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Sacrament

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An visible sign of the grace given by God and communicated to humans through participation in Christ's body – that is, the life of the church. Catholic and Orthodox churches accept seven sacraments: baptism, Eucharist, confirmation, penance, extreme unction, ordination, and marriage. While the sacraments of baptism and Eucharist are accepted by almost all Christian churches, Protestant churches generally do not recognize the latter five. Throughout history, sacraments have been integrally bound up with the spirituality of Christian individuals and communities.

Sacred Language

▶ Language and Literature, Hebrew

Salvation

▶ Happiness

Sanctity of the Individual

▶ Humanism in Islam

Sarvāstivāda

▶ Abhidharma, Northern

Sati (Pāli)

▶ Mindfulness (Buddhist)

Scalp-Recorded Potentials

▶ Evoked and Event-Related Potentials

Schizophrenia

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Related Terms

Mental disorder

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Description

Schizophrenia is a severe and complex mental disorder that affects about 24 million people worldwide. Due to chronification, the prevalence (∼0.7 %) substantially exceeds its rather low incidence (∼0.03 %). Symptoms, which typically begin in late adolescence or early adulthood, are multifaceted and include thought fragmentation or disruption, delusions and hallucinations ("positive symptoms"), as well as cognitive deficits, poverty of speech, emotional blunting, anhedonia or the lack of interest in or pleasure from activities usually found enjoyable, lack of motivation, poor grooming, and social withdrawal ("negative symptoms"). During its often lifelong course, schizophrenia can cause major disabilities in multiple spheres of an individual's functioning such as activities of daily living, including self-care, and social and occupational competence.

Schizophrenia research is a subdiscipline of psychiatry. It has profoundly enhanced our understanding of this major psychiatric disease and has thus facilitated the development of increasingly effective forms of treatment. During the past decades, schizophrenia research has fostered a multietiologic, so-called biopsychosocial model of schizophrenia implying significant roles of genetic, environmental, psychological, and neurodevelopmental factors for both origin and trajectory of the disease. As a consequence, treatment strategies have been developed that in many cases already enable affected people to lead a productive life and to be integrated into society. Current developments in the field comprise:

Pathogenesis

Most recently, several genetic variants have been identified that may predispose the brain to developing schizophrenia ("susceptibility genes"). Researchers hope that replication of disease-associated genetic variants across multiple cohorts in large-scale studies may pave the way toward novel gene-based therapies (Kim et al. 2011). Other avenues of current research on schizophrenia etiology follow the evidence that schizophrenia shares aberrant neurodevelopmental and even neurodegenerative features (Powell 2010).

Diagnosis

Recent interest has focused on the identification of preclinical disease stages in at-risk populations with the intention to discover early intervention strategies. To this end, disease biomarkers are being developed using molecular genetics, cerebrospinal fluid-based markers, structural and functional neuroimaging and, most recently, combinations thereof, e.g., imaging genetics (Oertel-Knöchel et al. 2011).

Treatment

Whereas previous and current pharmacological treatment strategies largely center on the so-called dopamine hypothesis as a specific biochemical dysregulation hypothesis in schizophrenia, ongoing drug research involves different neurotransmitter systems such as the glutamate and serotonin system.

Disease Concept

It has increasingly become clear that schizophrenia is not a single disease entity, bearing rather heterogeneous etiological factors, pathophysiological mechanisms, and clinical manifestations. Thus, on the current road to new diagnostic classifications in psychiatry (Diagnostic and Statistical Manual of Mental Disorders, 5th revision), efforts have been made to deconstruct schizophrenia as an entity into component dimensions linked to unique etiological and pathophysiological processes that may yield unique treatment targets (Nasrallah et al. 2011).

Self-identification

Science

Schizophrenia research is a biomedical, psychosocial, and anthropological science. It is a subdiscipline of *psychiatry* using molecular biological, biochemical, genetic, and neuroimaging as well as psychological and socio-epidemiological methods, among many others. It generates hypotheses and theories that are constantly being

reviewed, modified, and rejected. Research on schizophrenia is a science in that it "builds and organizes knowledge in the form of testable explanations and predictions" (Science. http://en.wikipedia.org/wiki/Science) about its specific topic, schizophrenia.

Characteristics

Schizophrenia as a disease may, unlike other diseases, lead to profound impairment of the perception of the environment (external reality) and the affected individual's self (internal reality) to an extreme extent due to core symptoms such as delusions, hallucinations, and symptoms the German psychopathology refers to as "*Ich-Störungen*" (particular delusions that one's thoughts are controlled, inserted, or withdrawn by external force).

Schizophrenia research as a scientific subdiscipline of psychiatry is distinctive among other disciplines/subdisciplines in its profound and almost unique overlap of natural sciences and humanities pertaining to methods and content of research. It integrates a diverse array of scientific disciplines such as but not confined to biomedicine, molecular biology, biochemistry, psychology, anthropology, social sciences, and philosophy.

Relevance to Science and Religion

Although still not fully considered in psychiatric and specifically in *schizophrenia research* numerous relations exist between *schizophrenia* and religion in its broadest sense (from spirituality to religiousness). The impact of religion on schizophrenia "... ranges from the worst to the best, as we can observe in the history of religion in mankind" (Mohr and Huguelet 2004). It may be positive (in helping to cope with the illness) or negative (in leading to violent behavior and refusal of treatment due to religious delusions). The significance of the schizophrenia–religion relationship is shortly exemplified by the following paragraphs.

Religious Delusions in Schizophrenia

Religious content is common in schizophrenic delusions and hallucinations. Such symptoms tend to be persecutory and may lead to acts of violence against oneself or others, e.g., in the perceived need of defense (against the devil, demons, etc.). Also, delusions of grandiosity (being god or sent by him) and belittlement (unforgivable sinner, etc.) occur frequently. There is a certain diversity of such psychopathology across different cultures. It has to be considered, though, that a continuum exists from religious beliefs to religious psychopathology and that the Western medical model tends to emphasize pathology over traditions (Mohr and Huguelet 2004).

Religious Coping in Schizophrenia

Religious commitment has been related to lower rates of suicides in individuals with schizophrenia (Koenig et al. 1998). Psychotic individuals often use religion to cope with their devastating symptoms and so do families in support of their ill relatives (Rammohan et al. 2002). Coping strategies include spiritual and congregational support (help by god, a priest, etc.), religious reframing (hallucinations being a godly test, etc.), and generally religion as guidance through psychotic anxiety and terror.

Religion, Spirituality, and Individual Outcome in Schizophrenia

Spirituality as an individual resource may play a crucial role in the heterogeneity of outcomes in this disease. Religious beliefs in individuals affected by schizophrenia may come with certain identification models strengthened by the active support of the religious community which may lead to a beneficial outcome. Other individuals may be burdened and demoralized by their religious beliefs or that of others (Mohr and Huguelet 2004).

Sources of Authority

The German psychiatrist Emil Kraepelin (1856–1926) distinguished individuals suffering from hallucinations and delusions and

a long-term dementia-like deteriorating course with early onset from those classified as having episodic manic-depressive psychosis with intermediate periods of normal functioning. Eugen Bleuler (1857–1939) from Switzerland coined the term "schizophrenia" (Greek: σχιζειν = "to split," φρην = "mind") denoting the intrapersonal and personal-environmental schisms typically occurring with the disease. The term has been internationally accepted but has led to the common misconception of a "split personality" and confusion with a condition today known as Dissociative Identity Disorder. Kurt Schneider (1887–1967) described a set of characteristic psychopathological symptoms that may guide the diagnostic process (such as audible thoughts, hearing of commenting voices, delusional perceptions, etc.). Psychopathological considerations of the named and of other famous psychiatrists have been incorporated into modern major diagnostic classification systems.

Ethical Principles

Ethical key concerns in modern management of and research on schizophrenia mainly focus on the issues of the disease-inherent impairment of the decision-making capacity and capability to give informed consent to treatment and/or scientific investigation. Regarding therapeutic decisions, the personal freedom of a given subject to refuse treatment or restraint has to be weighed against potential risks when treatment or restraint is not being installed (violence, suicidality, etc.). Regarding research studies, the risks of exposing schizophrenia patients as particularly vulnerable subjects to new forms of treatment has to be weighed against the benefit for future generations of those affected. Ethical principles that apply to treatment and research on schizophrenia are laid down in the Nuremberg Code, the Declarations of Geneva and Helsinki, the so-called Beecher Paper, the Protocol of the International Committee of Journal Editors (aka "Vancouver Group"), and the "Belmont Report" (Fischer 2006).

Key Values

Key values of *schizophrenia research* are the ethical principles as stated above, the guidelines of Good Clinical Practice (GCP) and Good Laboratory Practice (GLP), and the principles of evidence-based medicine.

Conceptualization

Nature/World

Nature is the physical/material foundation of life. Diseases such as schizophrenia are dysfunctional implementations of nature. Schizophrenia research is thus to a large extent a natural science.

Human Being

Schizophrenia affects the human being as a whole in that it fundamentally interferes with its perception of and reflection on the world and consequently impairs the affected individual's interaction with his or her environment.

Life and Death

Schizophrenia as a mental disease is an abnormal condition of life that leads to functional impairment of the affected individual, to suffering, and often premature death.

Reality

Reality is in a very basic sense the state of things as they appear to the (human) observer based on multisensory perception. Severe impairment of sensory information processing in schizophrenia often drastically impairs an individual's sense of reality causing misinterpretation of situations and events.

Knowledge

Schizophrenia research is building systematic knowledge of its specific field out of information gained by observation and the testing of hypotheses and applies it in order to broaden its understanding of how the disease develops, proceeds, and how it can be treated.

Truth
Truth in the context of schizophrenia research is the outcome of evidence-based scientific investigations.

Perception
Experimental studies with schizophrenic individuals have provided evidence for a profound disturbance of sensory processing, e.g., visual stimuli. Patients with schizophrenia seem to experience a rather random and fragmented than continuous sensory input pattern. This lack of consistency of sensory input may contribute substantially to the disintegration of reality which in turn leads to feelings of confusion, anxiety, and delusional states.

Time
Among other fundamental perceptual deficits, alterations of the subjective experience of temporal relations and the orderly temporal integration of internal and external information has been consistently demonstrated in individuals with schizophrenia most probably due to the impairment of various sensory input mechanisms. This perpetuates the individual's feelings of isolation and distress and may contribute to the loss of social cognition since time represents social order in daily life.

Consciousness
The symptoms of schizophrenia have been explained to emerge from an abnormal permeability of the consciousness due to impairment of the mechanism that controls and limits the contents of consciousness. As a consequence, excessive self-awareness and thinking may occur and account at least for some key aspects of "positive symptoms" and cognitive abnormality.

Rationality/Reason
Reason/rationality as the capacity of human beings to explain and make sense of things and situations in the world is largely dependent on perception and its processing in the brain which is fundamentally impaired in schizophrenia.

Mystery
Mystical experience/mystery in the sense of irrational presumptions of the world is a frequent topic in the schizophrenic perspective of reality.

Relevant Themes

Since culture is highly intertwined with religion, the cultural background is important when dealing with the issue of "Science and Religion," also in the context of schizophrenia treatment and research. Interdisciplinary cross-cultural research is beginning to elucidate how socio-environmental and cultural variables interfere with physiological pathways and genetic constitutions that relate psychosocial stress and psychotic symptomatology (Howes and Kapur 2009). Such knowledge could lead us to understand how culturally available tools such as religious practices may mitigate the disease burden and to design effective interventions for individuals with schizophrenia (Myers 2011).

Cross-References

- ▶ Cognitive Neuroscience
- ▶ Gene
- ▶ Neurophysiology
- ▶ Neuropsychology
- ▶ Neuroscience
- ▶ Psychiatry

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Science

▶ Personhood and Scientific Methodology
▶ Science and Scientific Knowledge, Sociology of
▶ Theoretical Psychology

Science and Catholicism

▶ Catholic Church and Science

Science and Kabbalah

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Related Terms

Consciousness; Creation; Jewish mysticism; Kabbalah; Microcosm; Psychology

Introduction

Jewish mysticism has a complex history through which various distinct phases have been identified. The principal source for all mystical speculation in Judaism is the *Torah* and other texts from the Hebrew Scriptures. From this perspective, the origins of the Jewish mystical tradition lie in the distant past. The earliest overtly mystical works in Judaism date from the third to sixth centuries CE and treat of the "secrets" of creation and the experiences of those who explored "heavenly" realms. While this, and each subsequent, phase has its defining characteristics, there are core features which enable us to identify the generic form of Jewish mysticism. Jewish mystics believe that the Torah contains an inner wisdom transmitted from God, which treats of the nature of ultimate reality. The mystical tradition conveys knowledge of the inner workings of the Godhead, which are recapitulated in all of creation. The tradition also conveys certain details of the practices whereby mystics may aspire to a higher state of being in which closeness, or even union, with the divine is experienced.

In this article, I shall use the term "Kabbalah" to refer generically to Jewish mysticism. There is a degree of ambiguity about the term, for some apply it specifically to the traditions stemming from the creative period of the twelfth and thirteenth centuries in Southern France and Spain, while others use it to cover the entirety of the mystical core in Judaism. While we do not find the term *Kabbalah*, nor the related *mekubbalim* ("kabbalists") prior to the twelfth century, the kabbalists in later periods certainly saw themselves as heirs to a coherent body of esoteric knowledge that constitutes the backbone of the Jewish tradition. The Hebrew root of the term "Kabbalah" means to "receive" and comes to designate the *received tradition*. In part, this reflects the notion that kabbalistic teachings had to be received orally from a teacher, but there is the further connotation that kabbalistic practices bring the individual into a deep relationship with the divine, or an agent of the divine, who imparts knowledge in a direct encounter.

The relationships between the discoveries of modern science and the insights found in the kabbalistic tradition require more than a cursory examination of both spheres. In the first place, Kabbalah is essentially concerned with the *spiritual* world, while science explores the realm of

the *physical*. A simple analysis would accordingly conclude that there can be little direct rapport between the two endeavors. As my explorations in this article will suggest, such a view is too monolithic and fails to capture the subtleties in both domains. Despite the seeming irreconcilability between their respective orientations, both Kabbalah and science are directed to uncovering the deeper structures and processes that underlie our experience of the world. While Kabbalah is essentially concerned with knowledge of God – which prima facia sets it apart from science – its path necessitates grasping the patterns that confront us in the outer world and in the inner realm of thought. The analysis of these physical and psychological domains is clearly within the remit of science; the question is, do the insights from the two traditions connect in any way?

A second reason for the need to dig beyond a simple understanding of Kabbalah and science arises from the dynamic nature of each. What exactly constitutes science is not an easy question to answer, and many have argued that challenges in areas like the fundamental constituents of matter, and the nature of consciousness are stretching the bounds of science as classically understood. As for Kabbalah, its language is highly codified. Indeed, becoming familiar with the elaborate system of symbols and codes constitutes an initiatory challenge for the would-be kabbalist. Moreover, its teachings have been limited by the worldview of their day. These writings hardly bring their scientific implications to the fore. Accordingly, some explication and elaboration of the original texts will be necessary in order to juxtapose Kabbalah and science.

Levels in Mind and Outer Reality

Kabbalah may be aligned with the view expressed by many quantum physicists that no rigid demarcation exists between mind and physical reality. A classical statement to this effect comes from Eddington: "The universe is of the nature of a thought or sensation in a universal Mind." Similarly, de Broglie and Wigner, both pioneers of quantum mechanics, held that consciousness is intrinsic to the quantum worldview. These ideas derive from the seemingly "mental" properties of elementary particles in the ways they interact and from the role observation plays in the collapse of the wave function. The quantum principle of nonlocality, for example, implies that something akin to *knowing* characterizes the behavior of micro-entities at a distance. In a recent overview of quantum phenomena, Schäfer (1997) asserts that "It is now possible to believe that the mind is the realization of potentia, a manifestation of the essence of the universe."

In common with other mystical and spiritual traditions, Kabbalah views the universe in mentalist terms, which dovetail with these views deriving from quantum science. The universe is held to be the product of thought – divine thought and is maintained by God's thought day-by-day. Moreover, a profound correspondence is said to exist between the universe and the human mind. The major text of Kabbalah, the *Zohar* (Margoliot 1978), states that the "artistry and design of the human being resemble the world" (*Zohar* 1:90b). Such statements – deriving ultimately from the biblical maxim that humankind is created "in the image of God" – apply only superficially to the physical human form: "The human soul is known . . . through the organs of the body" (*Zohar* 1:103b). It is the human soul, or mind, that is seen to be paralleled in the universe.

A central tenet of Kabbalah is that God is knowable through His emanations, termed *sefirot*, and that all things – both in the universe and in the mind – derive from the pattern of these emanations, known as the "tree" of the *sefirot*. The *Bahir*, a twelfth-century work expresses the point emphatically: "[God says,] I am the one who has planted this Tree for the whole world to enjoy. In it I spread the totality of all-that-is, and I called its name 'All' For All depends upon it and All goes forth from it and All need it." (Abrams 1994).

In this sense of the *potentia* (to use Schäfer's Aristotelian word), then, Kabbalah holds there to be no disjunction between mind and cosmos. In the words of the thirteenth-century Moses de León: "[God] created man in His pattern, in the

image of the likeness of His form. In miniature, he comprises the form of the world, which is in the image of the [sefirotic] entities."(Moses 1988).

The fundamental pattern is discernible *par excellence* in the Torah, which – far from being merely a *book* – is effectively the *world soul*, the living essence of reality. This essence unfolds characteristically through a dance of *concealing and revealing*: "Throughout the entire Torah, we find that the revealed coexists with the concealed. So it is with the world, both this world and the higher world, everything is concealed and revealed" (*Zohar* 2:230b). Moreover "Each domain comprises level upon level, concealed and revealed" (*Zohar* 3:73a). The challenge to unearth level upon level of meaning in the Torah very much comprises the heart of Judaism. To the extent that an interpretation is "concealed" prior to its being "revealed," the Torah can be seen to exemplify the cosmic pattern underlying all things. It is the bold assertion that *everything* manifests according to this dance of concealing-revealing that epitomizes the kabbalistic world-view. Parallels with physics and psychology are striking: quantum physics describes a similar "dance" whereby the elements of reality are continually unfolding (becoming "revealed") from, and being reabsorbed into, the "concealed" matrix, according to whether they are observed or not, and depth psychology conceptualizes the impact of events on the life of the unconscious and the movement of thought from unconscious ("concealed") to conscious ("revealed").

Multiplicity and Holism in Science and Kabbalah

These parallels across Kabbalah, quantum physics, and depth psychology extend into the way we might characterize the concealed and revealed levels. The concealed level is multipotential, holographic, and infinite; the revealed is particulate, discrete, and finite.

For Kabbalah, the holographic nature of the concealed is given expression in its view of the Torah, the inception of creation, and those events or entities which express contact with the transcendent. The Torah is identified with the divine. Accordingly, just as God is infinite, so must the Torah be infinite (Idel 2002). Indeed, according to the eighteenth-century Luzzatto, every one of its letters is infinite. All the elements of the Torah – its stories and laws, each word, and every letter – can unfold into an infinite number of interpretations: "There is not a single word in the Torah that does not radiate many lights in every direction" (*Zohar* 3:202a). A division is made between what may be conceptualized as the *primordial* Torah and the regular Torah that is written on the parchment scroll. The former is written in "black fire on white fire" and constitutes the plan of all-that-is. It comprises the name of God – which, for Kabbalah means the very essence of God – in infinite permutations. The concrete Torah might be best conceptualized as the intermediary vehicle between the ultimate, and infinite, primordial Torah and the Torah existing in the minds of those who study it, where there are a fixed, finite set of interpretations. In a more complex formulation, deriving from the Lurianic school of Kabbalah in the seventeenth century, the individual soul only comes into being as a result of the specific form of interpretation that is particular to it. The soul's very existence is dependent on the way the Torah will be *observed* by that person – a formulation reminiscent of the quantum view of the role of observation in collapsing the probabilistic wave function and bringing a discrete entity into existence.

During the primordial inception of creation, "All things were contained one within the other, good inclination and evil inclination, right and left, Israel and the nations, and white and black. All things were dependent on one another" (*Zohar* 3:80b). A further insight into the kabbalistic view of the very beginning of creation comes with the seminal idea that the Hebrew letters are the agents of the creative process. Thus, the first letter, *Alef*, itself a silent letter, epitomizes the primordial beginning – a nothingness and, at the same time, the totality that lies behind the beginning of manifestation (in turn symbolized by the second letter, *Bet*). "At the beginning of all is *Alef*, beginning and end of all the levels . . . designated as 'one'

to indicate that, even though it contains multiple images, it itself is undivided unity" (*Zohar* 1:21a).

The letter *Alef* begins the biblical enunciation of the *Ten Commandments* and is taken as a hint that the voice which resounded forth at Mt. Sinai was itself holographic and that each soul present experienced it in a way dependent on its individual propensity. As recorded in the Bible itself, the experience was synesthetic ("and all the people *saw* the voices," *Exodus* 20:18), implying a transcendence of the specificity of the senses. "All that they saw . . . they saw in one light which encompassed all the other lights" (*Zohar* 2: 146a).

These examples epitomize the view, expressed already in rabbinic Judaism and much elaborated in Kabbalah, that the concealed, inner level is holographic in form. A number of scientists have been led to similar views through their understanding of the findings of quantum mechanics. Bohm (1980) postulates the existence of two orders of reality, one *implicate*, the other *explicate*. The implicate order is the hidden basis from which all things arise; it is characterized as holistic such that "everything is enfolded into everything." The explicate order, by comparison, comprises entities which are each located in their particular time and space. The concealing-revealing paradigm in Kabbalah is paralleled in Bohm's model by the *enfolding* and *unfolding* which he sees as characterizing the movement from explicate to implicate levels and vice versa. In a formulation that tightly parallels the kabbalistic emphasis, Bohm asserts that this movement – the *holomovement*, as he calls – is the ultimate reality.

Schäfer infers from the data of quantum physics that reality comprises two domains: the "outer" domain includes the material things of immediate experience, while the "inner" is hidden, has the nature of undivided wholeness, and consists of "nonmaterial, nonempirical forms." These nonmaterial forms are real inasmuch as they manifest themselves in the empirical world and act in it. Schäfer's description of the concealed realm could be applied verbatim to Kabbalah's view of the realm of the *sefirot*. The *sefirot* are holonomic in the sense that each is present in all others, and they constitute the hidden pattern that is manifest in the world to those who quest to see it:

> Although [the *sefirot*] are supernal mysteries that cannot be known to the worlds, their influence and effect pour down and extend to the lower world; as a result of this extension, we in this world can have perfect faith . . . in those levels, as if they were revealed, and were not hidden and concealed. *Zohar* 2:137a.

A final idea which should be included in a consideration of notions of multiplicity in science and Kabbalah is that of the "multiverse." The notion that our universe is just one of many parallel universes has been advanced in both quantum mechanics and astrophysics. In brief, the "many worlds" hypothesis suggests that collapse of the wave function (i.e., the actualization of observable situations from the preobserved potentia) gives rise to multiple alternatives, each of which is realized in a different world. Given the large number of possibilities thus arising moment-by-moment, the overall effect of this hypothesis would be a near-infinite proliferation of worlds. Astrophysicists arrive at a similar conclusion from the *anthropic principle*; the odds against the Big Bang giving rise to the right set of circumstances for a universe conducive to life to arise are so astronomical that we must assume that ours is only one of many universes.

An echo of the concept of the multiverse is found in Kabbalah in its notion that ours is not the only universe which has been created. In early kabbalistic literature, the other creations are seen as *prior*, not parallel, worlds, a view which perhaps attenuates the link to astrophysics somewhat. Kabbalistic thinking comes closer to the many worlds hypothesis in its understanding of the infinite number of interpretations of the Torah which exist each in its own world. For the thirteenth-century Gikatilla, the diversity of interpretations of the Torah gives rise to "thousands and thousands of worlds," and a seventeenth-century Lurianic text asserts that "just as there is an infinite number of worlds, so is the depth of the Torah infinite."

Whatever the status of diverse worlds in its scheme of things, Kabbalah articulates its central tenet that God is the creator of all that exists

unambiguously. In this context, it is important to realize that the hypothesis of the multiverse is not the only solution to the anthropic conundrum: The alternative is to posit a creative intelligence which in some way *chose* the precise details of the Big Bang – effectively a Creator God. In this context, the interest of Kabbalah focuses on the primordial processes which unfolded prior to the events described in *Genesis*. The kabbalistic narrative of creation parallels the model advanced in astrophysics inasmuch as both describe the beginning as involving a tiny point of origin, which forms within a domain of "absence" and subsequently expands. For astrophysics, the Big Bang arises from an infinitesimally small, infinitely hot, and infinitely dense *singularity* inside a black hole. For the *Zohar*, the primal origin is "unknowable, concealed in recesses like the point of a needle" (1:21a). The Lurianic Kabbalah describes the initiating dynamic of creation as arising when God vacated a space within His all-enveloping oneness. The primordial polarity between His presence and His (relative) absence lies behind all of manifest creation. As Matt (1996) points out, the parallel here with the *quantum vacuum*, from which the explosive expansion of the Big Bang is posited to have arisen is striking.

The kabbalistic perspective on the origin of things returns us to our earlier emphasis on the oneness that comprises physical and mental realms, for the mystery of creation is "the mystery of the concealment of thought" (*Ibid*). "When the most concealed of all concealment sought to be revealed, He made first a single point, and this arose to become *thought*" (*Zohar* 1:2a). Here, we enter the enigma of consciousness. I shall consider two issues: Firstly, the extent to which kabbalistic insights relate to recent findings in the science of consciousness and, secondly, the relevance of Kabbalah to a psychological understanding of spiritual transformation.

On Consciousness and the Quest for Transformation

Whatever parallels we may find between the view of reality as presented by physics and that intrinsic to religious and mystical systems, one crucial difference remains. Physics is necessarily silent on the potential value of the transformative path that the mystical systems describe. Describing a hidden order lying behind the everyday world of experience is not an end in itself for Kabbalah; rather knowing is the handmaiden of journeying. The mystic is enjoined to embark on a quest for the divine, to achieve self-perfection, and contribute to the ultimate task, namely, rectification of divine and human realms. To put it in terms of the hidden order mentioned above, the *sefirot* are not merely the nonmaterial forms that order our world, they constitute a two-way sequence between the Absolute "above" and mundane human consciousness "below." From above to below, they describe the emanation of divine light through creation, and from below to above, they become the ladder of mystical ascent.

This disjunction between science and mysticism in terms of values and goals extends to the study of consciousness. A scientific account of consciousness attempts to specify the processes, most especially *brain* processes, that correlate with the presence of consciousness; neuroscience in particular has little to say about the value we might attribute to the kinds of higher states that mysticism fosters. In contrast, a kabbalistic account emphasizes the transformative dimension; it is interested in the relation between mundane states and expanded states of consciousness, between the ordinary state that it likens to sleep and "awakened" consciousness. And, of course, it sees the awakened, expanded state which brings closeness to God as a goal.

Despite this crucial difference in emphasis, there are significant points of comparison between what has been discovered about the brain correlates of consciousness and core kabbalistic teachings (Lancaster 2004). There are two key principles of the brain's functioning which have been correlated with consciousness: *binding*, meaning the generation of coherence among assemblies of neurons, and *recurrent processing*, which refers to the impact of "descending" neural pathways on activity in "ascending" pathways. To put it simply, *conscious* mental activity only comes about when both of these features are

present; mental events are conscious when, and only when, large assemblies of neurons fire in coherent synchrony (binding) and the incoming neural activity has been modulated by the outflow of activity from the brain's higher centers (recurrent processing). The kabbalistic teachings to which these relate are those of *unification* and *reflexivity* respectively.

As far as the consonance between binding and unification is concerned, both involve harnessing diverse elements together by means of establishing coherence. In the brain, it is the coherence in oscillatory firing patterns between diverse groups of neurons that signals their integration. The analogy with kabbalistic teaching is that coherence across different levels in the created hierarchy is viewed as bringing about the highest mystical states:

> "One" – to unify everything from there upwards as one; to raise the will to bind everything in a single bond; to raise the will in fear and love higher and higher as far as *En-Sof* [the limitless essence of God]. And not to let the will stray from all the levels and limbs but let it ascend with them all to make them adhere to each other, so that all shall be one bond with *En-Sof*. (*Zohar* 2:216b)

A major goal of all kabbalistic practice is to promote the unification of the divine name, a concept which focuses on binding the *sefirot* but extends more generally to include unifying all strands of thought and other mental processes.

Moving on to the fit between recurrent processing and reflexivity, both depend on activity at a "lower" level triggering activity in a "higher" level, which in turn acts back on the lower level bringing about the intended effect. In neuroscience, this system has been identified in relation to the brain's sensory processing systems, with the "lower" level comprising brain structures concerned with immediate properties of the sensory stimulus and the "higher" structures being those dealing with memory and cognitive analysis of the sensory signals. It appears that the *meaning* of the sensory stimulus is determined when the activity from the higher centers impacts on the lower regions though recurrent processing. The indispensability of recurrent processing for consciousness cannot be overstated. Indeed, there is compelling evidence that it is the "key neural ingredient of consciousness," according to Lamme, a neuroscientist studying the brain and conscious states.

The analogous teachings in Kabbalah need some unpacking from their context in order that the parallel with these findings in neuroscience might become evident. The *Zohar* enunciates the core teaching in its poetic language:

> Come and see. Through the impulse from below is awakened an impulse above, and through the impulse from above there is awakened a yet higher impulse, until the impulse reaches the place where the lamp is to be lit and it is lit . . . and all the worlds receive blessing from it. (*Zohar* 1: 244a)

The central imagery of the Kabbalah focuses on the *sefirotic* realms existing between the mundane human sphere and the Absolute. In this scheme, the "impulse from below" arises through prayer or other spiritual work and brings about resonances throughout the successive intermediary realms reaching to the top of the *sefirotic* chain. The "lamp" refers to an aspect of the Godhead which is capable of bestowing the "divine" influx or "blessings" back into the human sphere. Clearly, the imagery of the lamp being "lit" equates to the activation of this higher aspect of the Godhead.

We see here the fundamental operational pattern of the macrocosm as understood in Kabbalah. And it should be stressed that this pattern is not some peripheral concern; it constitutes the core narrative in the *Zohar* and other key kabbalistic works. It is but a small stretch of the imagination, I think, to see this pattern recapitulated in the brain systems for consciousness mentioned above in terms of recurrent processing. A sensory stimulus triggers activity in lower neural centers, which "awakens" activity in higher centers, through which the "lamp" that brings the "blessing" of consciousness is kindled. The language of neuroscience and Kabbalah is clearly divergent, but the essential pattern being described is identical.

As I stressed at the beginning of this section, the parallel between the neuroscience of consciousness and this kabbalistic narrative of

macrocosmic principles leaves out the lifeblood of the latter, namely, its concern with transformation. The mystic is enjoined to arouse the "impulse above" in order to transform themselves and the Godhead. Such spiritual work is intended to bring harmony to the realm of the *sefirot* and to manifest the divine presence in the world. Kabbalah is replete with specific practices directed to achieving these aims. Given their transformative goals, the appropriate domain for evaluating these practices is psychology and especially those subdivisions – depth, and transpersonal, psychology – that explore the mind's involvement in spiritual and mystical states.

The Psychology of Kabbalistic Transformative Practices

> Begin to combine a few letters with many. Reverse them and revolve them rapidly, until your heart is warmed through the revolutions. Pay attention to their movements and to what you bring into being through their revolutions. And when you feel that your heart has been greatly warmed through the combinations and when you have derived understanding from them – new ideas that were never disclosed through human tradition and that you could not have known through intellectual analysis – then you are prepared to receive the divine influx. . ..

The above is from the thirteenth-century Abulafia. The "divine influx" to which he refers is evident not only in intellectual stimulation but also very much in embodied ways: The body may tremble, the heart is activated, and there is the feeling as if being anointed with oil. Such effects are frequently encountered in the study of mysticism and have been explained psychophysiologically in terms of activation of the right temporal lobe of the brain cortex and *ergotropic* arousal of the sympathetic nervous system. However, the specific techniques that Abulafia teaches for achieving a higher state of consciousness are distinctively kabbalistic inasmuch as they draw on the mysticism of the Hebrew language and are intellectually complex.

A key source for all Hebrew language mysticism is the *Sefer Yetsirah* (Gruenwald 1971), thought to have been composed around the fourth-century CE. The *Sefer Yetsirah* elaborates the Jewish tradition that God created the world using the Hebrew letters as His agents. The practices detailed by Abulafia entail emulating the divine work of creation described in the *Sefer Yetsirah*:

> 22 foundation letters [of the Hebrew alphabet]: He [God] engraved them, carved them, weighed them, permuted them, combined them, and formed with them all that was formed and all that would be formed in the future. . . . He engraved them with voice, carved them with breath, placed them in the mouth in five places. . . . He placed them in a wheel, like a wall with 231 gates. The wheel revolves forwards and backwards. . . . How? He weighed them and permuted them: *Alef* with them all and all of them with *Alef*; *Bet* with them all and all of them with *Bet*. They continue in cycles and exist in 231 gates. Thus, all that is formed and all that is spoken derive from one Name. (*Sefer Yetsirah* 2:2-5)

For the *Sefer Yetsirah*, then, all things come into being through permutations of core elements, the "231 gates" being the number of two-letter combinations achievable from the complete set of 22 letters in the Hebrew alphabet. Stripped of its theological connotations, the logic enunciated here is commensurate with that operating within the biological sphere; permutations of the DNA code give rise to all the formations of life.

Those following traditions relating to the teachings of Abulafia and others emulate all the processes described in the above extract inwardly, that is, in a concentrative state of consciousness using techniques of visualization, breath control, chanting, etc. Thus, for example, "revolving" the letters entails bringing together pairs of letters, perhaps in the mind's eye, or in writing, or through chanting with a range of associated vowels.

Research has shown that practices fostering *mindfulness* increase levels of well-being and help combat a range of psychological and physical conditions. Although there have been no studies examining the psychological effects of these specific kabbalistic practices, the concentrative state they foster bears similarities to states associated with Buddhist mindfulness practices. However, any serious evaluation of the kabbalistic practices must acknowledge their most

distinctive feature, namely, the central role of language in the various techniques used. As Idel has noted, these kabbalistic practices are directed to *deconstructing* language as a semantic system. Given the role of language in structuring our sense of self and the world of experience, the practices are likely to bring about a lowering of ego-awareness and changes in our relationship to reality (Lancaster 2005). To use one of Abulafia's analogies, the "knots" which bind us to our world become untied and are reconnected to the divine.

For the eighteenth-century kabbalist and Hasidic master, Dov Baer, the Maggid of Mezeritch, "transformation comes about only by passing through nothingness." In the wake of Freud, the involvement of the unconscious in psychotherapeutic change is well established. Many psychotherapeutic schools recognize that nulling the mind from ego-based thought is essential in order to encounter the more transformational unconscious content. Indeed, the Maggid developed a concept of the unconscious, understood as the link between the divine and the human mind. Late in his life, Jung acknowledged that the Maggid's scheme was a forerunner of his own approach to the transpersonal unconscious.

While the specific Hebrew term the Maggid uses denoting the unconscious dates only from the eighteenth century, early kabbalistic material is fascinated by the concealing and revealing of thought, as we saw above. God's thought that engenders creation develops from an initially concealed state through to being revealed and finally re-concealed within the outer manifest world. From the human perspective, tracing thought to the concealed place of its source brings the longed-for encounter with the *Shekhinah*, the feminine presence of God.

The various themes I have touched upon come together here, for psychology connects with physics in conceptualizing the "concealed" unconscious realm as being the multipotential ground from which the particulate conscious domain arises. The logic of time and space are evidently unknown to the psychoanalytic unconscious, just as they have no reality in Bohm's implicate order. And from its more empirical research base, cognitive neuroscience has demonstrated that unconscious brain processing entails multiple parallel instantiations of possible meanings; the unconscious is characterized by holistic operations. Kabbalah, physics, neuroscience, and psychology seem to meet in their respective formulations of the known and the unknown.

> The *Alef* resembles the brain. Just as, in the case of the letter *Alef*, when you bring it to mind you open your mouth, so with thought – when you think a thought to the infinite and boundless. . . . (The *Bahir*.)

Cross-References

- Cognitive Neuroscience
- Creation in Judaism
- Kabbalah in Judaism
- Mysticism
- Names of God
- Neuroscience
- Panentheism
- Psychology in Judaism
- Quantum Theory

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Science and Redemption in Jewish Religion

► Redemption in Judaism

Science and Religion

► Creationism

Science and Religion Dialogue and the Interreligious Dialogue

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Related Terms

Interfaith

The Tradition for Dialogue Between Science and Religion

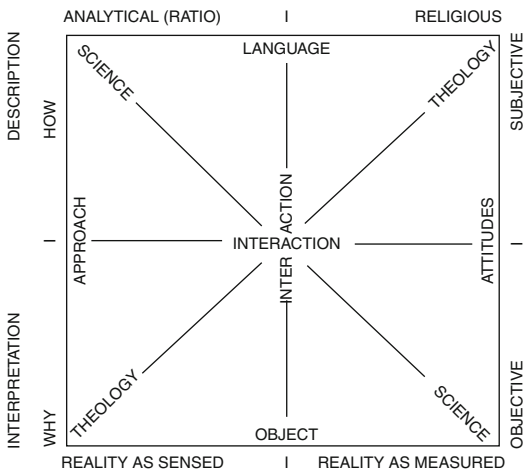
Science and religion represent very complex entities. Diversity reigns on both sides. The relationship between science and religion has gone from unity over conflict and condemnation to separation. The state of separation is in many ways a natural reaction to the confrontation between religion and natural science that grew out of the controversy following Darwin in the late nineteenth century. After that confrontation, the unity among the sciences was lost forever. The theological reconstruction that was necessary in order to adapt to the new situation lasted nearly a 100 years. By then, the now classical neoorthodox position had been formed: Religion and science are separate and mutually exclusive realms of human thought.

Dialogue between science and religion is an attempt to overcome this separation. The situation of separation developed so strongly because such different schools and isms as scientism, positivism, and existentialism could agree that theology and natural science belong in two different fields. The position is further strengthened by linguistic arguments (Wittgenstein's theory of language games). Defining religion as an independent autonomous language game means that religion is seen as a way of life that does not need to justify its concepts. This immunity to falsification – sometimes labeled "Wittgensteinian fideism" – threatens to isolate the religious language game from other intellectual disciplines and religious communities. An appealing way out of the dichotomy is to seek in the everyday language the common language out of which all the language games have grown insisting that there are not two languages, a language of religion and of science, but one language, ordinary discourse modified in different ways. Another way out of the dichotomy is to maintain a common meeting place that would then be a kind of metaphysics (Whitehead; K.E. Løgstrup).

Is This Science? Is This Religion?

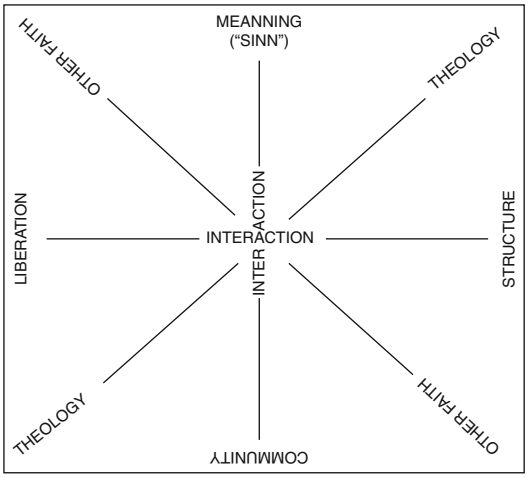
The natural sciences can give us valid knowledge of reality. But because it is reductionist in its approach to reality, it threatens to end in an abstract spirituality in which nature is reduced to a case of general laws and an area for using technology. Other approaches as phenomenological analysis, metaphysical speculations, and religious interpretations must be maintained in order to give the full picture. Somebody have – following Niels Bohr – used the notion of

complementarity to validate different approaches to reality that each from their perspective can contribute to the common understanding. If they exclude each other, the state of separation is cemented. But reality cannot be divided into distinct areas either scientifically and technically controlled or religiously interpreted. Reality is one. This one reality can be seen in different perspectives, but the underlying unity needs to manifest itself in the way we talk about it.



Relevance for the Field Science and Religion

Dialogue is a conversation which proceeds from a commitment to one's own stand point and a genuine openness toward the other. Dialogue means willingness to listen. The dialogical approach recognizes that there are shared areas of interest between science and religion and that each have their own distinct perspectives. Following dialogue, a fuller integration and interaction between the different perspectives will continue to develop. In a model of reciprocal interaction within the field of science and religion, the various approaches, languages, attitudes, and objects of both theology and natural science are brought into relationship with each other. The disciplines keep their integrity and follow their own inner logic, but in order to gain a fuller picture, they need to interact. This model of reciprocal interaction can help as an orientation in a world where the religious encounter has become globalized.



The Models for Interreligious Dialogue

Interreligious dialogue involves a desire to understand those of another faith better and learn from one another, leading to an ongoing reflection of one's own faith and practice. As it promotes mutual knowledge, the same model can be used in both forms of dialogue, the interreligious and the one between science and religion.

In the field of interreligious dialogue four different forms of dialogue have been identified:

- In the *dialogue of life*, believers of different religions encounter one another in the ordinary course of life. In order for the community to thrive, it is vital that one relates to the other with respect and attention, recognizing the basic community that incorporates all people in spite of differences.
- The *dialogue of intellectual exchange* is often an area for experts. Faith seeks understanding, and theologians and religious scholars grapple many times with issues that cut across religious lines. Through an exchange on the intellectual level, it is possible to get a deeper understanding of the different faith traditions.
- In the *dialogue of spiritual experience*, an attempt is made to share in one another's

search for the experience of God. In such a dialogue, spiritual resources can be shared enriching the religious experience.

- The *dialogue of common action* can take place at different levels. Common human and spiritual values can be promoted; alliances can be formed in order to transform the human community.

Dialogue between people of different faiths is necessary not only for instrumental reasons. Because the deepest motivation for dialogue is the common search for truth, science has a role to play, because science is also relentlessly seeking truth. It might not be the all encompassing truth, but what is established as scientific truth not only needs to be taken into account but it must also be respected in a dialogue between different faiths. But as it is always preliminary, it needs to be complemented with the insights gained in the world's philosophical and religious traditions.

What Are the Ethical Principles and Key Values?

The dynamic interaction between different religious traditions and the sciences must be carried out in an atmosphere of mutual respect and recognition of the fact that both the sciences and the religions are pursuing their endeavors in order to obtain truth. Scientific truth must be complemented with the insights of wisdom from the age old religious traditions. The proof of the truth claims within science and religion is of a different kind, but it should also be recognized that there are ways of knowing embedded in religious traditions of wisdom. Religions order and create structure in human lives; they give meaning, foster community, and provide liberation. Interreligious dialogue is furthered by a frank and truthful exchange on how the different traditions can contribute to order and community, meaning and liberation. Sustained by faith, nurtured by hope, and carried by the love of God, all people are called to engage in dialogue and to interact in a peaceful and truthful way with the fellow human being and the whole of creation.

Cross-References

- ▶ Existentialism
- ▶ Metaphysics
- ▶ Phenomenology
- ▶ Scientism

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Science and Revelation and the Jews

▶ Revelation in Judaism

Science and Revelation in Jewish Culture

▶ Revelation in Judaism

Science and Scientific Knowledge, Sociology of

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Related Terms

Science; Social; Sociology; Technology

Science is a social institution. Scientific work takes place in universities, academies, research institutes, and companies. It is funded by

governments, foundations, and corporations, all of which have institutional goals and interests. It is embedded in societies, with particular forms of solidarity, conflict, and inequality. For example, who is able to become a scientist depends on the broader education system which may tend to be meritocratic or may exclude on the basis of class, race, and gender. Just as sociologists study political institutions and education systems, sociologists of science study the institutional workings and social practices of science. So far, so straightforward and uncontroversial. But social life also centrally involves what people collectively believe and how beliefs are ordered and treated as true or false. The knowledge that scientific institutions produce filters through everyday life, and is employed and also contested in public. How scientific knowledge moves through society, informs political debate, and becomes subject to public controversy are therefore key concerns for the sociological study of modern societies. But does sociological explanation extend to the content of scientific knowledge itself? Is scientific knowledge social in the sense of beings shaped by social relations, values, and interests?

Contemporary sociologists of science argue that as scientific knowledge is produced in social institutions by human beings in definite social relations, its content is shaped by this context. What counts as science, what is denied scientific status, how scientific controversies are engaged and resolved, how local laboratory practices are transformed into more widely recognized truths are collective activities and accomplishments that call for sociological explanation. But the claim that the content of scientific knowledge is social has been probably the most controversial of all sociological ideas. It has been seen to threaten the special status claimed by science as the institutional embodiment of public truth and reason. In the so-called Science Wars of the 1990s, sociologists were accused of denigrating and undermining science and opening the door to a new irrationalism in which New Age mysticism and Creationism would thrive (Labinger and Collins 2001).

The sociology of scientific knowledge has its origins in the work of Karl Marx, Karl Mannheim, and Robert K. Merton, but goes beyond these forerunners by developing a systematic sociological analysis of the epistemic content of science. Marx's dictum that "The ideas of the ruling class are in every epoch the ruling ideas" suggested that social relations of class determined what societies took to be knowledge (Marx and Engels 1972). However, Marxists have disagreed about whether this social determination of knowledge applies only to ideology, understood as false belief, or whether it is the case also for science. Orthodox Marxists tended to reserve special epistemic status for science and to treat Marxism as the highest form of science. The sociologist Karl Mannheim sought to extend the analysis of social determination beyond the critique of ideology-as-falsehood through the notion of "total ideology" put forward in his 1936 work, *Ideology and Utopia* (Mannheim 1936). Ideology, for Mannheim, formed a total worldview that was not necessarily a mere illusion. But Mannheim still held back from applying his analysis of the social determination of knowledge to science.

The mid-twentieth century American sociologist Robert Merton wrote extensively about the sociology of science. He deliberately eschewed the sociology of knowledge, insisting that the central question for sociology of science should be the "ethos" or "normative structure" of science. Merton wrote in 1942 that science was demarcated from other social institutions by its values of universalism, disinterestedness, organized skepticism, and communism (which he later renamed "communalism") (Merton 1973). These values were appropriate for the production of universal truth. In contrast with what he called the "acrid quality" of the sociology of knowledge which tended to "indict, secularize, ironicize, satirize, alienate, devalue," Merton's was a sociological celebration and defense of science (Merton). Sociologists of science in the Mertonian tradition studied the social conditions that would tend to promote or impede science.

However, the publication in 1962 of Thomas Kuhn's groundbreaking historical and philosophical study, *The Structure of Scientific Revolutions*, made the Mertonian demarcation of

sociology of science from the sociology of knowledge increasingly untenable (Kuhn 1970). Kuhn's rethinking of the history of science suggested the deep social commitment of scientists to a paradigm, their resistance to abandoning fundamental theoretical assumptions, and the ways in which scientific revolutions opened the boundaries of science to broader social influences beyond those of the discipline. According to Kuhn's model, scientific change could not be treated as linear and exclusively rational. For a new generation of sociologists of science in the 1970s, Kuhn's analysis opened the way for a sociology of the epistemic content of science. At the Science Studies Unit at Edinburgh University, David Bloor and Barry Barnes put forward the "strong programme in the sociology of knowledge" which insisted on the "symmetry principle" of giving the same type of explanation for true and false belief (Bloor [1976] 1991; Barnes and Bloor 1982). The sociology of knowledge would extend to science. It followed from symmetry that the sociologist should adopt a relativist attitude toward the knowledge-claims being studied, bracketing the question of truth or falsity in order to focus on the social process by which scientific findings and claims come to be socially established as "true" or "false."

A key focus of early empirical and historical work in the "strong programme" was the influence of social interests on science. For example, Steven Shapin analyzed the way in which changing class relations affected the reception of phrenology in nineteenth-century Edinburgh (Shapin 1979). In their pioneering work on the rise of experimental science in early modern England, *Leviathan and the Air Pump*, Shapin and Simon Schaffer argued that "Solutions to the problem of knowledge are solutions to the problem of social order" (Shapin and Schaffer 1985). Later work by Shapin, examining the experimental program of Robert Boyle and the Royal Society, has emphasized the dependence of scientific knowledge on relations of trust (Shapin 1994).

At the University of Bath, Harry Collins developed the "empirical programme of relativism," analyzing the social dynamics of scientific controversies. Through participant observation of scientific work, Collins developed the concept of "tacit knowledge" coined by the chemist and philosopher Michael Polanyi (Polanyi 1964). Collins' studies show that scientific knowledge consists not only of explicit knowledge of the sort found in journal articles, but in skills and assumptions that are often embodied and implicit in practice. Tracing how tacit knowledge is shared and communicated involves illuminating the social networks of scientific communities or core-sets and the informal modes of scientific collaboration and communication. Collins also developed the key concept of the "experimenter's regress," showing the inherent problems in replicating experiments and thereby casting doubt on rationalist explanations for how scientific controversies come to be resolved (Collins 2004). A key focus for sociologists and anthropologists of science has been the thick description of laboratory practices and the mundane forms of reasoning employed in laboratory work (Latour and Woolgar 1979; Knorr-Cetina 1981; Lynch 1985; Traweek 1988; Pickering 1995).

Bruno Latour's actor-network theory challenged the primacy that the "strong programme" accorded to social explanation. Actor-network theorists provide what they regard as fully "symmetrical" accounts of scientific activity by treating nonhuman biological and physical entities as "agents" assisting or frustrating human goals (Latour 1993). Michel Callon's study of an attempted solution to the problem of the decline in the scallop population in St. Brieuc Bay exemplified actor-network theory by showing how the solution depended on a complex set of relations between the scientific researchers, the fishermen, and the scallops themselves (Callon 1986).

Feminist research has illuminated both the gendering of scientific knowledge, including the role of gender imagery in the scientific and technological domination of nature, and the way in which assumptions about gender difference are constructed and maintained through science (Harding 1986; Merchant 1980; Martin 1991).

Public controversies about science and technology, and the commercialization of science,

have made questions of governance and regulation a focus of attention for sociologists of science. Sheila Jasanoff's book, *Designs on Nature*, examines the politics and regulation of the life sciences in Britain, Germany, and the United States. The book pays particular attention to the contrasting "civic epistemologies" of these countries and argues that political institutions and political cultures are "coproduced" with science (Jasanoff 2005). Increasingly science is coproduced with capital and industry, and Daniel Lee Kleinman's book, *Impure Cultures*, demonstrates the depth to which these commercial relationships affect the practice of university biology (Kleinman 2003).

"Science Wars" accusations that sociologists were engaged in the denigration of science were based largely on casual misreadings and misunderstandings of sociological work. But viewing science as social relations can involve critique of those relations (e.g., science's military-industrial connections) and it implies that scientists should be more reflexive about the ways in which their knowledge is embedded within social relations of power and trust. Public controversies over such issues as radiation risk, BSE, genetic modification, and vaccination risks show the failure of a technocratic model of one-way communication from scientists to the public. Brian Wynne's study of the relations between nuclear experts and Cumbrian sheep-farmers in the wake of the Chernobyl disaster has been an important spur for generating a more nuanced understanding of relations between scientific expertise and other forms of knowledge and cultural values in the broader society (Wynne 1996). Sociologists of science have been involved in rethinking scientific communication as a dialogue between scientists and the public and in developing new forms of public engagement with science (Wilsdon et al. 2005).

Cross-References

- ▶ Critical Theory
- ▶ Cultural Studies
- ▶ Cyborgs
- ▶ Epistemology
- ▶ Humanities
- ▶ Philosophy of Science
- ▶ Scientism
- ▶ Sex and Gender

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Science in Buddhism

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Description

Buddhism is an Asian religion that is based on teachings attributed to Siddhartha Gautama, an upper-class male born in northeastern India in the fifth or sixth century BCE. Gautama became the "Buddha" ("awakened one"), according to tradition, upon achieving "enlightenment" as a result of engaging in a series of spiritual practices, most notably ▶ meditation. After achieving enlightenment, the Buddha is said to have gained a perfect understanding of the nature of the world and of human existence, and he spent the remainder of his life traveling and teaching as an itinerant mendicant. The religion of Buddhism is based largely on the teachings attributed to Gautama-Buddha.

Many authors and practitioners of Buddhism claim that not only are Buddhism and science compatible, but that Buddhism is inherently scientific. Buddhism is said to be scientific in at least four ways. First, unlike most other major world religions, Buddhism dismisses either the existence or the efficacy of supernatural deities. In this sense, some say Buddhism is atheistic. Second, Buddhism is said not to rely on blind faith, appeal to authority, or metaphysical speculation, for justification. Third, the Buddha's understanding of reality is said to be in line with much of modern physics. Specifically, our experience of reality is illusory because though we see the world as having a stable and permanent existence, the world is actually a collection of parts that are constantly in motion as is held by the atomistic theory in ▶ particle physics. Fourth, the Buddha's understanding of human psychology, in particular the cause and alleviation of mental suffering, is in line with certain tenets of modern psychology, notably cognitive therapy (CT). According to Buddhism, human suffering is the result of improper thinking. Specifically, to be happy, Buddhism claims that a person must eliminate incorrect and dysfunctional thinking and replace such thinking with new habits of thought, which is achieved through the practice of meditation. Meditation is said to "tame the mind" and thereby "calm the soul."

Inspired by anecdotal claims of meditation's therapeutic benefits made by prominent scientists who practice meditation, a number of contemporary psychologists and medical doctors have experimentally tested this claim and obtained confirming results. This area of investigation, between meditation and neuroscience, is arguably the most active in all of Buddhism and science.

It should be noted that some scholars have recently called into question the degree to which

the Buddhism being presented as in line with modern science is in line with *Buddhism*. That is, scholars have questioned the historical authenticity of the type of Buddhism that is said to be scientific. The hypothesis is that the "scientific Buddhism" that is being presented as in line with modern science is actually a historical invention by Asian monks in the nineteenth century as a strategy of combating European colonialist claims that Asians and their religions were "backward" and in need of being "civilized" by Christianity and Europe. Regardless of its historical authenticity, though, even these scholars recognize that while constructed, this reformed version of Buddhism is now quite popular, both in the West and increasingly in Asia, and so is likely here to stay.

Self-identification

Science

Both supporters and critics of the notion that Buddhism is scientific acknowledge that "scientific Buddhism" was championed in the nineteenth century first by Asian Buddhists themselves, such as the Singhalese ▶ Theravada Buddhist, Anagarika Dharmapala, but later championed by Western converts such as the American Henry Steel Olcott and the German-American, Paul Carus. Recently, prominent Buddhist leaders such as the fourteenth Dalai Lama, Tenzin Gyatso, and Chogyam Trungpa have advanced the notion that Buddhism is inherently in line with modern science. Similarly, Western scientists who practice Buddhism contribute to the self-identification of Buddhism as scientific. For instance, prominent scientists who practice or champion Buddhist meditation include psychologists Daniel Goleman and Richard Davidson, the medical doctor Daniel Siegel, the neurobiologist Francisco Valera, and the physicist Arthur Zajonc.

Religion

This is a difficult question, as the answer turns precisely on what constitutes a "religion" at all. Further, in many ways the scientific nature of Buddhism is defined vis-à-vis traditional religion. Thus while classical Buddhism is infused with elements of traditional religion, such as ritual, devotion, and supernatural beliefs, those who view Buddhism as scientific often dismiss such practices as folk belief rather than Buddhism proper. However, there is no disputing the fact that worldwide, Buddhism as practiced by most Buddhists contains elements of traditional religion.

Characteristics

Arguably, the most unusual feature of Buddhism, in relative contrast to other major world religions, is the claim that Buddhism is an atheistic religion. However, this claim itself has been disputed as being based on a misreading of a widespread quote attributed to the Buddha: "No one saves us but ourselves. No one can and no one may. We ourselves must walk the path." This quote can be interpreted to mean that no deities exist. Or, it can be interpreted to mean that though deities exist, they cannot provide salvation. If one assumes the former, Buddhism might be atheistic. However, if one assumes the latter, Buddhism is theistic.

Relevance to Science and Religion

Not only are many practitioners of scientific Buddhism interested in science and religion, they often see themselves as uniquely positioned – due to the features of Buddhism noted above – to be leaders of the science and religion dialogue. Buddhists regularly volunteer to be subjects in medical and scientific experiments, and an institution, The Mind and Life Institute, has been created specifically to further the dialogue between Buddhism and science.

Sources of Authority

As with all institutionalized religions, authority in Buddhism is occasionally contested. For

instance, members of the two major sects of Buddhism – Theravada and ▶ Mahayana – disagree over scriptural authority, monastic lineage, and so forth. Nonetheless, the most prominent figure in Buddhism and Science today, Tenzin Gyatso, is the theocratic head of the Tibetan government-in-exile in Dharamsala, India, and widely believed among Tibetans to be the fourteenth reincarnation of the Dalai Lama.

Further, scientists who champion Buddhism, such as Richard Davidson, Daniel Goleman, Daniel Siegel, Francisco Valera, and Arthur Zajonc, are seen as authoritative because of their scientific credentials and prominent research.

Ethical Principles

The ethical principles that guide Buddhism differ between monks and nuns, and the laity. Lay Buddhists are expected to follow five principles: no killing, stealing, lying, sexual misconduct, or intoxicants. However, monks and nuns are expected to follow a much larger set of ethical rules (227 for males, 311 for females) as outlined in a text known as the *Vinaya Pitaka*.

Scientists who conduct research on Buddhism are bound by the same ethical requirements all scientific researchers are expected to follow, such as not to distort the research process or fabricate data, and the ethical treatment of human subjects as outlined by the Institutional Review Board (IRB).

Key Values

The values of the Buddhism and Science movement can be said to be pragmatic empiricism whereby one should, to quote the motto of the Royal Society, "Take no-one's word for it." This claim is based on an oft quoted passage from a text known as the *Kalama Sutra – Angutarra Nikaya 3.65* in which the Buddha instructed:

Do not go by revelation.
Do not go by tradition.
Do not go by hearsay.
Do not go on the authority of sacred texts.
Do not go on the grounds of pure logic.
Do not go by a view that seems rational.
Do not go by reflecting on mere appearances.
Do not go along with a considered view because you agree with it.
Do not go along on the grounds that the person is competent.
Do not go along because [thinking] "the recluse is our teacher."

Conceptualization

Nature/World

Nature and the world consist of smaller (unseen to the naked eye) parts that are in constant motion. Therefore, according to Buddhism, life is empty of any stable, permanent reality.

Human Being

Like the world around us, humans consist of smaller (unseen to the naked eye) parts that are in constant motion. Therefore, according to Buddhism, humans are empty of any stable, permanent reality such as a soul.

Life and Death

According to Buddhism, an individual's life is the result of the transmigration of material from a previous life. At death, the material that constituted our bodies transmigrates into a new form, and that process continues on until one achieves parinirvana (via Buddhist practice). In Buddhism, parinirvana is the final stage which occurs upon the death of the body of someone who has attained complete enlightenment. It implies a release from the cycle of birth, life, death, and rebirth.

Reality

According to Buddhism, reality is not as it seems. We see reality as having a stable, permanent existence, but in fact it is constantly in flux and changing.

Knowledge

According to Buddhism and science, true knowledge comes from testing claims empirically.

Truth
According to Buddhism and science, truth can only be established through rigorous empirical testing.

Perception
According to Buddhism and science, our eyes can deceive us and therefore it is critical to test claims empirically and repeatedly to establish truth.

Time
In science, time is part of the measuring system used to sequence events, to compare the durations of events and the intervals between them, and to quantify the motions of objects. Scientists consider time to be linear in nature. In Buddhism, time is merely a feature of the mind.

Consciousness
According to Buddhism and contemporary neuroscience, consciousness is a continual series of individual moments or events. In neuroscience, however, many consider consciousness to be a product of brain function, and so "the mind is what the brain does."

Rationality/Reason
According to Buddhism, suffering is caused by irrational thinking and that training the mind (via meditation) to be perfectly rational – and thus achieving Buddha-hood is the anecdote. However, in modern psychology there is great debate over the extent to which it is possible to train the mind perfectly. Some psychologists argue that the brain is a collection of modules that was designed by evolution to function rationally in a world that is much different from the one in which we now live. As such, we have, at best, bounded rationality, based on a mismatch between what brains are designed to do and what we need them to do in today's environment.

Mystery
Some philosophers and scientists working in cosmology have argued that while we have solved two of the three great mysteries of life, namely why humans exist (answer: evolution) and how consciousness can exist (answer: brains), the last will never be answered: why something exists rather than nothing. There are only two possibilities, it has been argued, and each is incomprehensible: Either the world was created (but by whom or what, and who or what created the creator?) or it has always existed (but where did it come from?). Likewise, the Buddha purportedly noted that human beings cannot know the answers to all of life's mysteries and to try to do so is not only wasteful, it is counterproductive. Instead, we should focus our mental energies on problems we can solve, like alleviating mental suffering.

Relevant Themes

It is critical to note that Buddhist meditation is increasingly being recognized in the medical and scientific communities as having real therapeutic benefits. As such, it is safe to say that more and more scientific individuals may be looking to Buddhism as their religion of choice.

Cross-References

- ▶ Buddha (Historical)
- ▶ Buddhism
- ▶ Buddhism in the West
- ▶ Buddhist Meditation Practices
- ▶ Modernity in Buddhism and in Islam
- ▶ Psychology in Buddhism

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Science in Islam, Classification

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Related Terms

Encyclopaedism; Organization of science

Description

The classification of science in Islam is a subject which needs to be investigated in reference to the historical and intellectual context of early Islam (Endress 2006). For about 150 years, the field of theoretic knowledge remained largely the prerogative of traditional sciences, like jurisprudence or theology, which could be viewed as grounded in the Qur'an and the traditions of the Prophet. From about 750 A. D., as a result of a large-scale movement of translation, philosophy and the rest of rational sciences (mathematics, physics, metaphysics, and logic, with their own subdivisions) as already cultivated in antiquity by the Greeks were incorporated too (de Callataÿ 2008a). One way or another, nearly all classifications in premodern Islam reflect this bipolarity between traditional (or "religious" or "Islamic") sciences and rational (or "philosophical" or "foreign") sciences (Bakar 1998; Biesterfeldt 2000, 2002; Pellat et al. 1990; Vesel 2008).

Self-Identification

Science

In the same way as the page of contents in a book is part and parcel of this book, the classification of science in medieval Islam could easily self-identify as a science of its own, being a sort of natural corollary to the encyclopedic approach of reality. A typical example is the work known as the *Epistles of the Brethren of Purity*, a vast tenth-century encyclopedia of sciences consisting of about 50 epistles, one of which specifically concerned with one such classification of human knowledge (de Callataÿ 2008b).

Characteristics

What makes the classification of science distinctive among other disciplines in Islam is both its systematical and all-encompassing approach of reality.

Relevance to Science and Religion

For philosophers and humanists of medieval Islam, the organization of human knowledge served to stress the harmony between, and eventual reconciliation of, both traditional and rational sciences. In the eyes of people less favorable to the incorporation of foreign material into the building of Islamic thinking, the classification of sciences was a way to emphasize the superiority of traditional sciences over rational sciences, of revelation over human speculation, and, ultimately, of religion over science (in the modern sense of the word).

Sources of Authority

The sources of authority for the classification of science in Islam are the authors of classifications themselves, first and foremost the Greek masters,

most notably Aristotle, and then their Muslim epigones, such as Kindī, Fārābī, Ibn Sīna (Avicenna), or Ibn Khaldūn. What makes these sources authoritative is the intrinsic coherency of the classifications, along with the prestige and fame of the authors.

Ethical Principles

Some classifications of science, especially those meant to represent the traditional view, reflect ethical concerns. This is evidenced, for instance, from their rejection of a certain number of scientific arts or practices (such as alchemy, astrology, or logic) deemed to be incompatible with the "orthodox" view and therefore blameworthy.

Key Values

Coherency, comprehensiveness, and sense of hierarchy.

Conceptualization

Nature/World
God's creation.

Human Being
An animal possessing a spiritual soul.

Life and Death
A characteristic affecting those beings in the world which are subject to decay. Biology or zoology did not exist as such in medieval classifications of science, although the distinction between the mineral, vegetal, and animal kingdoms was usually reflected by them.

Reality
What exists per se, as opposed to what has been devised. In Islamic classifications, rational sciences are sometimes called "real," in opposition with the traditional sciences, which are assumed to have been conventionally "set up" for a certain purpose.

Knowledge
Theoretical and practical understanding of a subject.

Truth
Agreement with reality.

Perception
One of the faculties by which a human being, through the use of his senses, is able to understand the reality around him.

Rationality/Reason
Man's ability to understand a subject by his own effort.

Cross-References

- ▶ Philosophy in Islam
- ▶ Philosophy of Science
- ▶ Physics, Science in Islam
- ▶ Science in Islam, Transmission

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Science in Islam, Transmission

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Description

The transmission of science in Islam is a subject which needs to be investigated in reference to the historical and intellectual context of early Islam. Traditional sciences, that is, those sciences which could be viewed as grounded in the Qur'an and the traditions of the Prophet, used to be transmitted by generations of experts from the very beginning of Islam (Kraemer 1986; Makdisi 1981; Rosenthal 1975; Van Ess 1991–1997). Philosophy and the rest of the rational sciences were incorporated at a later stage (from about 750 AD, roughly coinciding with the accession to power of the 'Abbasids and the foundation of Baghdad), as a result of an unprecedented movement of translation into Arabic of ancient traditions (mainly Greek, but also Persian, Indian, and many others as well) that had survived in various communities of the Near East (Endress 2006; Saliba 2007; Wasserstein 1989). This formidable undertaking, made possible by a wide range of favorable factors (economic, social, political, cultural, etc.) acting at the same time, would not be over before the end of the tenth century when, with the exception of a limited amount of specific literature not deemed of interest by the scholars of Islam (most notably ancient Greek belles-lettres and history, and Christian literature in general), nearly all Greek sources accessible in that part of the world seem effectively to have been made available in the Arabic language (Gutas 1998). The field ranges from logic and metaphysics to ethics and politics, from medicine and the natural sciences to the sciences of the number (arithmetic, geometry, astronomy, and music) and the technical sciences. The other impressive feature is the unusually rich melting pot of cultures, races, and religions in which diverse groups of translators, copyists, and scientists were able to work with one another for more than two centuries, and this obviously in the absence of a centralized program or sponsorship, although some caliphs became quite famous for their support. Among scientists, Christians were in the majority, but there were also Jews, Persians, Arabs, and even idolaters. This multiculturalism was also to favor significantly the incorporation of sources that did not ultimately derive from Greece, but rather from India, Iran, and Ancient Mesopotamia. The succeeding decentralization of power in Islam may be viewed as having played a positive role in the development and transmission of the sciences as well, since it widely contributed to the availability of patronage, as newly arrived rulers competed with each other to take the place of the 'Abbasid caliphs as protectors of the arts and the sciences.

Self-identification

Science

The transmission of science in Islam is a cultural and intellectual phenomenon. It cannot self-identify as a science, since it was never meant to follow or obey predefined rules.

Sources of Authority

The sources of authority for the transmission of science in Islam are the authors themselves. The *Fihrist*, a monumental catalogue of the books available in Arabic (whether the result of a translation or not) compiled on every branch of knowledge by the tenth-century Baghdad librarian Ibn al-Nadīm lists about 4,000 authors, ancient or modern.

Cross-References

- ▶ Philosophy in Islam
- ▶ Philosophy of Science
- ▶ Physics, Science in Islam
- ▶ Science in Islam, Classification

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Science of Happiness

▶ Positive Psychology

Science of Human Strengths and Virtues

▶ Positive Psychology

Science of the Stars

▶ Astrology in Islam

Scientific Expansionism

▶ Scientism

Scientific Naturalism

▶ Scientism

Scientific Study of Religion

▶ Psychology of Religion

Scientism

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Related Terms

Scientific expansionism; Scientific naturalism

Description

Some people seem to think that there are no real limits to the competence of science, no limits to

what can be achieved in the name of science. There is no area of human life to which science cannot successfully be applied. A scientific account of anything and everything constitutes the full story of the universe and its inhabitants. Or, if there are limits to the scientific enterprise, the idea is that, at least, science sets the boundaries for what we human beings can ever know about reality. This is the view of *scientism*.

From a historical perspective, perhaps the most well-known proponent of scientism is the French social philosopher Auguste Comte, with his attempt to create a religion based on science – the "Religion of Humanity" 1852. Another interesting and far-reaching attempt to have science take over many of the functions of religion, and thus itself become a religion, was undertaken by the German chemist and Nobel prize-winner Wilhelm Ostwald (1912: 94–112). He argued for science as an "Ersatzreligion" – a substitute religion. Yet, many different forms of scientism have emerged over the last three centuries, and during the most recent decades, a number of distinguished natural scientists, for instance Peter Atkins, Richard Dawkins, Carl Sagan, and Edward O. Wilson (1978), as well as philosophers such as Daniel C. Dennett and Patricia Churchland have advocated scientism in one form or another (Atkins 1995: 132).

But what, more precisely, is scientism? Though it is not at all easy to define, we might say that someone is a proponent of scientism if he or she believes that everything (or at least as much as possible) could and should be understood in terms of science. Be aware here that the notion of science is used in the restricted way that is common in English usage, though not in the German or Swedish tradition. Thus, the term covers only the natural sciences and those areas of the social sciences that are highly similar in methodology to the natural sciences.

Another concept that could be invoked in this context is "scientific expansionism," and this explains quite well what the project is all about. Namely this: the proponents believe that the boundaries of science (that is, of the natural sciences) can and should be expanded in such a way that what has not previously been understood as amenable to scientific methodology can now be brought within the scope of science. Science can answer many more questions than we have previously thought possible.

In its most ambitious form, scientism can be defined as the view that science has no real boundaries; that is to say, eventually it will answer all empirical, theoretical, practical, moral, and existential questions. Science will in due time solve all genuine problems that humankind encounters. How, exactly, the boundaries of science should be expanded and what, more precisely, it is that is to be included within science are issues on which there is disagreement. Some proponents of scientism are more ambitious than others in their extension of the boundaries of science. That is to say, they are all scientific expansionists but in different ways and to different extents.

Perhaps the most well-known form of scientism, epistemic scientism, expresses a particular idea about the boundaries of knowledge, saying that the only genuine knowledge about reality is to be found through science and science alone. The only kind of knowledge we can have is scientific knowledge. Everything outside of science is taken as a matter of mere belief and subjective opinion. Consequently, the agenda is to strive to incorporate as many other areas of human life as possible within the sciences so that rational consideration and acquisition of knowledge can be made possible in these fields as well. If one holds this epistemological view, then it is of course not difficult to understand that one would believe that everything (or at least as much as possible) could and should be understood in terms of science – because what we cannot understand and explain in terms of science is something that we cannot know anything about at all. This is not the view that science is the paradigm example of knowledge or rationality, but the view that the only genuine knowledge about reality is to be found through science and science alone.

Epistemic scientism raises an obvious challenge to the religions of the world. For example, Christianity could only give us knowledge about God, human beings, and the world if those knowledge claims could be confirmed by

the methods of the natural sciences, because genuine knowledge – according to this version of scientism – could only be obtained by such methods.

Scientism has been criticized by many scholars who have taken part of the science-religion dialogue, such as Ian Barbour, John Haught, Mikael Stenmark (2001), and Keith Ward (1996) and in culture in general by people such as Bryan Appleyard, Mary Midgley (1992) and Huston Smith. Smith even think that "the greatest problem the human spirit faces in our time is having to live in the procrustean, scientistic worldview that dominates our culture" (2001: 202). Depending on what form of scientism analyzed and what understanding of religion defended, the critical responses have looked differently. The main criticism, however, is that the advocates of scientism in their attempt to expand the boundaries of science rely in their argument not merely on scientific but also on philosophical premises and that scientism therefore is not science proper, but naturalism or atheism disguised.

Perhaps the most embarrassing problem for spokespersons for scientism is that one of its central claims seems to be self-refuting. The difficulty is that the scientistic belief that we can only know what science can tell us (epistemic scientism) seems to be something that science cannot tell us. How can one set up a scientific experiment to demonstrate the truth of that claim? It seems not to be possible. But we cannot know that scientific knowledge is the only mode of knowledge unless we are able to determine this by scientific means. This is so, simply because science – according to epistemic scientism – sets the limits for what we can possibly know. Hence, the claim that we can only know what science can tell us falsifies itself. If it is true, then it is false.

Cross-References

- ▶ Epistemology
- ▶ Naturalism
- ▶ Truth

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Scientist-Practitioner

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A model of training wherein practitioners in a given field (e.g., behavioral medicine, health psychology) are trained to apply the findings, processes, and principles of science and scientific investigations to their professional practice. These practitioners may also be involved in conducting scientific investigations of their own. Thus practitioners incorporate methods of treatment that have received scientific empirical support and they engage in decision making that utilizes the logic of hypothesis testing informed by research findings and clinical experience. The model was first proposed as a method for training clinical psychologists at the Boulder Conference on Graduate Education in Clinical Psychology (1949) held in Boulder, Colorado, USA, but has since been adopted by many professions involved in treating human conditions.

Screenwriting

► Creative Writing

Second Law of Thermodynamics

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There are various ways of formulating this law of nature, but generally speaking, it holds that in a closed system, disorder increases with time. For example, it is much more likely that a chimney will collapse into a pile of rubble rather than the reverse: a pile of rubble spontaneously assembling itself to produce a chimney. The fact that sometimes a pile of bricks can be assembled to form a chimney does not violate this law. In this case the pile of bricks is not a closed system. Their assembly requires input from construction workers. When "the system" is extended to include the workers, together with their breakdown of food to produce energy, etc., then the second law is seen to hold.

Cross-References

► Time

Secular

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Profane, ordinary, the opposite and complement of "sacred." At the risk of oversimplification, it may be suggested that in Western society the realms of the sacred or religious and the secular have historically had three different relations: (1) hegemony of the religious outlook over the whole of society comprising both the sacred and secular realms (ancient and medieval periods); (2) competition of the religious and the secular for political and intellectual hegemony (late medieval and early modern); and (3) political and intellectual hegemony of the secular, along with privatization of the religious (late modern period). The application of this schema to the topic of "secularism and Judaism" has the following consequences:

- In Biblical society, the religious authority demarcated the realms of the sacred and the profane (see Ezekiel 44:23).
- In the Middle Ages, the religious philosopher adjudicated the claims of reason and revelation in a way that preserved hegemony of the religious outlook.
- Spinoza was typical of Enlightenment thinkers in challenging the veracity of Scripture and advocating the hegemony of the secular ruler.
- By calling a Jewish Sanhedrin in 1806, Napoleon asserted the hegemony of the secular state over religion; the nineteenth–century Jewish movements complied by adapting Jewish religion to the conditions of modern civil society.
- For a time, modern secular movements asserted modes of Jewish affirmation that dispensed with religion altogether; however, the commonest modes of Jewish affirmation take a religious form – though with the individual autonomy that is one of the hallmarks of modern secularity.

Cross-References

► Secularism in Judaism

Secular Jewish Movements

► Secularism in Judaism

Secularism

▶ Secularism in Judaism

Secularism in Judaism

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Related Terms

Judaism; Secular; Secular Jewish movements; Secularism; Secularization

Description

The intersection of ▶ secularism and ▶ Judaism will be considered here under four headings:

1. The place of the ▶ secular in classical Jewish thought
2. The impact of secular thought on the modern versions of Jewish religion, especially during the period of modernization in the nineteenth century
3. Self-styled "secular movements" in modern Judaism (such as Zionism) that conceive of a kind of Judaism divorced from religion
4. The question of positive Jewish identity and Jewish content in the lives of Jews who affiliate neither with Jewish religion nor with secular Jewish movements

The Secular in Classical Jewish Thought

Biblical Jewish thought. If by "secular" we mean "worldly," all religion has a secular element, for all religion must include the world somehow in its map of reality. The author of Genesis 1 conceived the world as the creation of God, but also as a good in its own right. The God of the Hebrew Bible situates humankind in the world for their benefit. He promises fertility of crops, livestock, and human progeny if people would obey His will. The pleasures of life are affirmed as good, subject to their enjoyment within lawful limits and constraints. Although worldly pomp and splendor can lead to corruption and abuse, they are affirmed as legitimate under the proper circumstances. Political rulers may exercise power if they do so justly, while acknowledging God as the supreme ruler.

Like most ancient cultures, ancient Israel posited a formal distinction between those areas of life that were "sacred," subject to the control and governance of the priesthood, and "profane," free for use by the laity with a lesser degree of restrictive regulation. The "profane" realm of Biblical experience foreshadows the "secular" realm of medieval Christendom, which evolved into the modern secular world.

Peter Berger (1967) follows Max Weber in characterizing the created natural world of the Hebrew Bible as "disenchanted" in comparison with the god-filled plenum of nature in the pagan mythic conception. In that respect, the Biblical outlook is perhaps somewhat more "secular" than the outlook of the Enuma Elish, the Vedas or the Nibelungenlied. On the other hand, the Biblical authors did not arrive at a systematized vision of physical nature obedient to natural law, as Greek science did. The Biblical authors recognized the exceptionality of certain miracles (see especially Numbers 16:29–30), but generally viewed the world as following an overall orderly course that is, nevertheless, subject to divine guidance and providence. In this outlook, there is not a sharp dichotomy between "natural" and "supernatural" realms or modes of causality, as would appear in medieval conceptualization of "miracle." There is no word in Biblical Hebrew for "nature," "natural," or "supernatural." Though "Heaven" is preeminently the abode of God, it is also the source of meteorological phenomena; it is the visible sky, not an invisible transcendent realm. In all these respects, though the Biblical world-outlook includes "secular" elements, it is lacking in the sharp "sacred-secular" dichotomy that characterizes the modern debate.

Rabbinic Judaism. Rabbinic thought arose at least in part to defend the integrity of the Biblically based ethos from the challenge posed by the Greco-Roman classical culture – inclusive of religious paganism, art, and philosophy. For our purposes, the following developments are noteworthy:

(a) Rabbinic Judaism defined a normative structure (halakha) governing a wide array of domains – divine worship, civil law, marital law, eating, the work-rest cycle, and relations between Jews and non-Jews in daily life. Comprising areas like civil law under halakha was simultaneously an affirmation of the legitimacy of secular pursuits and staking the claim of sacred law to govern it.
(b) Rabbinic hermeneutics sought to ground all normative discourse (insofar as possible) in the exegesis of sacred Scripture. In doing so, it affirmed implicitly that sacred authority holds sway over all existence, and denied the legitimacy of any radically secular domain that was free of divine governance. It similarly accentuated the radical difference between "Israel" and "the [gentile] nations," thus affirming the ultimate value of the Jewish people who live by God's law, and denigrating the value of the pagans and "sectarians" (i.e., Christians and Gnostics) who do not.
(c) On the other hand, rabbinic ethics affirms a category *derekh eretz* (literally "the way of the world") which has many shades of meaning but is very close in some of its significances to the Stoic concept of "natural law." As such, it affirmed the validity of a secular normative standard as both compatible with and complementary to its own religious normative standard.
(d) Rabbinic cosmology accommodated to the prevailing natural law conceptions by trying to harmonize Biblical miracles with an overall affirmation of natural order – for instance, by saying that God provided for these miraculous phenomena in the liminal time-slot between the sixth day of creation and the first Sabbath.

Medieval Judaism. Medieval Jewish philosophy (in particular, that of Maimonides) sought on the one hand to set up a sharp opposition between the rabbinic Jewish outlook, deriving all normative assertions from the Bible, and the secular philosophical outlook such as that of Aristotle. At the same time, it tried to mediate this opposition by achieving an accommodation, in which the Jewish and philosophical outlooks would be synthesized where possible (such as in proving the existence of God), and rendered distinct where synthesis was impossible (such as on the issue of the creation or eternity of the world). Maimonides' accommodation with Aristotelianism had the following implications for our problem:

(a) It affirmed the validity of secular reason as a legitimate intellectual method.
(b) It enlisted secular reasoning in support of traditional beliefs, particularly with respect to proving the existence of God and articulating a purified conception of God's nature.
(c) It demanded the reinterpretation of Biblical assertions in order to render them compatible with philosophical reason, particularly with respect to anthropomorphism; this left the Bible authoritative as to "word" but reason authoritative as to "meaning."
(d) It reinterpreted the very notion of "revelation" (i.e., prophecy) in a sense almost synonymous with philosophical enlightenment, and (in *Guide* III, 40, following Alfarabi) Maimonides offered a portrayal of the ideal prophet-legislator in the mold of Plato's philosopher-king.
(e) It demanded a rationalizing and ethicizing interpretation of Jewish normative injunctions, particularly in Maimonides' interpretation of certain areas of Jewish law in his code, the *Mishneh Torah*.
(f) On the other hand, it used the logical consistency of philosophic reasoning to solidify the definition of the demands of the sacred realm, for instance, in Maimonides' codification of the sacred law and in his defining for the first time a definite Jewish creed as a boundary-marker for demarcating Jewish legitimacy.

In short, the Maimonidean formulation of Judaism enlarged the area of the legitimate use of secular reason, both in itself and in the service

of sacred knowledge. At the same time, it sharpened the sacred-secular distinction in new ways, which would ultimately play a part in defining the battleground of secularization in the modern period.

The Impact of Secular Thought on Jewish Religious Modernity

Spinoza. Modern Jewish thought begins, in many important respects, with Spinoza. Harry Wolfson observed that Spinoza broke apart the synthesis of revelation and reason that had prevailed in medieval thought, primarily by discrediting (in his *Theological-Political Treatise*) the Bible's claim to embody infallible divine truth. Thus, secular reason for the first time posed a potentially mortal threat to the viability of traditional Jewish faith altogether. Moreover, Spinoza proposed, in his *Ethics*, a God-concept radically different from the personal, transcendent God of the Bible and medieval theism, and (some would say) dangerously close to the vanishing God of modern atheism. Nevertheless, Spinoza's position on both these issues developed organically and dialectically out of Maimonides' compromising synthesis. One might say that the substance of the challenge of secular philosophical reason to Biblically based Jewish faith was perceived similarly by Maimonides and Spinoza, only that in Maimonides' assessment the challenge could be met through compromise and reconciliation, whereas in Spinoza's assessment it could not, and the two outlooks would have to go in their separate ways.

Nevertheless, it has been the general direction of modern Jewish religious thought to try to rescue Jewish faith from Spinoza's challenges. This has meant establishing new syntheses of faith and reason that differ from Maimonides' synthesis by conceding the force of secular reason in stronger terms than Maimonides would have allowed. Specifically:

(a) Spinoza initiated secular scholarly analysis of the Bible as a literary and historical document. Modern Jewish theologians reconstruct the narrative of Jewish history, and the Jewish historical theology that grows out of it, based on this new scholarly foundation, which is secular in its methodology.
(b) Spinoza radically redefined God to conform to the emergent modern scientific worldview. Modern Jewish theologians may disagree with the specifics of Spinoza's theology. But they are generally agreed that Jewish theology must adapt its assertions to agree with the findings of modern science (particularly evolution, after Darwin). And the radical immanence of Spinoza's pantheism finds a modified echo in the panentheistic tendencies of many contemporary Jewish theologians. The revaluation of divine immanence may be seen as "secularizing" inasmuch as it brings God more into interaction with the world than the medieval transcendent God.

Enlightenment and Emancipation. From the eighteenth century onward, Jews of Western Europe (and later Eastern Europe) tended increasingly to adopt the intellectual ideologies growing out of the European Enlightenment, in tandem with their attempt to become integrated politically, socially, and culturally in the nation-states of modern Europe. For these purposes, they adopted ideas that had a secularizing impact on general European thought, which tended also to advance the interests of Jewish integration (See Schweid 2008). By the same token, the same ideas, when applied internally within Judaism, had a destabilizing effect on the traditional Jewish outlook and required the formulation of new Jewish religious ideologies to achieve a new equilibrium under which Jewish religion could exist in the modern age. Among these ideas (see Berger 1967; Martin 1969):

(a) All human beings are fundamentally equal, deserving equal rights and equal treatment under the civil law.
(b) All human institutions (including religion) are to be evaluated according to the extent to which they further human happiness, conceived in universal, nondogmatic terms (though consistent with a Deist conception of a universal, benevolent God).
(c) Among the universal human rights is liberty of conscience; hence, all persons should be

free to choose whatever religion suits them. Religious law (whether Christian law imposed on Jews, or rabbinic law imposed within traditional Jewish communities) should never be enforced; religious compliance is voluntary and a matter of private conscience.

(d) All religious dogmas (including the very belief in God) are unprovable. Disputation among religions is fruitless. In a tolerant, ecumenical society, all religions conducing to the public good are to be tolerated. Religious adherents should forswear triumphalist pretensions and agree to disagree amicably in the interest of the public good.

The net effect of adopting these principles was to incorporate the secular tenets of individual freedom and utilitarian measurement of success into the fabric of the modern denominations of Judaism, to a varying extent across the Reform, Conservative, and Modern Orthodox movements. Traditional Judaism had sought to exercise hegemony over all areas of Jews' lives. Modern Judaism reduced its sights to fostering a voluntary compact among its members, to adopt those portions of the Jewish religious legacy that could be justified as in agreement with the norms of liberty and pursuit of happiness that prevailed in secular society.

More generally, Judaism followed the example established by Western religion generally during the period of early modernism. Whereas in the medieval world, religion had sought to govern the tenor of life in its totality – outlook, social values, and sacred occasions, as well as maintaining a hefty political presence – in the modern world, religion is relegated to a much narrower, specialized domain. It was modern religion's business to maintain personal spiritual values and provide private moral teaching, while ceding the formation of intellectual outlook to science and philosophy, and the governance of public conduct to secular political institutions. In addition, it became the business of Jewish religious institutions to maintain Jewish identity in a new, purportedly integrated society where there was a marked tendency for Jews to assimilate and disappear completely into the general population.

The modern Jewish religious movements of Western Europe made an additional accommodation. Traditionally, Judaism was a complex phenomenon combining religious and national characteristics. In the new, modern nation-states of England, France, and Germany, there was no room for the national dimension of Jewish existence, as it competed with the national identities of the host nations. Jews had to redefine Judaism as solely a "religion" in order to be able to fit into their respective nations as "Englishmen/Frenchmen/Germans of the Jewish religious persuasion." This was a reduction of their Jewish identity to merely "religious" in order to be able to fit the secular identity of "English/French/German." Thus, paradoxically, stressing the purely religious identity of Judaism aided them in secularization.

The Rise of Secular Jewish Movements

From the 1880s to the 1920s, several movements (especially Zionism, Diaspora autonomism, Yiddishism, and Bundism) arose in Jewish life that asserted for the first time in history that it was possible to foster a Jewish group existence without religion. This period can be viewed as the heyday of Jewish secularism (See Biale 2011).

Historically, the roots of Jewish secularism may be traced to a bifurcation in the general European Enlightenment. The more religiously conservative Enlightenment thinkers – Leibnitz, Rousseau, Kant – saw a positive place for Christian faith in such an outlook. The more radical – Voltaire, Diderot, Condorcet – sought to supersede Christianity and relegate it to the unenlightened past. In the nineteenth century, advanced thinkers, such as the left-Hegelians and positivists (Comte, Mill, Spencer), progressed to full-blown atheism, a tendency that was fed intellectually by the advance of science (especially Darwinian evolutionist theory) in the course of the century.

Structural political differences between Western and Eastern Europe also fostered differences in Jewish intellectual development. Whereas unified nation-states were at least

a feasible ideal (if not quite a perfected reality) in Western Europe, Eastern Europe was dominated by multinational empires. By the latter half of the nineteenth century, the smaller nationalities within the Austrian, Russian, and Ottoman Empires were already moving toward demanding self-determination and autonomy. It, thus, made political sense, instead of demanding to be "a Russian national of the Jewish faith," to demand "Jewish national rights" alongside and in tandem with the national rights of Poles, Lithuanians, Ukrainians, Czechs, Slovaks, Hungarians, etc.

There was happy synergy between the religious/secular issue and the national/multinational issue. Young, modernizing Jews in Eastern Europe in the 1880s tended to be secular rather than religious in outlook, and Jewish-nationalist rather than assimilationist. Thus, whereas Western European Jews tended to be French or German in nationality and Jewish in religion, Eastern European Jews tended to affirm Jewishness as their nationality, while on the religious front they could comfortably say: "no religion."

Zionism. Classical Zionism comprised at least three distinct types: (a) political Zionism, which strove for establishment of a political Jewish state, for the protection of world Jewry, with no preconceptions as to its cultural identity or religious identity; (b) secular cultural Zionism, which sought return of Jews to their homeland and building a Hebrew-speaking society that would spearhead a Jewish cultural renaissance; and (c) religious Zionism, which sought establishment of a Jewish society in the land of Israel that would be observantly Jewish in its religious complexion. Of these, the second is the clearest example of a secular Jewish national movement in the sense we are describing (See Hertzberg 1959). The chief spokesmen of this variety of Zionism were Ahad Ha-Am, Hayyim Nachman Bialik, Aaron David Gordon, and Berl Katzelnenson. All these agreed on the following principles (which may be styled the principles of "conservative secular Zionism"):

1. Traditional religion is no longer viable as a basis of social consensus; hence, any new Jewish social consensus or group program must proceed irrespective of religious belief or practice.
2. Though the contents of Jewish group life in the past were formulated under a religious rubric, they are not essentially religious. At least a large portion of those contents can be reframed secularly as ethical teachings and cultural practices.
3. The Jews continue to remain a group in the modern world after the decline of religion. The basis of that continuity is national and cultural.
4. The preferred national language to serve as the basis of Jewish cultural continuity is Hebrew.
5. The preferred location for Jewish national existence and cultural renewal is the Land of Israel.
6. The renewed Jewish national culture should exhibit continuity with the Jewish past (including the Biblical, rabbinic, and medieval legacies) insofar as is possible with the rejection of formal religion. Such modes of continuity may include celebrating traditional Jewish holidays in secularized form; maintaining the validity of traditional Jewish ethical models; and adopting traditional Jewish literary sources as models for inspiration of modern Jewish literature.

To the previous thinkers must be added another group, who may be styled "radical secular Zionists," including such thinkers as Micah Joseph Berdichevsky, Joseph Hayyim Brenner, and Jacob Klatzkin. The thinkers of this group agreed with principles #1–#5 of the above list but differed sharply with #6. In its place, they would assert:

7. The renewed Jewish national culture should be free to express the existential values of present-day Jews without regard for previous Jewish legacies, with the possible exception of the Biblical legacy. Indeed, rebellion against the rabbinic and Diaspora legacies (including some of their ethical formulations) is perhaps mandatory as a prerequisite for asserting a healthy modern Jewish national identity.

The debate between the conservative and radical Zionists came to famous formulation in Ahad Ha-Am's essay, "Transvaluation of Values"

(1898), in which he argued for the ongoing validity of traditional ethical values against the younger generation of Zionist Nietzscheans. Nevertheless, this debate was conducted on a common basis of both sides accepting the fact of secularization (Principle #1).

Autonomism. The historian Simon Dubnow formulated an ideology which he dubbed "autonomism" that agreed with points #1–#3 and to some extent with point #6 of the conservative cultural Zionist platform but disagreed with #4 and #5. Dubnow maintained, on the basis of his detailed study of Jewish history, that Jews historically exhibited the characteristics of a national group, including limited self-government (or "autonomy"), despite their lack of complete political independence or exclusive possession of a territorial homeland. In place of #4–#5 Dubnow would stipulate:

8. The Jews have historically expressed their national culture in a wide variety of languages – Hebrew, Aramaic, Judeo-Arabic, Judeo-Spanish (Ladino), Judeo-German (Yiddish), and others. Today they may continue to express it in the traditional Jewish languages still in use, as well as in the modern languages of their host nations (Russian, German, French, and English).
9. Aside from the impracticality (around 1910) of establishing a Jewish homeland in the Land of Israel, the Jews have an opportunity to demonstrate to the world the ethical superiority of a nationalism that does not require its own territory, and will therefore never need to fight wars on its behalf.

Yiddishism. In Polish-Russian Jewry from the 1860s onward, Jewish writers started developing a modern vernacular literature in Yiddish, which started from portraying traditional religious Jewish society in a mixed sympathetic-satirical vein and progressed over the next generations into a full-fledged exploration of modes of Jewish consciousness that reflected modern European and American culture on every level and with every degree of modernist secular assertion (See Howe 1976). Several of these writers (particularly Yehudah Leib Peretz and Chaim Zhitlovsky, with the collaboration of Nathan Birnbaum who was not himself a Yiddish writer) articulated an explicit nationalist platform, which affirmed a Jewish national identity with Yiddish as its language. This platform was formally articulated in the Yiddish Language Conference held in Czernowitz in August 1908 (see Weiser and Fogel 2010). It can be formally defined as an adoption of Dubnow's "autonomist" principles, with the additional principle:

10. For Ashkenazic Jews, growing up speaking Yiddish, the Yiddish language is (a/the) preferred language of national-cultural expression.

Bundism. In the 1890s in Eastern Europe, young Jews who had joined the socialist movement started organizing activity among working-class Jews. Initially, they used the Yiddish language for practical purposes, for purposes of propaganda. The permissibility of affirming Jewish national-cultural identity within the context of an internationalist socialist movement was first denied, then debated, and finally affirmed. At the same time, joint affirmation of a Jewish cultural legacy and universalist socialist principles evolved into an affirmation that there was some intrinsic connection between them – the Jewish legacy was selectively interpreted to support the affirmation of socialism as a modern consequence of Biblical ethical ideals. (A similar selective appropriation of Jewish traditional values took place in the socialist wing of the Zionist movement.) To the foregoing principles of Autonomism and Yiddishim, Bundism would therefore add:

11. There is an intrinsic affinity between the ethical values of the Jewish tradition (appropriated in secular vein) and the political values of the movement to which we adhere (in this case, socialist, but other secular Jews might fill in the blank with a different political or cultural ideology).

Unaffiliated Secular Jews

From the start of the Enlightenment-Emancipation period, there were individual Jews who did not identify with any of the Jewish

religious movements or secular Jewish ideologies, yet who were identifiably Jewish in their own eyes or the eyes of others, and who expressed in their creative, social, and political achievements values around whom debate has persisted, whether to call them characteristically "Jewish" or not (Principle #11 in another context). On the grid of this discussion, they may be regarded as the most "secular" of all, as they have "liberated" themselves not only of religious tenets but also of the tenet (derived similarly from Jewish tradition) that Jews ought to constitute themselves as a Jewish group for the sake of doing Jewish things together in concert. Though these Jews might agree in part with Principles #1–#2 of the secular Jewish ideology as defined above, they explicitly dissent from #3.

One of the prototypes of this ultimate "secular" Jew was Heinrich Heine. He exhibited the "marginality" praised by Isaac Deutscher (1968) in an impressive number of ways. Though associated for a while with Leopold Zunz's *Verein für Cultur und Wissenschaft der Juden*, he maintained no further Jewish group affiliations after becoming baptized in 1825 (which he underwent for the purpose of qualifying for a law career which he thereafter did not pursue). Identifying as a German poet, he was expelled from German lands on account of his radical political stands (but he thereafter sharply criticized his erstwhile political comrades). He settled in Paris and reported on French politics for the German journals and on German philosophy and literature for the French press. In an essay on fellow-ex-Jewish radical Ludwig Börne, he defined "Hellene" and "Nazarene" as two opposing types that included religious, esthetic, ethical, cultural, and political dimensions – a typology that was later explicitly acknowledged by Matthew Arnold as one of the sources of his philosophy of "Hebraism" and "Hellenism." Though Heine identified polemically in this and other writings of his middle period with the "Hellene" and against the "Nazarene," he reverted to the opposite identification during his last years when he laid bedridden from a paralytic illness, reading the Bible and praising Moses as the artist par excellence who created the Jewish people – more durable than the Pyramids – and anticipated socialism in the Jubilee law.

Deutscher expresses a common modern folklore (as well as giving vent to his own preferences) by naming Spinoza, Heine, Marx, Rosa Luxembourg, Trotsky, and Freud as exemplars of this class of "non-Jewish" Jew. Mosse (1985) shows that in the heyday of German Jews constituting a subculture of universalist-conceived *Geist* within the larger German culture, they spanned the political gamut and included such figures as the *Völkisch* Wasserman, the nonpolitical Kafka, and the esthete Aby Warburg. What they all had in common, though, was that they followed no rules except the inner rules of their own vision, which differed from one to the next. As all principles were debatable, it may be better to speak of common "themes" characteristic of this group:

12. Whether one thinks of oneself as "Jewish" or is regarded as positively Jewish by others comes and goes mysteriously, but is often worth discussing. Often the non-Jewish Jew becomes more Jewish posthumously.
13. Judaism as religion is passé; but what Judaism "really" represents beyond any formal religious definition – whether ethically, socially, politically, culturally, or esthetically – may be of intense interest (and the focus of irresolvable debates).
14. The non-Jewish Jew generally prizes universalism over particularism. This penchant for universalism is sometimes viewed as the antithesis of religious or Zionist parochialism, or alternately as the true essence of Judaism at its best. And yet – in his private moments sometimes the particularist Jewish self-asserts itself after all; Freud belonged to the Bnai Brith, and Einstein embraced Zionism (See Yerushalmi 1991).
15. Though "organized" religion is off-limits, it is certainly permissible to seek "the spiritual" under various guises – even occasionally under the name of "God" – as long as one does so nondogmatically and with openness to insight from any source, whether from science, art, literature, philosophy, or the total ensemble of the world's spiritual traditions.

Conclusion

It should be evident from the above survey that there are an almost inexhaustible range of relations, combinations, and variations of the terms "secularism" and "Judaism" taken together. For example:

World: "Secular" by definition is world-affirming; Judaism as a religion varies from being more world-affirming or less world-affirming (more ascetic) but is rarely world-denying.

Human being: Classic religious Judaism defines the human being preeminently in relation to God; secularism defines the human being as autonomous, but religious Judaism recognizes a certain degree of human autonomy.

Life and death: Classic religious Judaism has variable notions of afterlife, but even in its other worldly variants affirms the value of this life; secularism is centered on this life. Though there is a difference of emphasis here, it is a matter of degree.

Reality: Classic religious Judaism recognizes the reality of the present world and the *real* existence of a transcendent realm; secularism recognizes the reality of the present world and the importance of transcendent values with *ideal* existence in the human mind; though there is a difference here, the possibility of translation from one to the other is evident.

Knowledge: Religious Judaism in its rabbinic and (even more) in its philosophical forms recognized the validity of knowledge from secular sources (philosophy and science), and confronted the task of mediating between it and knowledge from revealed religious sources. Secularism recognizes only the secular sources as providing objective knowledge, but in its moderate forms is receptive to religious sources, critically examined, as sources of subjective human wisdom. Also, as we saw, the secular Jewish movements were receptive to the traditional Jewish sources, approached secularly, as models for developing modern cultural Jewish identity. The chief difference here is which sources of knowledge are considered authoritative: for traditional Judaism, the religious tradition is the primary authoritative source, and for secularism, modern science.

Truth: For classical religious Judaism, God is the primary source of truth, and the Torah the primary vehicle, but reason is an important secondary criterion, and the findings of reason and revelation must ultimately agree. For secularism, reason (and the associated tradition of science based on observation and rational analysis) is the only reliable criterion of truth; though truth may arrive from other sources, it must pass the bar of reason in order to be certified as truth.

Perception: Biblical man "sees" and "hears" the evidences of God's revelation. For Saadia Gaon, there were four sources of knowledge: sensation, rational intuition, deduction, and revelation, all of which agreed. In modern secular epistemology, sensual perception is the base of the hierarchy of knowledge, and all depends on it; claims to revelation are suspect.

Time: The religious outlook divides all time into three phases: creation (the origin of all things), history, and eschatology (the end of days when all will be made perfect under God's rule). Some secular outlooks (such as Marxism and the visionary forms of Zionism – Moses Hess is a middle link between the two) adopt a similar eschatological outlook, though without God. On the other hand, some traditional religious thinkers (like Maimonides) anticipated some of the sobriety of post-modernist secularism, that even if the Messiah comes, the order of nature, with life, illness, and death will remain fundamentally unchanged.

Consciousness: (1) Metaphysically, the religious outlook posits a fundamental difference between conscious, rational human existence and the inert existence of inanimate nature. The secular outlook (following Spinoza, who is a key figure in the transition to the modern outlook here) sees more continuity between conscious and nonconscious being. Contemporary religious apologists minimize the distinction between body and soul especially in Biblical thought, but it cannot be eradicated. (2) All outlooks, ancient and modern,

recognize the distinction between ordinary and heightened modes of consciousness. The word "inspiration" has a metaphorical sense for Maslowian "peak experience" or artistic creativity, and a literal sense for Biblical thought ("the *spirit* of God rested on him, and he prophesied").

Rationality/reason: Ḥokhmah ("wisdom") is a positive value in all the strata of the Biblical corpus, as well as in rabbinic thought. Rabbinic thought also recognized *sevara*, the power of independent human reasoning distinct from revelation. The philosophical tradition in medieval Judaism recognized the validity of secular philosophical reasoning and tried to mediate between it and the revealed tradition. In modern secularism, reason becomes the sole arbiter of truth; however, it is possible that some of the traditions of the past will pass through the sieve of that arbitration and come out validated, or prove necessary for providing cultural identity and ethical values.

Mystery: One of the interesting debates in modern Jewish scholarship (initiated by Gershom Scholem and his disciples) is to what extent the mystical tradition of kabbalah was a minor underground current in "normative/mainstream" Judaism, and to what extent it was itself an essential part of the mainstream, creating many of the typical and abiding values of Judaism. Modern Jewish theology replicates this debate in the dichotomy between theologians of a more rationalist bent (Kaplan, Soloveitchik, Levinas) and others of a more mystical bent (Buber, Heschel, Green). As for secular culture itself, one must distinguish between a tradition running from the Enlightenment through positivism and modern analytical and scientifically based thought, versus a countertradition running from the Renaissance mystics (such as Boehme) through Pascal, the Romantics, Surrealism and existentialism. Neither religion nor secularism has a monopoly on rationalism or on mystery.

The Common Legacy of Judaism and Secularism. Today's Jew finds himself at the end of 3000+ years of Judaism and 200 years of secularization, with all the above-described variations and combinations played out. The freedom to choose from all these varieties and concepts is by itself a part of the secular legacy, which values openness and freedom. The insistent sense of imperative – if it is present – is a part of the Jewish legacy. Ultimately it is up to each Jew – if he or she chooses – to select the combination of elements from each of the legacies to construct one's outlook and value-orientation. If (as the foregoing seeks to illustrate) the Jewish and the secular share a considerable overlap, though with difference of emphasis, the final result of such a process may very likely end up deserving both the descriptions "Jewish" and "secular."

Cross-References

- ▶ Cultural Studies
- ▶ Judaic Studies
- ▶ Judaism: An Overview
- ▶ Natural Theology
- ▶ Philosophy in Judaism
- ▶ Progressive Judaism
- ▶ Secularization, Secularity, Secularism

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Secularization

▶ Secularism in Judaism
▶ Secularization, Secularity, Secularism

Secularization, Secularity, Secularism

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Related Terms

Secularization

Definitions

Secularism is an attitude or political ideology aiming to eradicate religion from public and social life, or at least regulate and control religion, and especially limit its influence on state politics. *Secularity* is a condition where religion is absent from specific areas of society, e.g., state and public sphere, and/or the minds and practices of people. Secularity in specific political and public spheres may be caused by a specific politics of secularism or by the need of politics with state neutrality in terms of religion in a society with several competing religions. *Secularization* is a complex historical process, especially known from Western Europe (Davie 2002), often leading to (and partly caused by) politics of secularism. For society, secularization means that the overarching and, as it often seems, the transcendent religious system are reduced to a subsystem or a marginal dimension of cultural identity in a functionally differentiated society. For the individual, secularization means moving from a religiously authorized, integrated world to, *pace* Weber, a "disenchanted" world. Secularization often develops along with weak and broken horizons for human identity and ambivalent interpretations of crucial experiences and the meaning of human existence. In certain areas (though so far in only a few) that may be signifying the end result, religious traditions finally disappear.

The Latin word *saeculum* means an amount of time, an age, or a century. Not least after the introduction of the clock in the twelfth century, time could be checked without listening to the religious bells of the monasteries and churches. At the Reformation, the transfer of (Catholic) church property to (Protestant) princes was called secularization. Since then, the word has been used to describe hundreds of similar processes in many areas – at state, institutional, and individual levels.

Secularism and Secularity

It has been argued that the major clash today is between religiously grounded civilizations (Huntington 1996) – or conversely between hopeful Asian, humiliated Middle Eastern, and frightened Western, especially European, cultures (Moïsi 2008). However, an equally serious clash, based on an almost total lack of mutual understanding, is that between religious and secular cultures or between secular and religious elements in the cultures of the world (Juergensmeyer 2003).

In the second half of twentieth century, the world was inhabited by (religious) Indians and ruled by (secular) Swedes as Peter L. Berger has put it (Berger et al. 1999). In spite of the personal religious commitment of various American presidents and their different religious-political rhetoric, the politics of the world in the twentieth century was governed by secular minds. In the index of former US Secretary of State Henry Kissinger's masterpiece on statesmanship, *Diplomacy* published in 1994, the word "religion" does not appear even once. Today, such an omission ought no longer to be possible – even among secular political scientists.

Over the last 30 years, the relation between politics and religion has been changing. In the 1980s, the three Abrahamic religions became

more visible in politics, with Menachem Begin from the Likud Party winning elections over the more secular Labor Party in Israel in 1977, anticommunist Polish Cardinal Karol Wojtyla being elected pope in 1978, Ayatollah Khomeini seizing power in Iran, and the Moral Majority being formed in the USA in 1979. The fall of the Berlin wall in 1989 outdated the focus on conflicts between East and West and created space for what some have called the clash of civilizations: the September 11, 2001, attack on the twin towers in New York by radical Islamists and Muslim protests against the Danish Muhammad cartoons, published in *Jyllands-Posten* on September 30, 2005, to name but two.

Especially in the case of Denmark, it is obvious that it is not the role of religion in the life of the people that has been changed. On the contrary, what has been changed and what has caused the overheated political debate on religion is its role in the modern politics of symbols. In three major Danish newspapers, the debate on religion covered 25% of all public opinion material in 2005 – in one of the world's most secularized countries!

Much of the turbulence around the role of religion in politics – and the politics of secularism – is linked to the fact that European politics of secularism often rest on historical myths. The 1648 Peace of Westphalia recognized the principle from the 1555 Peace of Augsburg, by which the princes gained the right to determine the religion (s) of their own state (*cuius regio, eius religio*). It is a myth, however, that the European wars between 1618 and 1848 were "religious wars," in which it was religious differences that caused the states to fight. They were rather wars through which European national states were reestablished, supporting themselves with the aid of state religions. Another myth is the idea that democracy in Europe developed after Christianity and secularization had already led to a state of secularity, even though it was often Christian conservative parties that promoted democracy (and were themselves secularized in the process). In the same way, the six countries, Germany, France, Italy, and the Benelux countries, the original signatories to the treaty of the European Economic Community in 1957, were all influenced by Christian politicians. Democracy did not come about as a result of secularism (Christoffersen). Rather, democracy together with other factors led to the politics of secularism and the process of secularization in Europe, which, however, has not so far been followed by a similar process *outside* Europe, where many forms of rapid modernization are taking place without the accompanying secularization that has been the dominant pattern in Europe.

Where we have seen new attempts by religious leaders or religiously defined groups to take over or dominate political power in other parts of the world, not least after 1979, in Europe, the so-called return of religion in the public sphere most often resembles the old European tradition with the nation-states using religion as a tool to support and legitimize themselves. In a number of European countries, the state's legitimization of civil religion is practiced (e.g., Britain), while in other countries such as Denmark civil religious practices have become more visible (e.g., in memorial services for soldiers). As the state seems to have no heart as such, it sometimes uses churches to express popular feelings linked to certain national affairs. France, with its strong principle of separation of church and state (*laïcité*) since 1905, is at one and the same time limiting the visible presence of religion in public places such as schools, yet promoting a National Islamic Council, and this is happening in a situation where the place of religion has switched radically from a principle of heteronomy to that of politics of identity, supporting individuals and minorities in an uncertain modern society. By listening to the public voices of religious leaders and sometimes even negotiating with them, President Sarkozy and other European politicians act as secular leaders attempting to integrate religious minorities in a democratic society, though they are far from ascribing any right of domination to these leaders.

In similar ways, the politics of secularism are manifold and complicated around the world, depending for instance on the state of secularity in the population and the process of secularization – or the absence of such a process. Principles of secularism, e.g., the independence of state government from religious influence, are found

in the constitutions of religious countries as widely diverse as the USA, India, Pakistan, and even Iran (Christoffersen 2006). In all cases – and most obviously in the USA with its "wall of separation" between church and state – the actual influence of religious forces on state politics is inevitable, such as when democratic elections of MPs and presidents for secular politics depend on religious affiliations and support.

It was said of Turkish writer Orhan Pamuk when he was awarded the Nobel Prize for Literature, 2006, "in the quest for the melancholic soul of his native city (he) has discovered new symbols for the clash and interlacing of cultures." As cultures are increasingly interlacing with one another, religions are interlacing with all sorts of dimensions of our societies in what seem unpredictable ways. For this reason, to describe the relationship between religion and its surroundings, the term *intertwinement* has been coined as being more appropriate than *separation*. Religion is adoptable, adaptable, and potentially everywhere available. Religion may mean and do almost anything, including absolutely nothing. It is often hard to *include* religion in the discourse, but it is also often hard to *exclude* it. What may be achieved in the politics of secularism is at best a *regulation* of the ways in which religions function in our societies.

Secularization

There are no metaphysical laws determining the historical process of secularization. If we take secularization to mean a process leading to *secularity* as *a condition where religion is removed from specific areas of society, e.g., the public sphere*, then secularization is promoted and more or less determined by state politics (Riesebrodt 2007:244–253). This is so even if religious traditions throughout the world refuse to see themselves as privatized and marginal in society. In sociology of religion, *differentiation of spheres in society* is the dominant definition of secularization. Another common definition emphasizes *the regression of religious beliefs and practices among common people in daily life*. In both senses of the word, Western Europe – as Grace Davie has argued – is the primary and almost only example of significant secularization. In recent years, the debate, especially among sociologists of religion, has focused on the direction of the secularization process: Is it going to continue until the full disappearance of religion, as argued by Karl Marx and Max Weber? Or has it stopped at the present level? Or, indeed, has it been turned into its opposite in a process of "desecularization"? Or is the place of more or less institutionalized and socially integrated *religion* being taken over by new and freer forms of *spirituality* after "the massive subjective turn in modern culture" (Heelas 2006)?

The Canadian historian and philosopher Charles Taylor has created a new point of departure for interdisciplinary discussion about secularization in his *opus magnum* from 2007, *A Secular Age*, where, through integrating what has been documented and debated in several disciplines in recent decades, he combines a historical account of the secularization of cultural and social life in Western societies with an examination of the conditions for the personal experiences of, and search for, religious or nonreligious existential self-understanding and practices in the secular age of Western societies.

The historical process of secularization in Europe has passed through a number of phases. Taylor points firstly to the *Reformation* when the hierarchy of holiness is broken, access to God is "democratized" through the individualization of faith and salvation, and finally, the Church is subject to reform by mortals (*ecclesia semper reformanda*) – as indeed hereafter are all sorts of institutions in society. Next comes the idea of *modern civility*, making room for a society based on common culture and manners supported by a rational interpretation of the laws of nature and with the downplaying of irrational antistructures to authorized religion such as carnivals. Next, Taylor points to the long age of *Deism*, where the new trinity is God as destiny, virtue as the golden mean, and eternal life compounded of an eternal soul, the impersonal laws of nature, and art as produced by human creativity (and no longer by imitating God's

creation). Along comes also *humanism*, which promotes the ideas of the absolute value of the individual human being and of universalism from Christianity, both freed from their connections to God and the Christian faith. The age of *mobilization* changes the established churches into denominations for the individual to choose among, the common backdrop for life in society breaks down, and the individual is left to be saved in the religion of their choice. Eventually, we come to the age of *authenticity*, where only what is experienced by the individual or some trustworthy first person (the author) can be believed. If we do not *feel* God, then he is dead. Conversely, if traditions and practices where God is alive are experienced as authentic, then God is alive again for that individual.

For Taylor, the process of secularization has especially three lines of development. Most fundamental is (1) *disembodiment, social disembeddedness*, and thereby, the *excarnation* of religion. In the constitution of human individuals, Taylor at the same time finds (2) a shift from *porous selves*, which may allow themselves to be invaded by religious powers, to *buffered selves*, which control their own relations to and use of, religious elements. Alongside these, he emphasizes (3) *the dissolution of holiness*, the belief that God's power is somehow concentrated in certain people, times, places, or acts. Being secularized – and not just old-fashioned religious or newly spiritualized – means (4) being able to experience the deep coherence and even fullness of life within *the immanent frame* where "God" at the most can be seen as the way the individual is part of the great evolutionary emergence and limited to the destiny ascribed to each of us as a part of nature. For Taylor, it is important that secularization is not primarily a disenchantment of life (as in Weber) but a very real transformation of human and thus religious life:

> We have moved from an era in which religious life was more 'embodied', where the presence of the sacred could be enacted in ritual, or seen, felt, touched, walked towards (in pilgrimage); into one which is more "in the mind", where the link with God passes more through our endorsing contested interpretations – for instance of our political identity as religiously defined or of God as the authority and moral source underpinning our ethical life. (Taylor 2007: 553 f.)

The process of secularization has ended not with the *disappearance* of religion but with radically *changed conditions for relating* to religion. For society, secularization means that the overarching and, as it seems, transcendent religious system is reduced to a subsystem – to a more or less marginal dimension of culture in a functionally differentiated society. For the individual, secularization means moving from a religiously authorized, integrated world into a disenchanted world with broken horizons for human identity and ambivalent interpretations of crucial experiences and the meaning of human existence.

Taylor accepts that religion is a viable interpretation of life. So are humanism and naturalism. He considers these three as equal from a philosophical and scientific point of view. His personal view, however, is that life depends on nature and culture, within which an experience of fullness can be embodied. It is a condition for human life that we always ask for more, for transcendence:

> Transcendence escapes embodiment in the sense that, on the one hand, I do not know if my present way of reaching God, understanding of God or whatever, is inadequate. It does not do justice to reality and hope that I will somehow be able to climb further. But, on the other hand, there is no way in which I will have a relation to God which is not in some way or the other embodied. It is just like when I am writing a poem and I am trying to find the right word and I feel all the time this is not the right word, but what I am trying to do is to find the right word, so there is no way for me getting that written without finding the word. (Taylor in Lombo et al. 2003)

Secularization is an integrated part of a complex historical process in Western societies, affecting human beings who are complex creatures – parts of nature but always reflecting on their own existence and place in history and nature. Secularization has changed the conditions for religious life in Western societies, but it has never made religion disappear – nor indeed has any "desecularization" made religion return – except for in specific cases and areas. Secularization cannot be adequately described as a process of subtraction, whereby religion increasingly

disappears from modern life as a result of modernity. On the contrary, it may be argued that exactly the malaises of modernity are challenging religion to *contribute* to human life in modern society. Especially in recent decades, the ethos of authenticity that originated during the Romantic age has established itself as a common condition for human beings in Western societies. The central question thus seems to be: What is experienced as "authentic"?

This is far from meaning that religion will return to a leading role in existential interpretation and practical support in the challenges of modern life. It does mean, however, that the long religious traditions which for centuries were part and parcel of our societies will remain as a common heritage to be drawn on in many areas of life – perhaps even more so in postmodern times. Jürgen Habermas, who personally believes in modernity and not in religion, puts it this way:

> In the West Christianity not only fulfilled the initial cognitive conditions for modern structures of consciousness . . . Egalitarian universalism, from which sprang the ideas of freedom and social solidarity, of an autonomous conduct of life and emancipation, of the individual morality of consciousness, human rights and democracy, is the direct heir to the Judaic ethic of justice and the Christian ethic of love. This legacy, substantially unchanged, has been the object of continual critical appropriation and reinterpretation. To this day there is no alternative to it. And in light of the current challenges of a postnational constellation, we continue to draw on the substance of this heritage. Everything else is just idle postmodern talk. (Habermas 2006:150f)

Future Prospects

It is generally agreed that the processes of modernization, often combined with urbanization, rationalization, and the massive introduction of modern technologies, do not in themselves lead to secularization. Some even use the terminology that modernities can be multiple and varied, with components of religion and secularity playing all sorts of roles.

In European tradition, the main trend is still to define modernity as a culture where (1) relations to nature are pragmatic and instrumental, (2) relations to fellow human beings are separated into public and private spheres, (3) the individual can act and see himself/herself as an autonomous being, and (4) relations to something absolute such as God depend on the choice of the individual and are only applicable in the private sphere. Often, the views of the destiny of modernity and religion are bound together. Some – in line with Marx and Weber – think that modernity is an unfinished project which will eventually lead to a full secularization. Others think that modernity in Europe for all of us is a realized condition of life which nonetheless cannot sideline religious questions and needs. In that case, the process of secularization is not likely to come to an end in any foreseeable future.

Cross-References

- ▶ Christianity
- ▶ Deism
- ▶ Embodied Theology
- ▶ European Studies
- ▶ Imagination
- ▶ Religion, Sociology of
- ▶ Religiosity
- ▶ Transcendence and Immanence

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Sedation

► Anesthesiology

Selection Pressures

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Environmental constraints that limit an organism's access to vital resources for survival and reproduction. These pressures are typically thought of in ecological terms such as limitations in food or shelter, or the necessity of avoiding predators. However, selection pressures can also be present in terms of access to mates, attraction preferences exhibited by mates, or social pressures that influence status within a group. These pressures are often divided into those represented by natural selection (competition for ecological resources, disease, predation etc.), sexual selection (competition for mates), and social selection (competition for social status).

Self

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Related Terms

Consciousness; I; Mind-body; Mind-body problem; Person; Soul

When answering the questions like "what are we?" and "who am I," the concept of self is typically employed. In minimalist terms, a being can be described as a self when it is able to have first-person thoughts. In order to have this kind of self-experience (such as, "it is I who is looking back at me in the mirror") in the sense that humans and some animals do, symbolic language and self-consciousness is needed. In human evolution, the turning point was the emergence of *Homo sapiens*, who had more developed cognitive functions compared to *Homo erectus* and other members of the *Homo* lineage. These capacities combined with symbolic communication enabled the recognition of oneself as "I." Mirror tests performed on certain nonhuman, highly developed primates demonstrate that this capacity is not restricted to *Homo sapiens* alone (Hyussteen and Wiebe 2011). This alone, however, does not yet help us to fathom the ontological status of the self, that is, in what sense the self exists.

The question about the nature of self is one of the most complex issues in contemporary philosophy, science, and theology. This is due to the fact that self (like the neighboring concepts of person, ► personhood, ► consciousness, and ► soul) exists in the borders of multiple modes of enquiry, which all are constantly developing and changing. It would be easier to list those sciences, which do not have bearing on our understanding of the self than those that do, and even in this case the list would be very short. In addition to the vast array of sciences that all want to have their say on self, the discussion is complicated by the disagreement between the sciences, their underlying theories, methodologies and philosophies, and even political agendas.

For example, postmodern philosophers typically see the deconstruction of any stable notion of self as their ethical and therapeutic duty. This is supposed to liberate humans from external restrictions. In contrast, some scientists wish to reduce human personhood to the level studied by neuroscience and thereby purify the discourse from the purportedly vague talk of the philosophers. Where some seek to end external control, some seek to strengthen it. In both of these two cases, the means, however, are relatively same, namely, adopting a skeptical attitude toward the existence of any stable and sustained self (Strawson 2009).

Both of these options are problematic for those religious notions of self, which require stability and continuity as well as a nonreductive understanding of self, soul, and person. For example, monotheistic religions need some kind of a stable self in order to make the idea of postmortem survival internally coherent or the idea of moral progress or growth in virtues possible. Of course, self is defined differently in different religions and sometimes these interpretations are debated within the traditions themselves. Some Eastern religions deny the existence of self and regard it illusory; some consider it to be real, but only episodic. Thus the relevance of the discussion about self in the sciences and humanities for specific religions has to be decided case by case. The greatest challenge for the understanding what is meant by the concept self is that it has radically different uses in different contexts. In the following, two basic ways of using the concept are distinguished.

Where Am I?

Depending on the context, self can be approached from scientific/philosophical or existential/sociological perspectives, and naturally there is much overlap. The scientific/philosophical question is focused mainly on the location of self. If I use the word "I," what do I refer to? Are we bodies, brains, immaterial souls, bundles of impressions, or some fusion of these, perhaps something else? Maybe there is no such thing as "I"? The heart of problem here is the difficulty to locate the *thing* that is the self. Above I gave a general, popular scientific answer to the question about what self as a concept means. These scientific/philosophical questions are more interested in the nature of the self: what kind of thing it is. The answers follow more or less the standard solutions of the ▶ mind-body problem in the ▶ philosophy of mind, with the crucial distinction that the mind-body problem is about the nature of consciousness and other mental phenomena, while the question about self is about the nature of the subject of these phenomena. Choosing some particular theory about the nature of the mind does not yet answer the question who we are as individual beings. The main ways of defining self in this context are either substantival (self is either physical or nonphysical entity) or non-substantival whence self is, as David Hume insisted, a bundle of sensations without any integrating unity (Olson 2007).

Recently, the emergence of neuroscience has had effects for the notion of self. If I detect the firing of neurons or an increase of blood pressure in some areas of the brain, does this mean that I have detected a human self? Is this event a human person? For example, Francis Crick (1995) has argued that we are "no more than the behavior of a vast assembly of nerve cells and their associated molecules." Those who oppose this conclusion argue that Crick has committed the *mereological fallacy*: he has attributed properties of the whole being to some particular part of that being. In other words, it is *I* who feels, the person, not my brain. This is not to deny that brain is one of the central organs we need to experience pain in the first place, but pain is the property of the whole being, not just one organ.

How Did I Become Me?

The existential/sociological question requires a more practical answer. Existential considerations involve questions, such as how we see ourselves in relation to the various expectations of our culture or our own personal ideals. Sociology is, among other thing, interested in those mechanisms that shape our self-image. More deterministic theories see individual selves as mere reflections of the environment they happen to dwell in; this view is sometimes called environmentalism. In order to confront this kind of determinism, it is common to use different concepts to speak about person's own desires and actions in contrast to self as it exists as a product of the society. This "unsocial" self brings in the element of indeterminacy. The question how much we are actually able to control how our selves are formed is open for debate (Elliot 2009).

From the existential/sociological perspective, self is the place where conflicting powers meet and clash with each other. Postmodernists usually speak about "subject" instead of self as it draws attention to being subjected to something, being influenced from the outside. Postmodern theory of the subject attacks stereotypical and frozen definitions of the self, in favor of more fluid and plural identities. The apparent paradox is that, in its radical forms, this politically motivated ideological strategy seems to make any sustained and public political action ultimately vacuous or even more subject to ambiguous use of power.

Both contemporary philosophy and psychology acknowledge the plural nature of human self-conception. We can inhabit multiple self-understandings in our lives and even at the same time. Among others, Charles Taylor and Paul Ricoeur have stressed the role of narrativity in our understanding of the self. Self is not an unchanging thing, but something that comes into being when our life is presented in the form of a narrative. This is one way we can try to have an access to an integrated self, without being able to answer all ontological questions; self just is the being that has had all these experiences. The narrative self is sometimes contrasted with the episodic self. Perhaps the best artistic portrayal of an episodic self is the representation of singer-songwriter Bob Dylan in the movie *I Am Not There* (2008), where Dylan is portrayed by different actors in a way that does not seem to form a coherent story.

Recently, Patrick McNamara (2009) has suggested that religion is an adaptation that allows us to cope with the fragmentation of the self. Religious activity helps the individual to mediate between the ideal self and current self by providing a framework, which is able to join together conflicting elements, both in individual and societal level. Ideally, religion contributes to healthy self-understanding and communal life by giving a structure to our lives. Here "religion" works as a meta-category that does not take into account particular philosophical or theological notions of self, and how self in fact appears in different traditions.

Cross-References

- ▶ Externalism and Internalism
- ▶ Personality Psychology

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Self Organization

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A defining feature of developmental systems that arises because dynamic interactions involve a dialectic relation between system-changing and system-constraining relations. Such a balance between changes that make the system different and changes that maintain the structure and function of the system reduces the potentially infinite complexity of the system and, as such, enables the identification of continuous instances of structure and function.

Self, From a Psychological Perspective

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Related Terms

Consciousness; Identity; Self-awareness

Description

The concept "self" has shifting meanings as a result of it originating in religious ideas about the soul, being heavily philosophized during the Renaissance and most recently being the topic of scientific research. The dominant contemporary definition is that self is the thoughts and images people have about themselves. Such a definition opens up the self to empirical research by asking people, in various ways, what they think about themselves. However, the self was not always conceived of as an empirical phenomenon.

The concept of the "self" grew out of religious thinking about the soul. Early thought experiments by Avicenna and Descartes tried to demonstrate that the thinking mind exists independently of all things material and thus that it belongs to the immaterial realm of the soul. Descartes was particularly influential in arguing for an ontological dualism between material and immaterial realms. In practice, this dualism was as much political as ontological. Specifically, it served the diplomatic function of legitimizing the sphere of science on the one hand and the sphere of religion on the other. While this dualism was a coup for science, in that it consolidated the domain of science as all things material, it created a problem for empirical research on the self because the self was seen to inhere in the immaterial realm.

Hume was one of the first to try to bring the self within the domain of empirical research. He argued against conceiving of the self as a spiritual or religious concept. "Man," Hume wrote, "is a bundle or collection of different perceptions" (Hume 1740). Thus, the self, according to Hume, is little more than the ongoing stream of thoughts, perceptions, and memory images as they are experienced. What Hume did was to take the self out of the immaterial realm of the soul and plant it firmly within experience – thus opening it up to introspective analysis. This situating of the self within phenomenological experience provided an essential platform for subsequent theorists and researchers who could then investigate, by introspection, the experience of self.

With the separation of psychology out of philosophy in the latter half of the nineteenth century came an even more determined effort to bring the self within the purview of scientific analysis. Central to this effort was William James (1890). James furthered the conceptualization of the self as an empirical thing, open to scientific analysis. Using introspection, James developed a model of the self which still provides the foundation for much contemporary scientific research on the self.

According to James, there are different levels of the empirical experience of self. At the most basic level, there is what he called the material self. This concerns the things that we can call "mine" – including our bodies, clothes, families, homes, cars, possessions, and accessories. The second level is the social self and includes the ideas and images that other people and groups have concerning us – including our parents, children, friends, colleagues, and society at large. The third level James somewhat confusingly called the spiritual self. The term spiritual reflects the religious heritage of the concept, but as James uses the term, it pertains to nothing spiritual. This third level includes our faculties of mind and habits that we identify with – our will, memory, determination, attention, moral convictions, piety, guilt, anxieties, and so on. Accordingly, it might be more appropriate to refer to this as the psychological self.

Today, there is a large and diverse scientific literature which elaborates James' outline and proceeds to examine the various thoughts and images that people have regarding themselves.

Using a disparate set of terms, researchers examine people's self-concepts, self-representations, self-images, self-narratives, social identifications, and identities. One important finding to emerge across this research emphasizes the social nature of self. Although people are not very good at judging what other people actually think about them, there is a close connection between what people think about themselves and what they think other people think about them.

James added subtlety to the three layers of the empirical self by pointing out that each layer contains past, present, and future images. In support of this idea, research has since shown that people have a range of "possible selves" which can be central to people's sense of self even if they are not currently living out those possible selves (Markus and Nurius 1986). James emphasized that the existence of different possible selves in the past, present, and future makes possible a range of tensions within the self. This aspect of James' thinking has been developed in research on discrepancies between these images. For example, a discrepancy between someone's self-image in the present and their ideal future self-image should lead to motivation to change. Alternatively, a discrepancy between their self-image in the present and their ideal self-image could lead to depression or anxiety (Higgins 1987).

James was acutely aware of the religious and philosophic heritage of the concept of self. Accordingly, he devotes considerable analysis to the question: Is there anything beyond the material and social images of the self in the past, present, and future? Is there something "behind" these images which bind them together and which create our phenomenological experience? In short, is there anything approximating a soul?

Using introspection, James finds no evidence for anything beyond the phenomenological act of thinking and introspecting. Moreover, from the point of view of science, he argues that there is no benefit in postulating a "thinking substance" behind the thinking in order to explain the thinking. However, he does acknowledge, under the influence of Kant, that every thought about an object presupposes a thinking subject and thus that there is by definition an aspect of people's selves that is beyond the content of the thoughts they have about themselves. James proposes to call everything which the self thinks about the self "me" and withholds the term "I" for that aspect of the self which does, or rather is, the thinking.

The three layers of the empirical self, and all the self-images in the past, present, and future, are all part of the "me" – they are self-descriptions. They cannot include the active, thinking, describing subject – the "I" component. Each thought about "me" and each act of self-regulation presupposes an "I" which is the subject of the thought or act. If the concept self were reduced to only the "me" – to self-description – then the self would be inert and inactive. Before a child has a self-narrative or self-concept, and thus before she has a "me," the child is still an active agent in the world: The "I" is active. As time passes, the baby becomes a child and develops self-descriptions, and each movement of self-awareness, each emergent self-conception puts, as it were, clothes on the naked "I" of action. First there is action, then there emerges an image of oneself acting, and then, those images begin to mediate action. But the self-images always lag behind the active component. According to James, one can never fully know oneself: The "I" of each action and thought exceeds previous self-description, thus making the self fundamentally open unto the future.

Recently, these ideas have led to research on the dialogical dynamics of the self (Aveling and Gillespie 2008). The self is conceived not only to be a system of self-images, or self-regulatory tensions between those images, but also to be a system within which there are I-positions which shape the stream of self-images but which are not themselves within that stream. The I-positions are not self-representations: Rather they are the positions from which people represent themselves. For example, someone who thinks that they are very wealthy, and prides themselves on their wealth, has, one could argue, internalized and cultivated a consumerist and materialistic I-position from which they are evaluating themselves. Alternatively, someone with a disability who stigmatizes themselves has,

arguably, internalized a negative view of others and that has become an I-position within their self. It is the position from which they stigmatize themselves. I-positions are often socially constituted through the internalization of the perspectives and discourses of others. Research has examined the contradictory tensions both between I-positions and between I-positions and self-images (Gillespie 2007).

Self, when conceptualized in common sense terms, seems to refer to something inside the person, an individual, idiosyncratic, even solipsistic thing – but it is not. As James recognized, and further research has productively elaborated – the self is deeply social. Considering first the "me," it is social in four ways: First, each "me" image is a self-observation and on an equivalent footing to the observations we make about other people. In this sense, self-images are attributions and acts of social perception. Second, our various me images are significantly influenced by what we think other people think about us. Third, how we think about ourselves and other people is influenced by the societal roles occupied. Fourth, each culture provides a range of collectively created and historical images, some idealized and others scorned. In this way, each of us constructs our own self-images out of the cultural templates and narrative tropes that we are offered within our cultural milieu. Turning now to the "I," it is social in a different sense: It is a set of socialized practices, tendencies, impulses, and habits. These habits of thought often correspond to the thoughts of others, and as such, when we adopt an I-position, we are in fact often taking the perspective of others.

If the self is social rather than spiritual, that opens it to change. We should expect that as society changes, so people's selves will change. New self-images and new I-positions should become available, and new values link them together creating new ideal self-images and thus new impulses for self-regulation. But it is important to emphasize that people are not the passive objects of societal and cultural change. Rather, they are agents within the change process.

To study this self-constitutive process, Foucault (1988) introduced the concept of technologies of the self. Technologies of the self are means which we use to act upon ourselves. Religions, much of psychology, and many cultural practices can be thought of as social technologies aimed at reconstituting selves. For example, Buddhism offers meditations and practices for breaking down the attachments and desires of the self. Consumerism, on the other hand, promises retail therapy through cultivating and satisfying people's attachments to products. Both are technologies of the self, and clearly they constitute very different selves. The list of technologies of the self is long: Each therapeutic practice, many religious practices, many institutional regulatory practices, and many common sense strategies of self-control are part of the processes through which selves reconstitute themselves. Contemporary societies are characterized by a proliferation of possible selves, and even contradictory self-ideals, combined with a wide range of techniques for cultivating the desired self-image. Today, Gergen (1991) argues, we are becoming "postmodern selves" – swimming in a sea of media images and communication technologies, which enable us to cultivate and live out many disparate aspects of our selves. This tradition of research is distinctive, in that the self is not something to be discovered and described, rather it is something that is made and remade.

Our conceptualization of the self has changed as the concept has moved from the domain of religion, through philosophy, to the domain of science. But, it is not only our conceptualization of the self which has changed, what the self is has also changed. Each conceptualization of the self entails different normative ideals (Markus and Nurius 1986) which have been used to guide our educational activities, socialization practices, and personal techniques of self-regulation. That is to say, different societies at different points in time have created different selves. The mechanisms of self-creation are societal institutions and technologies. Realizing this reflexive and fundamentally cultural and historical aspect of the self gives us an obligation to conceptualize the self in such a way as to open up, rather than close down, new domains in which the self can be cultivated and performed.

Cross-References

- ▶ Personality Psychology
- ▶ Phenomenology
- ▶ Philosophy of Mind
- ▶ Self, from a Psychological Perspective
- ▶ Simulation Theory
- ▶ Social Psychology
- ▶ Soul
- ▶ Theory of Mind

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Self-Actualization

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As utilized by Abraham Maslow, self-actualization refers to the full realization of a person's potential. Placed at the top of Maslow's need hierarchy, self-actualization was postulated as possible once the lower basic and meta needs of the self were met. Of particular importance, self-actualization is perceived to be motivated by the intrinsic desire for growth in the person, whereas more basic needs are motivated by deficiencies.

Self-Awareness

- ▶ Self, From a Psychological Perspective

Self-Help

- ▶ New Age Religions

Self-Organization

- ▶ Chemical Thermodynamics

Self-Regulation

- ▶ Coping, Psychology of

Semantics

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Description

A great many things possess meaning, e.g., thoughts, actions, gestures, natural objects, cultural artifacts, and linguistic expressions. Although all have meaning, some bear logical relationships and some do not. Clearly, while relations of synonymy (sameness of meaning),

antonymy (oppositeness of meaning), hyponymy (meaning inclusion), homonymy (same words/different meanings), analyticity (truth by virtue of meaning alone), entailment (whenever A is true, B is also true), logical truth (B follows necessarily from A), and equivalency (B follows necessarily from A and vice versa) obtain among linguistic expressions, they are not present in religious rites, hadrons, paintings, or storm clouds. Although both kinds of objects have meaning, they do not have it in the same sense. Theories of semantics arise principally in response to questions about meaning of the second variety: How do linguistic expressions gain and bear meaning?

The term "semantics" derives from the Greek adjective "*semantikos*" meaning "significant." While philosophers have always been interested in semantic questions (especially Plato, Aristotle, the Stoics, Augustine, medieval philosophers generally, Hobbes, Locke, Leibniz, Berkeley, Hume, Mill, Peirce, etc.), semantics has been more deeply explored since the 1879 publication of Frege's *Begriffsschrift*. While semantics has been traditionally studied within philosophy, since the late 1960s it has been increasingly explored within linguistics proper, where it is now investigated alongside of syntax, morphology, and phonology. One can distinguish within semantics the analytical study of artificial languages from the empirical investigation of natural languages. While the first seeks to provide an unambiguous interpretation or model for formal languages, the second aims to grasp the relations between terms and their meanings already present within natural languages.

Semantics is one of the three branches of semiotics (the study of signs), the other two being syntax and pragmatics. While syntax concerns relations among linguistic symbols, and pragmatics relations of uttering, using, responding, etc., to extralinguistic entities where the intention of the speaker, linguistic ability, belief, audience, and context of use are crucial, semantics deals with the relations of referring, denoting, and connoting extralinguistic objects generally. Semantic theories may be broadly divided among theories of meaning (connoting and intension), theories of reference (denoting and extension), theories which combine elements of both, and pragmatic theories taking meaning to be the use made of an expression by interactive participants.

Of fundamental importance in semantics is the distinction between an expression's extension and intension. Intuitively, the intension of an expression is simply its meaning (or concept) and the extension what is "picked out" by that meaning. More specifically, the extension of a singular term is its reference, of a general term the collection of things to which that term applies, and of a sentence its truth-value. Alternately, the intension of a singular term is its sense, of a general term the property or relation so expressed, and of a sentence the asserted proposition.

Extensionality applies if and only if the substitution of one term (or predicate) by another having the same referent does not change the truth-value of the sentence under question. Consider the following where "$\Box$" means "necessarily":

1. $\Box(9 > 7)$
2. The number of planets $= 9$
3. Thus, $\Box$ (the number of planets > 7)

The argument is clearly invalid because (1) and (2) are true while (3) is false. But what went wrong? Even though "the number of planets" and "9" have the same extension (the number nine), substitution of one for the other within a context of necessity (a "modal" context) does not preserve truth, and thus the context is intensional. In addition to modal contexts, intensionality also characterizes quotations, indirect speech, propositional attitudes (e.g., "believing that" or "knowing that"), intentional constructions (e.g., "looking for" or "wishing for"), and temporal designations. While extensional semantics has been enormously successful within formal languages, it has proven less so for natural languages. For instance, while the extension of "is a unicorn" and "is a ghost" is the same (both designate the empty set), natural language wants to be able to say "S believes that y is a unicorn" is true and "S believes that y is a ghost" is false.

Theories of meaning and theories of reference are framed to account for different sorts of things. Meaning, theories attempt to explain notions of synonymy, analyticity, entailment, intensional contexts, intentionality, and meaning inclusion, and thus appeal to sense, meaning, semantic markers, and lexical entry. Such theories employ a componential analysis in which the meaning of words is decomposable into more primitive semantic markers. Meaning theories can be divided further into atomic theories precluding analyticity and molecular theories presupposing it. On the other hand, extensional theories of reference extend to truth conditions – logical, necessary, and contingent truth – and entailment and therefore appeal to reference, denotation, satisfaction, truth, models, and possible worlds. An advantage of theories of reference is that they seem ontologically simpler, for one need not posit the existence of meaning entities. In addition, one can distinguish internalist and externalist semantic theories. While the former understands the semantic relation as holding between language and "what goes on in the head," the latter asserts a relationship between linguistic expressions and the world.

Another group of theories argues that the conceptual role of expressions and mental states are most important in understanding semantics. "Conceptual role semantics" (sometimes called "functional role semantics" or "procedural semantics") are related to the pragmatic attitude of the later Wittgenstein, whose "meaning as use" approach supposes that meaning must be understood functionally. Conceptual role semantics thus claims that the meaning of linguistic expressions and the content of mental states is determined by the role played by them. The theory is applicable both to language in an ordinary sense and to mental representations – either as part of a "language of thought" or as mental states generally. Because the theory denies that thoughts have intrinsic content prior to their functional use, meaning, and content derive from use, not vice versa.

While broadly speaking, conceptual role semantics claims that the content of linguistic symbols or mental states is determined by use, more narrowly, conceptual role semantics asserts that the content is determined by symbols or mental states within inferential mental processes. Simply put, the meaning of a sentence is fixed by its place within the network of the inferences it legitimates. (Fodor calls theories of this kind "inferential role semantics.") While the relevant "uses" which determine meaning generally in conceptual role approaches include perceptual input, internal thinking, and behavioral output, another class of (information-based) semantic theories claim that a symbol's content rests solely upon the first of these uses: information about the environment carried by the symbol's internal tokening.

Self-Identification

Science

While philosophical semantics explores what it is about language, persons, and the world that makes words and thoughts have meaning, linguistic semantics concerns itself primarily with the empirical question of how the meaning of particular expressions contribute to the meaning of larger ones. Just as physics starts with natural objects and properties and explains their interrelationships without advocating a philosophical ontology, so too linguistics seeks to explicate the interrelationships of linguistic meaning without ontological prejudgment. Although this is the goal, philosophical issues arise frequently in the work of contemporary linguistic semantics, a fact that is not surprising given the role philosophers have played in the area.

Since semantics is part of linguistics, and linguistics explores linguistic competence by investigating the innate endowment of human beings to speak a language, linguistics (and thus also semantics) is sometimes thought to be a special domain within psychology. Chomksy, for instance, speaks of "I-grammar," an internalized grammar having the components of phonology (rules telling how to pronounce expressions), syntax, and semantics. By virtue of this I-grammar, humans have an ability to acquire linguistic capacity; they possess a "language acquisition device" which explains

how they can learn a grammar though they have a poverty of stimulus.

Chomsky and followers argue "mentalist" theories of language against behaviorist methodologies that understand human linguistic behavior without appeal to internal states. Their mentalist theories were generally internalist in that they presupposed what Putnam calls "the principle of methodological solipsism," the notion that psychological states do not presuppose the existence of individuals external to the subject. Each speaker has her own internalized grammar, I-grammar, which is intensional, individual, and internal. While internal mentalist theories hold that speaker grammatical competence can be accounted for without postulating anything external to grammatical states, external mentalist theories claim that while each person has an internal representation, there is yet a relation between elements in the person's I-grammar and external objects. The nature of this relationship is a topic of some dispute. One option groups the I-grammars of individuals into resemblance classes; another holds that individual I-grammars token an I-grammar type. Critics have claimed that the ability of humans to learn language is accounted for on the basis of a general learning ability and not on the basis of a special linguistic-acquisition device. Others argue that the science of semantics need not appeal to internal representations at all.

Extremely important for the development of linguistic semantics is the pioneering work of Tarski's student, Richard Montague, who rejected a theoretical difference between formal and natural languages. In denying that natural languages were too unruly to be formalized, he claimed that both syntax and semantics could be grasped algebraically, and a homomorphism maps the elements of syntactic algebra onto the elements of semantic algebra. In his formal semantics, Montague showed how the compositionality of syntax could map to a corresponding compositionality of semantics. Because syntactic rules put expressions together to form expressions, corresponding semantic wholes can be decomposed into more primitive parts.

The work of Katz should also be mentioned. His acute sensitivity to intensionalist elements within natural languages, and his scathing criticisms of naturalism – his semantics does not reduce meaning to either use or to truth-functional, referential approaches – produced a trajectory of work that has been crucially important within linguistic semantics. He and Fodor proposed the first semantic theory in the framework of generative grammar: Starting with the semantic component of primitive lexical items, they showed that the meaning of longer expressions could be generated through application of recursive projection rules. Jackendoff's "conceptual structure" approach also accepts this principle of decompositionality and identifies an expression's meaning with the mental representation of its content, but his semantics analyzes verbs and sentences in terms of the notion of abstract location and movement.

Religion

A central semantic problem arises in all religious traditions: What do religious and theological expressions *mean*? In the sixth century, Pseudo-Dionysius articulated the problem of how human language oriented to the finite can conceptualize and speak of the infinite:

> Nor can any words come up to the inexpressible Good, this One, this Source of all unity, this supra-existent Being. Mind beyond mind, word beyond speech, it is gathered up by no discourse, by no intuition, by no name. (*On Divine Names*, 49–50)

Allegiance to this Dionysian-inspired apophatic tradition is found in varying degrees in most medieval theologians. Anselm's unconceptualizable "that which none greater can be thought" and Aquinas' analogical predication are two examples. Famously, the latter held that when referring to God, language is neither simply univocal (same sense) nor equivocal (different sense), but analogical: While the sense of the earthly term or predicate is stretched, it nonetheless remains applicable to the divine.

By the eighteenth century, trust in the apophatic approach had given way to suspicion. Hume suggested that because propositions in which "God" appears cannot be built up from propositions analyzable into simple ideas correlated to simple impressions, the propositions lack

meaning. Hume's insight clearly fueled twentieth-century concerns about religious language. Ayer famously denied truth-conditional semantics to religious and theological language entirely, asserting that all synthetic propositions not reducible to statements of sense experience are nonsense. Flew pointed out that because the believer's utterance, "God loves his children," is consistent with any way that the world might have gone, it is not falsifiable and thus meaningless.

Responses to this challenge were twofold: Some argued that the positivist theory of meaning was incorrect; others argued that religious language did connect empirically to the world by providing a label for particular empirically discernible patterns or a framework for explaining experience. Braithwaite argued that religious language communicates parables and stories that stimulate moral conduct, while Hare claimed that religious assertions merely state nonfalsifiable frames of reference ("bliks") that express evidentiary standards. Other accounts of religious and theological language include expressivist views in which religious language merely expresses human existential states and orientations, and metaphorical views where language functions nonliterally but sometimes referentially.

An interesting semantic issue concerns the putative reference of "God." Does "God" refer to a "rigid designator," the same individual in all possible worlds regardless of how language refers to it (Kripke), or does it denote a "world line," an individual that winds through possible worlds according to its identification within various intensional contexts (Hintikka)? The question is important religiously because it concerns the priority of semantics over both metaphysics and epistemology in religious contexts: Believers seemingly succeed in referring to God even in the absence of both metaphysical and epistemological accounts of the divine.

Characteristics

Important for understanding the significance of semantics is the "linguistic turn" of the last century. While much of the history of philosophy has focused upon the object (world), the Enlightenment ushered in a preoccupation with the subject (self), the epistemic agent whose investigation was deemed necessary for knowing the world. Much on nineteenth-century philosophy continued in this subjective spirit by stripping meaning out of the world and locating it in "the head" (psychologism). Twentieth-century philosophy, however, made the "linguistic turn," arguing that meaning resided neither primarily in things nor in the head, but rather in language. This approach implicitly made semantics foundational for all reflection about the self and its relationship to the world.

Relevance to Science and Religion

The question of the semantics of religious/theological and scientific language is logically prior to relating these languages to each another. Consider the expressions "God created the heavens and earth" and "the universe resulted from the Big Bang." How are they locatable with respect to each other? Do particular statements in the sciences entail statements in religion or theology, or vice versa? Is there a statement entailed by one that conflicts with a statement entailed by the other? Crucial here is the question of how the terms and concepts of each discipline acquire and sustain meaning.

We can distinguish semantic atomistic, semantic molecularistic, and semantic holistic approaches. While the first claims that the meaning of a representation (term, concept, etc.) is that to which it applies, and the second that the meaning is determined by its relationship to other (but not all) expressions, semantic holism holds that the meaning of a representation is determined by its relationship to all other representations within the system. Accordingly, a linguistic statement has meaning only within the context of a language, a scientific hypothesis has meaning only in the context of a theory, and a concept has meaning only within the context of a belief system.

Obviously, if semantic holism is true, it becomes difficult to relate scientific and

theological statements, for an individual scientific statement *s* has meaning only within the context of an overarching scientific theory, and a religious statement *r* has meaning only within religious practice and reflection. But how is it possible to relate *s* and *r* without the religious person knowing enough scientific theory to understand *s*, and the scientist knowing enough theology to understand *r*? In its most extreme form, semantic holism asserts *incommensurability* between religious/theological and scientific theory: There is no way to map meanings from one language into or onto the other. Fortunately for the religion/science discussion, claims of incommensurability are overstated, for the necessary condition for plotting the semantic difference of these putatively disparate languages is the existence of a common background language onto which the sentences of each can be mapped.

Sources of Authority

Philosophical semantics grounds its authority in logical analysis, and linguist semantics finds authority in empirical methods coupled with such rigorous analysis. Clearly, both make extensive use of logic and set theory, and one cannot enter the discussion deeply without competence in these areas. Crucial for the development of philosophical semantics in the twentieth century has been the work of Frege, Wittgenstein, Russell, Tarski, Quine, and Davidson. Within linguistic semantics, the work of Chomsky, Katz, Montague, and Jackendoff has been especially significant. Important journals in the field include *Linguistics and Philosophy*, *Natural Language Semantics*, *The Journal of Semantics*, *Mind and Language*, and *The Journal of Logic, Language, and Information*.

Ethical Principles

Semantics is guided by standards of academic excellence that apply to the empirical sciences and philosophy generally. There is no special code of ethics that guides the work of the semanticist. Scholarly societies include *The Linguistic Society of America*, *The European Society for Logic, Language and Information*, and *Die Gesellschaft für Semantik*.

Key Values

Just as human beings are curious about nature and the causal laws at work within it, so are they concerned with meaning and the regularities and laws governing it. Semantics' key values are mathematical precision and rigor. An example of such precision and rigor is *model theory*, a method by which artificial languages are granted interpretations.

One begins by assigning meaning to sentences through a *boolean interpretation*. Such an interpretation β assigns either "true" [1] or "false" [0] to each letter in language L. The interpretation is a *function* that maps for each and every sentence in L some unique value (1 or 0). For any sentence letter in L, say θ, and a particular boolean interpretation β_1, we can say that "θ is true for β_1" or "β_1 of θ is true." Because L is "truth-functional" – the truth-value of compound sentences are a function of the truth-value of simple sentences comprising them as they are connected by the five standard logical operators of negation, disjunction, conjunction, conditional, and biconditional – giving a boolean interpretation to the simple declarative sentences gives truth-values to all compound sentences. We thus obtain a "boolean model of a set." If every sentence belonging to a set Δ of sentences in L is true for a boolean interpretation β, then β models Δ. Accordingly, β models all simple sentences assigned as true under its interpretation, and all compound sentences model truth-functionally derivable from those sentences: "β models Δ" if and only if $\forall s \in \Delta[\beta(s) = 1]$, or more succinctly "$\beta(\Delta) = 1$." If no boolean interpretation models Δ, then Δ is *unsatisfiable*. If some boolean interpretation β_I models Δ, then Δ is *satisfiable*. If for every sentence $s \in L$, and any interpretation β_I, if *s* is true for every β_I, then *s* is a tautology:

Furthermore, if any boolean interpretation modeling Δ also models θ, then θ is a tautological consequence of Δ. Accordingly, if β models □ and Ω ⊆ □, then β models Ω.

Things become more complicated with predicate logic. Allow *f* to be a function that assigns an element from nonempty domain *D* to each logical name in the calculus. An interpretation *I* is a function that assigns either 0 or 1 to each 0-ary relation letter, assigns to each 1-ary relation letter a subset of *D*, and assigns to each k-ary relation letter a k-ary relation among elements in *D*. An interpretation specifies the domain, and the denotation of each sentence letter (1 v 0), the denotation of a 1-ary letter (a set), and the denotation of a k-ary letter (a set of ordered k-tuples). The naming function *f* then assigns a unique element in *D* to the names in the language. Thus, for the set of all Americans *D*, if *b* is Bush, and P = {x | x is an American president}, Pb is true because b ∈ {x | x is an American president}. A "naming interpretation" consists in the ordered pair <*I, f*> which assigns definite meaning to any statement of the language. A sentence θ is true for an interpretation *I* if and only if, ∀*f* ∈ <*I, f*>, (θ) = 1. <*I, f*> is a model of □ if and only if [∀θ ∈ □](<*I, f*> (θ) = 1], that is, it is a model for □ if and only if every sentence in □ is true. A set of sentences □ is *satisfiable* if and only if □ has a model, that is, that they are all true given a certain interpretation and naming function.

Interpretations of models can be further studied as algebraic groups. Accordingly, an interpretation maps from a language "domain" onto a range that is a structure. The elements in the range of the mapping are the elements of a structure. A structure *S* models a set of sentences Ω just in case the interpretation models Ω. When an interpretation models Ω, we say that *M* models Ω, or that *M* is a model of Ω. "Model" thus carries two meanings: (1) It is an interpretation for which a given sentence or set of sentences is true and (2) it is a structure. A "theory" is furthermore defined as an ordered triple <L_t, Ω_t, Cns_t>, where "L_t" is the language of the theory, "Ω_t" the axioms of the theory, and "Cns_t" the semantic consequences of Ω_t. We say that "θ" is an *assertion* of theory T just in case θ ∈ Cns_t.

Conceptualization

Nature/World

Semantics does not reflect directly upon the meaning of nature and the world, but rather upon the meaning of linguistic expressions about nature and the world. Because semantics deals with language, it is crucially important for those disciplines claiming knowledge of nature and the world, and is thus central in understanding the nature of scientific theory.

Human Being

One way that semantics connects to the question of human being is in the relationship between semantics, linguistics, and psychology. If scientific semantics is a subset of linguistics, and linguistics – as many argue – is a subset of psychology, then the study of semantics must tell us something about ourselves. Moreover, if one is committed to mentalism, then it is clear that when humans learn about semantics, they are learning something about their own capacities for inner representation.

Life and Death

Semantics does not deal with questions of life and death but is concerned with any interpretation of the meaning of questions about life and death.

Reality

Semantics does not deal with metaphysical questions directly but is useful in disentangling them. This is particularly true when considering the phenomenon of reduction, the claim that the things talked about in one discourse (the reduced theory) *really are* things talked about in another discourse (the reducing theory). Examples of reductions in philosophy include *logicism* (reducing statements about numbers into statements of logic and set theory), *phenomenalism* (reducing statements about external macro-objects into statements of actual and possible experience), *logical behaviorism* (reducing statements about mental states into stimulus–response conditionals), *logical positivism* (reducing statements employing theoretical entities to ones referring only to observed

objects), and *naturalism* (reducing normative ethical statements to ones whose terms refer to natural properties only). All these philosophical reductions are semantic, for all use definitional equivalence statements (i.e., statements in the reduced theory just mean equivalent statements in the reducing theory).

Semantic reductions like these have been out of favor in philosophy since the 1950s, however, and have been replaced by theoretical reductions that understand the biconditionals connecting theoretical terms in the reducing and reduced theories as specifying coextensive property instantiations. While statements in the reduced theory *mean* something different than statements in the reducing theory, the reduced theory statements are true if and only if their corresponding reducing statements are true, e.g., the reduction of thermodynamics to statistical physics.

Reductions can also be found in theology and religion, though they are not often presented as such. For example, Kant semantically reduced talk of God to expressions about morality, while Schleiermacher reduced it to modifications of the feeling of absolute dependence. Marx, Freud, and Durkeim attempted theoretically to reduce religion to economics, psychology, and sociology, respectively.

A general philosophical question concerns the reduction of semantic content to some other domain. For instance, if one begins with materialist ontological commitments and regards the phenomenon of "meaning" as not conforming with these commitments, then one might want to eliminate, reduce, or somehow square claims of meaning with what one thinks there ultimately is, e.g., "naturalizing semantics."

Knowledge

Epistemological questions arise in connection with semantic theories in a number of ways, the most obvious being the charge that semantics is not possible as a scientific theory. A powerful tradition of semantic skepticism associated with Wittgenstein claims that since linguistic expressions and utterances vary meaning from context to context and user to user, there is nothing constant across the tokening of these expressions for a scientific semantic theory to be about. Another way semantic theory relates to knowledge is the verificationist criterion of meaning where knowing a statement's meaning is knowing how to verify it. In this way, language-dependent epistemic norms become the subject matter of semantics.

Truth

Semantics is tied to truth within truth-conditional semantics. On this extensionalist view, the meaning of a declarative sentence is grounded in its truth conditions: To know what the sentence means is to know what the world would have to be like in order for the sentence to be true. Accordingly, semantics is concerned with *truth* for any syntactical language L. In order to understand this, we must distinguish an object language from a metalanguage.

Object language L is formed by specifying rules for the formation of proper formulas – so-called *well-formed formulas*. Here is an example:

$$\exists x \in D(Wx \ \& \ Px)$$

This states that there is some element of domain *D* that has W and P. The metalanguage *uses* words or symbols to *mention* the object language. For instance, one might say that the symbol "$\exists x \in D$" specifies that there is at least one object within domain D, and "Wx" and "Px" state that this object has a particular property W and P, or alternately, that this object is simultaneously a member of the set of all objects having W and all objects having P. Assuming that the metalanguage *m* is used to mention the object language *L*, specific rules are given in *m* which specify necessary and sufficient truth conditions for each sentence in L. According to Tarski, the material criterion for truth of sentences in L is a statement like the following:

"$\exists x \in D(Wx \ \& \ Px)$" is true in L if and only if there is someone who both walks and plants flowers.

The material condition for truth is given by that which follows "if and only if" in the locution, that is, "there is someone who both walks and

plants flowers" is an instance of the general material condition form:

. . . . . is true in L if and only if _____.

Tarski also specified a formal condition for L. Expressions of the form "is true in L" are precluded from themselves being in L. Semantic theory relates to truth when considering *truth in a model*. See "Key Values".

Perception

An example of how semantics relates to perception is information-based theories that use the notion of covariancy to capture the perceptual information carried by the environment. An internal representation of a tokening of blue carries the information that something is blue in the environment. The symbol has the content of blue if and only if the symbol's application covaries with the instantiations of blue in the environment. But a problem arises: Does the tokening of a rabbit covary with respect to rabbits, undetached rabbit parts, or temporal rabbit stages? Furthermore, the tokens of rabbit or blue must figure somehow in the percipient's psychology: How does the internal tokening of a symbol relate to other internal states of the percipient?

Time

While there are many ways in which semantic theory might be linked to questions of time, the two are obviously joined in any intensionalist semantics that attempts to give a semantics for tensed verbs. The idea is that just as the meaning of a term can be understood as a function from possible worlds to an individual, so can the meaning of a tensed verb be understood as a function from moments of time to propositions true at those times.

Consciousness

The question of consciousness is tied to semantics loosely because if consciousness is understood as "aboutness," then that which consciousness is about must have *meaning*. While phenomenology deals with content-meaning generally, semantics concerns the meaning of linguistic expressions and propositional attitudes. One might also argue that while linguistic ability might not itself presuppose consciousness, the kind of linguistic analysis done in semantic theory clearly does because such analysis presupposes imagination and design capabilities.

Rationality/Reason

Semantics is a highly technical endeavor that demands disciplined observation, rigorous application of mathematical and logical resources, and philosophical sensitivity. Reason, however defined, is necessary for engaging in semantic analysis. Furthermore, the internal representation of semantic structures suggests a determinate contour to our structures of reasoning.

Mystery

With religious language, of course, the question of mystery arises in that words from mundane contexts are supposed to mean and refer to supramundane, divine entities, properties, relations, events, and states of affairs. Sensitivity to semantic issues can help clarify what is essentially mysterious and what is not.

Relevant Themes

To further significant dialogue between religion/theology and science, it is necessary to know the meaning of the statements of each and the expressions into which they can be decomposed. It is as easy for theologians not to understand the semantics of scientific theory as it is for scientists to misunderstand theological semantics. Sensitivity to semantic issues (and issues in the philosophy of language generally) is crucial for the future of these discussions.

Cross-References

- ▶ Epistemology
- ▶ Holism
- ▶ Meaning, The Concept of
- ▶ Ontology
- ▶ Phenomenology
- ▶ Truth

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Semeiotic

► Semiotics

Semiconductor Physics

► Condensed Matter Physics

Semiology

► Semiotics

Semiosis

► Biosemiotics

Semiotics

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Related Terms

Semeiotic; Semiology

Description

Semiotics is the study of signs. That is, semiotics is concerned with such things as the processes of signification, representation, interpretation, and the nature of meaning. The field derives its name from the Greek *semeion*, meaning "sign." The tradition of semiotics can be traced to antiquity, perhaps originating with the Greek physicians as the branch of medicine concerned with the interpretation of medical symptoms and signs. Plato and Aristotle were both interested in the nature of signs and the Stoics regarded the theory of signs as the basis of logic. Augustine (354–430) developed these philosophical approaches to semiotics in a Christian direction, regarding aspects of the natural world as signs of God's will and activity in creation. Although an interest in what would now be called semiotics may be traced through medieval and Renaissance philosophy, the field only regained a sense of being a distinctive discipline in the wake of Locke's (1632–1704) division of the sciences into natural philosophy, practical philosophy, and "semeiotica," or "the doctrine of signs." Locke predicted that semeiotic would "afford us another sort of Logick and Critick, than what we have hitherto been acquainted with" (*Essay Concerning Human Understanding* Book IV, Chapter XXI). The discipline(s) of semiotics as currently practiced, however, are largely traceable to the work of Swiss linguist Ferdinand de Saussure (1857–1913) and American scientist-philosopher Charles Sanders Peirce (1839–1914).

Self-Identification

Science

Saussure envisaged his "semiology" as "a science that studies the life of signs within society … Semiology would show what constitutes signs, what laws govern them. Since the science does not yet exist, no one could say what it would be; but it has a right to existence, a place staked out in advance" (quoted in Nöth 1995, 57). Peirce, in contrast, regarded semiotics as a branch of philosophy rather than a "special science" (equivalent to, say, biology or physics). Nevertheless, Peirce thought philosophy itself should proceed by the method of science. He divided philosophy into (1) ▶ phenomenology, (2) the normative sciences, and (3) ▶ metaphysics, and the normative sciences were further subdivided into (a) aesthetics, (b) ▶ ethics, and (c) ▶ logic. Logic includes, or is constituted by, semiotics because all thought takes place in signs; logic "may be regarded as the science of the general laws of signs" (Peirce 1998, 260).

Religion

Semioticians would not understand their academic discipline as a religion. Semiotics is sometimes regarded as somewhat obscure and isolated from other academic disciplines (though its essence is, in fact, intrinsically interdisciplinary) with the result that some outside the field may regard it as a "religion" in a pejorative sense.

Characteristics

Semiotics is distinctive in studying that on which all other disciplines rely, namely, the possibility of representation, signification, and interpretation. In that sense, semiotics may be regarded as conceptually prior to, and necessary for, the practice of all other disciplines. Semiotics is therefore intrinsically interdisciplinary in nature, even though practitioners of other disciplines are often not explicitly aware of their reliance on the subject matter of semiotics.

Relevance to Science and Religion

The history of semiotics has many contacts with religion: witness, for example, the centrality of the concept of "signs" in the Fourth Gospel, Augustine's semiotic view of the created order, Aquinas's semiotic account of the sacraments, and the relation between biblical studies and the origin of the discipline of hermeneutics. Given that neither science nor religion can function without using signs and representations of various kinds and given that the ultimate concerns of both would appear to be closely related to the view one takes of how signs work, it is perhaps surprising that the discipline of semiotics has not been more extensively drawn upon by the field of "science and religion" (See Robinson 2010 for an attempt to do so).

Sources of Authority

As noted above, Saussure understood his "semiology" as a branch of science and hence, presumably, would have expected it to proceed on the basis of empirical investigation rather that deference to any authority. Similarly, Peirce regarded emancipation from authority as essential to the whole enterprise of philosophy and science. Nevertheless, two fairly distinctive traditions of semiotics can be traced, respectively, to these founders of modern semiotics. In that sense, it may be helpful to regard Saussure and Peirce as "authorities" in relation to their respective traditions.

Saussure suggested that signs consist of two elements, the signifier (the "sound image," the spoken word) and signified (the mental concept to which the sound image corresponds). He regarded these two aspects of the sign as related arbitrarily but inseparably – signifier and signified are like the back and the front of a piece of paper; one cannot be cut without affecting the other. A feature of Saussure's dyadic concept of the sign is that it does not include any element relating to a real, external world. Saussure's interest was in the relations between signs within a system. Hence, the label "structuralism" to describe the project that he initiated: the Saussurian tradition is interested in how systems of meaning hang together as a whole, rather than in how individual elements in the system connect with some non-semiotic reality.

Peirce, in contrast, proposed a triadic concept of the sign, according to which signs consist of a sign vehicle (sometimes simply referred to as the sign), an object, and an interpretant (the latter being the interpretive response of some agent, not necessarily a conscious interpretation). In his early semiotic theory, Peirce envisaged an endless progression of thought signs, each sign being interpreted by a further sign. This idea of unlimited semiosis is similar to Saussure's position in that it does not offer a clear account of how (if at all) signs connect with the world. Peirce later modified this view when he recognized the importance of "indexes": sign vehicles which are connected to their objects directly or causally (as when a weather vane indicates the direction of the wind). (Apart from indexes, Peirce proposed two other kinds of sign-object relations. Icons represent their objects by virtue of some resemblance; symbols are signs related to their objects by a rule or convention.) Furthermore, according to Peirce, not all interpretants need be thoughts: interpretive responses can also consist in actions (including, perhaps, very simple changes of state of an entity) or feelings.

The Saussurian and Peircean traditions have developed in ways that reflect these underlying differences. The Saussurian tradition has tended to remain anthropocentric. Its difficulty in giving an account of the connection between signs and reality tends to lead to a non-realist epistemology. For example, Michel Foucault claimed to identify a transition occurring in the seventeenth century when a previously triadic concept of the sign (stemming from the Stoics) was replaced by a dyadic concept. As Nöth puts it, "Thus a cleavage appears between the sign and its object. Since words no longer allow direct access to things, all that remains is representation, discourse, and criticism" (Nöth 1995, 305). Jacques Derrida took a step further, arguing that the idea of stable structures of meaning is problematic. According to Derrida, every sign in a system is marked by "traces" of every other sign. The system is characterized both by difference and "différance." Derrida coined the latter term to allude to the alleged instability of systems of meaning: the meaning of any individual element is infinitely deferred and never fully consummated.

Peirce's semiotics, in contrast, lends itself (as Peirce intended) to a realist ▶ epistemology. This is because Peirce's triadic concept of the sign includes an object. The object represented by the sign may be something quite abstract (such as a thought or concept) but can also be some actual thing in the (non-semiotic) world. Furthermore, again in contrast to Saussure's approach, Peirce's semiotics is not anthropocentric. Whereas the Saussurian tradition regards linguistics as the paradigm of all semiosis, for Peirce, language is one particular manifestation of more general semiotic processes. Consequently, Peircean semiotics has subsequently been able to expand to include the study of communication and signaling between nonhuman animals and organisms. Indeed, the field of "▶ biosemiotics" extends to the study of the role of representation and interpretation in fundamental biological systems such as the genetic "code" (e.g., Hoffmeyer 1996).

For the purposes of this entry, it will be helpful to emphasize the differences between the Peircean and Saussurian traditions in order to illustrate the potential consequences of different approaches to the concept of the sign. This strategy risks oversimplification, however, because it may overemphasize the degree of coherence within, and of separation between, each of the two traditions. Several major semioticians, including Roman Jakobson (1896–1982) and Umberto Eco (b. 1932), may be regarded as drawing on both the Peircean and Saussurian traditions.

Ethical Principles

Peirce regarded logic (of which he saw semiotics as a part) as the third of three "normative sciences." According to Peirce, aesthetics is the study of what is good in itself, ethics is the study of right control of conduct, and logic (including semiotics) is the "science" concerned with establishing right ways of reasoning. The

practices of the "special sciences" (physics, biology, etc.) were, in Peirce's view, understood to be subject to the principles established by the three normative sciences.

Key Values

Peircean semiotics has, in general, retained closer connections with the natural sciences than has the more anthropocentric Saussurian tradition (see Sources of Authority). If Peircean semiotics tends to align itself with the values of the natural sciences (see Ethical Principles), then arguably the outworking of Saussure's concept of the sign leads toward a different set of values, namely, the values of "suspicion" and "critique." However, making such a distinction risks oversimplification, not least because the boundaries between the Peircean and Saussurian traditions are not always clear-cut (see Sources of Authority).

Conceptualization

Nature/World

Peirce once wrote that "all this universe is perfused with signs, if it is not composed exclusively of signs" (Peirce 1998, 394). In fact, Peirce's philosophy is not consistently quite so "pansemiotic" in its vision as this statement may suggest. Nevertheless, Peircean semiotics at least regards everything in the world as having the potential to become a sign of something else. On the other hand, the Saussurian tradition, in keeping with its anthropocentrism and its lack of an account of the connection between signs and things, tends to be more agnostic about the nature of the world that is represented by semiotic systems.

Human Being

A particular contribution of semiotics to understanding the nature of humanity is to raise the possibility that what makes humans distinctive is our capacity (or the extent or specific form of our capacity) for using signs. This is reflected, for example, in Ernst Cassirer's designation of humans as the *animal symbolicum*. More recently, Terrence Deacon has proposed, from a Peircean perspective, an account of human evolution according to which we may be regarded as "the symbolic species" (Deacon 1997).

Life and Death

The field of biosemiotics, stemming from the Peircean school, regards semiotic processes as fundamental to life. Indeed, it has been suggested that the origin of semiosis is closely related to, and perhaps even defines, the origin of life. Although the origin of "coded" information in macromolecules such as deoxyribonucleic acid (DNA) is often regarded as central to the problem of the origin of life, the semiotic perspective suggests that a more general and fundamental issue may be the question of the simplest entity that would, in some minimal sense, be capable of interpreting its environment (Robinson and Southgate 2010).

Reality

As noted above (Sources of Authority), the Saussurian tradition tends toward a non-realist or antirealist view of the relation between signs and the world. Saussure described the non-semiotic world as "a vague, uncharted nebula" (quoted in Nöth 1995, 81). Peirce, in contrast, described himself as a "scholastic realist of a somewhat extreme stripe" (Peirce 1931–1935, 5.470).

Knowledge

Although the two main semiotic traditions differ in their attitudes to reality, they tend to share a commitment to epistemological non-foundationalism. That is, they do not seek any indubitable starting points for knowledge, either in reason (as did Descartes) or in sensory experience (as do philosophical Empiricists). As Peirce put it:

"But in truth, there is but one state of mind from which you can "set out," namely, the very state of mind in which you actually find yourself at the time that you do "set out," – a state in which you are laden with an immense mass of cognition already formed, of which you cannot

divest yourself if you would; and who knows whether, if you could, you would not have made all knowledge impossible to yourself?" (Peirce 1998, 336).

Peirce called his theory of inquiry "critical common-sensism" and regarded it as a development of the "common-sense" philosophies of eighteenth century Scottish thinkers such as Thomas Reid (1710-1796) and James Beattie (1735-1803).

Truth

Peirce conceived of "truth" in terms of the opinion that would be reached by the community of inquirers if investigation were to proceed well enough and long enough:

"The opinion which is fated to be ultimately agreed to by all who investigate, is what we mean by the truth, and the object represented in this opinion is the real. That is the way I would explain reality". (Peirce 1992, 139)

Peirce's notion of the final opinion, as originally formulated, is not entirely satisfactory. Peirce himself acknowledged that he might be asked what he would have to say "to all the minute facts of history, forgotten never to be recovered, to the lost books of the ancients, to the buried secrets" (Peirce 1992, 139). On Peirce's original view, these buried secrets and lost facts would not count as real even though they actually occurred. Conversely, it appears that were the community of inquirers to come to permanently hold an opinion that is at variance with the actual facts, then this opinion would, even though false, be held (by definition) to correspond to reality. Peirce's later formulations of the concept of truth avoid these problems by treating the idea of an ultimate convergence of opinion as a regulative ideal rather than as an inevitable historical occurrence. He therefore came to regard the existence of external reality as the ▶ explanation for observed convergences of opinion, rather than making the convergence of opinion constitutive of reality.

In the Saussurian tradition, the tendency toward agnosticism about the capacity for signs to represent a real non-semiotic world leads to different kinds of question about truth. Questions of interpretative correctness relate more to the "text." Where previously (e.g., with Schleiermacher's biblical hermeneutics) the aim of interpretation was regarded as that of discovering the original intentions of the author, hermeneutics now tends to gives priority to the interpreter, even to the extent of regarding the intentions of the author as irrelevant. Interpretation is always, according to this view, part of a "hermeneutic circle," a reciprocal relation consisting in "the interplay of the movement of tradition and of the movement of the interpreter" (Gadamer, quoted in Nöth 1995, 336).

Perception

A question semioticians might ask about perception is whether perceptions are pre-interpretive occurrences or whether they involve interpretation. Husserl (1859–1938) – whose term "phenomenology" was independently coined at around the same time by Peirce – took the former view. According to Husserl, the threshold of the origin of semiosis lies above, and depends on, a pre-semiotic intuition of the phenomena. Peirce, in contrast, regarded perception as much more closely related to, and perhaps inseparable from, interpretation.

Time

Semiotics does not have any unified approach to time, though it does grace the branch of semiotics devoted to how time is represented with the name "chronemics." The two main traditions of semiotics may be regarded as approaching their subject matter from different temporal perspectives. Thus, part of the originality of Saussure's project was to shift attention from the ("diachronic") evolution of languages to the ("synchronic") structural aspects of language at any particular time. Peirce, in contrast, was much interested in evolution and placed his semiotics within a speculative and highly original evolutionary cosmology.

Consciousness/Rationality/Reason

In a Saussurian perspective, the human capacity for using signs tends to be regarded as a product

of ▶ consciousness, rationality, and reason. In contrast, Peircean semiotics regards consciousness, rationality, and reason as products of semiotic processes. As Peirce remarked, "just as we say that a body is in motion, and not that motion is in a body we ought to say that we are in thought, and not that thoughts are in us" (Peirce 1992, 42).

Mystery

Semiotics does not have any unified approach to mystery, though it has been suggested that "The model of the sign is the model of the sacred: a relation to the Absent, to the Other" (Cassirer et al., quoted in Nöth, p. 381).

Relevant Themes

Three themes may be picked out from the discipline of semiotics that appear particularly relevant to the field of "science and religion":

1. An epistemological theme: the question of the relation between representation/interpretation and any reality external to such representation. Do religious/theological representations refer to something external to the mind or society that produces them, or are they to be understood in a non-realist sense as (merely) products of these minds/societies. Does religion/theology differ from science in this respect?
2. An anthropological theme: how are we to understand human religious practices and "symbols" (or, more strictly, "signs") in the light of the discipline of semiotics? Do religious signs/symbols function in the same way (though with different "objects") as representational practices in the sciences?
3. A theological theme: how do religions construe the relation between sign processes in nature and the existence and creative activity of God? The Fourth Gospel, echoing the first chapter of Genesis, speaks of God having created the world through the "Word"/Logos (John 1.1–3). Can traditional accounts of the role of the Logos in creation be revived or reframed in the light of contemporary semiotic perspectives in such a way as to cohere with current scientific understandings of the world (cf. Robinson 2010)?

Cross-References

- ▶ Biosemiotics
- ▶ Christianity
- ▶ Epistemology
- ▶ Evolution
- ▶ Philosophy of Mind
- ▶ Semantics

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Semitic Languages

- ▶ Language and Literature, Hebrew

Sensation

- ▶ Perception

Sense-Datum Theory, The

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Briefly means that the perception is been given or sensed (which is in line with Alston's thinking). A distinction is made between the mental act of perceiving or sensing and the object of the perception or sensation. This theory is open for perceptions that may be illusory, because it treats all phenomenal properties as properties of the immediate object of experience. Hence, if an object is perceived as having a property that in reality it does not have, the theory says that some other object, as sense-datum, has this property. Simply put, the sense-datum theory holds that if somebody has a sensory experience, there is something of which this person is aware (Broad 1923; Moore 1910; Crane 2011). Objections to the theory are that the theory places itself between the experiencer and the experienced and therefore it does not solve the problem of how our senses perceive the world (See also the entry by Runehov on ▶ Religious Experiences).

Sensory Cortex

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A region of the brain surface which mediates responses to sensory stimulation. Strictly, there are several sensory cortices, each responsive to one form of sensory input – visual, auditory, etc. – and in most cases more than one such area per sensory modality. As a stand-alone term, however, "sensory cortex" usually implies the primary somatosensory cortex, a large strip extending across the center of the cerebral cortex from the fissure between the hemispheres to the temporal lobe of each side, and activated by mechanical, thermal, etc., stimulation of the skin and deeper regions on the opposite side of the body.

Sensory Evoked Potentials

▶ Evoked and Event-Related Potentials

Sensory Experience

▶ Perception

Sentiment

▶ Emotion

Sex and Gender

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Related Terms

Identity; Politics of sexuality; Sexual orientation; Sexuology

Description

Sex

Biological/anatomical diversity between male and female, determined by the chromosome structure possessed by every human being.

Biological Specification

Chromosomal framework and sexual differentiation. It is an indisputable fact that when a human being is born, its sex is determined by the male gamete. Then the information that guides the growth of the cells, the differentiation, and the structuring is all codified inside the chromosomes. The difference male/female is given by the presence or absence of the Y chromosome in the last pair, of the 46 chromosomes, of the human cells. The chromosomes that determine sex are defined as X and Y.

That human beings have 23 pairs of chromosomes, which include 22 autosomes and one pair of sex chromosomes, either XX or XY (the Y chromosome in spite of its small size contains more than 86 genes; the X chromosome contains about 200–300 genes).

During meiosis, the spermatocyte is divided to form the spermatozoids, the sex chromosomes split into two, the Y chromosome goes to a spermatozoid and the X chromosome goes to another. In this way, every spermatozoid is endowed with 22 chromosomes (called autosomes as they are not involved in determining sex) and with one X or one Y chromosome. Because the mature but not fertilized egg cell, for the process of chromosomal reduction, always contains 22 chromosomes and an X chromosome, when it is fertilized by a spermatozoid that contains an X chromosome, the zygote will have its 23 pairs of chromosomes, including an XX and will be a female; instead if the egg cell is fertilized by a spermatozoid that contains a Y chromosome, the zygote will have 23 pairs of chromosomes, including an XY and will be a male.

The presence of the Y chromosome, through what is called the Sry gene, gives the signal for the development of the male gonad, independently of the female sex chromosomes (X chromosome) present. The absence of the Y directs the development of the individual in a female sense. Therefore, at the moment of conception, the genetic sex, male or female, is determined in the last pair of chromosomes present in the zygote. If the last pair of chromosomes is XX, we will have a female individual; if it is XY, a male will be born. Actually, even if the formula of the sex chromosomes is defined in the zygote, the earliest fertilized one-cell stage of development of the embryo, true sexual differentiation of the external genitals and reproductive organs occurs in the human embryo at the sixth week of pregnancy. The brain sexually differentiates as male or female in the third trimester of pregnancy (Jegalian and Lahn 2002).

Social Specification

In social life, sex is defined as an "independent variable" that might or might not influence attitude and behavior (Parsons 1991).

Despite numerous studies on the issue developed intimate behavior, in some social class, is still a taboo. After numerous studies, emerging from recent statements, in possession of social psychology with reference to the intimate behavior of individuals are: changes in the sexual expression and costumes, differences/similarities between male and female sexual behaviors, reactions to sexual impulses and to pornography (Jaspers 2007). The difference between sexual behaviors is determined also in relation to the action of the nervous system: specifically sexual behavior is under the control of the interaction that the neuronal and hormonal activities.

The hypothalamus (the nervous system structure situated in the brain stem and controls body temperature, thirst, and hunger, and regulates sleep and emotional activity), through a hematic feedback, controls the production of gonadotropic hormones by the pituitary gland, so it regulates certain aspects of reproductive and sexual behavior (Reese and Sanders 2007).

Gender Difference

The difference between male and female that is evident in the physiological sphere affects also the social-cultural sphere and therefore, we speak about gender difference. To be a female or a male is not just determined by purely physical factors but also by a series of behaviors that indicate the female or male status/role, as can be noticed not only in working contexts, but in social-religious ones as well (Guionnet and Neveu 2005).

Gender/Role

The gender is the first category that identifies an individual socially and therefore is at the base of the classifications and of the relations that have a social matrix. "Diversity" is a process that transforms the biological differences into social differences, thereby defining the man/woman representations. A role is a model that includes behavior, duty, responsibility connected to the female and male sex and is the object of social expectations (Delphy 1998).

The male or female role (excluding the obviousness of the biological evidence) derives from the result and the interactions of a series of social-cultural processes of the various public systems with a consequent complex of behavioral rules differently addressed to the individuals of the one and the other gender. H. Schelsky (1912–1984) states that these different rules tend to limit the natural inclinations of individuals producing social-cultural and economic tensions (Schelsky 1955). H. Popitz (1925–2002) follows Schelsky's footsteps. The scholar affirms that the holders of the gender roles are both the addressee and the beneficiary of the rules: In the first case, they are bound by the different rules of behavior according to the gender they belong to; in the second case, the rules do not only lay down the duties but also the rights and advantages of the corresponding addressees (Popitz 1967).

It is necessary to make a distinction between the gender role (masculine/feminine) and behavior and general behaviors. Being a male or a female is different from being a *vamp*, a *dandy*, a *macho;* or living with the conviction that a boy cannot cry or that women need to be constantly protected. Furthermore, in the gender roles, it is convenient to distinguish between *ascribed* roles and *acquired* roles. The ascribed role is of a natural, social order defined at birth. It is an ascribed role to be a man or a woman, young or old, free or enslaved, noble or plebeian. For every role, there are individual differences that regard both the interpretation and the realization of the role itself.

The acquired role is obtained during our lives through the activities and the performances of every single individual. It is an acquired role to be a husband or a wife, a father or a mother, a pensioner or a student (Toscano 2006). The first scholar to introduce the distinction between ascribed role and acquired role is Ralph Linton (1893–1953). The scholar asserts that the gender roles were ascribed, unlike the professional roles that were instead acquired (Linton 1936). Today, especially in a society with a high rate of variability of the human species, the acquired roles prevail over the ascribed ones (Toscano 2006).

Division of the Social Roles in the Religious Sphere

Every religious perspective in all ages has given to women a subordinate and limited role. The monotheistic religions are exclusively male. In Christianity, God almighty is called "Father," and his representative on earth, Jesus Christ, is conceived as "Son." Woman, because of original sin, is considered by many Christians to be the cause of the first evil. It is not her but "the devil," the Lord of hell. This male supremacy needs to be distinguished between the Old and the New Testament: In the case of the Old Testament, the Genesis says that God created man and woman in his own image and likeness.

For this reason, the two genders have equal dignity and equal nature; but from the moment that God created the male (that is man) first, the first gender is the masculine one and the female created from man's rib has a feminine gender that is second. In terms of time and function, man results to be superior to woman and his characteristics of noble, honorable, strong sex become the universal standard of the behavior in accordance to the role. Instead the woman embodies the deviated role: the seductress, the sinner, the "weak sex," the derived gender.

This deviated profile is extended also to the female body, through biological constructions, elevated to anthropological constant. In contrast to the "pure" man, the woman is considered because of menstruation "impure" and for this reason is bound by a series of prohibitions (Biale 1992).

The Muslim religion, like the Christian one ever since ancient times, has considered women greatly inferior to men. It is sufficient to consult the *Koran* to notice the sharp supremacy of man

over woman starting from everyday life with the obligation to remain silent and to keep the head and the face covered. *Veil = HIJAB*: Arabic word whose root is hjb. The term means "to hide the eyes, conceal," and indicates "any veil in front of one being or object to hide it from view or to isolate it." In the Sura An-Nūr (The Light) it is said: «And tell the believing women to reduce [some] of their vision and guard their private parts and not expose their adornment except that which [necessarily] appears thereof» (*Koran*, Sura XXIV, 31).

In the first case, the religious man has assured himself the exclusive right of the exegesis and of the preaching and even of the top positions in the religious institutions. The imposition to keep the face and/or the head covered still is in force in the Islamic world: The obligation to wear a veil has become a universally "recognized" symbol of the subordinate role of women while for men to go bare-headed and with a beard symbolizes their direct contact with God. In the Jewish culture, it is above all the woman's role of "mother" that is emphasized (Ahmed 1993).

The assumption of the maternal role in this case seems to be a makeshift given to women in order to take them away from the negative female roles but actually there are other female roles inspired by chastity, virginity that have permitted women to deny their female sexuality and to transform themselves "spiritually into men." It is interesting to notice that in almost all the religions, the exegetic and doctrinal aspect of religion is male, while the procedures and the realization of the precepts are female (Schelsky 1955).

The current orientation, above all in Christianity, wants a new social role of women to stand out that is not considered in a subordinate dimension anymore, but equal to the specific role carried out by man. In short, in the sphere of Catholicism, even the most accredited positions in matter from the recent popes are directed toward the confirmation of the peculiarity of the mission assigned to man (such as the presbyterate), but they also exalt the peculiarity of the female mission inside the church (Levitt 1995).

Many religions emphasize the need to respect differences of gender according to their biological sex, male or female.

Cross-References

- ▶ Affective/Emotional Computing
- ▶ Biology of Religion
- ▶ Determinism and Indeterminism
- ▶ Education, Sociology of
- ▶ Empathy
- ▶ Endocrinology
- ▶ Medical Genetics
- ▶ Neuroethics
- ▶ Social Neuroscience

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Sex Drive, The

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A motivatory complex aimed at seeking copulation. May be thought of as one of the three fundamental mating drives: (1) the sex drive motivates an individual to seek copulation with a *range* of partners and is mediated by testosterone and estrogens; (2) courtship attraction motivates an individual to prefer a *particular* partner and is mediated via pheromones, dopamine, norepinephrine, and serotonin; (3) partner attachment motivates an individual to *remain together* with a particular partner long enough to allow for sufficient parental care and is mediated via oxytocin and vasopressin (Fisher, H. (2004). *Why We Love*: *The Nature and Chemistry of Romantic Love*. NY: Henry Holt & Co.).

Sexual Orientation

► Sex and Gender

Sexuology

► Sex and Gender

Shakyamuni

► Buddha (Historical)

Siddhartha Gautama

► Buddha (Historical)

Simulation Theory

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Related Terms

Mental simulation theory; Off-line simulation theory; Theory of empathetic understanding

Description

Simulation theory is a theory in philosophy and psychology on the way in which we understand others, particularly in common sense psychological ("folk psychological") explanation and prediction of action. The central claim is that understanding another person is a matter of re-creating or copying the other's beliefs, desires, and other mental states in one's own mind. The interpreter thus functions as a model of the target system, the other person, in a way similar to that in which an airplane model simulates the reactions of a real airplane. In some cases, the interpreter voluntarily and consciously imagines herself being in the other's situation and seeing it from her perspective, having her background beliefs, desires, evidence, and so on. However, following the discovery of so-called mirror neurons (see Gallese and Goldman 1998), the recent debate has brought more primitive and automatic forms of mental replication into focus, which do not necessarily require "putting oneself in the other's shoes". (See below on high-level and low-level simulation.)

Besides "simulation" or "mental simulation," participants in the debate have used the terms "replication" (Heal 2003, pp. 11–27), "co-cognition" (Heal 2003, pp. 91–114), "projection", "empathy" (Stueber 2006), "empathetic understanding," and synonyms and cognates of the last-mentioned terms, such as "re-enactment of thought" and the German words *Verstehen*

(understanding), *Nacherleben* (re-experiencing), *Einfühlen* (empathy), and *Hineinversetzen* (transposition; Stueber 2006, p. 11). "Simulation" is the standard term in philosophy of mind and "empathy" in the philosophy and methodology of the humanities and social sciences (Stueber 2006; Davies and Stone 1995a, b; Kögler and Stueber 2000). In psychology, both terms are used (Harris 2000; Håkansson 2003). However, while "simulation" refers specifically to the understanding of others ("mind-reading" or "mentalizing"), "empathy" can also signify the sharing of others' emotions, and the concern or benevolence for others, sometimes also referred to as sympathy. Some authors distinguish simulation and empathy as separate steps in a mental process where the interpreter first reads the other's mind and then shares her emotions (Ravenscroft 1998), and some make even finer conceptual distinctions (for example, (Goldie 1999) conceptually separates simulation from understanding, emotional contagion, empathy, imagining oneself being in another's shoes, and sympathy). Others use "empathy" for the whole process (Stueber 2006).

Simulation and empathy are thus to some extent interchangeable terms, and the two theory traditions overlap. However, simulation theory is a strand in analytical philosophy of the last few decades, while empathy theory has roots in German nineteenth and twentieth century hermeneutics and aesthetics (Stueber 2006, pp. 5–19; Kögler and Stueber 2000). Unlike empathy theory, simulation theory is exclusively concerned with the phenomenon of understanding and interpretation of others (and to some degree oneself). Moreover, simulation theorists have investigated understanding as a topic in philosophy of mind, but have had less to say on philosophy and methodology of the human sciences and moral philosophy, which are central topics in empathy theory (Davies and Stone 1995a, b; Kögler and Stueber 2000). An exception here is Karsten R. Stueber, who discusses both philosophy of mind and philosophy of science, using preferably the term "empathy" but referring mostly to theorists in the simulation tradition, thus connecting the two traditions (Stueber 2006).

Some prominent simulation theorists, mentioned in alphabetical order, are Alvin I. Goldman, Robert M. Gordon, Jane Heal, and Karsten Stueber. Historically, the theory originates in two articles from 1986 by Gordon (Davies and Stone 1995a, pp. 60–73), who introduced the term "simulation," and Heal (2003, pp. 11–27). However, the prehistory goes as long back as the theory of empathetic understanding. Thus, it includes R.G. Collingwood's theory of re-enactment of thoughts as the method of history, Wilhelm Dilthey's theory of understanding in the human sciences, and, at least according to some interpretations, David Hume's and Adam Smith's theories of sympathy (on the history of empathy theory, see (Stueber 2006; Kögler and Stueber 2000; Nilsson 2003)). In analytical philosophy, W.V.O. Quine, Robert Nozick, and Hilary Putnam have defended similar ideas using other terms.

One person may simulate another physiologically, for example, by ingesting a drug and predicting that it will have the same effect on the other as it has on herself (Heal 2003, p. 14). In mental simulation, the interpreter exposes herself to the same situation as the other, or imagines herself being so exposed, and assumes that the other will respond by forming the same beliefs, desires, and volitional states as the interpreter does herself. For instance, I may venture to explain Hamlet's decision to revenge his father by imagining myself being in Hamlet's place, realizing that my father has been murdered, reacting emotionally to this insight, going through the alternative courses of action, reaching a decision, and finally inferring the motives for Hamlet's actions by assuming that he was motivated by the same reasons. To understand another's thoughts on some subject matter, I thus think through the same subject matter myself, and assume that the other is similar enough to follow the same lines of reasoning as I do. The simulation account seems to offer an explanation of the fact that, in common sense thinking, we are often able to predict and explain the actions of others without seeming to know anything like a general psychological or brain physiological theory of their mental functions.

Simulation theory is opposed to so-called *theory theory*, according to which we do understand others precisely by employing a general theory of mind, a set of psychological or other theoretical assumptions by which we can infer the mental states of others from their observable behavior, and explain and predict their behavior from their assumed beliefs and desires (see Davies and Stone 1995a, b; Goldman 2006). On this analysis, the fact that we are often unable to account for our theoretical assumptions shows only that we know them tacitly rather than explicitly. Hence, theory theory takes folk psychology to employ essentially the same general methods or patterns of reasoning as common sense ("folk") physics. By contrast, simulation theorists see a fundamental difference between the understanding of others and the understanding of nature. With regard to the last-mentioned issue, the debate repeats, or continues, the earlier controversy between that which is sometimes called positivism and hermeneutics, or methodological monism and dualism about the human sciences (Stueber 2006; Kögler and Stueber 2000).

Goldman has also opposed the idea of simulation to the *rationality approach* in interpretation theory, represented by Donald Davidson and Daniel Dennett, among others (Goldman 2006, pp. 4, 23–24, 53–68). According to this understanding or version of the simulation theory, the interpreter re-creates the other's mental processes without assessing them with regard to their rationality. Hence, the same process of simulation is applied to irrational and rational thought and behavior. By contrast, Heal and Stueber argue that an interpreter who simulates another person ascribes to her the beliefs and desires which, according to the interpreter's own standards, the other has reasons to hold in the circumstances (Heal 2003, pp. 6–7, 131–150, 225–249; Stueber 2006, pp. 65–97; rationality is here understood in a minimal sense of being responsive to reasons, rather than as the fulfilling of strict requirements of logical coherence and completeness, and Heal restricts herself to what below is called high-level simulation). Thus understood, simulation theory is a form of rationality theory, or overlaps with it. It can be noted here that W.V.O. Quine, when laying the foundations for the rationality approach, regarded the "projecting" of one's own logic and language on the other as integral to radical translation (Quine (1960), p. 58, see also Quine's his analysis of indirect quotation, Quine (1960), p. 219).

It is relatively uncontroversial to say that one person can replicate another's mental reactions in situations where both are literally in the same circumstances, or very similar ones, and have similar background beliefs and values (Stich and Nichols 1997, pp. 300–302). Gordon gives the example of someone who is hiking and sees a fellow hiker suddenly stop, turn around, and walk quickly in the opposite direction. Asking himself what happened, he looks ahead and sees a grizzly bear further along the path. Seeing this makes him at once experience the same feeling of fear as the other and understand the reason for the other's behavior (Davies and Stone 1995a, p. 102). Simulation of this type has been called *total projection* (Davies and Stone 1995a, pp. 102–105) and *actual-situation-simulation* (Stich and Nichols 1997, p. 302).

If the other's beliefs, values, or external circumstances are very different from the interpreter's, as in many cases of historical interpretation and interpretation of people from other cultures, then simulation becomes more complicated and theoretically problematic. In principle, one could separate four categories of interpretive situations, from the simplest in which interpreter and other share both external circumstances and perspective (point of view, worldview) via the more complex in which they share perspective but not circumstances, and vice versa, to the most complex and demanding, in which they share neither circumstances nor perspective. Simulation in the last type of situation has been called *pretense-driven-off-line-simulation* (Stich and Nichols 1997, p. 303). For reasons explained below, this choice of term is controversial, however.

A further distinction can be drawn between what Goldman calls *low-level* and *high-level simulation* (Goldman 2006, p. 113, 147), and Stueber *basic* and *re-enactive empathy*

(Stueber 2006, pp. 145–147, 151–152). Low-level simulation replicates relatively simple mental states, some of which lack propositional content, such as fear and disgust. It enables us to recognize simple emotions in others by immediate observation of their behavior – for instance, I realize that another is afraid by seeing her facial expression. Such simulation comes as a relatively automatic response, and largely operates below the level of consciousness. It seems closely connected to the phenomenon of emotional, cognitive, and motor contagion (mimicry, imitation) – which, for instance, invokes a feeling of joy in someone who sees expressions of joy in another, or makes someone jump when seeing another jump. There is evidence that low-level simulation depends on so-called mirror neurons, which are activated both during the execution of an action (grasping an object, for instance) and during observation of the same action being performed by others (Goldman 2006, pp. 113, 132–144). The interpretation of this evidence has been disputed, however (Gallagher 2007; Jacob 2008; Goldman 2009).

High-level simulation, by contrast, replicates more complex mental states, such as propositional attitudes, and is generally more voluntary and more accessible to consciousness than low-level simulation (Goldman 2006, p. 147). This is the type of simulation of which it seems appropriate to say that the interpreter imagines herself "being in the other's shoes." The nature of such simulation has been a topic of debate among simulation theorists. The two main positions which have emerged can be referred to as the *off-line simulation* view and the *imaginative identification* or co-cognition view respectively.

According to the off-line simulation approach, represented by Goldman and assumed by most theory theorist critics, high-level simulation is essentially a form of inference by analogy (which is not to say that it necessarily depends on all Cartesian notions associated with that idea). Thus, the interpreter simulates the other by imagining herself being in the other's situation, introspectively observing the resulting goings-on in her own mind, assuming that the other is sufficiently similar to herself to react in the same way to the situation, and finally attributing her own mental processes and states, or something very similar, to the other. In order to compensate for differences in background beliefs and values between herself and the other, the interpreter puts her cognitive apparatus into an "off-line" mode, where it does not receive its ordinary input or deliver its ordinary output. For the purpose of simulation, she introduces into her mind "pretend" beliefs and desires which match those of the other, suspends (or "quarantines") beliefs and desires of her own which the other does not share, and disconnects her action motivating mental functions from her motor system so that she does not act on her pretend-beliefs and pretend-desires (Goldman 2006, pp. 28–30; Stich and Nichols 1997). For instance, a social anthropologist studying the Azande tribe attunes her own mind to that of the Azande by pretend-believing in magic, witches, oracles, and so on, without of course for that matter taking active part in Zande customs and rituals. (If there exist no relevant differences in perspective between interpreter and other, the interpreter may simply apply her ordinary ways of thinking "on-line.") According to this view, the interpreter in simulation acts as a relatively detached observer of her own and the other's mental states and processes (see Stueber 2006, p. 122).

Some of the central ideas in the conception of high-level or re-enactive simulation as imaginative identification are aptly summarized in the title of one of Gordon's articles, "Simulation without introspection or inference from me to you" (Davies and Stone 1995b, pp. 53–67). According to this version of the theory, represented by Gordon, Heal, and Stueber, the interpreter's focus of attention is not on the mind of either herself or the other, but rather on the world as perceived from the perspective of the other (Heal 2003, pp. 91–114; Stueber 2006, pp. 151–171; Davies and Stone 1995b, pp. 60–63). To simulate the other, the interpreter re-centers her ego-centric map of the world by shifting the reference of her indexical concepts to match the other's, and simply imagines the world being the way it appears for the other – containing

witches and oracles, for instance. In doing this, the interpreter does not need to observe or consciously regulate her own mental functions. It is sufficient that she employs the ordinary human capability to imagine and hypothetically consider counterfactual states of affairs. Since the interpreter thus primarily looks at the world rather than at the other subject, simulation does not essentially involve introspection and inference by analogy from one's own mental states and processes to those of the other – although it can be argued, as Goldman, Stueber, and Heal have done, that the validity of simulation nevertheless depends on the minimal theoretical presupposition that the interpreter and the other are sufficiently similar in relevant respects. According to the imaginative identification view, the interpreter thus adopts a relatively engaged stance toward the other's mental goings-on, acting more as an active participant in the other's ways of thinking than as a detached observer of them. (Heal prefers the term "co-cognition" to "simulation" because the former suggests a more engaged and the latter a more detached mode of thinking, but despite this uses "simulation" to cover both off-line simulation and co-cognition; (Heal 2003, p. 92).)

Thus understood, the imaginative identification and off-line simulation views are conflicting interpretations of the nature of high-level simulation (re-enactive empathy). If otherwise construed, however, the two views are not necessarily contradictory. According to Heal, the co-cognition or imaginative identification view is an a priori analysis of the personal, or phenomenological, level of simulation, while the off-line simulation view is best thought of as an empirical hypothesis on the underlying subpersonal psychological or biological mechanisms (Heal 2003, pp. 108–111). What happens in the brain of an interpreter when he re-enacts the thoughts of others may well be that the decision making system is disconnected from the motor system, and so on, although the interpreter will normally be unaware of any such fact. If so, there is no real conflict between the two views. However, it is the imaginative identification or co-cognition view which primarily constitutes an alternative to the theory theoretical analysis of our capacity to understand others.

This connects to a further issue of debate among simulation theorists, namely, whether the theory is empirical or a priori. Goldman is probably the strongest proponent of the view that it is an empirical and more precisely psychological and neuroscientific hypothesis, to be confirmed or falsified by empirical data like any other such hypothesis (Goldman 2006, p. 20). Heal takes the opposite stance, arguing that the ability to think about others' thoughts and the ability to think about the subject matter of those thoughts are non-contingently connected in the way postulated by simulation theory (Heal 1994, p. 141).

The arguments for simulation theory are both empirical and of a more traditional philosophical kind. In common sense thinking and interpretive sciences, we seem capable of understanding others without knowing anything like a general theory of their minds, at least not explicitly (Davies and Stone 1995a, pp. 60–73), and something like simulation, or empathy, seems to perform an epistemic function in such understanding, as suggested by everyday language expressions such as "I would have done the same if I were you" or "Imagine being in my shoes."

Although theory theory is probably the dominant view among psychologists, certain findings in empirical psychology and neuroscience fit well with simulation theory, among them the relatively recent discovery of mirror neurons, which has already been mentioned. Studies on autistic children have shown them to be deficient not only in their capacity to understand and relate socially to others, but also in their abilities to see things from other people's perspectives, participate in pretend play, imagine counterfactual possible worlds, and react emotionally to such worlds – precisely what one would expect if these two sets of abilities were connected in the ways simulation theorists claim. The interpretation of these data has been contested, however, and other empirical findings seem to fit better with theory theory than with the simulation view (Stueber 2006, p. 103, 116, 118; Goldman 2006, pp. 134–144, 200–206; Goldman 2009).

Heal and Stueber among others have pointed to cognitive economy as an argument for simulation (Heal 2003, pp. 50–59; Stueber 2006, pp. 154–158; Ravenscroft 1998, pp. 174–177). I simulate another's thoughts on a given subject matter by using my own capacities for thinking about the same subject matter, and the motives for her actions by using my own abilities to consider alternative courses of action, weighing reasons for and against, and so on. Therefore, little more is required for understanding and interpreting others than the affective, cognitive, and conative capacities that I already employ for other purposes. According to theory theory, by contrast, I need a complicated theory of the laws or regularities governing other people's thought and behavior. Heal even argues that such a theory would have to be orders of magnitude more complicated than common sense physics or any other theory, because it would have to take account of the many different worldviews which people have, with all their complexities, and the respective consequences of these worldviews and the differences between them for behavior in indefinitely many possible circumstances (Heal 2003, p. 58). However, cognitive economy can also be an argument for the methodological monism of theory theory against the dualism of simulation theory, since applying the same kind of methods to both nature and people is in at least some respect simpler than applying two different methods, or sets of methods (see Stueber 2006, p. 150).

An influential objection against simulation theory, originating from Carl Hempel and Daniel Dennett among others, may be referred to as the *anti-simulationist collapse argument* (Hempel 1965, p. 240; Dennett 1987, pp. 100–101). Using a plane model to simulate a real plane presupposes that the latter generally behaves like the former in the relevant ways. Otherwise the results of the simulation will not be relevant to predictions or explanations of the plane's reactions to high speed, etc. By analogy, mental simulation presupposes a sufficient degree of similarity between the interpreter and the other for them to react with the same mental output to the same input. This assumption can only be justified by reference to general laws of psychology, which means that the supposed empathy-based explanation is in fact covertly theory-based. Hence, simulation is not really a distinct method of understanding, and the idea of mental simulation collapses into a version of the usual theory theoretical model of understanding. (This argument should be distinguished from the more general collapse argument, which questions the entire theory theory-simulation theory distinction and thus affects both positions equally; (Davies and Stone 2001).) A possible objection from proponents of the non-rationality approach is that the argument conflates the question how ascriptions of mental content are actually made with the question how they are justified; on the rationality approach, however, ascription is inseparable from justification.

In response to such objections, Goldman and Gordon in early articles defended a position that could be called externalism about simulation. According to epistemological externalism (of which Goldman is a proponent), it is sufficient to know something that one's belief on the matter has been produced through a reliable belief-forming process, such as visual observation in favorable conditions. Hence, it is not necessary that one is aware of reasons for one's belief, or for the assumption that the belief-forming process is reliable. In a similar vein, Goldman and Gordon have argued that successful simulation only requires the interpreter to be sufficiently and relevantly similar to the other, but not to have reasons for assuming this to be so (Davies and Stone 1995a, pp. 100–122; Davies and Stone 1995b, pp. 53–67, 74–99.).

A different response, perhaps most clearly stated by Arthur Ripstein, is that the interpreter can determine the degree of similarity between herself and the other by a kind of induction from particular cases. If the interpreter studies the other's statements and actions in a sufficiently wide variety of cases, and they consistently appear reasonable from the interpreter's own perspective, then she has reason to assume herself to be sufficiently attuned to the other, without thereby depending on a theory of the other's mind (Ripstein 1987; Bohlin 2009). That is, the

assumption of similarity is theoretical in the minimal sense that it is general and based on inductive reasons, but it is not a theory in the more demanding sense in which, according to theory theory, understanding of others depends on theory; it is an empirical surface generalization to the effect that the other in general reacts similarly in thought and action to the interpreter, not a theory of the inner structure or functions of the other's mind (see Stueber 2006, p. 180).

A third type of response has emerged in the later debate. The early theory theory-simulation theory debate was mostly dichotomous in the sense that understanding of others was assumed to be either entirely based on theory or else entirely based on simulation. More recently, hybrid positions have been developed, perhaps most fully by Goldman and Stueber (Stueber 2006; Goldman 2006). It has been maintained both that simulation can account for some but not all cases of understanding, and that even when we do simulate, the process of understanding combines simulation with theoretical inference.

For instance, Stueber argues that non-rational behavior requires other methods of explanation and prediction than simulation, or empathy, and that even central cases of simulation depend on theoretical assumptions. The argument for the last point is based on Stueber's division of the process of simulation into three phases, which he calls matching, simulation, and attribution. In the matching phase, the interpreter adjusts her own perspective to the other's, compensating for the relevant differences in background beliefs, evidence, and so on. In the simulation phase, the interpreter thinks through the subject matter at issue from the other's perspective. In the attribution phase, she ascribes the resulting cognitive, affective, and conative states to the other. Stueber argues that theoretical assumptions can play an essential role in both the matching and the attribution phase (Stueber 2006, pp. 120–121). When matching the minds of the Azande, for instance, it may be necessary for the interpreter to be aware of the fact that they generally believe in witchcraft and oracles, and it seems reasonable to say that any results of the interpreter's attempts to see things from the Zande perspective will be valid only if, apart from the differences compensated for in the matching phase, the Azande are relevantly and sufficiently similar to the interpreter herself, or more generally to members of her culture, social group, and so on. However, such unsystematic contrastive generalizations about perspectives do not amount to anything like a fully developed theory of Zande mind, or the human mind in its Zande manifestations. To compensate for the lack of theoretical knowledge in this more demanding sense, the central simulation phase remains indispensable.

Cross-References

- Autism
- Empathy
- Epistemology
- Externalism and Internalism
- Hermeneutics, Theological
- Philosophy of Science
- Theory of Mind

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Simulators

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A simulator is a computer program designed to artificially recreate a robot and its environment. Many robotic simulators incorporate some form of physics engine to simulate a robot's dynamics and kinematics, and a visualization system to provide sensor information to the robot and output for a human. Simulators aid in the development of new algorithms, in the debugging process, and facilitate rapid prototyping. They provide a safe environment in which to test theory and even write algorithms to control a robot in a hazardous environment.

Sin (Vice, Human Limits, Negativity)

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Related Terms

Evil; Human limits; Morality; Punishment; Vice

Most current societies have lists of morally right and wrong actions that are often sanctioned or supported by a deity (God, superior being, force, or agency) capable of causing retribution (Lyman 1989). In societies with salvation religion, being out of favor with the deity may make one ineligible for salvation (Coward 2003). In some current societies, these immoral actions are restricted to overt behaviors. Sin may be viewed as reality, even embodied, next to the concept of evil; more frequently, it is an attribution, a way to qualify an act or behavior. In some societies, sin is against other people. In other societies, it is against the deity. Most societies have degrees of sin. All societies have ways or means of being relieved from sin (Ensor 1997). In some societies, sin is an act; in other societies, it is a state from which one has to be relieved to be in good standing or to be in a state of grace with a deity.

Sin is inexorably related to the concept of evil, which is that which is morally bad or wrong.

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Virtually all sin is related to intentionality and the concept of free will. Because human beings may do things that are wrong or evil and because most concepts of deity attribute goodness and omnipotence to the deity, the concept of free will is also obligatorily related to the concepts of sin and evil, otherwise one would have to solve how a loving and good deity could allow evil human behaviors to occur. Many societies solve this problem by an evil deity or spirit who influences the free will of believers (Wright 2006).

Apart from setting and promulgating moral standards in a society, sin may have other functions. Whereas many sins are universal across societies, other sins are society specific. As such, they serve as religiously mediated in-group markers. They, along with the minimally counterintuitive and counterfactual beliefs that make up most religions, would help to bind the in-group together.

A vice is a habit or personal characteristic deemed immoral (Shklar 1985). Often, such behaviors are associated with such things as prostitution, sex with underaged children, illegal drugs, gambling, and even compulsive criminal activities. The degree to which some individuals are morally responsible for certain types of vice is difficult to determine, as certain individuals may be biologically predisposed to engage in behaviors that are nonnormative. The concept of criminal responsibility is not the same as moral culpability. Both crimes and what are considered morally objectionable behaviors have some degree of cultural and temporal relativity, as what may have been illegal or immoral at one point in time is not considered so in another point in time in the same society. Almost all human beings have moral vulnerabilities. Human beings differ in the degree to which they can conform their behavior to the legal and moral requirements of their society. As such, all human beings have their limits. The Native Americans understood this well with their often-quoted saying, "Do not judge another person unless you have walked a mile in their moccasins." Such an understanding can cause one to have compassion even for those who commit acts that are illegal and/or immoral.

Cross-References

- ▶ Action Control
- ▶ Biology of Religion
- ▶ Body
- ▶ Collective Behavior
- ▶ Criminology
- ▶ Ethics
- ▶ Evil, Problem of
- ▶ Experience
- ▶ Free Will
- ▶ Happiness
- ▶ Negative Theology
- ▶ Self

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Singularity

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A term borrowed by popular robotics and AI theorists from astrophysics. Mathematically, singularity refers to a point at which the object cannot be defined. In pop robotics, it refers to the point at which exponential progress in computation produces social changes so enormous that they cannot be predicted from our present vantage. This is generally assumed to mean that machines will become extraordinarily intelligent, and human beings will merge with technology as cyborgs and, shortly thereafter, minds uploaded into machines.

Skinner Box

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A Skinner box is used in a laboratory setting to study associative learning in animals. The device was introduced by the behaviorist Burrhus F. Skinner around 1930. It can be utilized, for example, to test classical conditioning in a rat by associating a blue light with an enemy in each session, eventually causing the rat to be frightened not only by the enemy, but upon seeing the blue light. In an operant (instrumental) conditioning paradigm, for example, a rat's behavior upon pressing a lever is reinforced by food, eventually causing the rat to press the lever in order to get food.

Sleep Disorders

▶ Sleep Medicine

Sleep Medicine

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Related Terms

Sleep disorders; Somnology

Description

Sleep has been fascinating people for centuries. Besides dreams, sleep was considered to be the brother of death in ancient Greece and has been taken as a state of "small death" until Berger in 1928 discovered the (electroencephalography) EEG and found that sleep has a different electrophysiological expression from the wake state (AASM 2005). In 1949, Moruzzi and Magoun showed that forebrain and cortical arousal/waking behavior is mediated by a set of ascending pathways that originate in the upper brainstem near the pons-midbrain junction called the "ascending reticular activating system" (Aserinski et al. 1953). When rapid eye movement (REM) sleep in the early 1950s was discovered by Aserinky and Kleitman, sleep could be clearly described as two major different forms: non-REM and REM sleep, the first being found in different forms of sleep depth from stage non-REM 1–4 (Berger 1929, Daan et al. 1984). The analysis of the sleep microstructure was first standardized by Rechtschaffen and Kales in 1968; the latest revision by the American Academy of Sleep Medicine was performed in 2007 (Feinberg and March 1995, Hobson 1975). Further analysis of sleep microstructure established models such as the "two process model of sleep and wake" by S. Daan and A. Borbély in 1982, while in 1975, Hobson and McCarley discovered that the occurrence of non-REM and REM is based on the reciprocal discharge by two brainstem neuronal groups (Iber et al. 2007, Lu et al. 2006). More recent models of sleep-wake regulation have been established like the "flip-flop switch model" of orexin by Lu and Saper in 2006 which also shows the connections with the autonomous, the motor, the endocrine, and other systems (Manni et al. 2011).

In most western parts of the world, scientific activity in sleep research expanded fast and stirred the foundation of National Sleep Societies, which today are established scientific medical societies. As sleep medicine is not restricted to one faculty, it is the first "interdisciplinary society" also including nonmedical disciplines.

After classifying sleep disorders by establishing accepted methods, some very efficient therapeutic tools were developed. The most successful until today is the therapy for sleep apnea by applying "continuous positive

nasal airway pressure" (nCPAP) during nocturnal and diurnal sleep. Research was and still is revealing the impact of the different sleep stages on diurnal physiology, psychology, and cognition in all kind of medical and behavioral disorders. Sleep deprivation studies have led to insights into all kinds of accidents caused by sleepiness or other sequelae of disturbed sleep.

In the meantime, sleep has found its way into all major medical disciplines and is a source of new insights into pathophysiology, morbidity, and mortality. Sleep deprivation studies challenging cognitive processes have set a trigger to understanding the function of sleep for our mental capacities. Genetics have been of tremendous help identifying some initially "rare diseases" such as the "sleep phase advance syndrome" and the "sleep phase delay syndrome"; they are able to identify the chronotype of complete populations with their vulnerable wake and sleep times (Mayer et al. 2009).

Pharmacogenetics is gaining more and more importance as the number of medical products to induce healthy sleep and to prevent daytime sleepiness is increasing. Imaging is a further contributor to new insights into the molecular mechanisms of sleep and its relation to other systems.

Self-identification

Sleep medicine from its beginning on has been based on scientific methods. It is not a religion as it is based on the principles of scientific methods and not on belief. However, in ancient times and in traditional cultures, people would tell their dreams in the morning to keep in touch with their "inner spirits" (Moruzzi et al. 1949). Dreams have been interpreted in many mystified ways, they have been used extensively in literature as predictors of fate (i.e., Lady MacBeth by Shakespeare) or even a whole nation (the seven good and the seven bad years in ancient Egypt), and people lived up to them. These traditions of awareness of dream contents became a real psychoanalytic method with Sigmund Freud who focused on dreams as a feature of unconscious wishes, while Hobson and McCarley stated REM-based dreams as a neural activity without any sense. Today, scientific methods show that a lot of equal brain regions are involved in REM dreaming, memory functions, and emotions or even the recall of emotions. Both the decrease of central regulatory control mechanisms and the dissociative tendencies of mental functions during REM may erase old affective patterns, allow the testing of new emotional behavior within a given situation and the subsequent selection, emphasizing these new learned affective patterns.

Characteristics

Since all findings clearly showed that sleep, respectively disturbed sleep, has a great impact on social life, productivity, and general health, sleep medicine is the first real interdisciplinary discipline which covers all fields of medicine including internal medicine, pneumology, cardiology, neurology, psychiatry, otorhinolaryngology, pediatrics, and others. Besides medical fields, it also includes nonmedical disciplines, that is, psychology, physiology, biology, physics, etc.

Relevance to Science and Religion

Dream research based on the scientific understanding of dreams has contributed very much to the understanding of "hallucinations," "out of body experience," and "appearances" (Palagini and Rosenlicht 2011). It has also shown that mankind is capable of commanding certain dream contents in a desired way (so-called lucid dreaming). The myth of "why we dream" and what the "individual meaning of dream contents" is has still to be fully analyzed (Rechtschaffen 1968, Toh et al. 2001).

Sources of Authority

The sources of sleep medicine are international classifications, guidelines, and recommendations

(see references) as well as established scientific procedures like PSG, first standardized by Rechtschaffen and Kales in 1968 and revised by the American Academy of Sleep Medicine was performed in 2007. Until today, the most important method to score sleep is the polysomnography which has 2–4 channels to record eye movements, 1–3 channels to record chin muscle activity, 3–8 channels to record scalp electroencephalogram, 1 channel for ECG, nasal airflow, thoracic and abdominal excursion, noninvasive oxygen saturation, and 1–2 channels (or more if needed) to record tibial anterior muscle activity. To classify disorders as parasomnias videometry is necessary to assess the behavioral phenotype.

These standardized methods helped to identify sleep disorders, which led to the first International Classification of Sleep Disorders in 1979 which in the meantime comprise more than 88 different disorders and which was revised in 2005 (Vogel 1960).

Ethical Principles

As for every medical subdiscipline, the ethical guidelines are the "Hippocratic Oath" and the "International Declaration of Helsinki."

Key Values

The key values are diagnosis and therapy of sleep disorder worldwide. Specific health care activities focus on the teaching of the need for sufficient sleep in the general population.

Conceptualization

For all the items listed, the International Sleep Societies have given no general definitions.

Relevant Themes

Themes regarding the topic "Science and Religion" could be manifold. They could include time management for religious services (i.e., to make the attendants more attentive), analyzing the scientific background of "appearances" occurring from sleep.

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SLI

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Specific language impairment; a deficit of producing sounds and grammar that runs in families.

Smṛti (Sanskrit)

▶ Mindfulness (Buddhist)

Social

▶ Science and Scientific Knowledge, Sociology of

Social Cognition

▶ Attribution/Attribution Theory
▶ Social Psychology

Social Component and School

▶ Education, Sociology of

Social Construction in Psychology

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Related Terms

Constructionism; Constructivism; Social constructivism

Description

The phrase, *social construction*, typically refers to a tradition of scholarship that traces the origin of knowledge, meaning, or understanding to human relationships. The term *constructivism* is sometimes used interchangeably, but much scholarship associated with constructivism views processes inherent in the individual mind, as opposed to human relationships, as the origin of people's constructions of the world. Social constructionism gained its initial prominence as a metatheory. It provided an account of all claims to knowledge, reason, and value – in science, religion, and elsewhere. On this level, it has served as a major alternative to empiricism. However, unlike empiricism, constructionists make no claims to the truth or ultimate rationality of constructionism itself. In this sense, constructionism may be viewed as a nonfoundational foundation.

However, constructionist ideas have also been used for purposes of substantive critique, description, and explanation of various social processes. At this level, constructionist ideas also give rise to new research practices, especially those considered qualitative. Constructionist ideas inform inquiry across the social sciences and humanities. They play a specially important role in narrative inquiry, discourse analysis, rhetorical studies, ethnography, cultural studies, conversation analysis, interpersonal communication, feminist inquiry, neocolonialist inquiry, organizational studies, the social studies of science, the history of science, and critical studies, among others.

Constructionism offers a major alternative to individualist and biological accounts of human behavior. Constructionist ideas also inform the development of numerous practices in society, especially those centering on dialogue, personal and social transformation, organizational development, and peace building. Many view constructionist ideas as the backbone of postmodern therapeutic practices. For further discussions of constructionist inquiry and applications, see Gergen (2004, 2009), Holstein and Gubrium (2008), Lock and Strong (2010).

Root Assumptions in Social Construction

Although one may trace certain roots of social constructionism to Vico, Nietzsche, and Dewey, scholars often view Berger and Luckmann's *The Social Construction of Reality* as the landmark volume (Berger and Luckmann 1967). Yet, because of its lodgment in social phenomenology, this work has largely been eclipsed by more recent scholarly developments. One may locate the primary stimulants to the more recent development of social constructionist thought in at least three, quite independent movements. In effect, the convergence of these movements provides the basis for social constructionist inquiry today.

The first movement may be viewed as *critical* and refers to the mounting ideological critique of all authoritative accounts of the world, including those of empirical science. Such critique can be traced at least to the Frankfurt School, but today is more fully embodied in the work of Foucault (Foucault 1980) and associated movements within feminist, black, gay and lesbian, and antipsychiatry enclaves. The second significant movement, the *literary/rhetorical*, originates in the fields of literary theory and rhetorical study. Poststructural literary theory has been especially prominent, including deconstructionist theory. Rhetorical study, in particular, demonstrates the extent to which scientific theories, explanations, and descriptions of the world are not so much dependent upon the world in itself as on discursive conventions. Traditions of language use construct what we take to be the world. The third context of ferment, the *social*, may be traced to the collective scholarship in the history of science, the sociology of knowledge, and social studies of science. Here the major focus is on the social processes giving rise to knowledge, both scientific and otherwise.

In what follows, I shall briefly outline a number of the most widely shared agreements to emerge from these various movements. To be sure, there is active disagreement both within and between participants in these various traditions. However, there are at least three major lines of argument that tend to link these traditions and to form the basis of contemporary social constructionism.

The Social Origins of Knowledge

Perhaps the most generative idea emerging from the constructionist dialogues is that what we take to be knowledge of the world and self finds its origins in human relationships. What we take to be true as opposed to false, objective as opposed to subjective, scientific as opposed to mythological, rational as opposed to irrational, moral as opposed to immoral is brought into being through historically and culturally situated social processes. This view stands in dramatic contrast to two of the most important intellectual and cultural traditions of the West. First is the tradition of the individual knower, the rational, self-directing, morally centered, and knowledgeable agent of action. Within the constructionist dialogues, we find that it is not the individual mind in which knowledge, reason, emotion, and morality reside, but in relationships.

The communal view of knowledge also represents a major challenge to the presumption of truth, or the possibility that the accounts of scientists, or any other group, reveal or approach an objective truth about what is the case. In effect, propose the constructionists, no one arrangement of words is necessarily more objective or accurate in its depiction of the world than any other. To be sure, accuracy may be achieved within a given community or tradition – according to its rules and practices. Physics and chemistry generate useful truths from within their communal traditions, just as psychologists, sociologists, and priests do from within theirs. But from these

often competing traditions, there is no means by which one can locate a transcendent truth, a "truly true." Any attempt to establish the superior account would itself be the product of a given community of agreement.

To be sure, these arguments have provoked antagonistic reactions among scientific communities. There remain substantial numbers in the scientific community, including the social sciences that still cling to a vision of science as generating "truth beyond community." In contrast, scientists who see themselves as generating pragmatic or instrumental truths find constructionist arguments quite congenial. Thus, for example, both would agree that while Western medical science does succeed in generating what might commonly be called "cures" for that which is termed "illness," these advances are dependent upon culturally and historically specific constructions of what constitutes an impairment, health and illness, life and death, the boundaries of the body, the nature of pain, and so on. When these assumptions are treated as universal – true for all cultures and times – alternative conceptions are undermined and destroyed. To understand death, for example, as merely the termination of biological functioning would be an enormous impoverishment of human existence. If a nourishing life is of value, there is much to be said of those who believe in reincarnation, the Christian vision of "a life hereafter," or the Japanese, Mexican, or African tribal views of living ancestor spirits. The constructionist does not abandon medical science but attempts to understand it as a cultural tradition – one among many.

The Centrality of Language

Central to the constructionist account of the social origins of knowledge is a concern with language. If accounts of the world are not demanded by what there is, then the traditional view of language as a mapping device ceases to compel. Rather, constructionists tend to draw from Wittgenstein's (Wittgenstein 1953) view of meaning as a form of language game. And, given that games of language are essentially conducted in a rule-like fashion, accounts of the world are governed in significant degree by conventions of language use. Empirical research could not reveal, for example, that "emotions are oblong." The utterance is grammatically correct, but there is no way one could empirically verify or falsify such a proposition. Rather, while it is perfectly satisfactory to speak of emotions as varying in intensity or depth, discursive conventions for constructing emotional life in the twenty-first century do not happen to include the adjective "oblong."

Social constructionists also tend to accept Wittgenstein's view of language games as embedded within broader "forms of life." Thus, for example, the language conventions for communicating about human emotion are linked to certain activities, objects, and settings. For the empirical researcher, there may be "assessment devices" for emotion (e.g., questionnaires, thematic analysis of discourse, controlled observations of behavior) and statistical technologies to assess differences between groups. Given broad agreement within a field of study about "the way the game is played," conclusions can be reached about the nature of human emotion. As constructionists also suggest, playing by the rules of a given community is enormously important to sustaining these relationships. Not only does conformity to the rules affirm the reality, rationality, and values of the research community, but the very *raison d'etre* of the profession itself is sustained. To abandon the discourse would render the accompanying practices unintelligible. Without conventions of construction, action loses value.

The Politics of Knowledge

As indicated above, social constructionism is closely allied with a pragmatic conception of knowledge. That is, traditional issues of truth and objectivity are replaced by concerns with that which research brings forth. It is not whether an account is true from a God's eye view that matters, but rather, the implications for cultural life that follow from taking any truth claim seriously. This concern with consequences essentially eradicates the long-standing distinction between *fact* and *value*, between is and ought. The forms of life within any knowledge-making community represent and sustain the values of that community.

In establishing "what is the case," the research community also places value on their particular metatheory of knowledge, constructions of the world, and practices of research. When others embrace such knowledge, they wittingly or unwittingly extend the reach of these values.

Thus, for example, the scientist may use the most rigorous methods of testing emotional intelligence and amass tomes of data that indicate differences in such capacities. However, the presumptions that there is something called "emotional intelligence," that a series of question and answer games reveal this capacity, and that some people are superior to others in this regard are all contingent on the conventions of a given tradition or paradigm. Such concepts and measures are not required by "the way the world is." Most importantly, to accept the paradigm and extend its implications into daily life may be injurious to those people classified as inferior by its standards.

This line of reasoning has had enormous repercussions in the academic community and beyond. This is so especially for scholars and practitioners concerned with social injustice, oppression, and the marginalization of minority groups in society. Drawing sustenance in particular from Foucault's work, a strong critical movement has emerged across the social sciences, a movement that gives expression to the discontent and resistance shared within the broad spectrum of minorities. In what sense, it is often asked, do the taken for granted realities of the scientist sustain ideologies inimical to a particular group (e.g., women, people of color, gays and lesbians, the working class, environmentalists, the elderly, the colonized) or to human well-being more generally? Traditional research methods have also fallen prey to such critique. For example, experimental research in psychology is taken to task not only for its manipulative character but its obliteration of the concept of human agency.

These three themes – centering on the social construction of the real and the good, the pivotal function of language in creating intelligible worlds, and the political and pragmatic nature of discourse – have rippled across the academic disciplines and throughout many domains of human practice. To be sure, there has been substantial controversy, and the interested reader may wish to explore the various critiques and their rejoinders (see, for example, Gergen 2001, 2009; Hacking 1999). However, such ideas also possess enormous potential. They have the capacity to reduce orders of oppression, broaden the dialogues of human interchange, sharpen sensitivity to the limits of our traditions and to their potential offerings, and to incite the collaborative creation of more viable futures.

Self-Identification

Science

Social constructionists do not generally identify themselves as scientists, at least in terms of the positivist/empiricist view of science that largely prevails today. More generally, they raise questions about the definition of science and what is at stake politically and socially in attempting to generate strong borders of exclusion. At the same time, many constructionists carry out scientific work of the traditional kind, viewing such work, however, as itself a form of construction.

Religion

Constructionists do not generally view themselves as participating in a religion, at least in terms of a commitment to theistic or spiritual beliefs. At the same time, many constructionists participate in religious or spiritual activities, understanding these activities as traditions of meaning that carry with them valued implications for cultural life. Simultaneously, various religious groups are finding social constructionist ideas useful for enriching church and pastoral practices (Hermans et al. 2002).

Characteristics

Constructionists are similar both to the traditions of science and religion inasmuch as they are engaged in creating and sustaining particular constructions of reality, reason, and value. They

differ, however, in their avoidance of the kinds of foundational claims that are common to both traditional science and religion. Social constructionism is not a belief system; rather it is an array of ideas and related practices that many view of enormous potential in helping the world's peoples live together amicably. In part, this is so because constructionist ideas invite understanding and collaboration across traditions as opposed to competition.

Relevance to Science and Religion

For many constructionists, the interest in science and religion stems from the fact that these are institutions of pivotal significance in the contemporary world in their constructions of reality and value. However, of particular significance in recent years has been the way in which constructionist ideas inform the emerging dialogues between science and religion. By viewing each of these traditions as "truth generating" within its domain of assumptions and practices, one may avoid the problematic tendencies of searching for convergences on the one hand and mounting critique on the other. Both such tendencies move toward a world of singular truth, which is ultimately oppressive and pragmatically debilitating.

Sources of Authority

The general orientation to what are traditionally viewed as "sources of authority" within the social constructionist dialogues is skeptical. Constructionists tend to be critical of authority structures and to opt for all-inclusive dialogue.

Ethical Principles

In general, one may find in the constructionist dialogues two orientations toward ethical principles. The first is critical of all such principles. As it is variously argued, ethical principles are problematic at the outset because there are no unambiguous means of deriving action from abstract principles. More importantly, such principles tend to reinforce a certain way of life, relegating others to a secondary status. In effect, they are exclusionary, and thus conflict provoking. Further, principles have a tendency to terminate the kinds of dialogues that are essential for understanding human action within what are inevitably unique circumstances.

The second orientation toward ethical principles is to locate within constructionist ideas an underlying set of ethical presuppositions. Some find, for example, that constructionist ideas favor pluralism, integration, collaboration, justice, tolerance, and democracy.

Key Values

The issue of values within social constructionist dialogues is controversial. As just outlined, one may see in constructionist thought a commitment to certain ethical principles or values. However, such claims are controversial primarily because a strong commitment to any value system may have the ultimate effect of bringing an end to the process of meaning, making out of which values are created.

Conceptualization

All the concepts included below are viewed as human constructions. They are created within cultures during specific historical periods and are used within these cultures for carrying out their ways of life. However, because there are multiple cultures and historical transformations in meaning, these concepts may be freighted with multiple meanings and usages. Most constructionist work with these concepts has had the purpose of denaturalizing them, opening them to critical inquiry, and offering alternative ways of thinking and practicing. In some of these cases, particularly where conflict is sharp and potentially lethal, new projects of dialogue are mounted. Some of this work is reflected in the following comments:

Nature/World

Important critical work has questioned the common binary between the natural world and the human or cultural world. As it is argued, this distinction has typically privileged the human world with resulting ecological catastrophe.

Human Being

Lively discussion of the various conceptions of the human being has taken place within constructionist writings. Recent attempts are aimed at moving beyond the conception of humans as self-contained organisms and toward a view of human action as an outcome of relational embeddedness.

Life and Death

Important constructionist work in this case has been devoted to defusing the conflict between pro-life and pro-choice factions. As noted, a constructionist orientation favors action-oriented contributions to society.

Reality

Whatever is to be said about reality, constructionists argue, is always issuing from a particular culture. Beyond these constructions, there is nothing that can be said. Foundational arguments about the nature of reality are futile.

Knowledge

All claims to knowledge are social constructions. This view invites a pragmatic orientation to knowledge making and a reflexive posture in evaluating the values inherent in any contribution to knowledge.

Truth

Like the concepts of reality and knowledge, constructionists view "truth" as a potentially dangerous category. Those who claim truth beyond a tradition are divisive. However, by viewing truth claims as means of securing trust within traditions, we can appreciate the use of the concept.

Perception, Time, and Consciousness

In viewing these as constructions, we avoid interminable debate and inquire into the utility and social value inherent in any given account.

Rationality/Reason

Rationality has come under critical fire among constructionists because of the way in which the concept has been used to valorize certain traditions and classes. In general, constructionists view reason in terms of discourses congenial with various traditions.

Mystery

Many constructionists celebrate the concept of mystery, as it invites curiosity and leaves paths to further dialogue open.

Relevant Themes

Of central concern to science and religion are issues of morality and materialism. While science tends to take no stand in the former case, those in spiritual traditions see the scientific preoccupation with materialism limited. Social constructionist ideas are useful here in inviting moral pluralism, on the one hand, and an appreciation (and the limitations) of multiple realities (including both material and spiritual) in terms of global contribution.

Cross-References

▶ Critical Theory
▶ Self, from a Psychological Perspective
▶ Truth

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Social Constructivism

► Social Construction in Psychology

Social Deviance

► Deviance and Social Control, Sociology of

Social Evolution

► Evolutionary Psychology

Social Inference

► Attribution/Attribution Theory

Social Influence Processes

► Social Psychology

Social Interaction Explanations

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Social interaction explanations examine how people become criminals and emphasize that criminal behavior is learned behavior. Sociologist Edwin Sutherland developed the theory of differential association in the 1920s and 1930s to explain how people become criminals. He maintained that criminal behavior is learned in interaction with others and that criminals learn to favor criminal behavior over noncriminal behavior.

Social Interactionism

► Deviance and Social Control, Sociology of

Social Movements

► Collective Behavior

Social Neuroscience

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Persons and Objects

We experience interactions with persons in social encounters and manipulations of physical objects every day. Although we are usually not asked to reason about this, there seems to be a fundamental difference between persons or human beings and physical objects, which we are usually not aware of. However, we are making use of this distinction continuously and automatically throughout our everyday life. This difference refers to the following aspects. Whereas the behavior of persons can only be successfully explained or predicted by reference to the inner experience of the person including perceptions, thoughts, feelings, desires, or intentions-to-act, there is no need to assume anything

comparable to such an inner experience if we are asked to explain or predict the behavior of physical objects or "things." The behavior of persons can only be explained on the basis of psychological rules ("folk psychology") that we learn and acquire during our ontogenetic development; the behavior of physical objects can be explained on the basis of natural laws in the framework of classical Newtonian physics ("folk physics"). The behavior of persons can be predicted only on the basis of probabilistic estimates: In a given particular instance of a social encounter, we can never be sure how an interacting human will react (e.g., smiling at another person and her/his reaction to the smile); the behavior of physical objects can be predicted in a deterministic fashion: If we are sufficiently informed about the different forces that influence a given object, we can by necessity predict how it will behave (e.g., a ball running down a slope because of gravity). In contrast, there are no natural laws in the strict sense that can guide us during processes of person perception or impression formation. This fundamental distinction was put forward by Fritz Heider, the founder of the so-called attribution theory in the field of social psychology. He distinguished between "person perception"or "social perception" in contrast to "thing perception" or "nonsocial perception"(Heider 1958). In the following, we focus on experiences and processes related to the social domain.

Naturalistic Account

We as persons or human beings experience mental phenomena, such as perceptions, thoughts, feelings, desires, or intentions-to-act, from a first-person-perspective. Complementary to this, mental phenomena can be reconstructed from a third-person-perspective as "the subjective experience of cognitive function" (Fuster 2003). Following a naturalistic view, which holds that all relevant cognitive processes and their neural mechanisms can be studied and fully understood by employing the methodology of natural sciences including cognitive neurosciences, our mental phenomena or conscious experiences are closely linked to their underlying neural mechanisms to which they correspond.

More precisely, the philosophical identity theory as prominently positioned in the philosophy of mind postulates that our mental phenomena are identical with neural mechanisms with which they can be (extensionally) identified, although the (intensional) content or "meaning" of mental phenomena and neural mechanisms are clearly different (Vogeley and Seitz 1995). In other words, whereas mental phenomena are experienced in a subjective space-time system, cognitive processes and neural mechanisms are observables in an objective space-time system (Kuhlenbeck 1981). Teleologically, consciousness provides an integrated internal representation of the outer world and one's own organism based on experiences and memories providing reflected responses to the needs of our environment (Vogeley et al. 1999).

Based on this theoretical grounding, cognitive neuroscience has started to identify and address increasingly complex explananda during the last decade including self-consciousness and intersubjectivity. More recently, processes that are related to interaction and/or communication in social encounters between human agents have been studied systematically and extensively. These research activities have constituted the new research field of "social cognitive neuroscience" or "social neuroscience" (Ochsner and Lieberman 2001; Adolphs 2009; Schilbach et al. in press), from which already monographs, edited volumes, and academic journals have emerged.

Self-Other-Differentiation and Self-Other-Exchange

It appears useful to introduce a rudimentary taxonomy that covers at least three essential distinctions. First, the processes that focus on self-other-differentiation (as the ability to differentiate between one's own and other person's mental states; Vogeley et al. 2004; David et al. 2006, 2007) are to be differentiated from processes serving self-other-exchange (as the ability to share or exchange mental states with

others; Vogeley et al. 2001; Schilbach et al. 2006). This distinction is a crucial basic step to avoid a possible confusion of whether a given mental phenomenon refers to or can be traced back to oneself or not: Survival in a social world clearly requires the ability to distinguish between oneself and others as the "owner" or "agent" of mental states. Disturbances of this important capacity might give rise to the psychopathological phenomenon of ego-disturbances during which the owner or initiator of experiences or movements can no longer be adequately attributed, neither to oneself nor to others.

A "minimal self" as prerequisite of social cognition (Gallagher 2000; Vogeley and Gallagher 2011) comprises at least the following essential features as key constituents: (1) the experience of ownership (with respect to perceptions, judgments, etc.; e.g., expressed by the adequate use of personal pronouns) or agency (with respect to actions, thoughts, etc.; e.g., expressed by the experience that oneself causes and controls one's own actions); (2) the experience of "perspectivalness" with conscious states being "centered" around myself, incorporated in my body, and embedded in a literally spatial, body-centered perspective; and (3) the experience of unity that is associated with a long-term coherent whole of beliefs and attitudes that are consistent with preexisting autobiographical contexts and that can, for instance, be empirically addressed by studies on autobiographical memory (Fink et al. 1996).

Based on the capacity of self-other-differentiation, we need to ground our everyday behavior in human encounters on adequate judgments and perceptions of other persons, also referred to as the so-called "theory of mind" or mentalizing capacity. A very prominent strategy to study such ascriptions of mental states to others in an inferential, rule-based manner refers to "theory of mind" paradigms that require the prospective modeling of the knowledge, the attitudes, or beliefs of another person (Vogeley et al. 2001). A very important key region among others that is involved in a variety of different social cognitive tasks including "theory of mind" tasks and mentalizing is the medial prefrontal cortex, a part of the frontal lobe of the human brain (Amodio and Frith 2006).

Levels of Processing

Being aware of one's own mental states and being able to "read" other persons' minds or to "understand" or "simulate" what they are experiencing are clearly two different capacities. A very important second distinction, presumably orthogonal to the first one that needs to be emphasized is related to different levels of processing of social information. Cognitive processes can, in general, be either implicit or explicit: Implicit information processing refers to a comparably fast, automatic, pre-reflexive mode that is employed, for instance, during nonverbal behavior. In contrast, explicit information processing comprises processes in a comparably slow, reflexive, inferential format, such as stereotypes or processing based on explicit rules (Lieberman 2007; Frith and Frith 2008). Only a part of psychological processes are experienced consciously and processed on a reflexive, inferential level, as shown for the processing of nonverbal communication cues (e.g., Burgoon et al. 1996). Whereas nonverbal cues including mimic expressions (Schilbach et al. 2006), gestures (Lindenberg et al. 2012), or social gaze (Kuzmanovic et al. 2009) are processed in a fast, automatic, pre-reflexive, and implicit manner, social interactions can also be based on explicit rules, such as stereotypes, that are processed in a comparably slow, reflexive, and inferential manner, and presumably more often in a controlled way (Lieberman 2007; Barsalou 2008).

Among nonverbal communication cues gaze behavior is an important and salient signal for social interest and the intention to communicate, thus indicating mental states of significant others (Argyle and Cook 1976). "Social gaze" is crucially modulated by various dynamic characteristics among which gaze duration is of particular relevance. We investigated the neural correlates of participants while being gazed at with varying gaze duration. Increasing gaze duration resulted in an increased likeability rating and increased neural activation again in the medial prefrontal cortex (Kuzmanovic et al. 2009). This process of gaze evaluation can be understood as a comparably late stage of processing implemented in the medial prefrontal cortex.

However, these levels of processing should be conceptualized as a continuum of different levels of processing resulting in a flexible capacity of person perception that is performed either automatically or in a controlled manner, depending on the data available.

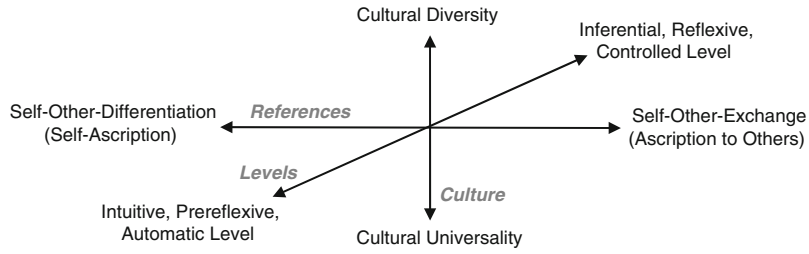
Gaze can also establish triadic relations between self, other, and the world via the modulation of attention of others or "joint attention," an important precursor of social cognition (Moore and Dunham 1995). It has been suggested that it might be the motivation to participate in joint attention that leads to shared, social realities as a unique aspect of human cognition (Tomasello et al. 2005). To realize a truly interactive paradigm we developed an eye-tracking setup allowing to track a participant's gaze behavior and to contingently control the gaze behavior of a computer-animated character visible on the screen (Schilbach et al. 2010; Vogeley and Bente 2010). Participants were instructed to lead the gaze of the other person toward one of three objects by looking at it. The gaze behavior of the other was made responsive to the participant's gaze and was systematically varied so that the participant had to follow the gaze (joint attention) or not. Alternatively, participants were asked to respond to the other by looking at the same or at another object. Employing functional magnetic resonance imaging, the analysis demonstrated that joint attention was associated with a recruitment of the medial prefrontal cortex. The second interesting finding was that directing someone else's gaze toward an object activated the brain's reward system (ventral striatum). This finding could correspond to the hedonic and motivational aspects of sharing attention with others or could reflect that control of others motivates to engage with others (Fiske and Dépret 1996).

Cultural Universality and Diversity

In addition, during the last few years researchers in the field began to take into account the potentially considerable influence of culture on self-construct development and group formation also referred to as "independent" or "interdependent" self (Markus and Kitayama 1991; Singelis 1994; Vogeley et al. 1999), which in turn might influence other domains of human cognition (Markus and Kitayama 1991; Nisbett and Masuda 2003). The issue of cultural influences should be taken into account as a third distinction. "Culture," however, is not a clearly defined, rigid body of rules that shapes each and every individual of a given culture in a similar, uniform way, but is highly dynamic and continuously interacts with its constituting individuals, any individual can be part of different cultures at the same time (Hofstede 2003). A culturally sensitive neuroscience must take into account the dynamic character of culture, the dialectic exchange between individual and collectivity, and the recursive "looping effect" of cultural classifications on social practices and identity processes (Hacking 1999; Vogeley and Roepstorff 2009).

Focusing on the key term culture, it is important to differentiate between a "universal" and a "particular" concept of culture resembling the proposals of cultural universality and cultural diversity. Whereas the universal concept holds that culture is a result of our capacity to interact and communicate with other human beings and is universal for our species (Tomasello et al. 2005), the particular concept emphasizes the differences of cultural backgrounds that influence and shape our cognitive capacities and lead to considerable variations across different cultural settings (Kitayama and Cohen 2007) leading to the necessity to introduce culture as independent variable into psychological experiments, however, with a number of caveats (Vogeley and Roepstorff 2009).

Many studies in the field of "cultural neuroscience" (Chiao and Ambady 2007) that included culture as an independent factor into functional neuroimaging studies addressed empirical indicators of culture such as language or nationality. For instance, based on Kelley et al. (2002) one of the early cultural neuroscience studies asked test persons to attribute and ascribe certain attitudes toward oneself as compared to one's own mother and other persons comparing a Chinese population and a so-called Western population



Social Neuroscience, Fig. 1 This figure illustrates three different distinctions that should be considered in the domain of social cognitive neuroscience. These include (1) the distinction of self-other-differentiation and self-other-exchange as the different "references," (2) the distinction of intuitive, pre-reflexive, automatic and inferential, reflexive, controlled processes as different "levels," and (3) the distinction of cultural universality and cultural diversity

(Great Britain, USA, Australia, and Canada). Ascription of mental states to oneself and to their own mothers resulted in the common activation of the medial prefrontal cortex across the conditions in the Chinese population, but revealed a distinct pattern of activation in the Western population (Zhu et al. 2007), leading to the conclusion that the different populations process information about themselves and their mother differently. Different religious experiences were studied by Han et al. (2008) that resulted in a differential activation again of the medial prefrontal cortex during self-referential processing in nonreligious and Christian participants (Fig. 1).

Neural Mechanisms of Social Cognition

These concepts and observations lead us to a consideration of the underlying neural mechanisms. The empirical findings cited above should not lead to the neo-phrenological impression that the medial prefrontal cortex is "the" social cortex of the brain that is always specifically recruited during social cognition. This would imply a "reverse inference" that tries to infer the functional role from the localization of brain activation. This, however, is only possible if the brain region is selectively and specifically recruited only during certain cognitive tasks (Poldrack 2006). As was shown in a meta-analysis this is not the case for the medial prefrontal cortex that is involved in a rich variety of different cognitive tasks (Van Overwalle 2009).

The functional role has to be identified instead as a basic process that can be understood as a common denominator of the variety of different cognitive functions recruiting this region. In the case of the medial prefrontal cortex, it was suggested that its essential function is to contribute to "inexact, probabilistic, internally generated" cognition (Mitchell 2009). This is intriguing as it nicely corresponds to the distinction introduced by Heider (1958) on "person perception" that is characterized by an inherent ambiguity and uncertainty as opposed to "thing perception" that can be understood deterministically.

Another strategy has been to search for the networks of activated brain regions and not only single regions. Social neuroscience has revealed essentially two different systems recruited during social cognitive processes as follows: (1) the "social brain" or "mentalizing" network including essentially the anterior medial prefrontal cortex, the temporoparietal cortex and superior temporal sulcus, and the temporal pole (Frith and Frith 1999; Adolphs 2009), and (2) the so-called human "mirror neuron system" covering superior parietal and premotor regions (Rizzolatti and Craighero 2004). However, it is still an open debate that needs more thorough empirical research dedicated to this research question: What could be the differential functional roles of both systems? One plausible suggestion is that as soon as the attribution of mental states to others is involved the mentalizing network is activated, whereas the

mirror neuron system is recruited when a real or virtual motor component is involved, for example, in actions, simulations, or imaginations thereof (Vogeley et al. 2004; Keysers and Gazzola 2007; Wheatley et al. 2007). Another suggestion, that does not necessarily contradict the first view, assumes that the mirror neuron system correlates with early stages of social cognition such as the detection of motor expertise and might putatively also underlie the fast processing of "first impressions" in social encounters that are generated on the basis of facial expressions or gestures. In contrast, the social neural network is recruited during comparably "late" stages of evaluation of socially relevant information (Santos et al. 2010). Social cognition appears to constitute a "natural kind" of our cognitive capacities that are characterized by "the dependence on a qualitatively distinct class of mental representations" (Mitchell 2009). Seemingly different cognitive phenomena (including thinking about oneself, accessing one's attitudes, experiencing emotions, inferring other person's mental states, etc.) have in common the characteristics of "fuzzy," probabilistic, and internally generated cognition, and on a neural level they share the same substrate, the medial prefrontal cortex (Mitchell 2009).

Notably, these key regions of the social neural network have also demonstrated to be active during the so-called resting states or baseline conditions that are characterized by the absence of any external instruction of an experimenter. This specific pattern of distribution of baseline activation has been identified as the so-called default mode of brain function or default network and was first studied by Raichle et al. (2001). Meta-analytical studies demonstrate a significant overlap between the social neural network and the default network (Buckner et al. 2008; Schilbach et al. 2012). Intriguingly this default network can be observed in humans irrespective of the task they are involved in and the methodology with which brain activity is measured and is also observed in other mammals (Vincent et al. 2007) and can, thus, be considered a neurobiologically universal building principle of mammalian brains.

This empirical observation of the overlap of both systems stimulates the speculation that one major cognitive function of the neural default network could be in fact social cognition which conversely implies that humans have a disposition for social cognition that is reflected in this default network. This convergence supports the hypothesis that this disposition for social cognition is neurobiologically instantiated and can be assumed to be disturbed during disturbances of social cognition. An even more ambitious move would be to assume that the default network is a neurobiological universal in humans and that social cognition is its key function. This would allow to conclude that social cognition itself is a universal cognitive capacity in humans. Notably, this is in concordance with the proposal of Michael Tomasello (Tomasello et al. 2005) who suggests that social cognitive capacities were a prerequisite for the development of human culture in a universal sense and were relevant for the development of the whole genus of *Homo sapiens*. According to this plausible proposal, social consciousness is what makes us human, and social cognitive neuroscience studies the neurobiological mechanisms that underlie these specifically human cognitive capacities.

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Social Perception

▶ Attribution/Attribution Theory

Social Psychology

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Related Terms

Group dynamics; Group processes; Interpersonal relationships; Social cognition; Social influence processes; Sociological psychology; Symbolic interactionism

Description

By Gordon Allport's classic definition, ▶ social psychology is the scientific attempt to understand and explain how the thought, feeling, and behavior of individuals are influenced by the actual, imagined, or implied presence of others (Allport 1954). This definition has been influential and instructive for researchers' partitioning of the field at many stages of its development from the earliest defining works of Ross and McDougall in 1908 through the conceptual and methodological pluralism of contemporary researchers. The attributes Allport chose as descriptors of the field also summarize a significant portion of current work, including cognitive models of attitude change, links between emotional response and aggressive behavior, interpersonal interaction in close relationships, and the implications of counterfactual thinking, each respectively corresponding to components of the classical definition (Gilbert et al. 1998).

Some areas of inquiry have fluctuated in the amount of attention accorded by researchers. For instance, studies of automaticity and the influence of the unconscious in social interaction are currently impactful in the literature, though scarce in earlier decades, especially during the periods dominated by behaviorist perspectives. Other topics have been important substantive areas within the field since its organization at the beginning of the twentieth century.

Stereotyping, prejudice, and discrimination are phenomena that remain current despite a relatively long history of investigation – a 1934 study by LaPierre famously reported a lack of strong correlation between self-reported attitudes and behavioral measures of discrimination. This finding led to an intense effort to understand the conditions under which attitudes and relevant behavior would correspond in a predictable way (Eagly and Chaiken 1993). Modern researchers address such phenomena with concepts such as implicit attitudes: Evaluations of people or other objects that predict behavior yet cannot be unexpressed by the individual. In settings from the courtroom to neighborhood backyards, implicit attitudes induce changes in judgment of others outside of awareness, either of the subject or object of the prejudice. While it is clear that implicit attitudes can have a negative impact on interpersonal interactions in matters of prejudice, other examples illustrate the adaptive value of nonconscious processes: Research in sexual attraction and mate selection shows that males tend to favor a particular waist-to-hip ratio of female partners despite the fact that they are not aware of the preference either during or subsequent to mate selection. This preference represents an implicit preference for body types most likely to bear reproductive success, and therefore the implicit attitude that drives this favoritism serves an adaptive utility that the conscious mind is simply not aware of in most situations (Tooby and Cosmides 1992).

Recently, demonstrated effects such as these have lead to some controversy over exactly how "smart" the unconscious process is and under what conditions nonconsciously driven behaviors are adaptive. For instance, the unconscious may have adaptive advantages in addressing some problems (e.g., optimal mate selection or adjusting attention appropriately to external stimuli), yet be wholly inappropriate for others: Driving down an unfamiliar road is best suited for conscious processes. Although psychologists have been aware of the impact and relevance of the unconscious since before the work of Freud, ascertaining properties of interest such as the amount of information that can actually be communicated via subliminal perception and its ultimate impact on attitudes and behavior change is an effort undertaken with enthusiasm by modern researchers (Hassin et al. 2005).

In addition to the content of study, a defining factor of the social psychological endeavor is the array of methodologies employed by researchers in the discipline. These methodologies are rooted in the rules of scientific observation, experimentation, mathematical and statistical analysis of data, and the scientific exposition of results when communicating to others in the field. Recent methodological developments include the use of meta-analysis to aggregate studies and estimate effect sizes across a wide variety of contexts, the use of structural equation modeling to assess the correlational structure of variables and factors in studies involving many interrelated variables, such as is common in personality research, and computer simulation to model a sequence of many events or interactions over a period of time, as in studies of the development of emergent segregation effects in housing due to group-based preferences (Reis and Judd 2000). The methodologies employed are not topic specific, and the field has generally benefited from multimethodological approaches in understanding a variety of phenomena from the impact of group-level pressures toward conformity in political decision-making to the most effective attributes of successful advertising campaigns.

Self-Identification

Social psychology operates within the scientific tradition of objective, replicable methodologies and the systematic accumulation of knowledge and is therefore termed a science by its practitioners (Campbell and Stanley 1963; Campbell 1988).

Phenomena within the realm of social psychological interest are generally observable, measurable, and replicable. For instance, the impact of a conceptual prime, even a nonconsciously administered one within studies of automaticity, may be scientifically assessed by observing

the subsequent behavior of the participant: An experimental manipulation of a prime such as describing the behavior of an elderly vs. athletic person can induce subsequent observable differences in participant behavior such as walking speed – participants are more likely to take longer to walk down the hallway if they received the elderly prime. Although the mechanism of the impact of the prime is thought to be contained in the mind and is by nature unobservable, the difference in the behavioral outcome is measurable and therefore communicable to other researchers and amenable to replication efforts in other laboratories (Hassin et al. 2005). Other examples of observable psychological effects include the impact of attitudes on behavior such as the increased likelihood of purchasing of luxury products like candy bars, the impact of persuasion on attitude change and resultant behavior such as voting for Democrats rather than Republicans, and the impact of group membership on usage of stereotypes as operationalized as differences in judgment or impression formation and the ability to detect prejudice and social discrimination (Eagly and Chaiken 1993). Despite the varying objectivity of some of the processes involved in many of these effects, all have been investigated utilizing one or more of the following methodologies: laboratory experimentation, content analysis of historical documents, survey experimentation and analysis, and correlational and field methods. All effects such as these are open to disconfirmation in replication efforts (Campbell and Stanley 1963; Campbell 1988).

Ultimately, the research endeavor is termed scientific due to the ability of researchers to communicate, amend, and/or contradict earlier findings and interpretation, thereby advancing theory and understanding of the phenomena of interest to subsequent researchers. Whereas religions tend to draw knowledge and understanding of the world from static sources of authority (e.g., holy books), the body of scientific knowledge is dynamic in nature and always susceptible to revision, even after extremely long periods of success (e.g., Newton's understanding of gravity).

Characteristics

The focus on the interaction between external, social causes of behavior, and internal, psychological causes of behavior is the heart of the distinction between social psychology and other related disciplines such as psychology and sociology. Researchers in psychology as a whole generally focus on phenomena intrinsic to individuals such as biological processes of the brain, sensation and perception, analyses of genetic relationships to behavior such as learning, and other purely psychological characteristics such as intelligence. On the other hand, sociological researchers generally focus on group-level phenomena such as population distribution and the successes and failures of social and political movements. In short, social psychology distinguishes itself from these fields though its focus is on social processes both as causes and effects of individual psychological phenomena. It is the interaction of the individual- and group-level variables that is of most interest to social psychologists.

Social psychology is practiced within both the psychological and sociological traditions. The subdisciplinary differences are evident in conceptual focus: Sociological social psychology draws its perspective from theories such as the ▶ symbolic interactionism of George Herbert Mead (Blumer 1969) and emphasizes the influence of individual-level variables on macroscopic social analyses in studying topics such as social structure and group dynamics. Psychological social psychologists place greater emphasis on the impact of social context on individual-level variables in studying effects such as social influence, group perception, and attitude change. In psychological social psychology, the theoretical basis of these and other effects have shifted often over the last decades with emphases stemming from functionalist, behaviorist, attributional, social cognitive, and currently multimethodological, polytheoretic approaches. Methodological differences are also present between the subdisciplines: Sociological social psychologists are more likely to use sociometric data, unstructured interviews, social

surveys, observational techniques, and archival and qualitative data analytic research methods, while psychological social psychologists are more likely to rely on experimental methodologies in their mode of inquiry. Importantly, professional publication outlets and professional society memberships for each of the subdisciplines are largely nonoverlapping. However, despite differences in theoretical foundation as well as methodology, social psychologists from both traditions share interest in largely the same domain of human behavior: the interaction of the psychology of the individual with the social environment. The differences may be seen as a matter of emphasis rather than kind: Whereas psychological social psychologists give primacy to the individual's psychology as shaped by the social environment, sociological social psychologists give primacy to the social construction of self, as shaped by group-level differences. The differences between the subdisciplines may amount more to differences in the theoretical training that researchers receive to address and explain the same basic behavioral phenomena than substantive content boundaries between sociology and psychology.

Relevance to Science and Religion

The discipline of social psychology takes for granted that the appropriate method of inquiry is scientific in nature. While religious methods of inquiry are usually more subjective by primarily relying on introspective self-report, scientific social psychology relies on methods that are objectively verifiable. Even studies of cognition or emotion ultimately use behavioral variables as indicators of "black box" contents – in addition to physiological or observational measures, self-report instruments such as questionnaires and surveys of experience are subject to analyses of reliability and validity. In short, the essence of the scientific aspect of social psychology is that study results must be replicable at other times by different researchers in different laboratories with different participants. External peer review of results and interpretation is often used to ensure that studies entering the literature meet the criteria of high scientific rigor and substantive contribution the field.

However, social psychologists acknowledge that there are many questions important to the human experience that is not answerable with this sort of approach. It is taken for granted that scientific methodologies cannot address the myriad of moral issues surrounding the determination of ethical practices, goals of research, and applications of findings. For instance, while it may be possible to assess the potential risk of a human or animal participant in a particular research project, weighing this risk against the potential benefits of the research to society is a value judgment that in some cases will be a cause of disagreement between researchers and disciplines or between the scientific and nonscientific communities. These roots of these values lay more within the domain of religion, or more generally, philosophy, rather than the scientific method. However, what current scientific practices can do is objectively study the effectiveness of policies and practices in reaching goals driven by these values. For instance, a social psychological analysis of interpersonal relationships may find correlates of love and friendship but cannot answer the moral questions about whether there is a need for love and friendship in order to live an objectively fulfilling life. Furthermore, the primarily sociological processes by which people in groups come to consensus on the answers to these moral issues and the primarily psychological process for each person deriving their own answers within the social context are both within the domain of social psychological inquiry; however, the content of these moral issues is largely beyond the scope of the scientific endeavor as it now stands.

Sources of Authority

The root authoritative sources in social psychology are textual, and found within peer-reviewed journals. Articles that are cited by others' work as foundational for future research endeavors are considered more authoritative as indicators

of the current direction of the field. Individual social psychologists gain authority by publishing frequently and/or having their publications frequently cited by other researchers. Largely influential lines of research are often synthesized in book form, which may or may not be peer reviewed, but will often consist of a collection of chapters assembled by an editorial team. The lead investigators are more likely to be invited to edit or publish textbooks and speak at major conferences; these contributions are also cited by other authors, adding to their influence.

Specific publications of historical and current interest in defining the field include *The Principles of Psychology* (1890), by William James, as important to the field of psychology as a whole, and his chapter on the Self continues to be influential in current social psychological considerations. As symbolic interactionism is a guiding theory in sociological approaches to social psychology, the work of George Herbert Mead is considered authoritative, as are other works summarizing his perspective; Blumer's *Symbolic Interactionism: Perspective and Method* (Blumer 1969) is a prominent example. Fritz Heider's *The Psychology of Interpersonal Relations* (1958) was and continues to be an inspirational source for research on cognitive consistency, which culminated in many ways in the massive 6-editor, 84-chapter volume *Theories of Cognitive Consistency: A Sourcebook* published in 1968. Susan Fiske and Shelley Taylor's advanced text *Social Cognition* (1991) emphasized the importance of the processes involved in perceiving, remembering, and interpreting information about ourselves and others. All editions of *The Handbook of Social Psychology* (first edition published 1954, most recent edition, 1998 (Gilbert et al. 1998)), which summarize recent research in the most important and active subfields of social psychology, are considered important summary sources of authority.

Ethical Principles

Several experiments in the 1960s and 1970s such as those by Stanley Milgram on the social conditions of obedience and Phil Zimbardo on the impact of social roles on prison behavior have often been cited as examples of the need for the enforcement of ethical principles in the proper use of human participants in research. For instance, Milgram's studies asked the basic question, "Under what conditions would people obey authority figures when ordered to harm an innocent person?" Even though no physical harm was administered during his experiments, participants believed that they were administering painful (and in some cases hazardous) electric shocks onto a fellow participant. Understandably, this state of affairs was the cause of great psychological distress among the participants, even after they were informed following the study that no shocks were actually given. Zimbardo's methodology required the confining of participants within a simulated prison setting and is another example cited by critics who question whether the benefits of scientific knowledge gained in the study outweigh the psychological and physical risks of the participants involved. Zimbardo found that the situational characteristics of the social and physical environment were sufficient to elicit both extremely aggressive and submissive behaviors (in the case of guards or prisoners, respectively) that are often attributed to personality characteristics. The psychological and physical trauma reported by the participants in these and some other studies caused researchers within and outside of the social psychological community to question the methods by which these risks are weighed against potential benefits to society and therefore reevaluate the guidelines that protect participants from psychological and physical harm due to research participation.

An important guide used by social psychologists is the American Psychological Association code of ethics first published in 1953 and most recently revised in 2002. Relevant ethical principles guiding the use of human subjects include informed consent (participants should be notified of the nature of the research undertaking, including their right to decline to participate, or withdraw at any time before commencing with the study), restrictions on deception (researchers

will not conduct a study that willfully deceives the participant unless it can be determined that the use of such techniques is justified by the scientific, education, or applied value that could not be obtained through nondeceptive measures), and debriefing (researchers provide a prompt opportunity for participants to obtain appropriate information about the nature, results, and conclusions of the research, and they take reasonable steps to correct any misconceptions that participants may have had). These and other principles guide researchers in contributing to the literature in a uniformly ethical manner, as defined by leaders in the psychological community (Rosenthal 1994).

Key Values

Researchers in social psychology value knowledge of social psychological processes that can be communicated and verified with others in accordance with the general rules of scientific investigation. Social psychologists utilize the scientific method to develop and validate the theories they develop, creating new knowledge that can be reliably applied to relevant social situations. Often, the most valued and influential findings are those that are particularly nonobvious or counterintuitive. An example is the fact that a participant will often say that he thought a task was more enjoyable if he was paid less to complete it. The explanation is derived from the literature on cognitive dissonance: Enjoyable tasks are often done with no reward required, so a participant is more likely to rate a task as enjoyable if he was paid a nominal amount to complete it. That is, the cognitive dissonance of completing an unenjoyable task for little reward is reduced by nonconsciously altering perception of enjoyment of the task itself. The scientific nature of the investigation is also valued as a defining feature of the discipline, so efforts to advance methodology, measurement, statistical analysis, as well as more efficient publication and communication methods (e.g., electronic journals) continue to be actively sought.

Conceptualization

Nature/World

Social psychological conceptions of nature and the world include both environmental stimuli such as particular sights and sounds (assessed via sensory organs) and more endogenous mental stimuli such as particular emotions and thoughts (often as self-reported by participants to researchers). From a macroscopic perspective, the concept of nature and the world implies the totality of individual and social experience as it is to be understood through scientific means.

Human Being

In general, this is defined as the particular type of animal known as *Homo sapiens*, largely as they exist presently. This is the primary subject of inquiry by social psychologists, although some researchers use animal models to investigate certain aspects of behavior that are not amenable to testing with humans. For instance, some aspects of sexual behavior are more easily studied using nonhuman subjects; also, social facilitation, the idea that the presence of others will increase physiological arousal and therefore increase the probability of the psychologically dominant response to a problem, has been demonstrated in humans as well as other animals such as mice and cockroaches.

Life and Death

Human life and death are generally explained through social and biological processes. Life is produced by sexual behavior which is governed by a variety of social norms and biologically driven tendencies. Death inevitably occurs when the biological organism can no longer maintain normal functioning.

Reality

Reality can be defined both subjectively and objectively. Objective reality is governed by social agreement of the interpretation of physical phenomena. For example, many people agree that the color of the sky is "blue," and therefore that perception is objectively real. On the other hand, subjective reality is governed by an individual's

personal interpretation of internally derived physical and mental phenomena. For example, when one experiences the physical pain of a paper cut, or feels depressed, those perceptions are subjectively real, as no other person can personally corroborate the experience. Nonreality is generally a condition where an individual's experience does not correspond to the majority of others' experience when circumstances are such that a meaningful comparison is possible. For example, if one person believes that there is a conversation going on behind him, even though it is observed that no other people around are speaking, the perception would then be judged as nonreal.

Knowledge

Knowledge is generally considered as information, either cognitive or affective in nature, which is typically gained through any of several learning processes. For instance, learning can be nonconsciously attained through modeling behavior, as is common for young children when learning social rules from their parents and roles from their peers. Alternatively, knowledge can be obtained in a very strategic, conscious manner, such as is often done by students attempting to memorize material for an upcoming exam. Social psychologists often describe knowledge and the interrelationship between different knowledge structures in terms of individual schemata, or organized cognitive modules. This understanding of the interrelatedness of knowledge is necessary in accounting for a variety of effects in studies of memory, impression formation, and role-based behavior.

Truth

Truth qua the objective set of accepted facts comprising scientific knowledge of social psychology is generally considered to be the object of agreement between perceivers. This position is closely related to consensus epistemological theories, and the critical qualification is that relevant perceivers are professional researchers indoctrinated in scientific methods and hold compatible understandings of relevant substantive topics. From a methodological perspective, a social psychological effect is "true" to the extent that the finding can be replicated by other researchers in other places at other times. This applies not only to effects such as an increase in aggressive behavior under certain social conditions but also to social psychological understandings of the effects themselves. For instance, the truth of the frustration-aggression hypothesis – the idea that feelings of frustration are likely to induce aggressive behavior – has been progressively uncovered since its first expressions as derived from psychoanalytic theory. The effort to reduce the uncertainty of the extent and conditions under which the effect would hold true represents the scientific endeavor to seek the truth of the effect, thereby progressively solving the mystery inherent in the previous uncertainty regarding the phenomena (see below).

Social psychologists also accept truth qua subjective personal or interpersonal experience. That is, personal experiences such as the qualitative nature of diverse emotions or spiritual awakenings may be accepted as true, yet beyond the bounds of current scientific modes of investigation or measurement techniques. Therefore, an experience may be accepted as true, insofar as an individual maintains an honest self-perception of psychological phenomena, yet outside the bounds of the accepted social psychological truth, as constructed by professional leaders in the field.

Perception

In its most general form, perception is the basic set of mental operations that brings subjective meaning to otherwise objectively meaningless stimuli. That is, while our sense of hearing can enable us to discern a wide variety of sounds, perceptual processes that lead to meaning are inherently psychological in nature and are therefore susceptible to influence from other psychological phenomena such as emotional state, cognitive complexity, motivation, and social context. In this way, although two listeners may objectively hear the same stimuli, some will perceive greater intricacy and beauty in a composition by Mozart, and this judgment will be impacted by social factors such as cultural

norms or social learning. Furthermore, these perceptual effects are often nonconscious and can often be developed through practice and training.

Time

Time is usually conceived as an objective aspect of reality, governed by regular planetary motion (e.g., the rising and setting of the sun). Different aspects of time are often implicit in social psychological theories and phenomena. For instance, theories of attitude change require that in order for persuasion to occur, in some conditions, communication messages must be delivered and elaborated on over a period of time.

Consciousness

Consciousness is often contrasted with the nonconscious and has been studied in terms of influences on affect, cognition, and behavior. John Bargh specified the "four horsemen" of automaticity – distinguishing features that together determine the nature of experience as being conscious or nonconscious: awareness, efficiency, intention, and control. Though social psychologists are far from a complete understanding of the nature of consciousness, the construct has been useful in understanding a variety of effects of interest to social psychologists. For instance, influential models of persuasion differentiate between automatic and controlled processes by which attitude change can take place: The persuasion that occurs when a person consciously thinks about an issue to decide which presidential candidate to vote for will be more durable and predictive of behavior than the persuasion that occurs when a person is nonconsciously influenced by subtle cues in a persuasive message such as attractive appearance or likeability.

Rationality/Reason

Rationality and reason are normally contrasted with more emotive or affectively based processing. Rational processes are often associated with maximizing the utility of actions to bring an individual pleasure or closer to a desired goal. Usually, such processes are considered to be conscious and cognitively based.

Mystery

Mystery describes aspects of social psychological phenomena that have not yet been thoroughly investigated in a scientific manner. That is, mystery is inherent in gaps in the field's understanding of how the thought, feeling, and behavior of individuals are influenced by the actual, imagined, or implied presence of others. Areas such as the extent of the impact of nonconscious perception, the interaction of psychological and social forces to induce macroscopic effects such as war, and a complete understanding of the characteristics of successful romantic relationships are still being investigated by modern researchers. The collective lack of understanding of these and other effects represents the mystery that the scientific process is designed to progressively reduce.

Relevant Themes

Social psychologists also study religions as instances of social groups. Therefore, aspects of the behavior of individuals identifying with a religion will have commonalities with other social groupings such as those based on race, ethnicity, or nationality. Effects such as in-group favoritism and out-group homogeneity apply generally to members of groups, including those defined by religion.

It should also be noted that the study of religious groups in particular has been useful in understanding more general aspects of cognition and behavior. For instance, one of the most influential theories in social psychology, Leon Festinger's theory of cognitive dissonance, was largely inspired by his study of a UFO cult in the 1950s and attempts to explain increased socialization within the group following the failed prophesy of extraterrestrial contact. The inconsistency between the prophesy and the resultant reality produced a dissonant state that group members were motivated to reduce. One mechanism of reducing this dissonance involved the seeking out of additional social support by recruiting other members into the group. Therefore, the counterintuitive finding that the group

members increasingly sought others' participation following the failure of the prophesy can be explained by the relatively simple construct of motivated dissonance reduction.

Social psychologists bring a unique perspective to the issues in the science and religion dialogue due to the fact that they incorporate both a scientific investigation of subjective psychological experience, as well as the corresponding objective social phenomena.

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Social Scientific Study of Religion

▶ Psychology of Religion

Social Stigma

▶ Deviance and Social Control, Sociology of

Socialization

▶ Education, Sociology of

Socialization Process

▶ Education, Sociology of

Sociological Psychology

▶ Social Psychology

Sociology

▶ Ecclesiology
▶ Ethnology
▶ Functionalism
▶ Science and Scientific Knowledge, Sociology of

Sociology and Religion

▶ Religion, Sociology of

Sociology of Communication

▶ Popular Culture and the Mass Media, Sociology of

Sociology of Culture

▶ Popular Culture and the Mass Media, Sociology of

Software Design

▶ Software Engineering

Software Development

▶ Software Engineering

Software Engineering

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Related Terms

Computer science; Software design; Software development

Description

Software engineering is a discipline that attempts to deliver fault-free software on time and within budget to meet the needs of the customer. A more formal definition from IEEE (IEEE Standards Collection: Software Engineering 1993) is as follows:

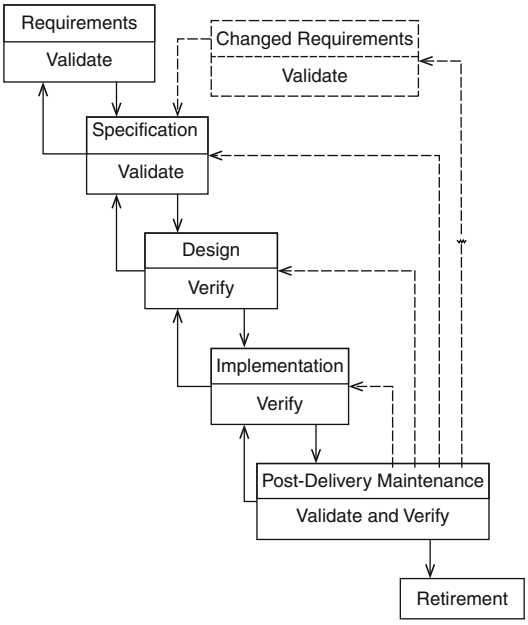
Software engineering: (1) The application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software, that is, the application of engineering to software. (2) The study of approaches as in (1).

There are a variety of software development life cycle (SDLC) models currently in use by professional software engineers. The first SDLC model was the Waterfall Model, but this model proved to be inflexible, as it is not conducive to changes in customer requirements or faults discovered late in the SDLC. The Waterfall Model, as originally proposed in 1970, consists of the following sequence of phases:

- Requirements (The customer's needs are determined.)
- Specification (A formal document enumerating product features and system constraints is composed.)
- Design (Architectural Design: The modules of the system are determined; Detailed Design: The data and algorithms are specified.)
- Implementation (The algorithms are translated to code.)
- Unit Testing (Individual modules are tested for correctness.)
- Integration Testing (Modules are combined and tested to check if system requirements are met.)
- Postdelivery Maintenance (Errors discovered after delivery are corrected; environment changes requiring adaptive maintenance are performed; improvements or enhancements known as perfective maintenance are implemented.)
- Retirement (The product has become obsolete or too cumbersome to maintain, so it is removed from operation.)

A more modern depiction of the Waterfall Model (see Fig. 1) contains feedback loops and often appears without testing phases. The omission of the testing phases emphasizes non-execution-based testing (Walkthroughs and Inspections) and/or execution-based testing should take place during every phase of the SDLC. Notice the terms validate and verify in the model. As originally defined by Boehm, validation is a customer-oriented activity where the developer asks the question "Are we building the *right* product?" Meanwhile, verification is a developer-oriented activity; the relevant question is "Are we building the product *right*?" It is interesting to note that even though the Waterfall Model has several shortcomings, the model or one of its adaptations is still widely used in industry (Sommerville 2007). The reason for its usage is probably due to the fact that management likes the model, because it requires developers to create a project plan with milestones and deliverables announced early in the SDLC.

The Rapid Prototyping Model was developed to counteract the shortcomings of the Waterfall



Software Engineering, Fig. 1 A modern Waterfall Model (Adapted from (Schach 2007))

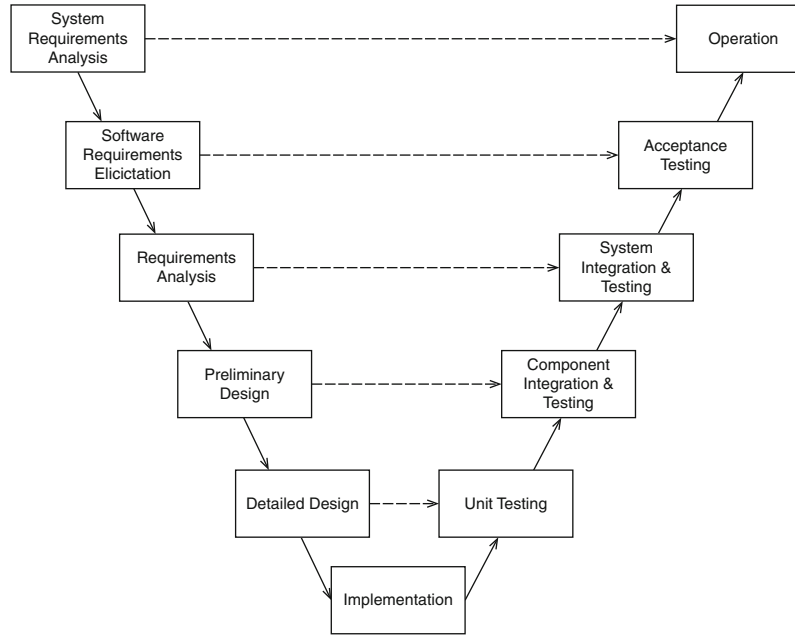
Model. In particular, this SDLC model prescribes that developers first build a rapid prototype to elicit customer requirements. The prototype is often a mock-up of the proposed graphical user interface. Because the prototype is rapidly constructed without attention to design details, it should be thrown away. The phases of the Rapid Prototyping Model match those of the Waterfall Model except that prototype construction and customer feedback replace the Requirements Phase. The major advantage of the Prototyping Model over the Waterfall Model is the early customer feedback because, with feedback, the final product is more likely to satisfy the customer's requirements. However, the Prototyping Model has not proven to be successful in all cases.

Another adaptation of the Waterfall Model that clearly demonstrates the importance of testing is the V Model (see Fig. 2). In particular, the model illustrates that different types of test cases should be written in the early phases of the SDLC model as opposed to after implementation. For example, acceptance test cases should be written during requirements elicitation. Similarly, integration tests can be written during Architectural or Preliminary Design, and unit tests are easily constructed when performing Detailed Design.

Another important SDLC model is the Spiral Model developed by Barry Boehm in 1988 (Boehm 1988). The illustration of the Spiral Model is perhaps the most complex of all SDLC models, as it encompasses all of the life cycle models (e.g., Waterfall, Rapid Prototyping, ▶ Evolutionary Prototyping) of its time. The Spiral Model is especially important, because it was the first SDLC model to promote ▶ risk analysis. A simplified way of thinking about the model is to consider it as the Waterfall Model with each phase preceded by risk analysis (Schach 2007). However, the actual model contains a spiral drawn over four quadrants, and each quadrant contains a guideline for development. In particular, software developers should first determine project objectives and consider alternatives; second, they should evaluate the alternatives and resolve the risks, if possible; next, they should perform the activities associated with the phase in question, including verification; and finally, they should plan for the next phase. The major tenet of this model is software developers should perform risk analysis, and if the risks are too great, a project should be abandoned.

In today's world, the majority of software developers support an incremental, iterative approach to software development. That is, in order to better fulfill the customer's needs, software is constructed in increments with customer feedback at the completion of each increment. However, even when incremental development is employed, there are two widely differing schools of thought on how to best produce a software product. The conflicting models and associated guidelines are known as the disciplined or plan-driven approaches versus the agile methodologies (Boehm and Turner 2004).

A comprehensive plan-driven method is the Rational Unified Process (RUP) (Jacobson et al. 1999), which was developed by Booch, Rumbaugh, and Jacobson. Unlike other software development life cycle models, the RUP model contains both a vertical axis and a horizontal axis

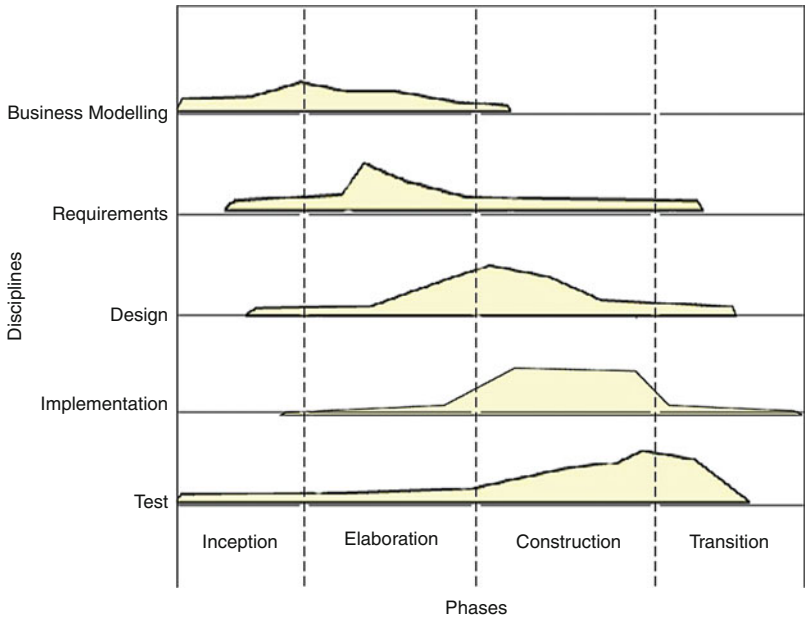


Software Engineering, Fig. 2 The V Model

(see Fig. 3). The vertical axis specifies the disciplines (formerly known as workflows), which are similar to the phases of the Waterfall Model, whereas the horizontal axis denotes the actual phases of RUP. There are five major disciplines: Business Modeling, Requirements, Design, Implementation, and Testing. Other disciplines include Deployment, Configuration and Change Management, Project Management, and the Environment. At the same time, there are four phases: Inception, Elaboration, Construction, and Transition. During any one phase, developers may perform activities associated with multiple disciplines, although one or more disciplines usually predominate a phase. (Fig. 3 depicts a typical project; different projects would have different graphs.) The disciplines precisely describe the activities that software developers undertake when building software applications. In other words, developers follow a sequence of steps to implement a deliverable, but often iterate the steps in order to improve the documentation, correct errors, or adapt to changing requirements. In contrast, the phases of RUP correspond to management goals such as well-defined schedules with deliverable dates for documentation such as the Vision Statement, the Software Requirements Specification (SRS), the Design Document, and Test Cases. Note: Nowadays this model is usually referred to as simply the Unified Process (UP).

Another thorough plan-driven method is the Team Software Process (TSP) (Humphrey 2000), which was developed by Watts Humphrey at the Software Engineering Institute (SEI). This method prescribes activities for individuals on a software development team based on their roles, and is meant to be used with Humphrey's earlier Personal Software Process (PSP). Note that PSP guidelines were written by Humphrey in response to companies being unable to reach acceptable levels of "goodness" in their processes as outlined in the original Capability Maturity Model (CMM). (See below for a description of CMM.)

An important skill for software engineers is the ability to model software systems. A modeling notation associated with RUP is the Unified Modeling Language (UML), which has become an industry standard. There are seven



Software Engineering, Fig. 3 Unified process

major diagrams of UML: the Use Case Diagram, the Class Diagram, Interaction Diagrams (the Sequence Diagram and the Communication Diagram, formerly known as the Collaboration Diagram), the Statechart Diagram, the Activity Diagram, the Component Diagram, and the Deployment Diagram. Most tools supporting UML allow users to draw Use Case Diagrams, which specify the functionality of the system from the user's viewpoint; Class Diagrams, which denote the attributes and methods of each class and also illustrate the relationships and dependencies among classes; and Sequence Diagrams, which denote the time-ordering of messages between the objects of a software system. Although UML is normally associated with RUP, software engineers employing any other method may choose to model their software using one or more of the UML diagrams. For those applying agile methods, the Class Model and Sequence Diagrams would be the most likely choices.

The philosophy behind agile methods is best stated in the Agile Manifesto of 2001 (Beck et. al 2001).

- *Individuals and interactions* over processes and tools
- *Working software* over comprehensive documentation
- *Customer collaboration* over contract negotiation
- *Responding to change* over following a plan

The Manifesto itself is often misunderstood. Sometimes software developers will state that they are following an agile process, because they do not bother with documentation. However, all agile methods require documentation; the documentation produced is just different when compared to the deliverables of more traditional, plan-driven methods. Perhaps a better way to state the agile enthusiasts' point of view is the following: The most important objective of a software development team is to deliver a working product that meets the customer's needs. In other words, the developers should not become bogged down in documentation or become overly concerned with adopting the newest process or tool. Their goals can best be met by interacting with the customer throughout the project and having the farsightedness to change an infeasible plan.

There are several agile methods, but the most popular are Scrum (Schwaber and Beedle 2001) and Extreme Programming (XP) (Beck 2004).

As stated above, in UML, the functionality of a software system is expressed by the developer by drawing use case diagrams and a corresponding description for each use case. In contrast, in agile methods, customers record their requirements as user stories on index cards. An important characteristic of agile methods is the time boxing associated with incremental development. In particular, a software development team works a specified time period before displaying or delivering an increment to the customer. In Scrum, a typical increment, also known as a sprint, is about a month, whereas in XP, the time period is usually about 2 weeks. With both methods, customers prioritize the requirements, thereby allowing them to view or interact with more important features earlier in the SDLC. A distinctive characteristic of Scrum is the Daily Scrum, a meeting lasting about 15 min in which each team member describes his or her progress, problems, and plans for the day. Extreme Programming is more disciplined than Scrum, as its developers prescribe 13 practices. Below, we describe two distinguishing features: pair programming and test-driven development.

In pair programming, one developer acts as the pilot or driver for the code, while the other member serves as the copilot or observer. The pilot controls the keyboard and is responsible for algorithm creation; in her role, she is said to have "tunnel vision." At the same time, the copilot looks for both syntax errors and logical faults; we also say that she is in charge of the "big picture," or, in other words, how the code being implemented fits into the overall product. Another one of the copilot's duties is to suggest when roles should alternate, as one developer may become tired, often with an associated degradation in performance. In agile teams, it is also recommended that individuals work with different partners occasionally, because pairs may become so accustomed to working together that the benefit of automatic reviewing of the algorithm and associated code is lost.

There are two testing activities associated with test-driven development: acceptance testing and unit testing. In acceptance testing, customers (perhaps with the help of developers) compose their own test cases. Note each test case represents a particular scenario, and the customer typically uses a tool with tables in which he or she enters various values representing input data, along with the desired results or output. Meanwhile, unit testing in XP is called test-first development, because developers write their test cases in code before any production code is written. Naturally, when the test cases are first executed, they fail. Then, the developers' strategy is to write "just enough code" for the test case to pass. Issues such as efficiency, readability, maintainability, and so forth are addressed later when the code is refactored.

It is important to note that there is really no best software development process (SDLC model plus associated guidelines) for all types of software applications. A process model should be selected based on the application domain including the degree to which requirements change, the size of the development team and the experience of its members, and the culture of the development organization (Boehm and Turner 2004). In reality, there are times when a combination of the agile and plan-driven methods is actually the best approach to implement a software product.

When developing safety-critical systems, a plan-driven approach is usually more desirable. A safety-critical system is a software system that may result in injury, loss of life, or damage to the environment. An example of a safety-critical system is the software monitoring a nuclear power plant. Furthermore, formal methods, which are mathematically based techniques, may be employed. There are two major categories of formal specification languages: algebraic and model oriented. With an algebraic specification language, a system is first described in terms of its operations by providing a signature (the input and output types, known as sorts) for each operation. Next a collection of axioms describes the relationships of the operations. In contrast, with a model-oriented specification language, the developer builds a model of the system using mathematical constructs such as sets and functions. Another consideration when building safety-critical systems is verification techniques, which may include proofs of correctness.

A related issue to process models is team organization. Just as there are widely disparate software development paradigms, team models exist at both ends of the spectrum. The two most widely cited team models are the Chief Programmer and the Democratic Team, but there are many other models as well. Note that companies using a plan-driven method will usually have a hierarchical team structure, whereas agile teams prefer the Democratic model.

In the Chief Programmer Model, each team member has a role to perform with associated duties. For example, the Chief Programmer is both the team leader and the team manager. As the leader, the Chief Programmer constructs the system architecture, and is ultimately responsible for every line of code. There is also a Backup Programmer, who has the same qualifications as the Chief Programmer, and is capable of replacing the Chief Programmer if necessary. A person responsible for system documentation called the Secretary and several general programmers comprise the remainder of the team. The advantages of this model are specialization and the limited number of communication paths (due to a hierarchy in interacting with the Chief Programmer). The major shortcoming of the model is finding personnel that can fit each of the roles, especially two people (Chief Programmer and Backup Programmer) who are excellent managers as well as established programmers.

Meanwhile, the Democratic Team or "egoless team" has no designated leader. Rather, this team structure often arises in a research environment, where all team members respect the knowledge that each individual brings to the table. In a Democratic Team, the code belongs to the whole team. Because there is no "finger pointing" when errors are discovered, Democratic Teams are said to be better at locating faults and often produce higher quality code. The disadvantage of the model is the number of communication paths, because as the number of team members increases, the number of communication paths produces a ▶ combinatorial explosion.

In today's global economy, team members are not necessarily colocated, rather they may have offices in different buildings, different cities, different countries, or even different continents.

Distributed teams offer specific challenges for software developers and management. For example, team members may have different technical backgrounds, come from dissimilar cultures, work in separate time zones, just to name a few concerns. Organizations are currently experimenting with modified team structures (including those with an agile leaning as reported in the 2008 Agile Alliance Conference).

Another phenomenon related to team structure is open source code. Nowadays, many software products are developed as open source, meaning that they are freely available on the World Wide Web. Usually there is a cadre of developers, but these primary developers allow others to suggest improvements and/or alter their code.

As mentioned earlier, CMM, which became S-CMM, was a process improvement and assessment model for organizations. Founded at the Software Engineering Institute in 1986, CMM described five levels of "goodness" and corresponding key process areas that an organization should follow, if it wanted to improve its process. The highest rating that a company could achieve was Level 5, which included two important imperatives: (1) a company should have a continual process improvement strategy in place and (2) a company should encourage innovative ideas and technologies. When a company's process was formally evaluated, it received a single rating. For example, a company might be following a key process area in Level 4 but only receive a Level 2 ranking. The reason for this discrepancy was the fact that all key process areas of a particular level and all levels below must be exercised to receive the higher rating.

In 2001, the Software Engineering Institute compiled the Capability Maturity Model Integrated (CMMI). This process improvement model has several advantages over its predecessor Software Capability Model (S-CMM.) First, it combines several different capability models including the Software Capability Model, the Systems Engineering Capability Model, and the People Capability Model into a single framework. Furthermore, with respect to software, the

CMMI actually has two models: the staged CMMI and the continuous CMMI.

For companies accustomed to applying S-CMM, the staged CMMI is especially attractive. Like S-CMM, a company must practice all key process areas at a particular level to achieve the associated ranking, and ranks range from 1 (Initial) to 5 (Optimizing). However, if a company is more interested in assessing specific key process areas, the continuous model may be more appealing. In particular, the continuous model specifies goals to achieve along with desired practices. Furthermore, when using the continuous model, an organization receives a collection of ratings corresponding to the key process areas of interest. For example, a company could work on the six key process areas in the category of engineering and receive a ranking for each. If using the staged model, only a single ranking for the entire organization would be given.

Self-identification

Science

The term "software engineering" arose in 1967 as a result of a NATO study group, and the first conference devoted to the topic was held the following year in Germany. The goal of the attending members was to prescribe a more disciplined approach to the development of software applications. In other words, the motivation for the term was practitioners and academicians should pattern software development after the older, more established subdisciplines of engineering. Although a laudable goal, software engineering is actually very different from traditional engineering. To illustrate this point, let us compare software engineering to the older engineering subdiscipline civil engineering. When building a bridge, a civil engineer can build a model before constructing the final product, whereas software is invisible. Furthermore, the civil engineer has a foundation of knowledge that was built on "thousands of years of experience" compared to a mere 40 years for the field of software engineering. Similarly, the public's expectations are different when comparing software to a bridge. For example, when using software applications such as operating systems or word processors, oftentimes the software will fail, and the customer has come to accept these defects as necessary evils of computer systems. However, if a bridge collapses, the public is much less forgiving. Another difference between bridge-building and software construction is the type of mathematics involved. Traditional engineers must use calculus, which considers continuous functions, whereas a software engineer applies the theories of discrete mathematics. In other words, a software engineer must consider all of the system states, which are discrete, that a software application may occupy. However, the paradox is there is no way for a developer to determine "all" the states or the ways that a computer application may be used; because, when computer applications are successful, customers ask for additional enhancements (perfective maintenance) or use the system in unexpected ways resulting in software failures requiring corrective maintenance.

Characteristics

This question was best answered by Frederick Brooks in his definitive essay "No Silver Bullet." That is, four characteristics of software engineering distinguish the discipline from the other sciences. Brooks describes each of these features in the following order: complexity, conformity, changeability, and invisibility. See the section "Science" for a discussion of complexity (number of discrete states in a system). Conformity means that software must comply with the requirements of a workplace or customer. These requirements may not be the most natural way to approach the problem making the developer's job more difficult than necessary. Changeability is also discussed under section "Science" in that satisfied customers often request additional features when they like a product. Furthermore, as the world, economy, and so forth change, software needs to be modified (adaptive maintenance). The invisibility of software compared to physical models in other sciences is self-evident.

Relevance to Science and Religion

For the majority of software engineers, there is little interest in the area of "Science and Religion." However, software engineers are interested in improving the lives of individuals. As an example, let us consider software used in the field of medicine. We all have heard of cases where a doctor predicts a patient will not recover or will only live for a limited amount of time, but the patient exceeds the doctor's expectations; oftentimes, there is no medical explanation for this occurrence. Those who believe in religion might say that the patient's experience is an "act of God." Software engineers build systems that help doctors to better predict the illnesses (e.g., cancer, dementia, etc.) that plague mankind. Such applications are known as diagnostic systems.

Sources of Authority

Conference and journal articles are one major source of authority for this discipline/subdiscipline. The major conference is the *International Conference on Software Engineering (ICSE)*, and the major journals are *IEEE Transactions on Software Engineering* and *ACM Transactions on Software Engineering and Methodology*. All of the published articles in these sources are peer reviewed. Two other sources of authority are the Special Interest Group on Software Engineering (SIGSOFT), which is sponsored by ACM, and the *Guide to Software Engineering Body of Knowledge* (also known as SWEBOK), which is sponsored by the IEEE Computer Society. There are also many IEEE Standards publications that target specific subareas of software engineering. Finally, another source of authority is the Software Engineering Institute (SEI), which originated in 1984 at the request of the U.S. Department of Defense. SEI publishes several white papers each year describing research conducted at the Institute. Note: This is not an exhaustive list of sources. For example, there are several other major conferences devoted to software engineering (e.g., *Fundamental Approaches to Software Engineering* (FASE)), as well as many well-respected conferences targeting subareas of the discipline (e.g., *International Conference on Requirements Engineering* (RE)).

Ethical Principles

The Software Engineering Code of Ethics (and Professional Practice) is comprised of a short version and a long version. The short version prescribes eight principles to which a software engineer should aspire, whereas the long version outlines specific examples for more guidance. In the discussion below, the principles are paraphrased, but the associated categories remain unchanged. Note: The categories are listed in the order of importance. In other words, if there is a conflict of interests, the principle with the lower number has priority.

1. Public: The foremost principle is software engineers must consider the interests of the public before all other concerns.
2. Client and Employer: The interests of the client and the employer should be considered when developing software.
3. Product: The original product and any modifications to the product after its initial delivery should meet the highest professional standards possible.
4. Judgment: Software engineers should adhere to both moral and ethical principles when making decisions in their daily jobs.
5. Management: Managers should foster an environment where both managers and engineers abide by the ethical principles when developing and maintaining software.
6. Profession: Software engineers need to demonstrate their ethical principles when dealing with the public. Furthermore, they should advance the knowledge of the public when they have opportunities to do so.
7. Colleagues: Software engineers should help their colleagues and give credit where due.
8. Self: Software engineers should continue to learn new techniques for software development, as information technology is a rapidly

changing field. Furthermore, software engineers should adhere to moral principles in their professional lives.

Key Values

In the Code of Software Engineering Ethics and Professional Practice, it states that software engineers should commit themselves to making the discipline a respected profession. Furthermore, they should always strive to promote the health, safety, and welfare of the public.

Conceptualization

Nature/World

Software engineers consider nature as the items in the world that are not necessarily associated with human beings. When developing applications, software engineers must consider the effects on the environment.

Human Being

The discipline of software engineering considers a human being to be a member of the human race or, in other words, a person (living or dead). The Software Engineering Code of Ethics states that a software engineer's primary responsibility is to the public. In other words, if there is a conflict of interests, the concerns of other human beings should be foremost.

Life and Death

Life is the beginning of existence for members of the plant or animal kingdoms, whereas death is the ending of this existence. However, the discipline of software engineering considers the concept of life as the steps in the development of a software application. (See the discussion of software development life cycle models in section "Description").

Reality

Reality refers to living or nonliving items that actually exist. Software engineers may build "virtual reality" systems, which are imaginary worlds simulated by computers. For example, users might like to imagine that they are playing particular sports or going to exotic vacation spots.

Knowledge

Knowledge is information gained through study and reasoning. The management of knowledge and knowledge engineering are both important to the field of software engineering. For example, knowledge management is a necessary requirement when building an expert system.

Truth

Truth is a fact that has been proven or, in other words, the opposite of a falsehood. Software engineers have a responsibility to educate the public about technology. A concern is some computer users are naïve or uneducated in basic computer literacy. For example, naive individuals may believe that all output from a computer application is correct or that all information on the Internet is true.

Perception

Perception is an individual's interpretation of a situation or a concept by using one of the five senses. A common perception among the public is a software engineer spends most of his/her time programming. However, the majority of software nowadays is developed in teams, where software engineers meet regularly with the customer and report to management. In other words, the job of software engineer requires excellent communication skills, and the activities in a typical day involve much more than programming (see discussion under section "Description").

Time

Software engineers define time as the duration of a period, measured in minutes, hours, days, and so forth, for an activity to be completed. They are especially interested in delivering software "on time." Like computer scientists, in general, software engineers must also consider the "run-time" of the algorithms that they use to solve problems.

Consciousness

Consciousness is an awareness of a problem or concept.

Rationality/Reason

Rationality is the ability to make the optimal choice, whereas reason is the action of considering alternatives. This concept is of major importance to software engineers. In fact, if one were asked to describe the requirements for the job of software engineer, the ability to reason might appear first. Two examples follow. First, when implementing a program, a software engineer must consider the trade-offs between how data is stored (a space issue) versus efficiency (runtime). Similarly, a software engineer must deliberate the price that a customer is willing to pay for a product versus the amount of time that it will take to implement the desired features. As a point in question, some features of a system might have to be implemented in a future release due to customer's time and cost constraints.

Mystery

A mystery is an occurrence or phenomenon with no logical explanation.

Relevant Themes

There are now several universities that offer degrees in software engineering. When compared to computer science degrees, software engineering degrees are more application oriented, whereas computer science degrees are more theoretical in nature.

In 2004, the Software Engineering volume of *Computing Curricula* designated ten knowledge areas: Computing Essentials, Mathematical and Engineering Fundamentals, Professional Practice, Software Modeling & Analysis, Software Design, Software Verification & Validation, Software Evolution, Software Process, Software Quality, and Software Management. Some of the topics in the knowledge areas coexist with topics in the Computer Science or Computing Engineering volumes of *Computing Curricula*.

Cross-References

- ▶ Algorithms, Computer
- ▶ Complex Systems
- ▶ Cyberethics
- ▶ Games, Computer
- ▶ Robot Programming

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Solar Temple

▶ UFO Cults

Somatology

▶ Embodied Theology

Somnology

▶ Sleep Medicine

Soteriololgy

▶ Eschatology

Soul

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Related Terms

Dualism; Psyche; Self; Spirit

The idea of the human soul defines what most people think of as the inner being or core principle of an individual person. The anthropogeny contained in the *Atrahasis* poem of ancient Mesopotamia contains initial hints of ensoulment, since by mixing the flesh and blood of a god that the other gods have killed with clay, a new creature is formed. The soul is related conceptually to the Hebrew word *nepheš* (נפש) in the Hebrew Bible which refers to a living being which breathes. A living being is that which breathes, an effect of God's breathing life into Adam through his nostrils (Gen. 2:7). A dualism is potentially implied between the spiritual living being and the physical dust from which the human is created. Prior to the development of a belief in the resurrection of the body in Judaism and the Christian church, the soul in the Hebrew Bible goes to *She ol* after death. In the Hebrew Bible, the soul of a living being refers to an aspect of a person, the seat of one's appetites, the self and even mental processes, including the will.

In Hellenistic culture initially, the soul was a univocal means for expressing how a living organism lives and mentally functions. A conceptual separation of the soul from the body became formalized through the use of the different words for spirit (*pneuma*), body (*sōma*), and soul (*psuchē*). Plato's idea of a disembodied post-mortem life, of immortality, develops earlier ideas from the Homeric age. Plato's dualism between physical and ideal realities signifies the identity of personhood with a non-visible soul. He was opposed by Aristotle, who held out for the existence of souls as essential operating principles for all living things, including plants and animals (Aristotle, 1961).

Christian belief in the human soul is attested by the numerous mentions of *psuchē* in the New Testament. Related to the Greek verb *psuchein* "to breathe," this word refers to a natural sense of self, in continuity with the Hebrew word *nepheš*. In contrast, *pneuma* is associated with the equally less physical Hebrew word *ruah*. This spirit, in contrast with ordinary human soul, is associated with the being of God, a predecessor to the development of the Christian doctrine of the trinity. Yet, Paul is less precise in employing the term *pneuma*, as, for instance, in 2 Cor. 2:13, which suggests the notion of soul. And, the New Testament generally assumes a body-spirit unity rather than a notion of human persons who "have" either a soul or body, despite Paul's account of struggle between the flesh and the spirit.

In Islam, the word *nafs* (etymologically similar to the Hebrew *nepheš*) means soul and is distinguished in the Qur'an from God's spirit or *ruh*, which is breathed into humans at their creation. Al-Kindī (d. c. 870) articulates an Islamic philosophical notion of the soul in neoplatonic terms, while Ibn Sīnā (or Avicenna, d. 1037) is the most influential exponent of an Islamic understanding of individual immortality of the soul. Sufi interpreters of the soul emphasize its role in the mystical experience of God, while its metaphysical status is contested among Sufi philosophers. And, among Indian religions, the soul is an accepted concept that marks off the living from the dead.

Historically, and especially in the science-religion dialogue, accounts of the soul are related to accounts of mind. Particularly since philosopher René Descartes defended a causal interaction between two separate entities, mind and body, the soul has come to be associated with dualism, which postulates the separate, mutual causation of two kinds of phenomena: spatial physical

objects and nonspatial mental events. For Descartes, nevertheless, the soul was postulated as located in the pineal gland, where he speculated that all thoughts are formed (Descartes, 1897).

A subtle mind-body dualism is proposed by Thomas Aquinas, who sees the soul in terms of an Aristotelian outlook, where the soul is the formal, not the efficient, cause of thought and bodily movement. This is the most well-known form of hylomorphism, in which the substance of the person is understood as a composite of matter and form. The human person is "not a soul only but rather a composite of soul and body" (Aquinas 1964–1973: I, q75, a4). While Aquinas' and Descartes' accounts of the soul share a substance metaphysics, the semantic thrust of Aquinas' understanding of substance is conducive to the idea that mind can emerge from the physical world. Hence, current defenders of the idea of the soul are more likely to rely upon a Thomist metaphysic than a Cartesian metaphysic. Prominent exponents of a substantial soul include the philosophers Karl Popper, John Eccles, and, earlier in the twentieth century, neurophysiologist Wilder Penfield. Contemporary Thomists, such as Fergus Kerr and Alasdair MacIntyre, argue for the retention of a broadly Aristotelian notion of human personhood in terms of rational animals, as opposed to the idea of humans as essentially thinking beings.

Some contemporary thinkers expound an "emergent dualism," in which the soul is the organizing principle within a network of complex rational and affective operations that potentially orient the reception of God's grace. For W.G. Leibniz (1646–1716), the soul plays a role in his metaphysical view which mediates two famously opposed eighteenth century dualist portraits of consciousness: those of Descartes' picture of mind-body interaction and Malebranche's suggestion of a miraculous cause for mental events. Leibniz sees the concept of the soul as important for the "primitive unities" of bodies, which are otherwise aggregates of non-unified substances. Jean (John) Calvin discusses the soul in the *Institutes* and affirms it in continuity with medieval thought, as, for example, when he claims "man consists of a body and a soul; meaning by soul, an immortal though created essence" (Calvin 1960: I,15).

In the contemporary period, materialists deny the existence of the soul due to their belief that consciousness is entirely physical in nature. This denial takes a number of forms, beginning with British philosopher Gilbert Ryle's description of Descartes' dualism as that of a "ghost in the machine." Another criticism materialists make is that the soul is simply based upon a commonsense view of mind constituted by an invalid "folk psychology." So, on the materialist view, the notion of the soul is unable to illumine any problem of consciousness. Cognitive scientist Steven Pinker claims that the mind "is what the brain does," a functionalism that stresses the role of physical causal relations in making up mental states, thus disallowing any nonbiological elements in cognition, emotion, or higher forms of reason. Daniel Dennett adopts a similar skepticism toward the mind and, by extension of the soul, in his well-known eliminativism: philosophical problems arising from consciousness are to be eliminated from existence because they are problems based on nonscientific, unanalyzable, first-person accounts of experience (Dennett, 1992).

Opposed to materialism is a range of philosophers who stress a number of elements, especially those of thought and intentionality. Richard Swinburne's composite dualism posits that mental properties are ascribed to the soul while physical properties are ascribed to the body (Swinbure, 1997). Property dualists hold, contrary to Descartes, that there is only one material substance, yet there are two kinds of properties, physical and nonphysical. This position is sometimes called "dual-aspect monism." William Hasker holds that individuals emerge alongside the properties for consciousness in bodies. His position is called "emergent" dualism wherein the mind is a "soul field" analogous to a magnetic field's relationship to a magnet (Hasker, 1999). For Hasker, both humans and animals possess souls. Nancey Murphy and others adopt a "nonreductive physicalism," which stresses a definition of supervenience, in which mental events supervene by means of informational feedback loops upon neural

processes, thus leading to "downward causation" of the mental on the neuronal. Yet, for Murphy, the soul is ultimately an unnecessary concept for Christian belief. And, in a similar vein, Kevin Corcoran advances a "constitution" view wherein the human person is constituted by bodies but not identical with bodies. Less scholarly contemporaries provide the soul with a looser psychological, phenomenological, or spiritual meaning. Examples of thinkers in this genre include James Hillman, Gerald May, and Ken Wilber.

Cross-References

- ▶ Consciousness
- ▶ Dualism
- ▶ Free Will
- ▶ *Imago Dei*
- ▶ Mysticism
- ▶ Negative Theology
- ▶ Neurotheology
- ▶ Self
- ▶ Theological Anthropology

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Source Localization

- ▶ Magnetoencephalography (MEG)

Space

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Related Terms

Curved space; Dark energy; Expansion of the universe; Gravity; Heisenberg's uncertainty principle; Planck length; Relativity theory; Spatial dimensions; String theory; Virtual particles

Introduction

What is space? By this we do not necessarily mean outer space – the cosmos. We are talking of space in general. The obvious answer seems to be "nothing." If there are no objects in a particular region of space, we speak of it as being empty space – which seems to imply nothingness. And yet that is not how the modern physicist views it.

The Expansion of Space

The sun is a star. The stars are gathered into great swirling whirlpools called galaxies. Galaxies in their turn form clusters of galaxies. When we view distant galaxy clusters we find that they are all retreating from each other. The universe is expanding. This is in the aftermath of

the Big Bang which is believed to mark the creation of the universe. But the Big Bang was not an explosion like other explosions. The galaxy clusters are not receding from us by moving through space; it is space itself that is expanding and carrying the clusters along with it. The situation is similar to inflating a rubber balloon on which 5p coins have been glued. The coins separate not because they are sliding over the rubber into regions where previously there had been no coins. They are separating because the rubber in between them is expanding. So it is with space. The clusters are being carried along on a tide of expanding space. This is our first indication that space is hardly to be regarded as nothing!

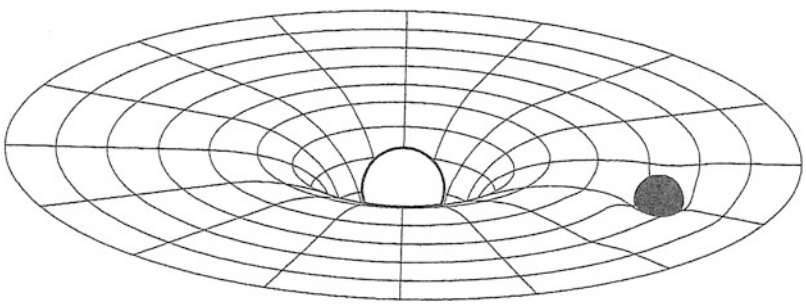
The Creation of Space

At the instant of the Big Bang, all the contents of the universe were at a point. But not just the contents, but space itself. A point has no volume. For this reason it is believed that the Big Bang saw not only the creation of the contents of the universe, but also the creation of space.

The Curvature of Space

A space station moves in orbit about the earth. Why? Because of the force of gravity exerted on it by the earth. That, at least, is how one conventionally describes the situation. However, there is something very odd about the gravitational force. We can see that by considering an astronaut stepping outside the space station and floating in orbit alongside it. Both the astronaut and the station are essentially traveling in the same path. But the astronaut is much lighter than the spacecraft, so it takes less force to keep her on course than it does the craft. Thus gravity has to pull less strongly on her than on the craft. Gravity somehow seems to know exactly how hard to pull on objects to make their motions the same. How does it know? And in any case, *why* would it want to keep both the craft and the astronaut on the same path?

The answer from relativity theory is to do away entirely with the concept of gravitational forces. Instead it holds that a better way of looking at things is to say that what the Earth is doing is not exerting a force on the objects orbiting it, but instead it is curving, or warping, the surrounding space. As a result of this distortion of space, anything passing through the affected region no longer travels in a straight line. Instead it follows a curved trajectory. The spacecraft and the astronaut follow the same path because that is the *natural* path for *any* object to follow if they start off from the same point with the same velocity. The natural path is not a straight line – a straight line requiring a force to convert it into an orbit. It is as though the Earth has caused a dimple in space – much as a ball bearing would if placed on a stretched rubber sheet (see Fig. 1). A second ball rolling across the sheet – say, a light table tennis ball – would follow a curved path because of the curvature of the sheet. It might even find itself captured into an "orbit" repeatedly circling the ball bearing. So, the Earth causes a dimple in three-dimensional



Space, Fig. 1 The Earth causes the surrounding space to curve, this curvature being responsible for spacecraft and spacewalkers following curved orbits

space, and the Sun an even more pronounced dimple such that the Earth finds itself describing an orbit around it.

This way of viewing gravity – which we owe to Einstein's general theory of relativity – comes up with more accurate descriptions of nature than Newton's ideas based on an inverse square law of gravitational forces – and so is to be preferred. Thus we find space is something that can be curved.

Space and Quantum Theory

According to quantum theory, so-called empty space is not empty at all. Instead it is a seething crowd of subatomic particles popping into and out of existence. It is a manifestation of the basic uncertainty that afflicts everything going on at the subatomic level.

How can particles, which were not there before, suddenly come into existence? Did we not learn at school that "matter can neither be created nor destroyed"? The simple answer is that this statement is not true. According to relativity theory, matter is just another form of energy – much like the others: kinetic energy, the energy of the Sun's rays, heat energy, etc. There is a law called the law of conservation of energy. It maintains that whatever energy you have at the beginning (in all its forms) will be the amount of energy you will have at the end. From this it would appear that if one starts off with the zero energy of empty space, one cannot create particles in it – the particles being a form of energy. However, that is not the whole story. This is where Heisenberg's uncertainty principle comes in. While it agrees that the law of conservation of energy must hold in the long term, averaged over a period of time, there can be minute fluctuations over shorter times. A physical system can "borrow" energy, provided it pays it back within the brief time specified by the principle. It is similar to a short-term loan to cover a firm's temporary cash flow problem, rather than an extended mortgage for a house purchase. The reason these energy fluctuations are not obvious in normal everyday life is that they are so transient. They are too fleeting to notice.

But on the subatomic scale, the energy fluctuations can be significant. All of atomic and subatomic physics must take account of quantum uncertainties. And in the present context, when thinking of the nature of space, we must allow for subatomic particles to be popping into and out of existence thanks to this fundamental uncertainty. We do not actually *see* these particles; they disappear again much too quickly. For this reason they are called *virtual particles*. They are expected to be formed in pairs rather than singly: particle/antiparticle pairs. Antiparticles have the same mass as their particle, but opposite values for other properties, like for example, electric charge. Thus, an electron has negative electric charge, whereas the antielectron – called a *positron* – has positive charge. The proton – one of the constituents of atomic nuclei – has positive electric charge, whereas the antiproton has negative charge. The creation of a virtual particle/antiparticle pair will therefore not violate other physical laws such as the law of conservation of electric charge which has to be obeyed rigorously.

It is in this way the physicist has further reason to consider so-called empty space to be not empty at all.

Dark Energy

All this quantum activity is expected to give rise to an overall average energy. This energy – the energy characteristic of empty space – is called *dark energy*. Dark energy accounts for 70% of all the energy in the cosmos; it outstrips that of the matter we see. Though we never see the virtual activity causing the dark energy, the dark energy is expected to be there. Indeed, Einstein himself was aware, from his equations of general relativity, that empty space could have an energy density itself – an energy density that would be the same everywhere. Though the energy cannot be seen directly in the form of virtual particles, it is expected to produce detectable effects. It should give rise to an expansion – moreover, one that is accelerating. In other words, unlike gravity which attracts, dark energy produces a repulsion.

Until recently it was thought that, although the universe is expanding, with the galaxy clusters separating to greater and greater distances, they will be slowing down because of the mutual gravitational attraction between them. But in 1998 it was discovered that the distant galaxy clusters, far from slowing down, were actually accelerating away from us. It is now believed that at an earlier stage of expansion there probably was indeed a slow down due to gravity. But operating against this attraction was the repulsion of dark energy. With the expansion of the universe being due to an expansion of space, there was ever more space being created, and with it more and more dark energy to go with the new space. It is the enhanced repulsion due to the increasing amount of dark energy that has now led to us passing over into a phase of the universe's expansion where dark energy has at last won the day in its battle against the gravitational attraction, and the clusters are no longer slowing down but accelerating away from us. And all this is due to the action of so-called empty space!

Holes in Space

We mentioned just now how particles had antiparticles. The existence of antiparticles was actually predicted by Paul Dirac long before they were experimentally found. Here we are talking about *real* antiparticles as opposed to the virtual ones we have so far dealt with. These are produced at particle accelerators where subatomic particles like electrons and protons are accelerated to high energy and then undergo violent collisions with the transformation of energy of motion into energy in the form of new matter – new subatomic particles.

Dirac was engaged in seeking an expression for the energy of an electron, taking into account the new insights that had become available through Einstein's theory of relativity. The details do not concern us. Suffice to know that the last step in the derivation involved taking a square root. Now, as is well known, two solutions arise whenever one takes a square root – a positive solution and a negative solution. For example, the square root of 4 is either +2 or −2. Thus Dirac found that the mathematical solution to his problem yielded a positive value for the energy of the electron and a negative one. The first solution correctly described the behavior of the electron. But what about the negative solution? In this sort of situation it is customary to discard the negative value as being "nonphysical" – a quirk of the mathematics having no practical significance. After all, if an electron did have a negative energy it would mean that its locked up energy, that is, its mass, would be negative. That would imply a particle such that when you pushed on it, it would come toward you, and when you pulled on it, it would move away! Clearly we know of no such behavior. So the sensible thing would simply have been to ignore the negative solution as just a mathematical oddity.

Dirac, however, thought differently. By an astonishing piece of lateral thinking, he suggested that the reason we never saw negative mass electrons was not because they did not exist. On the contrary, we did not see them because there were so many of them! They were everywhere – literally *everywhere*. They filled up the whole of space – even the space between the nucleus and the electrons of an atom. Negative energy electrons formed a continuum – a perfect continuum – and a feature of a perfect continuum is that it is undetectable; it cannot be observed. To be able to observe something, a chair, say, it must be characterized by being at a particular location in space. You need to be able to point to it and say "I am talking about that; I am not talking about anything else in the room." But in the case of the continuum of negative energy electrons, where does one point? Everywhere – and nowhere in particular.

Dirac did not let this difficulty put him off. He hit on a way that might disturb the continuum. He envisaged a particle, or a packet of light energy (called a *photon*) moving through space and hitting one of these unseen negative energy electrons. In doing so, it could be that the impact was so great, and the consequent energy transfer so significant, that the negative energy electron acquires sufficient energy to convert its negative

mass into a normal positive mass. This being the case, the electron would no longer be part of the continuum of negative energy electrons, and would thus suddenly become visible; it would appear to have popped into existence from nowhere. Not only that, it would leave behind a "hole" in the continuum. What would that look like? It would be a loss of a negative mass – which is equivalent to a gain of positive mass. So the "hole" would appear to be a particle with the normal mass of an electron. What else? The original negative mass electron would have had a negative charge like any other electron. But now we have the loss of a negative charge – which is equivalent to the gaining of a positive charge. So the "hole" would show up as a positively charged particle with the same mass as the electron – the antielectron, or *positron*. In summary, such a collision would give rise to a pair of particles – an electron and a positron. And indeed, this is exactly what is observed. Particle-antiparticle pair production is now a well-established phenomenon.

This then is another indication that empty space is not to be regarded as simply nothing. It is packed with negative mass electrons – and also with the negative mass versions of many other fundamental particles described by Dirac's equation, such as the proton and neutron.

Or is it? Although it is true that the negative energy continuum was the route by which Dirac came to his prediction of the existence of antiparticles and how they might be produced – a discovery for which he was awarded the Nobel Prize – the question arises as to whether this actually is a true description of reality. Opinion is divided. Some physicists will have nothing to do with the continuum idea. The fact that Dirac correctly predicted the existence of antiparticles by a somewhat quirky line of reasoning does not necessarily mean that this is the correct way of looking at things.

The Dimensionality of Space

A popular physics theory at the present time is string theory. This is based on the idea that the fundamental particles, such as the electron, are not point-like particles as hitherto thought, but tiny vibrating strings. It is the different modes of vibration that confer on the particle its various properties such as mass and electric charge. One of the features of the theory is that in order to accommodate all the required properties, the vibrations must be in 10 or 11 spatial dimensions. But we only know of three. This gives rise to the idea that the additional dimensions might be curled up so tiny we cannot see them, that is, at each point in three-dimensional space there are 7–8 curled up dimensions. Whether this is so or not has still to be resolved.

A Smallest Unit of Space?

We are accustomed to thinking of it as being divisible into ever smaller distances: kilometers, meters, centimeters, millimeters, nanometers, and so on. But does that go on indefinitely? Is there no limit to how small a division of space can go? Or do we eventually get to a basic unit of space that is no longer divisible?

At present we have two great physical theories: quantum theory and general relativity. The eventual aim is to reconcile these two into a combined theory of quantum gravity. Such a theory is bound to depend very heavily on three fundamental constants: (1) the gravitational constant, G, governing the strength of gravity in both Newton's theory of gravity and Einstein's general theory of relativity; (2) Planck's constant, h, governing the size of quantum fluctuations, and (3) the speed of light, c, which figures prominently in both relativistic and quantum physics. From these three constants, the German physicist Max Planck, one of the founders of quantum theory, found that there was a unique way of using them to define a quantity with the dimensions of length:

$$l_P = \left(hG/2\pi c^3\right)^{1/2} \approx 1.6 \times 10^{-35}\,\mathrm{m}$$

This quantity is named the *Planck length*. It is very small – about 10^{-20} times the size of the proton. It is often regarded as in some sense

the "natural" unit of distance. What one can say is that any attempt to unite quantum theory with relativity must involve these three constants, and hence any expressions of a distance arising out of the combined theory will involve this unit of length, possibly multiplied by some unimportant numerical factor such as 2π. According to some theories of quantum gravity, this is expected to set the scale where quantum fluctuations become so pronounced that the very structure of space itself breaks up and it becomes a discrete kind of foam – thus setting a limit on the smallest distance that can still have properties recognizable as those of space. But there are other attempts at formulating a theory of quantum gravity that do not point to such a conclusion. The position is unclear, and could remain so.

Space in Relation to Time

According to relativity theory, motion affects spatial distances. For example, a spacecraft flying at high speed is, according to the mission controller, shorter than when it is stationary on the launch pad. Distances are also affected by gravity. Time is also affected by motion and gravity. As explained under the entry *Relativity*, all this points to the idea that space and time are intimately connected as a four-dimensional continuum called spacetime, rather than there being a three-dimensional space and a separate one-dimensional time.

Space and Religion

We have seen how physicists have thrown into question the idea that empty space is just another name for nothing. We have seen that one might just as well regard space as full everywhere with dark energy, full of particles popping into and out of existence, and furthermore as a uniform continuum of negative energy fundamental particles.

Those familiar with attempts of Buddhists to explain Nirvana might see the same dichotomy arising in that context. That blissful state is sometimes described in terms of nonbeing or nothingness. And yet there is a certain ambiguity between nothingness and plenitude.

Christians contemplating Heaven traditionally thought of it as being "up there" – for example, Christ ascending to heaven. Then it became more a case of "out there." Neither is satisfactory. With the possibility that there might be further spatial dimensions we do not perceive – either because they are curled up as suggested by string theory, or because they are nothing to do with our spacetime, some might seek to locate Heaven in some of these extra dimensions. But such attempts, in all likelihood, are spurious. Heaven, however it is conceived, is simply not to be described in terms of a physical spatial location.

Cross-References

- ▶ Astronomy
- ▶ Cosmology
- ▶ Energy in Physics
- ▶ Gravity
- ▶ Quantum Theory
- ▶ Relativity
- ▶ Space and Time

Space and Time

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Modern ideas about the nature of space and time have been decisively shaped by the development of physical theory. A few key aspects of the evolution of these ideas can be traced by comparing the conceptions of space and time of Aristotle and Newton, with the conception of spacetime due to modern relativistic physics.

Aristotelian Views

Aristotle identified space and time as features of perceptible entities and processes. His cosmology

described a finite, bounded universe, spherical in shape, with nothing outside of it – not even empty space. Thus, Aristotle rejected the conception of space as an infinite expanse within which material objects are located. He held that regions within the cosmos are necessarily filled with matter and these "places" are properly characterized in terms of the matter by which they are bounded. A region of space, considered as a bare volume, he held to be a mere mathematical abstraction. As for time, Aristotle declared time to be an aspect of change. The time of a change is the quantity of this change, as measured by comparison with a periodic process used as a standard (e.g., the motion of the sun across the sky). In general, then, Aristotle held time to be change considered as quantifiable by comparison with co-occurring changes. Aristotle's views of time and space were highly influential throughout the middle ages and into the seventeenth century.

Newtonian Absolute Space and Time

The conceptions of space and time formulated by Isaac Newton as part of his system of mathematical physics (first published in 1687) are starkly opposed to Aristotelian views. Newton held the passage of time to be independent of any physical processes, a precondition of change rather than a feature of it. He acknowledged the necessity of using some "sensible and external measure" of time – an observable, regular process – to detect and measure its passage, but he insisted that the "relative" times thus picked out should not be mistaken for "absolute" time itself. Any physical standard for measuring time might fail to pick out intervals of perfectly uniform duration; but "absolute, true, and mathematical time, in itself and of its own nature, without reference to anything external, flows uniformly" (Newton 1726/1991, in the Scholium to the Definitions, p. 408).

According to the *absolute* conception of space championed by Newton, space exists in its own right, as an infinite arena with a Euclidean geometric structure within which material objects can exist. There are locations in space, and spatial relations (e.g., distances) between them, quite independent of whether any matter exists. Material objects inherit spatial properties and relations from the regions of space that they occupy. Space itself is an enduring entity – one and the same space exists through all times – and each part of space is immovable and unchanging. It follows that a material object has a definite state of motion with respect to absolute space: either its location in absolute space changes over time (absolute motion) or it does not (absolute rest).

Newton posited absolute space in order to provide a theoretical basis for the distinction, central to his laws of motion, between *inertial* (non-accelerated) motion and accelerated motion. Newton insisted that the physical effects displayed by accelerated matter, such as the concavity of the surface of a liquid made to rotate by stirring, could not be understood merely as the results of acceleration relative to other material bodies, and he took such effects as marks of acceleration with respect to absolute space itself.

Gottfried Leibniz, Newton's contemporary and critic, objected forcefully to Newton's conception of absolute space. To posit absolute space, Leibniz insisted, is to assign artificial significance to concepts, namely position and velocity with respect to absolute space, that are manifestly nonphysical since they have no discernible effects on matter. Leibniz advocated instead a *relational* conception of space, according to which spatial relations are properly understood as relations between material objects rather than between locations in an independently existing space. Space itself he held to be a purely conceptual entity consisting of all (actual and possible) spatial relations among material objects. In a similar way, Leibniz insisted that time itself was a conceptual entity, arrived at by abstraction from the real temporal relations among objects and events.

Since Leibniz and other relationist critics of Newton were unable to provide an alternative version of Newtonian mechanics, freed from dependence on the notions of absolute acceleration and hence of absolute space and time, Newton's views came to be widely accepted as the basis of physical theory for the next two centuries.

Spacetime

Albert Einstein's 1905 theory of special relativity resulted in a decisive transformation in scientific conceptions of space and time. Einstein's central insight was that previous conceptions of space and time presupposed a relation of absolute simultaneity that could not be empirically substantiated. He argued that a physical method of determining whether two events are simultaneous, would in fact lead different inertial observers (i.e., observers moving at different constant velocities) to disagree about simultaneity: two events simultaneous from one observer's perspective would fail to be simultaneous as seen by another. Taking this *relativity of simultaneity* to be a fundamental feature of the nature of space and time has profound consequences; in particular, it implies that spatial distances (e.g., the length of a rod) and temporal intervals (e.g., the time elapsed between ticks of a clock) can be assigned a definite magnitude only relative to the state of motion of an observer. These consequences are undetectable at ordinary speeds, but they become significant when the relative speeds involved are a sizeable fraction of the speed of light (approximately 300,000 km/s), which represents an upper bound on the speed with which physical effects can be transmitted; these relativistic effects have been thoroughly confirmed by experiment.

In 1908 the mathematician Hermann Minkowski reformulated special relativity in geometric terms. In this setting, space and time appear as inseparable aspects of a single four-dimensional manifold, *spacetime*. The relativity of simultaneity appears as the freedom to "slice up" spacetime into instants of time encompassing all of space in many different ways. Different slicings give different ways of decomposing four-dimensional spacetime intervals into distinctly spatial and temporal components. The physical equivalence of these many possible decompositions reflects the fact that they amount to descriptions from different perspectives of a single four-dimensional reality.

Like Newtonian absolute space, the spacetime of special relativity has a perfectly uniform geometry that is unaffected by the matter within it. Einstein's 1915 theory of general relativity, which he devised in order to account for gravitation in terms of the structure of spacetime, gives up both of these features. In general relativity, the geometry of spacetime is determined (in part) by the distribution of matter and energy. Spacetime is curved in the vicinity of a massive body, and it is this matter-induced curvature of spacetime, rather than the gravitational force posited by Newton, that is observed as gravitational attraction. A freely falling (or orbiting) body in a gravitational field is not accelerating under the influence of a force but is following an inertial path (a *geodesic*, the analogue in relativistic spacetime of a Euclidian straight line) in a curved region of spacetime.

Absolute space and time as traditionally conceived have an intrinsic structure that is completely independent of physical objects or processes in space and time. Since in general relativity the structure of spacetime varies with the distribution of matter and energy, the spacetime of general relativity is not absolute in this sense. However, in many models, the structure of spacetime is not completely determined by the distribution of matter and energy; some residual structure is due to spacetime itself, and so general relativity does not support a full-fledged relationism, either. For similar reasons, other aspects of the traditional absolute-versus-relational debate are difficult to settle with regard to general relativity. Multiple distinct issues are bound up together in the traditional debate; these must be pulled apart and considered separately, in the context of general relativity (Earman 1989; Huggett and Hoefer 2006).

Future Physics

Quantum mechanics, our best physical theory of the very small, has yet to be reconciled with general relativity, our best physical theory of the large-scale structure of the universe. Quantum field theory, which unites quantum mechanics with special relativity and spacetime curvature by setting quantum fields within a relativistic spacetime background, has been remarkably

successful. But this approach still represents spacetime as a fixed background structure; a full unification would treat spacetime itself as a fully fledged dynamical entity, subject to quantum-mechanical description (see Rovelli 2001).

The looked-for theory uniting quantum mechanics with general relativity is called "quantum gravity." There are at present no fully worked-out theories of quantum gravity, only various research programs. Some physicists expect that spacetime will not appear as a fundamental element of a theory of quantum gravity at all but only as apparent or emergent structure within a physical reality whose basic elements are non-spatiotemporal in nature.

For Further Reading

Geroch (1978) is a classic, non-technical introduction to spacetime and relativity theory. Disalle (2006) explains how philosophical reflection by Newton, Einstein, and others regarding presuppositions about space and time played a crucial role in developments in physics. Dainton (2001) is an excellent and accessible guide to a wide range of philosophical debates about the nature of space and time beyond those discussed here.

Cross-References

- ▶ Cosmology
- ▶ Physics
- ▶ Relativity
- ▶ Space
- ▶ Time

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Spacetime

▶ Relativity

Space-Time

▶ Time

Spandrel

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An emergent trait irrelevant to fitness which is later co-opted for some adaptive purpose. Harvard biologist Stephan Jay Gould coined this term making reference to the architectural design of the San Marcos Cathedral. Where the pillars of the cathedral met the vaulted ceiling an open space was created (spandrel). This space was filled with attractive artistic designs. Aside from their artistic contribution, these "fill-ins" did nothing for the actual design of the building. However, this creative use of otherwise useless space stood as a metaphor for how evolution takes left-over or extraneous structures and finds functional uses for them.

Spatial Dimensions

▶ Space

Spatial Hemi-inattention

▶ Neglect

Special Divine Action

▶ Divine Action

Speech

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Related Terms

Communication; Production of sounds; Spoken language

Description

Speech is defined as the acoustic, linguistic, and cognitive processes that lead to the production and perception of sounds used in spoken language. Speech is the vehicle that humans use for symbolic communication. No other species possesses the ability to use speech sounds to communicate. Speech is studied by several academic disciplines including linguistics, phonetics, psychology, speech therapy, neuroscience, and computer science. When speech disorders also are included in the definition of speech, psychiatry, neurology and neurosurgery are three other disciplines that utilize knowledge about speech processes. See Lieberman (1996) and Stevens (2000) for further information.

Self-identification

Science

Speech is self-identified as the topic of study for phonetics and phonology. In other words, the fundamental units of speech; phonemes, morphemes and syllables, and their analysis in a speech context make up the characteristics of speech research. Recent developments in functional neuroimaging, with, for example, fMRI, have moreover established a new discipline in neurolinguistics, where localization in the brain of speech production and speech perception is the major focus. The localization in the brain of speech production and speech perception processes has a long history in linguistics, neuropsychology, speech therapy, neurology, and neurosciences, only reinforced by the more recent introduction of neuroimaging techniques. In the nineteenth century, Paul Broca and Carl Wernicke suggested that areas in the left frontal and temporal cortex were the sites of speech production and perception, respectively. Broca's and Wernicke's discoveries came from close analysis of patients with circumscribed brain lesions to the left hemisphere, which also laid the foundation for studies of hemispheric asymmetry and lateralization. The failure to either produce or understand speech after frontal or temporal brain lesion is called motor or sensory aphasia, respectively, and is typically seen after stroke affecting the left hemisphere.

Characteristics

Speech is a distinctive subtopic in studies of language with its focus on the acoustic properties of language production and perception, including an understanding of the anatomical structures that are necessary for producing speech sounds, that is, cortex, vocal chords, vocal tract, and tongue and lip movements. Speech is however also an integrated aspect of linguistics and in some instances not regarded as a discipline of its own but a subdiscipline of language studies. In recent years, studies of speech processes have also been an integrated and distinctive aspect of

neuropsychology and cognitive neuroscience, with important new theories and models for the understanding of how the brain integrates the acoustic input to words and sentences and produces utterances (Hickok and Poeppel 2007; Tervaniemi and Hugdahl 2003; Binder and Price 2001).

Relevance to Science and Religion

Speech and language is the fundamental vehicle through which humans communicate and is as such critical for bridging humanities and natural sciences, also including the study of religion.

Sources of Authority

The study of speech processes, including the acoustic, phonetic, and semantic aspects, has a long history in the disciplines linguistics and phonetics, and more recent in psycholinguistics, neurolinguistics, and cognitive neuroscience. An influential school of study is the Haskins Laboratory, New Haven, USA, where researchers suggested the motor theory of speech perception (Liberman and Mattingly 1985) and that fundamental speech units, like consonant-vowel syllables are differentially identified by the left and right cerebral hemispheres (Shankweiler and Studdert-Kennedy 1967).

Ethical Principles

Studies of speech production and speech perception follow the ethical guidelines put down in the Declaration of Helsinki for research on humans, and most countries have, in addition, their own ethical committees that evaluate and approve research projects before they are conducted.

Key Values

A fundamental key value is to *understand the basic units of speech production and perception* and how they combine to give rise to meaningful words and sentences that are understood by other humans, and how this is organized in the brain. A second value is to diagnose and alleviate sufferings from brain lesions and disorders that affect speech production and/or perception, for example, stroke, schizophrenia, dyslexia, and specific language impairment. A special variant of a speech disorder is auditory hallucinations in schizophrenia, where the patient is absolutely convinced that he/she is "hearing voices," although there is no external acoustic input to the brain.

Conceptualization

Nature/World

Nature is conceptualized from a natural science perspective, that is, as an objective reality independent of the processes that are studied.

Human Being

Humans are considered as biological beings and speech occurs as electrochemical signals or impulses that activate single and/or populations of neurons in the brain.

Life and Death

Life is considered from a biological perspective, and speech is the result of the action and functioning of different organs and structures in the body and the brain, which follows the physical laws of how acoustic waves occur and are transmitted through different media.

Reality

Reality is the physical world in an objective manner.

Knowledge

There exists an objective dimension to knowledge, in the sense of objective truth on a probabilistic nature. That is, phenomena in nature are possible to gain knowledge about only in a probabilistic way.

Perception

Perception is the decoding of the phonological structure of an acoustic signal that gives rise to

a conscious sensation of understanding a message sent by another individual.

Time
Speech occurs in a feedforward time perspective, although speech-related flashbacks can occur.

Consciousness
Speech is a conscious process directed toward another individual, either as intended speech output or as the intended recipient of speech input.

Rationality/Reason
Rationality is/reason is the basis of conscious speech processing.

Mystery
Speech is typically a rational human act but can take on mystery as, for example, in auditory hallucinations in nonpsychotic individuals, who frequently experience "hearing voices."

Cross-References

- ▶ Cognitive Psychology
- ▶ Developmental Psychology
- ▶ Neuroimaging
- ▶ Neuropsychology
- ▶ Perception
- ▶ Philosophy of Mind
- ▶ Semantics

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Speed of Light

▶ Relativity

Spirit

▶ Soul

Spiritual Intelligence

▶ Intelligences, Multiple

Spiritualism

▶ Mysticism
▶ New Age Religions

Spirituality

▶ Mysticism
▶ New Age Religions

Spirituality, African

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One unique aspect of African psychotherapy particularly in its indigenous paradigm is the use that

is made of the technique of spiritualization and invocation in the socials stage of its interviewing process. This is a direct carry over from the traditional African healing systems (Nwoye 2010). It involves the exercise of beginning every psychotherapy process with a prayer intended to make the client believe that he or she is connected to and in the presence of that power from which all good things come and that the healing process to be entered into is approved by God and the ancestors. To achieve this effect the counselor engages in spontaneous prayer and commits his or her effort to the guidance, support, and benediction of these agencies. One who resorts to this technique recognizes and respects the religious view of the client. In this way, the client is made to believe that there are more powers involved in intervening on his or her case than that of the psychotherapist working alone. The African psychotherapist in this way presents himself or herself as a channel of God's intervention in the client's life, with God being presented as the person in the chair of the intervention process. The expected impact of this enlargement in perspective of healing is the spiritualization of the therapy process and ambience. With the atmosphere of therapy spiritualized in this way, the client starts to see himself/herself as within the liminal space rather than in the ordinary counseling office. In this way, again he or she becomes spiritually persuaded to tell his or her story, as it is, without distortion, believing that there are, apart from the counselor, some unseen listeners to his or her story within the counseling room. Through this, an honest narration of his or her story becomes facilitated.

Cross-References

- ▶ Attachment: Theory and Patterns
- ▶ New Age Religions

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Spirituality and Christian Theology

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Description

In the twenty-first century, the term "spirituality" is utilized broadly and often in opposition to "religion." However, this current usage has a surprisingly brief history; for centuries, "spirit" and "spirituality" have been closely affiliated with Jewish and Christian religious thought and practice. This entry sketches the etymology, history, and contemporary features of spirituality from the viewpoint of its relationship to Christian theology.

Etymology

Although etymology can only take one so far in understanding the content of Christian "spirituality," it is a helpful place to begin. Spirituality derives from the Latin terms *spiritus* and *spiritualitas*, which biblical translators used to render the Greek New Testament terms *pneuma* (πνεῦμα) and *pneumatikos* (πνευματικός), respectively. These New Testament terms, in turn, are closely related to the more ancient Hebrew scriptural term, *ruach* (רוח).

Meaning spirit, wind, or breath, *ruach* is connected with *life* in the Hebrew Bible. It is often used in close conjunction with symbols that point toward YHWH's creativity or renewal such as fire, fluidity, and fertility. The authors of the New Testament carried the Hebrew notion of *ruach* into their writings but reinterpreted it in light of their experience of the Spirit as the gift of the risen Jesus to the community of disciples. They called upon the Greek word *pneuma* ("breath of life") to describe the Holy Spirit of God animating and empowering the community and *pneumatikos* to describe anything under the influence of (or a manifestation of) that Spirit.

Translated into Latin, then, *pneuma* and *pneumatikos* became *spiritus and spiritualitas*, from whence we derive spirit and spirituality.

History

The first-century writings of Paul the Apostle suggest that the earliest Christians understood spirituality to mean human life conformed to Christ (Rom. 8:29) and empowered by the Holy Spirit (Rom. 15:13). By participating in the "body of Christ" (or the community of Christian disciples); cultivating the virtues of faith, hope, and love (1 Cor. 13); and appropriating the charisms given to the church by the Holy Spirit (1 Cor. 12, 14; Rom. 12), Christians experienced themselves as being united to Christ and enlivened by the Spirit.

Life "in Christ" and "in the Spirit" was shaped, among other things, by the Greco-Roman culture in which the Christian faith was birthed. In early Christianity (especially monastic movements), contemplative practices from Greek philosophical traditions such as Stoicism and Platonism significantly influenced Christian thought and practice. Early Christian *askesis* (the practice of spiritual exercises) included the deliberate cultivation of such Stoico-Platonic-inspired philosophical therapeutics as attention (*prosoche*), self-mastery (*enkrateia*), and meditation (*melete*) (Hadot 1995). The influence of Greek philosophical categories and practices is notable, for instance, in the theology of Origen of Alexandria (c. 185–253). In his *Commentary on the Song of Songs*, Origen uses Middle-Platonic language to describe the ascent of the soul, which takes place in a threefold manner: *ethike* (amending behavior; keeping commandments), *physike* (recognizing the world's transitoriness), and *enoptike* (contemplating God in unitive love). For Origen, this threefold contemplative way is the means by which we come to know God, share in God's divinity (*theopoiesis*), and be thus transformed (Louth 1981).

While we could point to other examples, Origen alone is evidence that early Christianity itself was viewed as a kind of *philosophia* – a transforming way of life carried out in the power of the divine *pneuma* and in conformity to the divine ▶ *Logos*. While some chose to carry out this life with special intentionality (i.e., monastics), deification via incorporation into Christ and empowerment by the Spirit was available to all baptized believers. Deification means the process by which humans, already made in the divine image and likeness (Gen. 1:26), are called to become partakers in the divine nature through grace (1 Pet. 1:3-4).

In the Middle Ages, Christian contemplatives writing on spirituality often drew on Platonic and Neoplatonic strains in earlier Christian theologies (e.g., Origen, Augustine, Pseudo-Dionysius the Areopagite), articulating the soul's inner transformations through symbols of luminosity and ascent. An outgrowth of the *ethike-physike-enoptike* tradition, the so-called threefold way of purgation (purification from sin and its effects), illumination (growth in wisdom and virtue), and union (oneness with God, perfect love) emerged as an important pattern in some strands of medieval Christian thought and practice.

However, spirituality in the Middle Ages was not bound to the contemplative life; *askesis* leading to deification was available to all Christians who pursued the Christ life by partaking in the church's sacraments and appropriating the Spirit's *charisms*. As historians of Christian spirituality have shown, through diverse spiritual practices and/or rituals of devotion, and with different theological and scriptural emphases, many medieval Christians (monastic and lay) sought advancement in the spiritual life thereby to attain a more perfect ordering of their soul and a more perfect love of God and neighbor (McGinn 1998).

In the late medieval period and on into the Reformation and post-Reformation eras, *spiritualitas* became exclusively linked with inward, rarefied experiences of the individual soul's purification, ordering, and exaltation. The concurrent rise of medieval scholasticism with its heavy use of Aristotelian scientific categories contributed to theology's increased focus on technicality and abstraction. By the sixteenth century, these factors (among others) had resulted

in what some have called a "divorce" between spirituality and theology (Vandenbroucke 1950; McIntosh 1998).

Following this break, the seventeenth- and eighteenth-century Age of Reason strained the relationship between rationality and religion. Moreover, the philosophical "turn to the subject" with its emphasis on individual conscious experience engendered a demand for renewed attention to the subjective experience of religiosity. Thus, post-Enlightenment theologians and philosophers were faced with the problem of finding terminology to describe personal faith in the midst of the double estrangements between spirituality and theology on the one hand and religion and rationality on the other. Able theological minds rose to the task; however, we may point to Søren Kierkegaard, who spoke of "faith" as the absence of despair in which "the self relates itself to itself, and in willing to be itself, rests transparently in the power that established it"; to Friedrich Schleiermacher, who referred to "religious experience" as the "feeling of absolute dependence"; or to Paul Tillich who defined "faith" as "ultimate concern."

Current Trends

In our late modern situation, disillusionment with institutional religion in the twentieth-century West has, for many, rendered 'religion,' 'religiousness,' and even 'faith' nonviable linguistic options for describing an individual's experience of self-transcendence and/or transformation. Thus, "spirituality" has become in parts of the academy and the general public a decontextualized placeholder for a large and complex constellation of themes relating to human life, including the search for transcendence, identity, meaning, authenticity, virtue, ultimacy, fulfillment, inner potential, interconnectedness, and morality.

In the last 30 years, spirituality has become an increasingly important topic among Christian theologians. Trends in late modern Christian theology seem to suggest that the breach between spirituality and theology is lessening. Contemporary theologians across biblical, ethical, systematic, historical, and practical subdisciplines have focused increasingly on spirituality and have treated it in diverse ways according to their particular traditions and scholarly emphases.

However, there is disagreement among recent theologians regarding which overall conception of spirituality ought to be (re)embraced. Some prefer to remain focused on the spirituality of patristic and monastic Christian figures, with concurrent treatments of related doctrinal topics. For example, Hans Urs von Balthasar's definition of spirituality hews closely to his espousal of a nuptial-Marian ecclesiology; for von Balthasar, spirituality is "the subjective aspect of dogmatic theology, the word of God as received by the bride and developing within her" (Balthasar 1989). Similarly, for Edith M. Humphrey, spirituality is closely tied to pneumatology: "Christian spirituality is the study and experience of what happens when the Holy Spirit meets the human spirit" (Humphrey 2006). These and like-minded theologians would generally be suspicious of notions of spirituality that fall outside the bounds of orthodox Christian teachings.

Other theologians advocate a more broadly circumscribed, less confessional notion of spirituality that is attuned to its meaning and usage in contemporary life. Thus, for Sandra M. Schneiders, spirituality is "the experience of consciously striving to integrate one's life in terms not of isolation and self-absorption but of self-transcendence toward the ultimate value one perceives" (Schneiders 1990). The upshot of this approach is that it can perhaps more easily accommodate interdisciplinary and/or interreligious exploration and collaboration. Still, others seem to work within a framework that adopts and adapts both specialist (confessional) and pluralist (not or partially confessional) conceptions of spirituality. F. LeRon Shults, for example, carries out a constructive analysis of Christian spirituality that is informed by both doctrinal developments in pneumatology as well as scientific and philosophical insights in contemporary thought (Shults and Steven 2006).

The split between theology and spirituality that began in the Middle Ages and widened during modernity is starting to be healed. But

contemporary Christian theological pluralism and specialization, combined with spirituality's broad and shifting meanings, mean proposed models for reuniting the two are usually complicated and controversial. Most theologians agree, however, that any responsible treatment of spirituality in contemporary theology must be informed by careful historical analyses of Christian spirituality and oriented toward the integration of rigorous conceptual analysis with existentially meaningful experience and practice.

Cross-References

- ▶ Biblical Studies
- ▶ Mysticism
- ▶ Secularization, Secularity, Secularism
- ▶ Systematic Theology
- ▶ Theological Anthropology

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Split-Brain Research

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Surgeries in which the corpus callosum (a thick bundle of nerves connecting the two hemispheres of the brain) has been severed, thereby cutting off communication between the right and left hemispheres, have revealed a wealth of knowledge about the functioning of the brain and the specializations of each hemisphere. In part because of split-brain research, we now know that, in general, the left hemisphere is specialized for language and the right hemisphere is specialized for more nonverbal abilities.

Spoken Language

▶ Speech

Sport, Sociology of

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Introduction

Sociologists of sport critically examine the role, function, and meaning of sport in the lives of people and the societies they form and attempt to describe and explain the emergence and diffusion of sport over time and across different societies. In doing so, they identify the processes of socialization into, through, and out of modern sport and investigate the values and norms of dominant, emergent, and residual cultures and

subcultures in sport. On this basis, they explore how the exercise of power and the stratified nature of societies place limits, and create possibilities, for people's involvement and success in sport as performers, officials, spectators, workers, or consumers.

The sociology of sport, while grounded in sociology, also encompasses research in history, political science, social geography, anthropology, social psychology, and economics. Also, the new offshoots of sociology, such as, cultural studies, postmodernism, media studies, and gender studies, are also used. Sociology of sport is both a theoretically driven and an empirically grounded subdiscipline of sociology. It overlaps with, and is informed by, works on the body, culture, and society more broadly and, contributes to the formation of policy that seeks to ensure that global sport processes are less wasteful of lives and resources. Sociologists of sport seek to generate knowledge that will critically examine the costs, benefits, limits, and possibilities of modern sport for all those involved, rather than focus solely on the performance efficiency of elite athletes, and, in studying sport in the same way they examine religion, law, or medicine, they seek to highlight aspects of the general human and societal condition.

Sociological research also seeks to "debunk" popular myths about sport, critically appraise the actions of the more powerful groups involved in sport, and inform social policy toward sport. Sociologists of sport seek to intervene in sport worlds in several ways. They offer expert advice to government agencies, public enquiries, and commission reports on areas such as drugs, violence, and health education. In addition, they act as advocates for athletes' rights and responsibilities. Researchers have sought to provide knowledge for groups who seek to challenge inequalities of gender, class, ethnicity, age, and disability, particularly with respect to access, resources, and status (Collins and Kay 2003). Sociologists of sport have also argued for the better use of human and environmental resources to ensure that there is a sporting future for generations to come. These, then, are some of the aims and tasks that sociologists of sport have set themselves.

Given that sport brings people together, yet also divides them along the societal and cross-cultural lines that already exist, sociologists probe the coexistence of cooperation and confrontation, power and control. The struggles that shape sport provide rich case studies that highlight broader social questions. For example, consider the question "What is sport?" For sociologists, such a question requires understanding the set of social practices adhered to by a set of conventions. That is to say, an understanding of what sport "is" requires an analysis of the society that produces sport. Sport, then, is a form of collective action, involving a host of different people, connected in particular figurations, and creating particular forms of sport products and performances. Attention has been paid to the "conventional understandings" that mark sport subcultures and govern sport practices and which gives sport a relative autonomy, while also critically examining the extent to which sport worlds are "free" from the political and economic context in which they are situated. The intimate and extensive relations between sport and other social worlds must be traced. For example, sport worlds are interconnected with questions of foreign policy, big business, environmental degradation, the medicalization of social life, and the socialization of citizens of different societies (Coakley 2004).

Sport is then both a separate world and a suspension of everyday life, yet it is also highly symbolic of the society in which it exists and is embedded in wider political-economic and sociocultural currents. In the context of sport people both experience a form of exciting significance that is rarely, if ever, encountered in their daily lives, and also conduct a symbolic dialogue with fellow participants and spectators that reveals things about ourselves and others (Maguire 2012). Sport, then, can be viewed as a modern morality play that reveals fundamental truths about us as individuals, our societies, and our relations with others. Sport, moves people emotionally and matters to us socially. Sports are mimetic activities that provide a "make-believe" separate setting that allows emotions to flow more easily. This excitement is elicited by the

creation of tensions that can involve imaginary or controlled "real" danger, mimetic fear and/or pleasure, sadness and/or joy. This controlled decontrolling of excitement allows for different moods to be evoked in this make-believe setting that are the siblings of those aroused in real-life situations (Elias and Dunning 1986).

Tie-breaks in tennis, penalty shoot-outs in football, and sudden death play-offs in golf evoke a range of emotions, so much so that by the end of the contest we are emotionally drained. And, unlike a well-performed play or well-acted film, we know that what we were witnessing in sport is real and that the outcome was not determined beforehand. Only when sports are associated with matters of deep cultural and personal significance do they become important to fans. Major sporting events are thus mythic spectacles where fans are provided the opportunity for collective participation and identification that serves as a means of celebrating and reinforcing shared cultural meanings. It is precisely because sports are a separate world that suspends the everyday world that they are able to celebrate shared cultural meanings that are expressed through and embodied by sports men and women. The anthem, the emblem, and the flag associated with sporting contests highlight how teams and individuals represent the nation. If social life can be conceived of as a game through which identities are established, tested, and developed, then sports can be viewed as idealized forms of social life. Its rules and codes of play (such as in golf etiquette) allow for a fair contest and a true test of ability. The "true" champion, playing an authentic match, with integrity, is the "best" expression of this. In this context, it is possible to establish an identity with greater consensual and authentic certainty than in social life itself. We insist on the authenticity and integrity of the contest – on the strict formal rules and their fair enforcement – because we want any differences of worth between us to be based on merit. In real life, our class, race, gender, or religion interfere and rig the game of social life and its outcomes. As such, its victors and losers are profane deceptive illusions. But, on the field of play, it is claimed, sport outcomes are sacred, they are real and authentic. That is also why champions seek to beat fellow champions: That is the true test. Honor and respect are not achieved by knowing in advance that you will beat inferior opponents (Hughson 2009).

Sport is thus a symbolic dialogue: It symbolizes the strict requirements of how a dialogue should be conducted (Ashworth 1971). Sport, then, involves a dramatic representation of who we are and who we would like to be. The stadia is a theater in which we experience a range of pleasurable emotions and exciting significance: the excitement of the played-game, uncertain as to its outcome but its significance lying in what we have invested in it emotionally, morally, and socially. Sportsmen and -women act as our heroes, expressing both the myths, and revered social values of a society, and the sports ethic that underpins involvement in sport. They have to take risks, to exhibit the hallmarks of bravery and courage and show integrity. Yet, there are, as the sociological account of sport reveals, other sides to the sports experience (Jarvie 2006).

Developments in the Sociology of Sport

Although the first texts on sociology of sport appeared in the 1920s, this subdiscipline did not develop until the early/mid-1960s in Europe and North America (Caillois 1961; Loy and Kenyon 1981; Loy et al. 1981; Stone 1971; Yiannakis and Melnick 2001). A small number of scholars from both physical education and sociology formed the International Committee for the Sociology of Sport (ICSS) in 1965. The sociology of sport is internationally represented by the International Sociology of Sport Association (ISSA, formerly ICSS), which also publishes the *International Review for the Sociology of Sport*. This body is a research committee of the International Sociological Association (ISA) and also an official committee of the International Council for Sports Science and Physical education (ICSSPE). From the mid-1960s, symposia, conferences, and congresses were held annually and theoretical and empirical work was presented. Researchers from different sociological backgrounds began to

develop sociological definitions of sport, conduct pioneering work in different aspects of sport, including sport and socialization; sport and social stratification; sport subcultures; the political economy of sport; sport and deviance; sport and the media; sport, the body, and the emotions; sport violence; sport politics and national identity; and sport and globalization. The subdiscipline has now developed a sophisticated understanding of how people become involved in sport; what barriers they face; and how gender, class, ethnicity, and sexual relations work in sport (Hall et al. 1991). In addition, scholars have developed considerable knowledge about how sport is mediated, contoured by a complex political economy, and bound up in global identity politics (Cornelissen 2011; Lawrence and Rowe 1986).

Main Theoretical Perspectives

As the sociology of sport developed as an academic subdiscipline in the 1960s, it is not surprising that the theories that were used to explain sport were those which were dominant at the time (Jarvie and Maguire 1994; Maguire and Young 2002). In North America, and in particular in the USA, functionalist accounts held sway (Lever 1984). Thus, American-based accounts of sport in the 1960s and the 1970s tended to emphasize that sport reflected society and that society itself was based on a social order where consensus and shared values were evident. Functionalist accounts highlighted that society was made up of a system of interrelated parts that contribute to the satisfaction of system needs and thus to social order. In mainstream functionalist accounts, the "social functions" of religion, education, and law, for example, were assessed in terms of their contribution to meeting the functional prerequisites of society. Sport was viewed in a similar vein. Its social function was and is seen in terms of how, as a social institution, and as a source of personal expression, it contributes to social stability and socialization. Parallels were also drawn between the role of sport and religion. Considered in this way, sport functions as a "surrogate" religion and acts as a form of social glue that brings and binds people together (Coles 1975; Stevenson and Nixon 1972).

While this approach fell increasingly out of favor in Europe and North America in the 1980s, its influence lingered on in Korean and Japanese accounts of sport into the 1990s. More recently, it is arguable that some of the underlying assumptions of this approach have found expression in the use of the concept of "social capital" to assess the potential of sport to "solve" wider societal and indeed global problems (Putnam 2000).

In contrast to the functionalist accounts provided in North America in the 1960s, European sociology increasingly turned to Marxist accounts to explain the conflicts and inequalities evident within and between societies (Bairner 2007). Drawing on the work of Karl Marx, and others, writers such as Jean-Marie Brohm (1978) and Paul Hoch (1972) focused on the role of economic interests and the exploitative relations built into the capitalist system. In Marxist accounts, attention was given to how economic resources were unequally distributed to the role that social class plays within societies and to how power was based on the ownership and control of the economic means of production. In this light, participation in and consumption of sport was seen to reflect and reinforce class relations. The power elite in the wider society had/have their equivalents in sport: The system of sport is used to maintain the interests of the powerful and its consumption viewed as "distracting" the working class from engaging in a more critical stance against the inequalities of the capitalist system. Indeed, sport itself was viewed as being distorted by the role of capital and broader political and economic interests. The play element of sport was undermined and sport had become, much like the role of religion more broadly, the "opiate of the masses" (Rigauer 1981).

While reaching quite different conclusions about the function and meaning of sport, functionalist and Marxist accounts tended to downplay the role of the individual in shaping their lives and sporting involvement: By and large, sport reflected society and reinforced the existing status quo. Critique and counter-critique between

these paradigms remain a feature of sociology of sport to the present day (Morgan 1994). Within Marxist accounts, however, academics began to questions whether the account offered was too economistic and deterministic. Instead, in the research of Richard Gruneau (1983) and, in the later work of John Hargreaves, (1985) for example, attention was increasingly given to the role of culture. Throughout the late 1980's and 1990's, neo-Marxist and cultural studies accounts of sport superseded "classical" or orthodox Marxist accounts. Consideration was increasingly given to the role of sport as part of wider cultural relations. Power was viewed as contested, exploitation was resisted, and alternative subcultural responses provided. Sport was viewed as a site where culture was produced and reproduced but also transformed. Sporting subcultures were investigated to assess the extent to which people were repressed and/or empowered. Particular attention was given to the resistance offered by people at the margins of societies. Arguably, the sentiments of neo-Marxists and cultural studies scholars found expression in the more postmodern studies of sport that came to the fore in the 1990s and throughout the last decade (Andrews 1993, 2000; Markula and Pringle 2006; Rail 1998). Indeed, postmodern studies, examining sport in terms of identity politics, consumption, the body, and globalization, have become very popular, especially in North America, and in some ways have supplanted classical Marxist accounts of how best to understand to role and meaning of sport in and across societies.

These postmodern accounts have also been influenced by feminist perspectives (Flintoff and Scraton 2002). This perspective developed later than either functionalist or Marxist accounts and has, since the 1970s, changed considerably in terms of the societal basis of patriarchy, the role that sport plays in this regard and what solutions are offered to overcome gender exploitation. As with other perspectives, feminism is not one thing. Yet, all approaches within this perspective are agreed on the centrality of gender in understanding society. This approach grew in prominence in Western societies and in the academy in the 1980s onward. Initially, liberal feminists were concerned with ensuring that women had equal access to and equal treatment within sport. Throughout the 1990s, a feminist approach grew in popularity. Some scholars, such as Jennifer Hargreaves (1994), combined a Marxist and feminist approach and used a class and gender analysis to raise questions about the role that sport played not just in reflecting the inequality of society but, in some instances, also exacerbating these inequalities. In particular, the impact of hegemonic masculinity and the role it plays in the biased nature of sporting ideology and content was focused on. The solution to this was viewed not simply in terms of access, status, or resources but rather in a reconceptualization of the meaning and function of sport (Hall 1996).

This perspective was also accompanied by a radical feminist critique that questioned the very structure and meaning of sport. Arguing that sport was inherently unequal and unhealthy, radical feminists argued for separate development and alternative body cultures. This latter emphasis gelled with postmodern concerns focusing, as noted, with the body, identities, sexualities, and consumption. More recently, therefore, feminist accounts of sport have combined with postmodern approaches that probe these questions of identity (Markula 2005). By and large, however, they have tended to be a much more prominent feature of Western scholars and, as yet, have not taken a significant hold elsewhere.

While these approaches have tended to emphasize, to a greater or lesser degree, how sport reflects and reinforces society, there is also a long-standing approach, again dating from the 1960s, that examines sport in terms of how society is created through the exchange of meanings, identities, and culture in interaction with others. Drawing on the work of George Herbert Mead (1934), Erving Goffman (1959), and others, a symbolic interactionist approach, while less prominent in sociology of sport, has provided a counterpoint to more macro and deterministic explanations of the meaning and function of sport. Focusing on small-scale social settings, this approach examines the meanings, identities, and (sub)cultures created in and through

interaction (Donnelly and Young 1988). Attention is given to how social worlds, including sport, are socially constructed by the expression, interpretation, and exchange of meanings (Klein 1993). This approach has proved particularly valuable in probing the socialization into, through, and out of sport (Curry 1991; Fine 1987). In addition, the symbolic side of sport, how it represents identities at local, national, and global levels, has been fruitfully explored. Perhaps its biggest weakness, however, is its inability to explain how these small-scale, micro settings in which the agency of the individual is emphasized and meanings constructed and exchanged, relate to wider social structures and issues of power and inequality.

Two other perspectives that directly address this issue of the relationship between individual agency and social structure have also been extensively used in sociology of sport. These approaches derive from the work of European social theorists Norbert Elias and Pierre Bourdieu. Eliasian or figurational/process sociologists highlight the chains of interdependency that people form and live out their lives in. While active in the ongoing development of interdependency, such chains act back on people in enabling and constraining ways. In examining social change, figurationalists probe the power balances within figurations that influence relationships between individuals, social groups, and societies – between the established and the outsiders. Developed by Elias and Eric Dunning (1986) and others, this approach has examined the emergence and global diffusion of modern sport, the expression of violence by participant and spectators in sports, the role that sport plays as a male preserve in affirming masculinity and male power, the connections between sport and the medicalization of the body (Waddington 2000), the significance of global sport on local and national identities, and the meaning and importance of sport in terms of an individuals and groups quest for exciting significance (Maguire 2012).

With a somewhat similar intent as Elias, Bourdieu sought in his general theory to resolve the tension between the individual and the society. For him, researchers inspired by his framework, the key building blocks for understanding society lay in probing the connections between the accumulation and investment of capital, the formation of a person's habitus and the gaining and maintaining of distinction. Unlike more Marxist accounts, Bourdieu was keen to highlight that the accumulation and investment of capital involved cultural and social elements as well as economic (Bourdieu 1984). That is, while an understanding of the distribution of wealth and income was a necessary part of any analysis, consideration had also to be given to the gaining of cultural capital (formal qualifications and informal high status knowledge) and the presentation of an individual's social capital as expressed in and through their bodies – accent, demeanor, and body language. Together, these forms of social capital construct social fields in which individuals share with others common life chances, experiences, and tastes. The embodied social memories, or habitus, of an individual, reflects and reinforces the ongoing struggle for distinction, power and status within societies. Sport plays a significant role in both the form of a person's habitus and the accumulation of distinction (Bourdieu 1984; Wacquant 1992). For Bourdieu, and others, the social function of sport serves to reflect the different uses and investments of social capital and the differential rewards that flow from such investment. Sport itself is also marked by the struggles to gain and maintain status – different sports and sport settings require and confer differential distinction on its participants and consumers (Kay and Laberge 2002).

There are other approaches that have been used to explain the relationship between sport, culture, and society (Jarvie and Maguire 1994; Maguire 1999; Maguire and Young 2002). The intention here has been to highlight how the sociology of sport both uses and contribute to wider sociological theory. Informed by these theories, sociologists have focused on the following areas:

1. Culture and socialization into, through, and out of sport

2. The relationship between sport and stratification – particularly with reference to social class, gender, and "race"/ethnicity but also disability
3. The body and the emotions – focusing on the able/disabled body, the technologized body, the medicalized body, the consuming body, and bodies and identities politics
4. The role that sport plays in the generation and expression of deviance: violence by participants and spectators; drugs and pain and injury
5. The connections between sport and local, national, and global spaces and places – with particular reference to issues of political economy, migration, national identity, and the media

Why Sport Matters?

Any study of sport which is not a study of the society in which that sport is located is study out of context. In order to make sense of society – and how sport both reflects and reinforces societal structures and subcultures requires theoretical insight and empirical enquiry of the kind outlined above. The facts about sport and society do not speak for themselves: sociological theories both help us make sense of our observations and assist in development of an analysis and explanation for the patterns we observe. The interplay between theory and evidence lies at the heart of the sociological imagination that seeks to make sense of history, biography, and social structures (Sugden and Tomlinson 2002). Hence, the study of sport sheds light on both the subcultures of different sports but also the society in which such sports are located. Through the seemingly mundane and unserious aspects of sport, the sociologist can see the serious and significant aspects of society and the human condition. This can be illustrated with reference to the role and significance of champions in sport. That is, what is it to be a sporting champion and why do they mean so much to people in different cultures and civilizations – be in Western or non-Western cultures? In a simple sense, a champion is someone who is the first among all contestants or competitors, and in this regard, the word refers to the ability of an individual or team to win a contest or championship. Yet, the origin of the word, in English, indicates a different usage and offers a clue as to why champions are so much more important to us than just their ability to win and why people across the globe attach such meaning to them. Its first usage, in English, emerged in the context of the medieval tournament and referred to the person who would act as a champion of others; who would defend, support, or *Champion* a cause (Hughson 2009). Athletes are not simply champions of their sport, but also of their local community and nation and, sometimes, humanity as a whole. An example of this is the American boxer, Muhammad Ali. A champion is said to possess special gifts and exude a certain charisma: They perform "miracles" and achieve the seemingly impossible. Athletes, for better and for worse, are our modern heroes: symbolic representations of our cultural values and who we would wish to be. Champions are talented individuals, but as heroes, they are people whose lives tell stories about ourselves, to ourselves, but also to people from other nations (Huizinga 1947/1955).

People from different cultures appreciate excellence and have a desire to achieve it, and if not, then at least to share in it. The champion allows us to catch a glimpse of what we could be: By representing us, they make us vicariously fulfilled human beings. They are our modern heroes because sport has become the forum in which communal self-revelation occurs. That is, modern sport is a form of surrogate religion and popular theater in which there occurs the communal discovery of who we are. Sports stadia are contemporary venues in which we can observe champions as heroes and experience the "sacred," moments of exciting significance, while leaving behind the profaneness of ordinary life. In this sense, society needs its champions as heroes. They perform the manifest function of achieving sporting success for themselves and their local community and nation. But they also perform a more latent role: They are meant to

embody the elements that a society values most. As idealized creations, they provide inspiration, motivation, direction, and meaning for people's lives. Champions as heroes act to unify a society, bringing people together with a common sense of purpose and values. That is how modern sport developed (Guttmann 2004). Pioneers of the nineteenth century linked sport to Western muscular Christianity: unselfishness, self-restraint, fairness, gentlemanliness, and moral excellence. This was itself supplementing traditional notions of chivalry: honor, decency, courage, and loyalty. These qualities are some of the very attributes associated with what people describe as the "true" champions.

Despite this sense of nobility, there are, however, threats to the manifest and latent functions of champions as heroes. This stems from issues associated with authenticity and integrity. The status of the champion relies upon the authenticity of the contest. If the contest is tarnished by corruption, cheating, drug taking, or betting scandals, then the hero is diminished in our eyes. The contest is no longer either a mutual quest for excellence or societies forum in which communal self-revelation occurs. This lack of authenticity also occurs when the sport becomes too make-believe, is rigged, or becomes too predictable. Professional wrestling may produce "champions" but they are not taken seriously, and they are not our heroes. In addition, if the champion represents a state system that the people do not support, then their respect is lacking. Alternatively, athletes can become signs of resistance and offer glimpses of different social systems (Dyck 2000).

The champion can, as hero, embody the elements that a society holds most dear. But the integrity of the champion may also be undermined in several ways. The champion may be a flawed genius – either due to the fact that they suffer from hubris and feel they need not dedicate themselves to the level and intensity of preparation and performance required, and/or because their private lives intrude on their status as heroes. Our idealized image of them as athletes is shattered. In addition, our champion maybe less a hero and more a celebrity – they are famous but not heroic. David Beckham may be seen in this light. If this be the case, such fame is short lived and they fail one of the tests of a true champion as hero – the test of time. Celebrity sport stars can once be famous, but be neither a champion nor a hero, and is now forgotten. In order to understand why champions mean so much to us and what impact they have, we have to consider the role sport plays in society. This is where sociological theory helps and why the insights from this subdiscipline are so crucial to an understanding of sport and society (Coakley 2004; Tomlinson 2005, 2007).

Cross-References

- ▶ Body
- ▶ Cultural Studies
- ▶ Emotion
- ▶ Media Studies
- ▶ Myth
- ▶ Religion
- ▶ Ritual

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Standard Intelligence

▶ Intelligence

Statistics and Probability

▶ Probability and Statistics

Stereotactic Surgery

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A special kind of neurosurgery utilizing a frame attached to the skull of the patient. By referring to a Cartesian coordinate system, every point around the frame could be defined by a x, y, z coordinate system. A special targeting arm, attached to the frame, enables to reach every place or point inside the skull with a high precision. It is used for taking biopsies from the brain, for removing tissue like abscess or hematomas, and for placing electrodes or radioactive tissue within the brain.

Story

▶ Myth

Stress

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Stress is a multifaceted construct which can be viewed in three different ways. First, stress refers to a state of the organism in which physiological processes are activated which leads to heightened arousal, including faster heart and respiratory rates, glucose is released into the blood system, and cognitive and skeletomuscular processes are heightened. Second, stress can also refer to environmental challenges which can be physical or psychosocial, such as exposure to environmental toxins, loss, or other threats to well-being. Some researchers distinguish between strain (state of the organism) and stressors (environmental challenges). Others refer to stress as a transaction between the person and the environment, in which environmental requirements strain or exceed the individuals' resources to cope. In this system, appraisal processes are central, and result from an evaluation process through which the individual decides whether a situation is benign or whether it involves a threat, a harm or loss, or a challenge. Aldwin (2007, p. 24) defined stress as "that quality of experience, produced through a person-environment transaction, that, through either over-arousal or under-arousal, results in psychological or physiological distress."

There are several different ways to assess stress. Trauma refers to situations which are life-threatening or may result in serious bodily harm, either to oneself or others. Life events refer to major changes in living situations, often due to changes in social roles, such as divorce, job loss, or bereavement. Daily stressors refer to more minor problems which occur in everyday life, such as traffic congestion or arguments with friends and family, and are often assessed through daily diaries. Chronic role strain refers to ongoing problems such as poverty, chronic job stress, or caregiving. Finally, microstressors are assessed through ecological momentary assessment, in which individuals are "beeped" and asked to report on what they are experiencing at a particular moment.

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String Theory

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This is a theory that the fundamental building blocks out of which matter is made consists not

of point-like particles as previously thought but tiny vibrating strings. It is the different modes of vibration of the string that gives rise to the particle's properties. It is believed that such strings vibrate in up to 10 spatial dimensions. As we experience only three spatial dimensions, it is claimed that the extra dimensions are curled up too small to be detected.

Cross-References

▶ Space

Structure

▶ Architecture in Islam
▶ Functionalism

Study of Character Strengths

▶ Positive Psychology

Study of Intelligence

▶ Intelligence

Suffering

▶ Dukkha

Sufism

▶ Mysticism in Islam

Suggestibility

▶ Hypnosis

Suggestion

▶ Hypnosis

Supervenience

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A term used to conceptualize the relationship of mental and physical properties within a physicalist perspective, without necessarily reducing mental properties to physical ones. Typically, a supervenience relation is understood to hold if one set of properties (the mental) are understood to depend on another set of properties (the physical), and any change of property at one level entails a change at the other level. An extensive philosophical literature surrounds supervenience, with considerable debate over whether supervenience relations allow for mental causation and whether they support non-reductionist interpretations of mind-brain relations.

Surgery

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Related Terms

Medical procedure; Surgical procedure

Description

Today in Europe, surgery is devoted to offering detailed diagnostic criteria and therapeutic

regimens for diseases affecting all the body that need a surgical operation. The term surgery was derived by the Greek word *kheirourgos* that means "man that operates (*ergon*) with his hands (*cheir*)." Throughout Europe, surgery became a discipline of its own right at the end of the nineteenth century, being treated as a separate entity distinctive from *medicine*. This development started in the university hospitals and was followed by the establishment of separate departments of surgery in most major community hospitals and, in the second half of the twentieth century, with the development of specialized subdisciplines such as vascular surgery, cardiac surgery, thoracic surgery, etc.

Self-identification

Science

Surgery has self-identified, from its very beginning, as a medical science. It sees itself as a scientific endeavor with the aim to develop the knowledge about the diseases that can be treated with an operation. The disease concepts and related surgical procedures were developed in the twentieth century with the birth of general anesthesia. The increasing knowledge of the surgical pathology is considered as a fundamental basis for specific surgical procedures. Surgery is one of the so-called natural sciences because it applies the scientific methods of the natural sciences for clinical and basic research as well as for diagnostic procedures and therapeutic procedures. Progress in surgery is characterized by the development of specialities such as cardiac surgery, vascular surgery, thoracic surgery, pediatric etc.

This was pioneered by the turn of the century with the clinical triumphs of various English surgeons (R Tait, W Macewen, F Treves), German surgeons (T Billroth, T Kocher, F Trendelenburg, J von Mikulicz- Radecki), French surgeons (J Pean, J Lucas- Championiere, M Tuffier), Italian surgeons (E Bassini, A Ceci, G Tagliacozzi), and US surgeons (W Williams Keen, JB Murphy).

In the second half of the twentieth century, surgery expanded over *organ transplantation* as the medical basis of these operations became available (immunosuppression).

A new focus of scientific work in surgery has been to elucidate the *role of minimally invasive surgery*. This involves all surgical disciplines.

More recently, surgery was also equipped also with robotic assistance.

Nevertheless, with the discovering of new medical treatment, some surgical procedures were abandoned (e.g., gastric resections for peptic ulcers).

In more recent times, multicenter randomized double-blinded studies have become very important to establish evidence-based guidelines for surgical treatments.

The increase of knowledge in the different surgical disciplines has fostered the emergence of a broad range of independent surgical specialities. This is reflected by dedicated national and international scientific organizations and separate educational pathways. In addition, many specialized societies have been founded addressing specific diseases/operations or research topics. These organizations arrange their regular scientific meetings and in the majority have their own scientific journals. These societies show increasing numbers of members.

Characteristics

Surgery is distinctive among other specialities of medicine because it is based on the surgical therapy. This particular aspect of surgery guides the surgeon in considering all diseases that cannot be treated only with drugs.

In contrast, diseases in *internal medicine* typically are treated with drugs.

Relevance to Science and Religion

Surgery sees itself as relevant *to, interested in, the scholarly area called Science and Religion because in the field of organ transplantation, many religious issues are discussed, but also in the field of surgical indications in high-risk patients, many religious and ethical issues are present (euthanasia).*

Sources of Authority

The authorities in surgery used to be scientifically interested surgeons who were also fundamental for the establishment of famous academic institutions.

For example, the origins and history of the Royal College of Surgeons of England lie in the union of the Fellowship of Surgeons and the Company of Barbers by Henry VIII in 1540 to form the Company of Barber-Surgeons. They maintained a somewhat uneasy partnership in the sixteenth and seventeenth centuries when the degree of surgical intervention was limited. The eighteenth century, however, saw the rise of private anatomy schools and the development of an academic basis for surgical practice through the teaching and publications of the leading European surgeons. As a consequence, the number and importance of surgeons increased, along with a firm desire for independent professional recognition. In 1913, the American College of Surgeons was founded.

Among the great difficult technical problems faced by the nineteenth-century surgeons was that of reconnecting the divided ends of hollow tubes, especially blood vessels and bowel. The successful appendectomy, the Billroth operations for esophageal and gastric cancer, and the improved hernia repairs of Bassini and Halsted, all caused great excitement in the medical world at the end of the nineteenth century.

Before antisepsis was introduced, laparotomy was not usually possible. The basic principle of bowel suture was discovered in the nineteenth century by Guillaume Dupuytren and John Hunter; Dupuytren's student, Antoine Lembert, is known for his suture.

In America, important contributions to the advance of surgery were from the work of Charles McBurney of New York and John B. Murphy of Chicago. Charles McBurney described the point of maximal tenderness in appendicitis and proposed a new incision for appendectomy.

The successful treatment of an abscess of the appendix in King Edward VII of England helped break down the resistance to surgery.

With the advent of the web, electronic publishing, and electronic libraries, original papers in surgical journals have become widespread.

Surgical scientific societies have established guidelines for *good clinical practice* and evidence-based guidelines which are constantly updated for therapeutic protocols of the major surgical diseases.

Ethical Principles

As for every medical subdiscipline, surgery is guided by the oath and law of the ancient Greek physician *Hippocrates (born 460 B.C.)* who is considered the so-called father of medicine. This "Hippocratic Oath" has been supplemented by the rules of the Declaration of Helsinki of 1971.

Key Values

The key value of surgery is treating human *diseases* with a surgical procedure. A second key value in surgery is that of diagnosing, treating, counseling, and guiding patients before and after the operation.

Conceptualization

Nature/World

Nature is conceptualized as the *biological* and *biochemical* foundation of life on our globe. The world comprises the material and the interspersed space of the universe.

Human Being

The human being is considered as a biological being equipped with unique capacities of the human brain.

Life and Death

Life is conceptualized as the presence of physical functions in biological systems; death is considered the cessation of such physical functions. A special case, which has raised ethical

challenges for transplant surgery, is that of so-called brain death: bodily functions are partially maintained, but there is no evident brain activity. In this case, it is possible to proceed to organ retrieval for transplantation.

Reality
Reality is considered the world around us that human beings can observe with their senses.

Knowledge
Knowledge is the *wisdom* that can be transferred in a verbal form or has been written down.

Truth
Truth is conceptualized as the supreme reality in accordance or agreement with facts and rules.

Perception
Perception is the *conscious sensation* of the external physical world on living human beings. Anesthesia during surgery cancels or impairs perception.

Time
Time is the fundamental category of ongoing change in past, present, and future. Human perception of time can be affected by anesthesia during surgery.

Consciousness
Consciousness is the responsiveness of human beings to any physical stimulus. Anesthesia during surgery can impair consciousness globally, or in differentiated fashions.

Rationality/Reason
Rationality is a foundation of accountable and *responsible* human comportment. It is impaired in anesthesia during surgery.

Mystery
For definition, surgical diseases have a clear cause that can be treated with a surgical procedure.

In surgery, the only place for mystery is what is as yet unknown.

Relevant Themes

A critical issue in surgery as regards "Science and Religion" is the idea of the surgeon's "hands" guided by God during their difficult work. Many religious patients and surgeons think that this could be possible.

Cross-References

- ▶ Anesthesiology
- ▶ Child Surgery
- ▶ Ethics
- ▶ Medical Sociology

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Surgery in Childhood

- ▶ Child Surgery

Surgical Procedure

- ▶ Surgery

Survival

- ▶ Biology of Religion

Symbolic Interactionism

- ▶ Social Psychology

Sympathy

► Empathy

Synapse

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The junction between a nerve and the next cell in an information chain – another nerve, or a muscle or gland cell located to carry out neuronal instructions. At almost all human (and other vertebrate) synapses the signal is conveyed by the extremely rapid diffusion of a "transmitter" chemical across a tiny gap between the cells. Two important properties follow. Firstly, because only the "output terminals" of the transmitting cell have the means to make and release transmitter, and only the underlying membranes of the next cell have the means of responding to it, transmission can occur in only one way across the synapse. And secondly, it is at synapses that the great majority of other chemicals, from hormones to drugs, act on the nervous system. The number of synapses is huge: there are about 10^{14} nerve cells in a human body, and large cells may have 10^4 synapses on their surfaces. It is considered that learning, memory, and many neurological aspects of both development and aging are mediated by synaptic changes.

Cross-References

► Neuron

System

► Functionalism

System Assurance

► Information Security

Systematic Theology

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Overview

Systematic theology (ST) is a scholarly discipline within the context of Christian theology, aiming at relating the contents of faith to the present stand of knowledge. ST presupposes the existence of the Christian religion and relates to this religion in a constructive as well as critical manner. The outcome of the work in ST is a comprehensive articulation of the content of Christian faith within the horizon constituted by contemporary knowledge.

Description

Systematic theology (ST) is the attempt to articulate a coherent and normatively acceptable understanding of the content of ► Christian faith in the light of the following: (a) the teachings of the ► Bible and the tradition of the Church and (b) present experience and established knowledge. This task is carried out while reflecting on the conditions for understanding and interpreting the world as well as the teachings of the Bible. Hence, the whole enterprise of systematic theology involves pragmatic, hermeneutical, and contextual considerations.

In a historical perspective, emphasis in systematic theology has shifted from a coherent and encompassing systematization of the usages of the Bible relating to doctrinal topics ((a) above) toward a more philosophically, hermeneutically, and historically reflexive and comprehensive

articulation of the possible content of this faith under present terms of knowledge ((a) and (b) taken together). Moreover, systematic theology has today to be differentiated from ethics and philosophy of religion, which often are seen as the neighbor disciplines of ST within the study of theology. It also cannot be identified with doctrinal theology (a mere exposition of the doctrines of the Church), as it will have to discuss critically the conditions for, and content of, such expositions.

The *pragmatic* scope and context for ST is related to the Christian Church. As a systematic articulation of the content of Christian faith, ST aims at making this faith as transparent and as viable as possible in the light of knowledge from all the sources above, solving the different problems emerging in the present situation from the point of view of Christian faith. The pragmatic dimension implies understanding *how* Christian faith makes a difference in relating to the world, why it makes a difference, and *what kind* of *difference* faith in the triune God makes.

The *hermeneutical* dimension of ST is constituted by the relation of classical texts of Christianity (the Bible, the ecumenical and confessional creeds) with a normative status to the present-day insights, knowledge, and experience. To interpret the contents of Christian faith within the horizon of the present context is the main task for ST. Hence, ST cannot be understood simply as the summa of what the Church did believe in the past – as such historical reconstructions are never sufficient in order to relate the content of faith to contemporary contexts, with their implicit or explicit conditions for understanding what the faith implies and with what problems the contexts challenge it.

ST is accordingly an attempt to articulate versions of contemporary, viable, and *scholarly and scientifically informed understandings of Christian faith*. These articulations emerge out of different contexts, and are conditioned by the knowledge, the problems, and the traditions of these different contexts, but are nevertheless often done in a manner that also relates to other versions of such articulations, be it from a confessional, socially, or theoretically different point of view. This engagement across different positions makes it possible to have a *reasonable* and *warranted* assertion of ST that is more than a mere confessional statement of what a given group of people, Church, or theologians hold as their private opinion.

The articulations of ST can be done in a manner that *incorporates* all relevant material and understanding within one (more or less) coherent and explicitly Christian understanding of the world as a given frame of reference (narrative theology, postliberal theology, Barth, Jüngel, Hauerwas) in a manner that tries to explicate the contents of Christian faith over against and in relation to other realms of knowledge (Pannenberg, Tracy, Tillich) and in a manner that is also willing to discuss to what extent there is a possibility for relating the contents of Christian faith to the present amount of knowledge. The latter mode of doing ST is more likely to grant the modern way of looking at the world in a relatively independent normative status, despite the fact that some of the preconditions for a modern understanding of the world is still discussed or put to scrutiny.

Among the more recent developments in ST is the realization that as theology, like any other field of knowledge and scholarly work, is historically and contextually bound in all its different aspects, the modern quest for one coherent and objective articulation of what faith is is left as an unwarranted illusion that neglects the historical and contextual dimension of all forms of knowledge, including theology. Acceptance of plurality and of different theological positions has thus become more apparent and necessary, and it has resulted in discussing the normative status of theology from a lot of different perspectives, where none can claim more privilege than others. As a result, previous types of confessional theology seem, in many places (at least in the academy), to recede to the background.

Another important development in ST is its increasing interaction with other subjects in the university, be it social sciences, natural sciences, or parts of humanities. The interaction with and employment of resources from these areas are today becoming an increasingly more important

horizon for the articulation of theology, be it in everything from understanding the political implications and dimensions of religion over gender studies to the information provided by present results in the natural sciences. In principle, ST should be done within a university or university-like setting in order to fulfill its intellectual responsibilities toward other scholarly and scientific disciplines, as well as its obligations toward the Church for which it is assigned to articulate a viable version of its faith.

Self-Identification

Science

ST self-identifies as a scholarly or scientific enterprise as it relates to and, to a certain extent, has to engage with and interpret the results of science. Without being informed by the results of science, ST would not be able to articulate a viable contemporary articulation of Christian faith. By presenting the articulation in a transparent manner that makes explicit the contextual, hermeneutical, and pragmatic considerations that condition the articulation, as well as what resources and texts it draws on, ST is able to present its conditions and its results as scholarly work that can be discussed, contradicted, or accepted by others. These features condition the scholarly or scientific status of ST.

However, as ST interprets scientific results within the framework of Christian worldview, or as part of what constitutes its contemporary meaning, this does not mean the theology itself is *producing* scientific results in the manner that it makes predictions possible or can explain phenomena in the same manner as does, e.g., natural science. ST provides a possible and as much as possible *understanding* of phenomena within a coherent *interpretative* framework and not a scientific *explanation* of the isolated individual phenomena as such.

Religion

ST self-identifies as part of religion as it is an attempt to make a coherent and transparent articulation of the contents of religion within the context of contemporary society. It presupposes the existence of religious convictions, faith, praxis, and attitudes as its given basis but reflects on, criticizes, and relates to these givens of religion in all possible ways, both critical and constructive. In this way, it is based on religion, and it can also have impact on present religious view to the extent that what is done as theological work is received and recognized as important in the constitutive pragmatic context of theology, i.e., the Christian Church.

Characteristics

The distinctiveness of ST over against the other historical disciplines of theology is that it is explicitly dealing with how it is possible to articulate a *potentially normative* (i.e., true, coherent, and acceptable) Christian faith in the contemporary world, on the conditions that are given with the present universe of knowledge and understanding. *Historical* theology does not in the same way have the present situation as its constitutive pragmatic context and as their sole hermeneutical horizon.

Relevance to Science and Religion

The understanding of the dimension of human life that expresses itself in religion is something that needs to be addressed, inquired, and interpreted from a multitude of scientific perspectives. It does provide us with a better understanding not only of what it means to be human and of how and why we relate to the world as we do but also of the moral and spiritual dimension of these relations. ST provides articulations that other disciplines can relate to and discuss and may have a clarifying, a critical, and a constructive engagement to offer in relation to the approach to religion that other disciplines have.

ST is interested in the scholarly area science and religion simply because it cannot afford to ignore the scientific horizon as one of the present conditions for interpreting and articulating a contemporary understanding of what Christian

faith is. Moreover, much of what the result of science is both conditions and restricts what kind of articulations of faith theology is able to offer, given that ST works under the requirements set forth by a coherentist understanding of truth. From that position, science is relevant to all areas of faith, including understandings of the origins of the world, of humanity, of morality, of the ecosystem, etc.

As a result, it is hard to see how academic work in ST today can be carried out in ignorance or neglect of the results of other disciplines. Put strongly, it is a requirement for ST as a scholarly enterprise with academic recognition that it relates to and is informed by what takes place in the science and religion debates. Teachings of religion that fails to fulfill such requirements will, at least in a European context, usually not be considered as academically acceptable or satisfactory ways of practicing the discipline.

One of the important consequences of this is that some work in ST is needed in order to overcome the problems emerging from a naïve religious outlook that takes the convictions of a religious tradition to be a competitor to what is the present stand of scientific results. Hence, ST has a mediating role when it comes to relating the content of religious traditions with sciences.

Sources of Authority

The basic source of authority for Christian ST is the ▶ Bible. As the main source for access to the preaching of Jesus of Nazareth and the Early Church, its status is unchallenged. The main reason for seeing the Bible as authoritative is this content, and it was from early on understood as such by the ▶ Church in order to safeguard the main contents of Christian doctrine and preaching. However, in what respect it is authoritative depends largely on what kind of hermeneutical approach one employs when using it. In the modern period, the authoritative status of the Bible does not imply taking anything it says for granted or unquestioned. Many of the conflicts emerging between Christian religion and modern science do, however, result from a lack of understanding of the historical character of the biblical sources, allowing them to have authority also in matters of science. Recent ST who employs different hermeneutical approaches to the Bible questions and criticizes this use of it and attempts to establish the authoritative elements of Christian teaching (more or less) in consonance with the results of science.

In addition to the Biblical sources, the different ecumenical and confessional creeds of the Christian Churches also play a restricted role as authorities that ST has to relate to. Moreover, in Roman Catholicism, the decisions of the Holy See (the Pope) also have authoritative status.

A generic feature is that the authoritative status of all the above is constantly, in some way, *negotiated* in terms of their relation to the present stand of knowledge.

Ethical Principles

The ethical principles are *fairness* to positions described or discussed, *coherence* with regard to the knowledge established, *reliability*, *transparence*, *openness*, and *corrigibility*.

Key Values

The key value of ST is its result: the presentation of a viable version of Christian faith in the light of contemporary status of knowledge.

Conceptualization

Nature/World

The nature and the world are seen as the result of God's loving creativity.

Human Being

The human being is seen as created in the image of God – i.e., as the being called to represent in a specific way God's love, care, mercy, and compassion for all of creation.

Life and Death

As God is seen as the source of life, all life emerges from God's creative activity. God sustains life through God's own power. Death implies being separated from God's loving power. This separation is usually interpreted as the consequence of sin, meaning that humans reject God and install themselves as God instead. Hence, life and death both have a spiritual and moral, as well as physical, dimension. (cf. below).

Reality

Reality in ST is seen as having a physical, moral, and spiritual dimension. Hence, in ST no priority is given to the physical approach to the world, just as important is the way human relates to reality by moral or spiritual means.

Knowledge

Following the above, knowledge implies more than the mere acquisition of "objective physical facts." It means to take part in and explore the reality of God, in all its different dimensions. Moreover, the knowledge established within a specific scientific discipline is not regarded as sufficient to provide full understanding of reality, as reality basically cannot be fully understood without reference to God.

Truth

In ST, truth must be understood as that which emerges from a coherent interpretation of reality, given the different sources for knowledge and insight. A coherentist approach to questions of truth allows for ST to take fully in the results of different sciences and to be informed by them when it articulates what Christian faith means in the contemporary world.

Perception

Perception is a way of taking part in the world of God.

Time

Time is one of the dimensions in which God allows for the world to exist.

Consciousness

Consciousness is among these capabilities that ST usually describes as soul, although the soul also comprises the subconscious and the emotional dimension.

Rationality/Reason

Reason is the capacity to share in the reality of God and to acquire knowledge of it. However, in ST reason is not reduced to what follows from perception or logical deduction – reason also implies taking into account the moral and spiritual dimension, following the common rules of argumentation, deduction, and inquiry. To be noted is the fact that reason presupposes understanding us as being part of God's creation, not as standing over against it. Hence, reason has its created limits.

Mystery

Mystery is (a) God, (b) the fact that the world is, and (c) anything that goes beyond what human reason has the capacity to explore fully – which from a Christian point of view means literally everything. Hence, in one way, ST is articulating the contents of the mystery of the world by trying to articulate what can and cannot be said.

Relevant Themes

What does creation mean in the light of evolution?

The origins of the world and of life

Human uniqueness

God's agency with and relation to the world

The question of the openness of the future (vs. determinism)

Cross-References

▶ Christianity
▶ Constructive Theology
▶ Truth

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Systems Approach

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The systems approach provides the philosophical foundation for the biopsychosocial model of human functioning that is fundamental to the field of behavioral medicine. A system is considered to be a whole, comprised of a set of parts, whose unique properties or behaviors as a whole emerge out of the interactions among the parts as well as out of the interactions of the system with its environment. The parts (or levels) may be arranged in a hierarchical manner. This model was originally proposed by physicists in the 1930s.

Systems Theory

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A term for a related set of disciplines developed in the late twentieth century to describe complex, nonlinear, dynamical systems. It involves the development of new terminology (such as components versus physical parts; structure versus organization). It employs the resources of nonlinear mathematics (i.e., equations that require iterations such that the result of the first calculation is entered into the second calculation, and so on).