now imagine that after a rather large and perhaps variable number of these micro-time ticks, the state of the universe is to be updated or recreated, to a new state that we call *occasion.* The process of creating an occasion from the activity of QX network we call condensation, following the early philosophers. The ongoing condensation process and its sequence of occasions create space, macro-time and the space–time history of objects moving through space–time that we experience as human consciousness. Here, we have introduced the concept of two times in describing condensation process: one at submicroscopic level and another at macroscopic level. The concept of time and the epistemological issues attracted large attention to Indian philosophers (Balslev 1983) for many centuries. Especially, the Brahmanical, Buddhist and Jain schools studied the time as instant and its relevance to consciousness. It is worth mentioning that two times concept have been described allegorically in *Visnu Purana where a kalpa is a day of Brahmaa, and one day of Brahmaa consists of a thousand cycles of four yugas or ages.*

Here, two times include the cyclic concept, and the cyclic concept became a temporal frame within which any past could be incorporated (Katina 2002).

22.6 Conclusion

The above analysis clearly indicates that internal geometry associated to the central nervous system is formed due to interactive relationship between sensory and motor expression. We call it as dynamic geometry. In fact, the functional states of ensemble of neurons are associated to this kind of geometry, and hence we call it functional geometry. Neuronal basis of consciousness can be described in a consistent manner within the preview of functional geometry. The functional geometry is not the unique one in the sense of its existence in the brain only since it can exist also in the external world. We have discussed above how one can describe the geometry around Planck scale considering evolving cellular network. At Planck scale, mini black holes are being created and absorbed simultaneously due to quantum fluctuations. So we call it as a type of functional geometry. The challenging issue is how to construct the correspondence between the two geometric worlds, i.e. the internal world associated to CNS and the geometric world outside and their invariants.

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Chapter 23
Consciousness, Libertarian Free Will and Quantum Randomness

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23.1 Introduction

Free will (FW), as we informally understand it in daily life, is the power of a rational agent to pick her/his own choice from among various alternative possibilities. But what exactly is FW? The age-old question has provoked much debate among philosophers and scientists (Zagzebski 2011; O'Connor 2010; Timpe 2006). Our outlook on the world implicitly assumes that human behaviour is governed by FW: we choose, we plan and we normally hold people responsible for what they say or do, either because we imagine that they are at liberty also not to act so or because we don't have the freedom to believe otherwise! Neuroscience has been uncovering causal chains that appear to explain our choices, emotions and even beliefs, in terms of neurophysical events extending back to the prenatal stage. As much as it is interesting and important to understand whether we have FW, there is a more elementary and pressing problem to deal with, namely, to try to define FW rigorously and scientifically in a way that agrees with the above intuitive notion. This last requirement is important, as one can define almost anything one wants in a theory of one's own design (Esposito 2012). Having defined FW, one might

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*, DOI 10.1007/978-81-322-1587-5_23, © Springer India 2014

ask whether such a FW is compatible with known scientific knowledge or can be demonstrated experimentally as a new kind of resource in Nature.

Philosophers over the millenia have proposed different responses to the problem. Two prominent positions are *compatibilism*, according to which determinism is compatible with FW, and *incompatibilism*, according to which the two are incompatible. There are shades of intermediate positions. Compatibilism is espoused by, among others, Calvinists who believe that personal freedom to choose does not preclude foreknowledge (possessed by a all-powerful intelligence) of future choices. Two broad incompatibilist positions are (*metaphysical*) *libertarianism* and *hard determinism*. According to the former, in a situation of alternative possibilities (AP) which is ontologically (metaphysically) available, an agent has the liberty to choose one or other option, which is not predetermined. This position upholds FW and rejects determinism. In Western theological thought, this is represented by Arminianism. By contrast, *hard determinism* upholds determinism and rejects FW, relegating it to an illusory feeling. The Jaina sect of Ajivikas was an example of fatalists who subscribed to this view of FW.

Recently, a number of physicists have studied FW mainly (but not exclusively) in connection with quantum mechanics (QM) (Conway and Kochen 2006, 2008; Stapp 2001; 't Hooft 2007; Nikolič 2010; Suarez 2008, 2010a,b; Vedral 2006; Gisin 2010a,b; Hall 2010; Hossenfelder 2012; Svetlichny 2012). The important contribution of quantum mechanics to this debate is in introducing a concrete instance of fundamental indeterminism via the $|\psi|^2$ Born rule. Whether this indeterminism is epistemic or ontic still remains a moot issue and is related to the notion of realism in the sense of the Bell-Kochen-Specker theorems. In the quantum approach to FW, some have assumed that quantum indeterminacy gives "elbow room" for FW to act, while others identify FW with unpredictability or independence from all past information (with "past" defined in an appropriately relativistically invariant way). We call this approach *soft incompatibilism*, according to which FW is incompatible with determinism but compatible with indeterminism. However, this approach, which also finds favour in the neuroscientific and artificial intelligence (AI) communities, fails to capture the sense of control, of having liberty and making a deliberate choice, implicit in the notion of FW.

In this work, we aim to define libertarian FW, which encompasses such a liberty, and to study its relation to the laws of physics. Libertarian FW is arguably the most intuitive variety of FW and yet, as we will find, the most elusive to define. We do not claim that it is somehow a better variety of FW or that it can be experimentally demonstrated at this time. It is our preferred understanding of FW simply because it feels right! This chapter is arranged as follows. Section 23.2 presents a logical paradox that would afflict attempts to define libertarian FW and presents a resolution. Section 23.3 explains another basic logical paradox that would thwart an attempt to define libertarian FW. This logical barrier is surmounted in Sect. 23.4 through a new model of FW. Certain biological implications of the model are discussed in Sect. 23.5. Sections 23.6 and 23.7 may be omitted by readers not interested in quantitative aspects of the mode. Section 23.6 presents a simple mathematical representation of the proposed model, while Sect. 23.7 applies it to quantum mechanics and considers some unusual consequences. Neurological tests, implications and applications of our model are considered in Sect. 23.8.

23.2 The Weak Free Will Paradox and Its Resolution

The reason libertarian FW resists definition is that attempting to define it leads to logical paradoxes, which we discuss in this and the next section. Although these paradoxes were not, to our knowledge, explicitly mentioned before, yet they implicitly crop up in past attempts to define FW, thwarting a definitive resolution to the problem for over two millenia. It is not surprising that in the face of this daunting logical barrier, scientists tend to adopt a position other than libertarianism.

If we accept the libertarian position, then by assumption of incompatibilism, one rules out determinism as the universally correct description of the physical laws. But neither does indeterminism (as governed by some fixed probability rule, P) leave enough room for FW to act. Consider the sample mean X_n over N trials

$$\lim_{n\to\infty} \Pr\left(\left|\overline{X}_n - \mu\right| > \epsilon\right) = 0,$$

by the Weak Law of Large Numbers. This implies that there is a "probability pressure" *not* to choose *atypical* sequences, which would cause deviations from the sample mean. Thus, there is a kind of long-run determinism, and hence a restriction on FW as we intuitively understand it. For example, given a coin with outcome space $\Omega = \{H, T\}$ and the corresponding probability vector $P = (\frac{1}{2}, \frac{1}{2})$, the coin is not free to indefinitely choose outputs HHHHHHHHH$\cdots$. Thus, libertarian FW is compatible with neither determinism nor indeterminism and thus belongs to the position of *hard incompatibilism*. This situation creates a paradox for the libertarian position, which we call the Weak FW Paradox (WFWP), whereby FW is compatible with neither of the available alternatives. The other mentioned positions on FW are unaffected by WFWP.

Therefore, if we accept libertarian FW, the free-willed choice will potentially interfere with the underlying physical dynamics $\mathcal{D}$. This interference will take the form of (a) overriding causality, if $\mathcal{D}$ is deterministic, or (b) causing deviations from the relevant probability rule P, if $\mathcal{D}$ is indeterministic.

Clearly, it is immaterial whether the underlying physics is classical or quantum. The argument sometimes made, that quantum indeterminism gives "room" for free-willed action, is thus not found to be persuasive. FW itself can't be part of the dynamics $\mathcal{D}$, for in that case, it could not produce the required deviations. Therefore, we require a Cartesian dualism with a physical and an *extra-physical* component making up a free-willed agent. Physical dynamics $\mathcal{D}$ governs the former while FW comes from the latter. It is important to stress that this extra-physical agency must be something that is *qualitatively* different. If it were merely part of a larger deterministic or indeterministic dynamics, say $\mathcal{D}'$, then the consolidated agent, comprising of the physical component and the extra-physical agency, will not be affected by deviations from its laws, and thus there will be no FW at this more general level. The extra-physically induced deviation must harness a new form of causation for libertarian FW to be viable (to wit, the extra-physical agency must be "magical"). This is the point of the following section.

23.3 The Strong Free Will Paradox

The above resolution of WFWP says that if libertarian FW exists, it must be an extra-physical resource whose intervention causes deviations from $\mathcal{D}$. It still leaves open the question what libertarian FW is or how it can be consistently defined. Here, we will show how trying to pin down its nature leads to another paradox, which we call the Strong Free Will Paradox (SFWP). The paradox is obtained essentially by extending the traditional incompatibilist claim for the incompatibility of determinism and FW to that of *indeterminism* and FW. The idea is that the truth of determinism or indeterminism would mean that we do not control actions in a way one would expect of self-determining, free-willed agents. Since determinism and indeterminism are the only available causal primitives, there is no such thing as libertarian FW, according to this line of reasoning. There is a similarity to WFWP, but the focus has shifted from "where?" to "what?" or even "whether?".

We present two slightly different versions of SFWP. In the first of them, one assumes that FW exists and tries to locate it in terms of properties of the agent. According to this argument:

[I] An agent has free will only when her intentional actions emerge from the agent herself.

[II] Therefore, they are deterministic functions of her volitions, beliefs, desires, etc., which we denote by *variables of intent*, $x_j^{(1)}$.

[III] If there are no prior causes of her volitions, desires, etc., then the values $x_j^{(1)}$ take on must be random, making the agent's volitions, desires, etc., and hence her actions, whimsical.

[IV] Since whimsicality undermines the notion of control or intent, $x_j^{(1)}$ must not be random, but deterministic functions of some other second order intent variables $x_k^{(2)}$, which, by virtue of **[I]**, must belong to the agent herself.

[V] As before, the variables $x_k^{(2)}$ themselves are caused or uncaused. If the latter, then $x_k^{(2)}$ are random, making $x_j^{(1)}$, and hence also her actions, ultimately whimsical. But if the former, then $x_k^{(2)}$ are not free but depend, by a similar reasoning, on higher-order variables $x_j^{(3)}$, and so on similarly to even higher orders indefinitely.

[VI] If this pattern of recursion terminates at some finite depth N, then $x_j^{(N)}$ either has no causes or external causes of unspecified origin. In the former case, we obtain capricious, indeterministic behaviour, in the latter case, unfree, deterministic behaviour. Neither connotes FW as we recognize it.

In brief, when we try to incorporate the notion of will or intent into the action, the action becomes deterministic and hence unfree. Putting freedom back means removing determinism, which undermines intent by making the action random and the agent whimsical. Thus, the "free" and the "will" in "free will" are at loggerheads, making the word an oxymoron. This is the Strong Free Will Paradox (SFWP), according to which randomness and determinism seem to be the only fundamental causal primitives in Nature, with libertarian FW a figment of imagination.

It is of interest to note that certain classical accounts of FW fall prey to SFWP, illustrating its elusiveness to define. According to Thomas Hobbes, "A free agent is he that can do as he will, and forbear as he will….". David Hume characterizes it thus: "power of acting or of not acting, according to the determination of the will: that is, if we choose to remain at rest, we may; if we choose to move, we also may…. This hypothetical liberty is universally allowed to belong to everyone who is not a prisoner and in chains". To paraphrase in terms of our discussion above, they both are essentially saying $E = E(x_j^{(1)})$, but weren't taking the argument farther. Arthur Schopenhauer does take it one step farther but says: "You can do what you will, but you cannot will what you will. In any given moment of your life you can will only one definite thing and absolutely nothing other than that one thing". He is thus effectively responding to SFWP by characterizing $E = E\left(x_j^{(1)}(x_k^{(2)})\right)$ and denying the existence of libertarian FW. One can try other variants, such as $E = E(x_j^{(1)})$ being a probabilistic function, whereas $x_j^{(1)} = x_j^{(1)}(x_j^{(2)})$ being deterministic, so that there is mix of determinism (Will) and indeterminism (freedom) at *different* levels of the agent's personality. However, the core of SFWP remains.

A related but different version of SFWP tries to identify FW as a particular kind of influence over the act of making a choice. According to this argument:

[A] Suppose that from a set of alternative possibilities (AP), a choice is eventually made by an agent.
[B] From the principle of excluded middle, the choice was made either according to a rule or it was not made according to a rule.
[C] In the former case, there is no genuine AP situation. Hence, we have determinism, and there is no FW.
[D] In the latter case, we have pure randomness and hence, again, no FW in the sense of the agent's control and voluntary choice.

We thus find again that the agent's choice is deterministic or random, with no apparent room for (libertarian) FW. This is the basis of the *pessimist* view that there can be no such thing as FW (Timpe 2006).

Implication **[C]** lies historically at the heart of the incompatibilist argument. Here, if the rule is *prescriptive*, we have *causal determinism*, as a law of physical dynamics in Nature. If the rule is only *descriptive*, we have *logical determinism*, with outcomes of future choices being known to an all-powerful intelligence and assigned definite truth values.

23.4 Resolution of the Strong FW Paradox

We propose the following hard incompatibilist model as a way out of SFWP, drawn from an interpretation of Eastern philosophy. According to the model, the conscious personality of the free-willed agent, which may be called the *Ego* (after the father of modern psychoanalysis, Sigmund Freud), is influenced in an AP situation by three structural elements. This tripartite division is at the heart of our model. Two of the elements, and their functions, are as follows:

Nature (N). Imposes mental constraints in the form of desires, instinctive drives and emotional tendencies

Understanding (U). Offers guidance in action through a rational capacity to model the world and understand the (ethical, social, financial, etc.) implications of each choice

When a situation with alternative possibilities is encountered, Nature **N** and Understanding **U** present their respective recommendations to the Ego on selecting one of the alternatives. While the recommendation of Nature appears as a *desire*, that of Understanding appears as a *thought* or *feeling*. As a specific example, the desire may be oriented towards seeking pleasure (Freud's pleasure principle), while the thought or feeling may be about conscientious restraint. The dilemma sometimes experienced by one about to make a choice is the possible conflict between the two recommendations.

It is convenient to designate the *mind* as the seat of Nature **N**. In Freudian psychoanalytic terminology, the mind may be identified with the *id*. Similarly, the seat of **U** is posited to be the *intellect*, which may be identified with Freudian *superego*. To use a crude but visually helpful computer analogy, we may picture the Ego as the CPU (central processing unit) of a computer, with **U** and **N** being softwares uploaded onto it during the waking period from their respective seats, which are like hard disk memory locations.

For non-libertarian accounts of FW, including AI, the two elements **U** and **N** suffice. They are both *causal resources*, i.e. systems that can drive the agent's behaviour independently and thus aspects of the dynamics $\mathcal{D}$. The eventual choice will be some deterministic or probabilistic outcome of their interplay. Philosophically speaking, the main drawback with such accounts is that they lack the sense of having liberty to make a deliberate choice.

Crucially, for (libertarian) FW, **U** is not a causal resource, but a *guidance resource*, unlike **N**. When the input from **U** and **N** are experienced as possibly conflicting tendencies by the Ego, the guidance by itself is powerless to influence the agent's choice. A further element is required, the third and last in our model, which expresses the idea of empowering the Ego to deliberately choose between the recommendations of desire and guidance. This is the faculty of volition or simply:

Freedom of Will (F). The *extra-physical* freedom to orient or align the choice in line with the Understanding **U** by overcoming, if necessary, the Constraints imposed by Nature **N**

The extra-physicality follows from the resolution of the WFWP. SFWP also implies it because if it were not extra-physical, then **F** would be part of the underlying dynamics $\mathcal{D}$ as a deterministic or indeterministic aspect, and not libertarian, as required. As to the question of whether such an extra-physical resource is sanctioned by physics or can be tested, we return to it in Sect. 23.7. Here, we are concerned only with obtaining a suitable *definition*. We call our model "FUN" in recognition of the fact that it involves the triad of elements **F**, **U** and **N**.

Faced with an AP situation, Nature and Understanding may present conflicting recommendations to the Ego under some description – a desire or drive vs a thought, feeling or belief. If the Nature-induced desire is aligned away from the Understanding-proposed thought, then supported by FW, the thought acts as a restraint, whereas if the desire is attuned to **U**'s recommendation, then FW acts to that extent effortlessly. Together **F** and **U** constitute a causal resource, in which **F** contributes the magnitude or "energy" while **U** the direction. Recognizing this is crucial in resolving SFWP, and its oversight is the cause of much confusion in existing accounts of FW. Thus, FW is the expression of **F** in a situation where the Ego is exposed to the potentially conflicting recommendations of **U** and **N**.

FW as defined above is the new *causal primitive* or *principle of causation*, apart from determinism and indeterminism. By its fundamental character, it is empowered to override physical causality (of Nature) under the intellect's guidance. FW thus enables a state of affairs wherein logical determinism holds whereas causal determinism fails. We return to this point elsewhere to use this as a basis for a (meta-)logical framework to characterize FW. We think that our definition of FW, and a quantification of it below, agrees with the notion of *volitional causation* proposed in Hodgson (2001) as distinguished from *physical causation*.

The agent's freedom to control, together with the Understanding, as we have proposed, bears some similarity to the *Ultimate Responsibility* posited by the philosopher Kane. However, the role of **F** and **U** need not be confined to moral issues alone and may extend to other walks of life. For example, agent X is suffering from a medical problem and has the Understanding that X needs to undergo treatment. However, X's Natural tendency, governed by Constraints **N**, would be to avoid the treatment because it would cause discomfort. X exercises FW to endure the discomfort in the interest of later cure and long-term benefits.

We will now prove that the FUN model resolves SFWP. In particular, the above example highlights how the *incompatibilist* implication **[C]** of pessisimist fails. If one happens to be familiar with the *Weltanschauung*, and hence the Understanding of X, and X has high free will, then the *freely* chosen alternative will be *predictable*.

Proposition 23.1 below, whose truth is clear in this light, is rigorously validated by our definition of FW. We define a *Saint* as an agent whose Understanding is ethical and whose FW is near maximal.

Proposition 23.1. *Presented with the choice between the good and the evil, the Saint* freely *chooses the good.*

By definition, the Saint, equipped with maximal FW, can if necessary override any Constraints like desire and instinctive drives imposed by his human nature and align his choice in tune with his Understanding.

Thus, the deterministic behaviour and predictability of the Saint does not preclude his free will, contrary to the *incompatibilist* implication **[C]** in SFWP. We have here an instance of a descriptive rule (logical determinism) that is strictly non-prescriptive (i.e. strictly not causal determinism). Intuitively, this is clear, since one should be able to choose freely, even to act predictably. Not to be able to choose to act predictably would imply a constraint on freedom. Libertarian freedom also means that one is free to choose *not* to make a deliberate choice, but to simply lay back and allow Nature to take her course, because the Understanding flags the given AP situation as unimportant or has no particular preference for one choice over the other. We will refer to libertarian FW marked by this *laissez-faire* attitude towards Nature, as laissez-faireian FW.

The instance of Saintly determinism does not make our model compatibilistic, as it must be clear. In particular, other situations are allowed to exist by our model that resist compatibilistic interpretation, as noted below. Suppose that an agent's FW is not maximal. Then, his choice will fluctuate randomly between choosing according to the dictates of his nature and the recommendation of his Understanding. This is illustrated in the following proposition, whose intuitively apparent truth is validated rigorously by our definition of FW.

Proposition 23.2. *Presented with the choice between the good and the evil, the Conscientious Criminal vacillates.*

This criminal, being conscientious, has a clear Understanding of the virtue of ethical behaviour, but, owing to lack of sufficiently high FW, cannot always overcome the compulsion of his criminal nature. His choice is random, being good sometimes and being evil at other times. Thus, the randomness of his choice does not imply lack of free will. Here, it only implies low free will. The *pessimist* (Timpe 2006) implication **[D]** in SFWP is also therefore falsified. The recognition of FW as a new form of causation also clarifies why the first version of SFWP fails. For example, implication **[VI]** is incorrect for reasons stated above.

In contrast to Proposition 23.1, predictable behaviour can arise also because of low degree of FW. Consider:

Proposition 23.3. *Presented with the choice between the good and the evil, the Hard-core Criminal chooses evil.*

Although the Hard-core Criminal may possess an ethical Understanding, yet, because he almost entirely lacks FW, his choice is deterministically decided by his evil nature. If we theoretically empower him with some FW, we obtain the scenario of Proposition 23.2. In other words, adding a degree of FW removes determinacy. Clearly, this prediction of the model is not in accord with compatibilism. Therefore, our model is neither incompatibilist nor compatibilist.

23.5 Some Neuroscientific Considerations and Philosophical Musings

The FUN model as it stands does not explain the notion of moral responsibility. Further assumptions are needed to develop a more complete notion of moral responsibility in the model, which will be taken up in a subsequent work. For the triad of elements of the FUN model described in Sect. 23.4, we suggest the following plausible brain correlates. For convenience, we refer to this neurologically adapted version of FUN as the FUN# model. In this model, the mind's brain correlate is the limbic system, which, comprising brain structures like the hippocampus and amygdala, is known to support a variety of functions, including behaviour, emotion and long-term memory. The intellect's brain correlate is located presumably in the brain prefrontal cortex. This region of the brain is believed by neuroscientists and psychologists to be responsible for many higher cognitive functions, such as planning, differentiating between the good and bad, determining consequences of actions, and planning actions. The FUN# model provisionally posits that the brain correlate of FW is the pineal gland. The claim for this gland is mainly historical, which the FUN# model accepts as a working hypothesis.

In the FUN model, **F**, **U** and **N** are elements independently influence a choice. Observation suggests that they are expected to influence each other. As an example of Understanding modifying Nature, brand loyalty towards a product in the market influences the level of desire one experience for competing products.

One may discern three broad behavioural traits: that dominated by Nature **N** ("the animalistic"), that dominated by freedom ("the saintly") and that wherein the two are roughly in balance (the "human"). We suggest that these terms correspond to the *yogic* terms of *tamas*, *sattva* and *rajas*, as summarized in Table 23.1 where the $\|\cdots\|$ indicates "degree of" in some sense.

To complete the model, we offer some thoughts on the extra-physical agency to which the will is ascribed. Here, we will appeal to the Eastern philosophies of *Vedanta* (Srikanth 2012) and *Yoga* (Srikanth 2012), which recognize and supply such an entity – the *Self* (*átman* in Sanskrit), which is quite distinct from the

Table 23.1 Character traits according to relative dominance of Freedom and Nature in *Yogic* terminology

Condition		Character trait
$\|\text{Freedom}\| < \|\text{Nature}\|$	$\Rightarrow$	*tamas*/"animalistic"
$\|\text{Freedom}\| \approx \|\text{Nature}\|$	$\Rightarrow$	*rajas*/"human"
$\|\text{Freedom}\| > \|\text{Nature}\|$	$\Rightarrow$	*sattva*/"saintly"

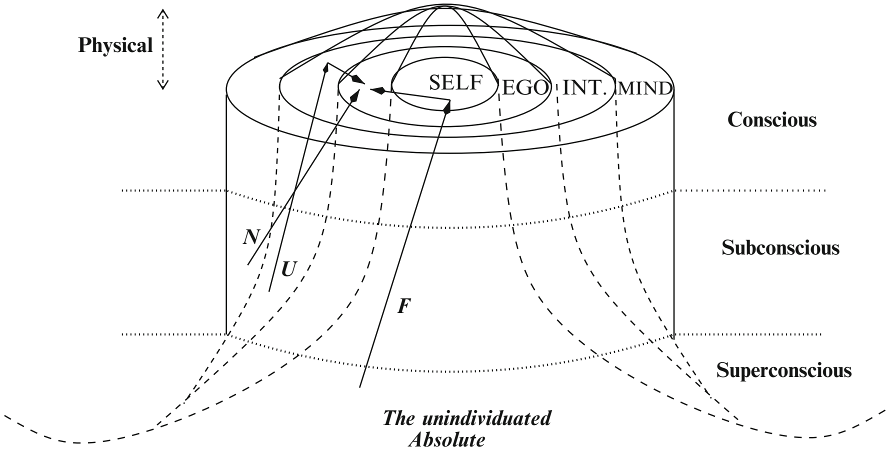

Fig. 23.1 Scheme of the structure of the individual psyche as used in the FUN model. The scheme is based primarily on the Eastern philosophy of *Vedanta* (Srikanth, 2012) and *Yoga* (Srikanth, 2012) with inputs from Freud's iceberg model in psychoanalysis and Edgar Cayce (Puryear, 1982). The Ego receives causal constraints from the mind, guidance from the intellect and freedom from the Self to direct the choice to favour guidance over constraints, if the latter two conflict. In this geometric interpretation, the Ego Consciousness is *horizontal* (spreading out concentrically from the centre), while the mode of Cognizance of the Self is the Witness Consciousness (a *bottom-up* perspective from the base rooted in the Absolute), which is *vertical* and illumines all objects, including the Ego, in the horizontal surface patch at the *top*. In this sense, the Self's Witness consciousness is of higher dimensionality than the personality's Ego consciousness. (An even higher-dimensional consciousness can be associated geometrically with an observer looking at the above image on a page. This perspective represents a subtler, Witness of Witness Consciousness, and so on. Vedantic philosophy posits that this hierarchy terminates in *brahman*, the Absolute or the fundamental substratum

Ego (*ahamkára*) and conceived of as the essential individual. At a deeper level of consciousness, the Self fans out to serve as the overarching *substratum* on which the agent's faculties of Ego, Understanding and Nature rest. At the deepest level of consciousness, there is no structure and the individual Selves resolve into an unindividuated Absolute. These ideas can be readily interpreted geometrically; cf. Fig. 23.1. Analogous to the Freudian *structural iceberg model*, the Constraints of **N** are communicated from the mind at the subconscious level. The Understanding and Will, although having deeper roots, are supplied from within the conscious level.

The Self cognizes the faculties of Ego, mind and intellect through a mode of Consciousness called *witness consciousness* (*sákshi bháva*). This is subtler than and different from the agent's Ego consciousness. Figure 23.1 depicts a simple geometric interpretation of these modes of awareness. (One can analogously construct a hierarchy of subtler modes or dimensions of consciousness that terminate in an Absolute consciousness, *brahman* in Vedantic philosophy.) The basic information about the above three elements are summarized in Table 23.2.

Table 23.2 The three structural elements of libertarian FW according to the FUN model, their corresponding place of origin, the function of the elements, possible physical correlates in the brain and the corresponding character trait, according to the philosophy of *Yoga*

Faculty	Seat	Function	Possible physical correlate
Nature, **N**	Mind	Mental constraints	Limbic system
Understanding, **U**	Intellect	Guidance	Brain frontal cortex
Freedom, **F**	*Self*	Control	Pineal gland?

23.6 A Quantitative Version of the *FUN* Model

We develop a minimal mathematical model, denoted FUN+, to quantify the qualitative ideas developed above as part of the FUN model. Given an AP situation, and a choosing event **e**, let the choice be represented by a random variable E over the sample space $\Omega \equiv \{e_1, e_2, \cdots, e_n\}$, representing the possible n choices that can be made. If **e** involves a material particle, which presumably lacks any libertarian FW, the outcome e_j at event **e** would occur with probability p_j, and there is no distortion of P.

The dictates imposed by the Constraints of Nature **N** are represented, over Ω, by the probability vector $P = \{p_1, \cdots, p_n\}$, normalized so that $\sum_{j=1}^{n} p_j = 1$. The vector could be pure ($\forall_j \left(p_j\right)^2 = p_j$) or mixed. The recommendation due to Understanding **U** is represented, over Ω, by the probability vector $P^U = \{p_1^U, \cdots, p_n^U\}$, which is normalized and could be pure or mixed. For example, if $\Omega = \{\texttt{good}, \texttt{evil}\}$, then we would have $P^U = \{1, 0\}$ according to the moral criterion, whereas by Nature, $P = \{\frac{1}{2}, \frac{1}{2}\}$. If $\Omega = \{\texttt{coffee}, \texttt{tea}, \texttt{alcohol}\}$, the Understanding could use a health criterion to return $P^U = \{\frac{1}{2}, \frac{1}{2}, 0\}$, whereas it may be that $P = \{\frac{1}{4}, \frac{1}{4}, \frac{1}{2}\}$.

FW **F**, as freedom to drive the choice from the prescriptive P towards the recommended P^U, is represented by the scalar quantity ϕ (where $0 \leq \phi \leq 1$), the freedom parameter, such that greater freedom connotes larger ϕ. To account for laissez-faireian FW, we require a parameter, denoted υ ($0 \leq \upsilon \leq 1$), which quantifies the degree of importance or attention given to the AP situation at hand. Denote $\sigma \equiv \upsilon\phi$. The probability vector P', representing the eventual choice of an alternative, is obtained by distortion of P towards P^U in the measure of strength of σ. A particularly simple form to capture this idea is a convex combination of P and P^U, parametrized by σ:

$$P' = \sigma P^U + (1 - \sigma) P. \tag{23.1}$$

Thus, the random variable $\mathcal{P}'$ representing the selected option is a weighted mean of random variables $\mathcal{P}^U$ and $\mathcal{P}$, representing, respectively, Understanding and Nature. When $\sigma = 1$ (maximal FW), $P' = P^U$, i.e. the choice is aligned with the

Understanding. When $\sigma = 0$ (vanishing FW or laissez-faireian FW) $P' = P$, i.e. the choice is entirely determined by Nature. For example, if P is the probability for obtaining an outcome 0 or 1 when measuring the Pauli observable σ_z on a quantum two-level system (qubit) in the state $\alpha|0\rangle + \sqrt{1-|\alpha|^2}|1\rangle$, then $P = (|\alpha|^2, 1-|\alpha|^2)$. Since the qubit arguably lacks FW ($\sigma = 0$), $P' = P$ according to Eq. (23.1). The non-linear functional $P'[P]$ must be viewed as a set of ontic probabilities, and thus a fundamental limitation on the predictability of an agent's choice, and not epistemic probabilities arising from ignorance about the details of an agent.

The unpredictability ξ of an agent may be quantified by the Shannon entropy of $P' = \{p'_x\}$:

$$\xi \equiv H(P';\sigma) = -\sum_x p'_x \log p'_x = \langle \log(\sigma p^U_x + (1-\sigma)p_x) \rangle, \tag{23.2}$$

where $H(P';\sigma)$ is the Shannon entropy of P' for a given value of σ. The following two results quantitatively present our earlier resolution of SFWP. In each case, we provide an example in the following two theorems that contradict each of implications **[C]** and **[D]** of SFWP. In both cases, and the remaining for rest of this section, we set $\phi = 1$, reflecting the high importance accorded to the moral AP situation considered.

Claim 1. The predictability of a Saint's behaviour does not imply his lack of FW.

Proof. We construct an explicit instance of predictable behaviour with (high) FW. Let $\Omega = \{\texttt{good}, \texttt{evil}\}$. By definition, the Saint of Proposition 23.1 is ethical in his Understanding, so that $P^U = (1, 0)$, and his will is free, so that $\sigma \approx 1$. Even if he may bodily not be attuned to perfection, still by dint of his high FW, he is always able to choose in accord with his (ethical) Understanding, i.e. $P' = P^U$ by Eq. (23.1). From Eq. (23.2), we have $H(P';\sigma) \approx 0$ bit, implying almost complete predictability, irrespective of P. □

This implies, as noted earlier, that our model is not incompatibilist. More generally, we note that $H(P';\sigma)$ is not a monotonous function of σ. The regime where

$$\frac{dH(P';\sigma)}{d\sigma} < 0, \tag{23.3}$$

and thus increase in FW leads to certainty, may be regarded as a zone of disagreement with the incompatibilist position. For example, given a situation involving two choices, with $\Omega = \{0, 1\}$ and $P^U = \{1, 0\}$ and $P = \{0, 1\}$, $dH/d\sigma < 0$ for $0.5 < \sigma \leq 1$.

Claim 2. The randomness of the Conscientious Criminal's choice does not imply his lack of FW.

Proof. We construct an explicit instance of random behaviour with non-vanishing FW. In the case of the Conscientious Criminal of Proposition 23.2, who has non-vanishing but not maximal FW, let $\sigma = \frac{1}{2}$, and let $P \approx (0, 1)$, corresponding to the constraint imposed by his evil Nature. From Eq. (23.1), we have $P' = (0.5, 0.5)$, and hence $\xi \approx 1$, implying near maximal randomness in choice. However, he does not lack FW, as $\sigma > 0$. □

In the case of the Hard-core Criminal of Proposition 23.3, we have the same Ω, P and P^U as in the example used in Claim 2, but $\sigma \approx 0$, corresponding to this criminal's low FW. From Eq. (23.1), we have $P' \approx P$, and thus from Eq. (23.2), $\xi \approx 0$, implying very little unpredictability in choice, similar in this respect to the Saint of Proposition 23.1. However, unlike with the saint, whose predictability comes from high FW, here the predictability is due the criminal's sure surrender to his Natural instinctive constraints. Augmenting his FW, we find that

$$\frac{H(P'; \sigma)}{d\sigma} > 0, \tag{23.4}$$

that is, increase in FW leads to increase in uncertainty (when $0 < \sigma < 0.5$). Thus, our model is also not compatibilist. Together, Eqs. (23.3) and (23.4) imply that our model is neither compatibilist nor incompatibilist.

The FUN model implies that σ must be at least partially extra-physical and cannot be described by any purely physical theory, even a theory-of-everything (ToE), that accounts for only physical phenomena. In particular, artificial intelligence (AI), which is fundamentally built on (quantum) physical rules, cannot encompass libertarian FW (and thus cannot also capture true cognitive behaviour).

These considerations entail that a human agent, and by extension any sentient agent, could not be considered merely as a sufficiently complex robot but a qualitatively distinct class of entities. Here, Penrose's interesting thesis is worth noting, according to which conscious processes are fundamentally non-algorithmic (Penrose 1994).

23.7 Quantum Indeterminism and Free Will

WFWP shows that quantum indeterminism is not better for FW than classical determinism. However, the fact remains that the world is fundamentally a quantum mechanical place. Further, there is in a sense a lesser departure from the physical dynamics $\mathcal{D}$ through free-willed intervention if $\mathcal{D}$ were indeterministic rather than deterministic, in that there is only a *statistical* violation of causality in the former case, rather than the *logical* violation of causality, as it is with the latter.

Accordingly, if X is the random variable corresponding to a FW-influenced quantum measurement $\mathcal{M}$ on system S (presumably a suitably small brain element) in state $|\psi\rangle$, then X would deviate from the Born probability rule. Free-willed intervention will therefore manifest as *statistical deviations from the Born rule*. By contrast, the freedom or "free will" of quantum particles, which is plain quantum randomness, will conform to the Born rule. In the model described below (called FUN++), which is a particular realization of the FUN+ model, we propose that FW intervenes by controlling the collapse of the wave function.

To begin with, we represent the AP situation as a *uniform* quantum superposition and the wilful choice by a directed collapse of the wave function. This quantum model thus presumes objective collapse of the wave function, and is compatible with interpretations of quantum mechanics that admit it. The exercise of FW is broadly divided into three stages as follows:

Attention. Faced with an AP situation of alternatives j, the brain creates a quantum superposition that reflects the dictates of Nature **N**:

$$|\Psi\rangle = \sum_j \sqrt{p_j}|j\rangle \tag{23.5}$$

in a suitable subneuronal system S in an appropriate basis $\mathcal{B} = \{|j\rangle\}$, where the states $|j\rangle$ correspond to the base choice space Ω. The main requirement is that it should be possible to shield S indefinitely from decoherence or other noise, while the process of making a choice is under way. According to Hameroff and Penrose (1996), brain microtubules may be the seat of such superpositions.

Survey. The Ego surveys the recommendations of the mind and intellect. This event is mathematically represented by the preparation of a nonlinear positive operator-valued measurement (POVM)

$$M_j \equiv \sqrt{p_j^{-1}\left(\sigma p_j^U + (1-\sigma)p_j\right)}|j\rangle\langle j|, \tag{23.6}$$

which satisfy the completeness condition $\sum_j \langle\Psi|M_j^\dagger M_j|\Psi\rangle = 1$. In the absence of FW, $\sigma = 0$, and the POVM reduces to ordinary projective measurement.

Collapse. Application of the POVM to the state $|\Psi\rangle$ causes the transition:

$$|\Psi\rangle \longrightarrow \frac{M_j|\Psi\rangle}{\sqrt{\langle\Psi|M_j^\dagger M_j|\Psi\rangle}}, \tag{23.7}$$

with probability $\langle\Psi|M_j^\dagger M_j|\Psi\rangle$.

The last stage in the model is tantamount to controlling and directing the wave function collapse to produce an outcome probability distribution that is closer (as quantified by trace distance, relative entropy or any other suitable distance measure) to $P^U = \{p_j^U\}$ than $P = \{p_j\}$, if FW is available. If FW is absent or there is a laissez-faire situation, then Nature alone determines the outcome probability distribution, which will conform to the Born rule.

When $\sigma \neq 0$, the resulting probabilities of outcomes will violate the Born rule. In general, such violations can give rise to various non-standard effects, among them violation of energy conservation, possibility of signalling at superluminal speed

(Srikanth, 2010) and the possibility of counter-intuitive models of computation that allow efficient solution of hard problems (Srikanth, 2010). However, these non-standard effects will be confined to a small subcellular region of the brain, where it will not be easily discernible from measurement errors, decoherence effects, neural noise and statistical fluctuations. Moreover, it can be facilely masked behind the remaining features of the brain's physiology, which can be described in terms of deterministic, classical mechanisms (e.g. metabolic changes leading to arousal potentials in motor neurons, initiating familiar physical movements of the body).

Finally, it is worth stressing that the extra-physical agency posited to determine the outcome of wave function collapse should not be confused with hidden variables in the sense of Bohm (Bohm and Hiley, 1993). The latter represent a device to turn QM into a deterministic theory and thus restore classical causality, whereas in our approach, FW is a new form of causation.

23.8 Neuroscientific Implications, Tests and Applications

It is an interesting question what would constitute a falsifiable proof of FW since experiments that purport to prove the existence of FW can probably be reproduced by a suitable mix of deterministic and indeterministic dynamics. For example, in research reported by Maye et al. (2007), apparently voluntary behaviour of tethered fruit flies (Drosophila melanogaster) is shown to be simulable via intrinsic noise amplified by suitable nonlinearity.

Experiments that purport to *disprove* the existence of FW can also find alternate explanations. Based on a study of volunteers wearing scalp electrodes, Libet et al. (1983) showed that brain activity was detected before decision-making, implying lack of true FW. In a recent follow-up to the experiment, Trevena and Miller (2010) showed that the brain activity need not imply choice, but simply a readiness.

There is another basic objection to the ability of such neuroscientific experiments like that of Libet et al. (1983). They can at best only establish the existence of a *laissez-faire* FW, in that the choices presented in the control experiments (such as pressing or not pressing a button and suchlike) are understood by the human test subject to be unimportant in their real lives and thus not worth exercising their freedom over. Such experiments more likely demonstrate neuronal noise rather than FW. As such, such experiments are really "caricatures" (Roskies, 2011) of serious decision-making.

A more direct sort of experiment would be to trace backwards along a deterministic observable causal chain of neurons to the specific area in the motor cortex responsible, perhaps a single neuron, that may be considered as initiating a free-willed action at the physiological level and hence a candidate site for carrying signatures of the putative new physics, such as the claimed deviation from the Born rule. Identifying such single neurons will be difficult, given the high density of neuronal packing and the weakness of excitatory synapses, which would make the role of individual neurons in the brain cortex hard to identify. In an interesting study, the twitching of a mouse's whisker has been traced to single pyramidal neurons in the cortex is reported in by Brecht et al. (2004).

Another promising area to look for evidence suggestive of FW is psychiatry and neurology (Ramachandran and Blakeslee, 1999). The FUN# model suggests that the decision-making ability in a human is affected, possibly leading to antisocial behaviour, in broadly three *different* ways: when the limbic system, or the frontal cortex, or the pineal gland area (or any other candidate FW-correlate) is impaired. If in some case such behaviour does not coincide with impairment to the limbic system and to the frontal cortex, then there is a reasonable case to attribute the behaviour to diminished FW.

There are potential therapeutic and medical applications based on the above observations. The FUN# model can help clarify what abnormalcy of behaviour means and can help classify abnormal depending of which faculty is affected. If a particular behavioural disorder can be attributed to one of the three above causes, then the therapy prescribed to the afflicted patient could also be varied with better efficacy.

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S. Menon et al. (eds.), *Interdisciplinary Perspectives on Consciousness and the Self*,
DOI 10.1007/978-81-322-1587-5, © Springer India 2014