

Religious "Cognition": Between Integrated Physiology and Network¹

Gabriel Levy
University of California, Santa Barbara

"Find a scientific man who proposes to get along without any metaphysics... and you have found one whose doctrines are thoroughly vitiated by the crude and uncriticized metaphysics with which they are packed. We must philosophize, said the great naturalist Aristotle – if only to avoid philosophizing. Every man of us has a metaphysics, and has to have one; and it will influence his life greatly. Far better, then, that that metaphysics should be criticized and not allowed to run loose."

– Charles Sanders Peirce²

Recent scholarship in the cognitive science of religion would have us believe that we are somewhere close to a cognitive explanation of religion.³ I argue that it will take us a

¹ The original version of this paper was given at a religion and cognition colloquium at the Department of Religious Studies, University of Copenhagen, organized by Anders Lisdorf. I would also like to thank Dr. Robert Lewis for his help and encouragement. All errors are my own.

² *Collected Papers of C. S. Peirce*, C. Hartshorne, P. Weiss, and A. Burks, eds. (Cambridge, MA: Cambridge University Press, 1958), 1.129.

³ This despite recent arguments by Jerry Fodor that the field of cognitive science is itself in deep trouble. See his debate with Pinker in *Mind and Language* 20:1 (2005): 1-38. While Fodor claims that "truth is cognition's proprietary virtue" (29), Pinker thinks that the fact that we have many false beliefs such as "that fortune and misfortune are caused by the intentions of bribable gods and spirits," (18) throws doubt on this position, arguing that cognition is disposed to maximize fitness. Pinker does admit that "the idea that the mind is designed for truth is not completely wrong. We do have some

step even closer if we give up on the project of reductive psychology. Recent cognitive approaches to religion are excessively psychological, focusing primarily on the brains of individual subjects. Since the brain develops in the context of non-cognitive physiological and network processes, and concepts and actions in the world depend on non-cognitive physiological and network processes, we can say that these processes are just as important to understanding religion as those processes that take place in individual heads.

I thus argue that any 'bottom-up' approach must look to the field of integrated physiology, while any 'top-down' approach must look to pragmatism. An individual's cognitive capacity for religion may only be understood in relation to the physiological systems, notably the endocrine system, and in light of a sophisticated network theory.⁴ After some introductory remarks, I describe in detail some of the physiological constraints on cognition. This domain very loosely corresponds to what Searle, following John Dewey calls "background".⁵ I then describe the notion of triangulation, which corresponds to Searle's "network" and Dewey's "environment". The last

reliable notions about the distribution of middle-sized objects around us and the quotidian beliefs and desires of our friends and relatives." (19) Fodor responds by saying that of course "truth alone doesn't determine the course of action; how could it? But that doesn't deny that cognition *per se* is interested in truth *per se*." (30)

⁴ I would also offer warning to humanist scholars of religion who have refused to engage with the cognitive science. While it is true that in a perfect world science would be in the service of humanity, and to some extent it always is because ethical responsibility begins with knowledge, scientific pursuit is often clouded by monetary interests, egoism, or you name it. 'Science', in other words, is not looking back on the humanities for its approval, and it probably never will. Thus realistically it is up to those of us who have humanity in mind to enter the sciences and engage them. Skepticism means nothing without engagement.

⁵ See John Searle, *The Social Construction of Reality* (New York: Penguin Philosophy, 1995). John Dewey, *Art as Experience* (New York: Capricorn Books, 1934), 24, 266.

section lays out some of the implications of the argument for religion.

This argument should be considered part of a defense of a pragmatic conception of religion which finds irreducible “normative” properties that enter into the study of religion.⁶ If a scientific explanation of religion is possible, it will have to be subsumed under theories that make sense of everyday beliefs and actions more generally. Scientific pragmatism provides our best possibility for accounting for the normative dimensions of communication, recently shown in the work of Robert Brandom⁷, and finding expression in theories that try to make sense of complex social interactions like game theory and complexity theory.⁸

The emergence of normative network properties such as intelligence is a factor of the material, chemical, and physical constraints on the exchange of “information” between the nodes in a network. From the neuron-level to language, the exchange of “information” is actually the exchange of chemical or mechanical energy. The properties of the network that emerge will be dependent on the material-network relationship; for example, on the material side the propagation of energy (charge) between an animal’s neurons is much slower than fiber-optic cables, while on the network side a circuit-board made up of binary logic circuits has far less computational power than one which employs predicate logic such as a human social network. In sum, the materials that make up the nodes have their own physical properties and hence constraints, while the network is

⁶ For an enlightening review of the recent literature on cognition and religion, see Matthew Day, “The Ins and Outs of Religious Cognition,” *Method and Theory in the Study of Religion* 16 (2004), 241-255.

⁷ See Robert Brandom, *Making it Explicit* (Cambridge: Harvard University Press, 1994), especially the chapter: “Objectivity and the Normative Fine Structure of Rationality,”

⁸ See for example A. Benz, G. Jäger, and R. van Rooij, eds., *Game Theory and Pragmatics* (Basingstoke: Palgrave Macmillan) or David Sally, “Risky speech: behavioral game theory and pragmatics,” *Journal of Pragmatics* 35 (2003), 1223–1245.

constrained by the number of nodes and their arrangement (structure, or architecture).

The question of which comes first the emergence or the property is perhaps the wrong way to approach these issues.⁹ The focus point of this debate in recent years centers around the argument, as Joel Pust puts it, that “beliefs, desires, and other intentional states are the theoretical posits of a folk theory of the mind known as folk psychology.”¹⁰ Some psychologists and philosophers find that folk psychology is false and therefore subject to elimination as part of a reductive form of materialism. The internalists with regard to folk psychology think the normative system (i.e., of ‘platitudes’) is ‘represented’ in the heads of ‘the folk’ while “externalists take folk psychology to be either (1) simply the collection of psychological platitudes to which most of the folk readily assent, or (2) a ‘theory’ that systematizes or ‘captures’ the platitudes.” The extent to which the latter captures the platitudes, it must be true. This leaves only the former variety of externalism in jeopardy of eliminative materialism.

However, none of these options leave much hope for eliminative materialism. Internalist reductionism is patently false because there is no clear sense in which folk psychology is in the head, since brains are made up of physical structures and nothing else. For externalists the idea of eliminative materialism is either incoherent or it relies on unsophisticated or unclear notions of what it means for the “folk” to assent to propositions.

⁹ Cognitive approaches may be divided between modularity theories, complexity theories, theory theories, and simulation theories. For a good summary, see Peter Caruthers and Peter K. Smith, eds, *Theories of Theories of Mind* (Cambridge: Cambridge University Press, 1996). Logical pragmatism may also offer an answer to some of these questions. Brandom for example argues for a version of externalism called *inferentialism*, positing a view of communication as *deontic scorekeeping*. Donald Davidson had earlier argued for a kind of externalism called *triangulation*, discussed below. See Brandom 1994 and Donald Davison, *Subjective, Intersubjective, Objective* (Oxford: Clarendon Press, 2001).

¹⁰ Joel Pust, “External Accounts of Folk Psychology, Eliminativism, and the Simulation Theory” *Mind and Language* 14:1 (March 1999), 113–130.

To paraphrase a similar argument made by G. Scott Davis: the communicative interaction in which we engage when we attempt interpretation is inescapably normative and the normativity of interpretation implies either that the material vocabulary envisioned by the eliminative materialist will reproduce that normativity or that it will be inadequate to the sort of complete description his eliminative materialism requires.¹¹

Given these critiques of reductionism we are still left to think about the relation between “matter” and folk psychology. The main problem from the perspective of psychologists of religion is that the normative network idea may lean toward mysticism or reified conceptions of the social. On the one hand, it makes sense to say that social processes are dependent on the ‘bioware’ (biological hardware and software) of individual brains. Where, one may ask, on the other hand, is the network hardware?

But why are neurons a more fundamental place to begin our inquiry than embodied minds? We may say then that the network hardware is embodied minds.¹²

This paper defends the now widespread idea that cognition *begins* as an extensional process of individual brains. Extensionality is immanent in our conceptual and cognitive capabilities. Language acquisition, for example, is activated by social physiology. There is thus an irreducible social element to cognition that must be faced squarely. The task at hand is to reconcile the relation between social and psychological embodiment.

However, this position is not an attempt to apologize for mysticism and religion, or to offer a functional explanation of religion; religions are patently false and are not explained by

¹¹ G. Scott Davis, “Anomalous Monism and the Study of Religion,” Paper delivered for the “Pragmatism and Empiricism in American Religious Thought” Group, American Academy of Religion Conference, Philadelphia, 2005 (and is forthcoming).

¹² The philosophy of Daniel Dennett is clearest about extended mind. For the debates, see Bo Dahlbom, ed., *Dennett and His Critics: Demystifying Mind* (Oxford: Blackwell, 1995)

functions.¹³ It is merely an attempt to reorganize our subject under the fundamental premise that though there are such things as individual brains, there is no such thing as individual minds, i.e., emergent properties of mind are social in nature.

In light of these brief remarks concerning the material-network relation, in what follows I try to provide a detailed description of the two sides of the relation. In cognitive theories of religion, physiology is often left out of the material account, while networks are dismissed as fantasy. However, the nervous system and the endocrine system are integrated and to some extent cannot be distinguished as systems. Furthermore, to the extent that the endocrine system is distributed throughout the body, physiological bodies are just as fundamental to religion as brains. This applies not just at an internal level, but also externally. The body is the irreducible normative element in social interaction. To understand somebody as meaningful we must understand intentionality in the light of some body’s behavior (action).¹⁴ Thus not only must cognition be understood in the context of complex networks between embodied minds, within an individual body cognition must be understood in light of integrated physiology.

¹³ See Hans H. Penner, “On Self-Regulating Systems, Cannibals, and Cogs that Turn No Wheels: A Response to Joel Sweek,” *Method and Theory in the Study of Religion* 15 (2003), 390-408 and “You don’t read a myth for information,” In *Radical Interpretation in Religion*, edited by Nancy K. Frankenberry (Cambridge: Cambridge University Press, 2001), 153-187.

¹⁴ And we do not readily distinguish between our own actions and those of others. See Cristina Becchio and Cesare Bertone, “Wittgenstein running: Neural mechanisms of collective intentionality and we-mode,” *Consciousness and Cognition* 13 (2004) 123–133. Becchio and Bertone suggest that what is actually shared in joint attention is the brain region, the format or pattern as it were. Their research indicates that we do not readily differentiate between our own actions and those of others. A special mechanism is responsible for this that malfunctions in the neurological condition known as *echopraxia*. Becchio and Bertone’s research thus suggests that the classic question of collective intentionality should be reversed: the problem is no longer how is shared intention possible, but rather *how do we distinguish our own actions from those of others?*

Integrated Physiology

An integrated physiology of religion is consistent with embodied approaches to cognition such as that of Lawrence Barsalou. Barsalou et al. summarize their simulation theory, for which they find empirical areas of support, as follows:

In traditional theories, knowledge consists of amodal symbols that redescribe sensory, motor, and introspective states. . . . Traditional theories assume that *knowledge* of such experiences does not consist of the sensory, motor, and introspective states that constituted the experiences originally. Instead these theories assume that a symbolic system redescribes these states, producing amodal descriptions that reside separately from sensory, motor, and introspective systems and that operate according to different principles. . . . Conversely, embodied theories represent knowledge as partial simulations of sensory, motor, and introspective states (e.g., Barsalou, 1999a,b; 2002, in press; 2003; Damasio, 1989; Silnions & Barsalou, 2003b). When an event is experienced originally, the underlying sensory, motor, and introspective states are partially stored. Later, when knowledge of the event becomes relevant in memory, language, or thought, these original states are partially simulated. . . . these embodiments are not merely peripheral appendages or epiphenomena of social information processing, they constitute the core of it.¹⁵

¹⁵ See Lawrence W. Barsalou, et al., "Social Embodiment", *The Psychology of Learning and Motivation* 43 (2003), 44; see also Lawrence W. Barsalou et al.,

If memory, knowledge, and the 'core of information processing' are embodied in the way Barsalou describes, one could even make the following strong thesis: the endocrine system is more important than the central nervous system to the study of religion. In fact both systems are equally important but *must be understood in relation to one another*. This is a gap I will begin to fill by reporting on a introductory integrated physiology textbook, the third edition of *Human Physiology: An Integrated Approach*, by Dee Unglaub Silverthorn et al.¹⁶ I will begin with the basics, not assuming the reader has any familiarity with this discipline.

Physiology is "the study of the normal functioning of a living organism and its component parts." (2) Thus whereas anatomy is the study of structure, physiology puts more emphasis on mechanism. Integrated physiology puts more emphasis on how the human body functions as a "coordinated entity," how different levels of organization and complexity communicate and interact. The domain of knowledge of physiology thus overlaps with the fields of chemistry, molecular biology, cell biology, and ecology.

Physiology studies levels of organization from molecules to the population of one species. Molecules compose cells, which compose tissues, which compose organs, which compose organ systems, which compose organisms, which compose populations. The human body has ten interrelated organ systems: circulatory, digestive, endocrine, immune, integumentary (skin), musculoskeletal, nervous, reproductive,

"Embodiment in Religious Knowledge," *Journal of Cognition and Culture* (2005) 5.1-2. This approach must be augmented with recent attempts to understand the cognitive basis of intersubjectivity. Amongst the growing literature, see for example Daniel M. Wegner, "Précis of *The illusion of conscious will*," *Behavioral and Brain Sciences* (2004) 27, 649-692; Michael Tomasello et al., "Understanding and sharing intentions: The origins of cultural cognition," *Behavioral and Brain Sciences* (In Press).

¹⁶ Dee Unglaub Silverthorn et al., *Human Physiology: An Integrated Approach, Third Edition* (Redwood City: Benjamin-Cummings Publishing Company

respiratory, and urinary. “The nervous and endocrine systems coordinate body function” which optimally results in homeostasis of the organism.

Coordination of the systems requires that the “cells of the body communicate with one another rapidly and efficiently.” (9) Energy in the form of molecular or chemical bonds is necessary for all this communication to take place. These are chemical signals and electrical signals, by close range and long range. There are four basic methods of cell to cell communication in the body: 1) gap junctions, which allow “direct cytoplasmic [cell substance] transfer of electrical and chemical signals between adjacent cells;” 2) contact-dependent signals, which occur through surface binding; 3) local communication where “chemicals diffuse through the extracellular fluid;” 4) long-distance communication “through a combination of electrical signals carried by nerve cells and chemical signals transported by blood,” which circulates through the body about once a minute.

Homeostasis is maintained by a circuit (or feedback loop) from the stimulus, change, or disturbance, to the sensor or receptor which is continually monitoring its environment, to the integrating center, which evaluates the signal from the sensor, sending an output electro-chemical signal to the effector, which responds to bring the situation back to normal limits (191). For example, “the endocrine cells that secrete insulin monitor blood glucose concentrations by using ATP production within the cell as an indicator... When blood glucose increases... endocrine cells respond by secreting insulin in the blood.” (200)

Receptors thus transform stimuli into a signal. Receptors include a chemoreceptor (pH, gases, chemicals), an osmoreceptor (osmolarity), thermoreceptor, baroreceptor (pressure), proprioceptor (position), mechanoreceptors (pain, vibration, touch). The eyes, ears, nose, and tongue are *central* receptors, and are significantly more complex. But it is important to note that in complex circuits, there is usually more than one integrating center.

One interesting example of an integrating center within the digestive system is called the enteric nervous system. The enteric nervous system, which is composed of neurons on the walls of the gastro-intestinal tract, anatomically and functionally shares many features of the central nervous system, and is thus termed “the little brain”. There are neurotransmitters and neuromodulators, support cells of neurons, capillaries that surround ganglia similar to the blood-brain barrier in cerebral blood vessels, and an integrating center independent of the central nervous system (671)

I will now move on to a description of the endocrine system. The endocrine system is primarily responsible for the regulation of hormones. Hormones are chemical messengers secreted in the blood by specialized cells. Most hormones are peptides or proteins, which are amino-acid (an organic compound) chains. They are responsible for many long-term functions of the body, including growth and development, metabolism, regulation of the internal environment, and reproduction. Hormones act on their target cells in three basic ways: 1) they control the rates of enzymatic reactions, 2) they control transport of ions or molecules across cell membranes, and 3) they control gene expression and the synthesis of proteins (209). Hormones are generally secreted by endocrine glands, for example the Pineal, adrenal, or thyroid glands; though also by some clusters of neurons, for example the hypothalamus; and some cells or tissues such as the liver. Hormones are able to act at concentrations from the small (nanomolar, 10^{-9} M) to the extremely small (picomolar, 10^{-12} M).

Some relevant examples include: the Pineal gland which secretes the hormone melatonin, and whose target cell is unclear in humans, but the main effect is the regulation of circadian rhythms (night-day, sleep-wake, balance). The Adrenal Medulla gland secretes epinephrine and norepinephrin, whose target is many different tissues and effects the fight-or-flight response. The thyroid secretes triiodothyronine, thyroxine, and calcitonin which regulate metabolism, growth and development.

Obviously two of the most important hormones, testosterone and estrogen are secreted by the testes and ovaries respectively, which effect secondary sex characteristics. The hypothalamus regulates the release of pituitary hormones, which in turn effect milk production, growth and metabolism, and sex hormone production.

Often thought of as an external hormone, a pheromone is an air or water born signaling molecule, “secreted to influence others of the same species.” Pheromones are “compounds that regulate a specific neuroendocrine mechanism in other people without being consciously detected as odours.”¹⁷ Most mammals and vertebrates communicate with pheromones through what is known as the vomeronasal system, which contains two populations of neurons that project into the olfactory bulb.

The existence of pheromones in humans however is still controversial. Silverthorn for example notes that the vomeronasal organ (VNO) “is present in the early embryo but appears to regress during development. A VNO-like bulb can be found in some adult humans, but it has no evident sensory cells and no discernable neural connection to the brain.” However Silverthorn also notes that “some recent studies have shown that human axillary (armpit) sweat glands secrete volatile steroids related to sex hormones that appear to serve as human pheromones.” (212) More recent anatomical studies have also “indicated that a vomeronasal organ was present in human adults and reports were published indicating that this system might be functional.”¹⁸ Other researchers also find that “a potentially functional VNO-hypothalamic-pituitary-gonadal axis exists.” For example, Stern and McClintock found that “odourless compounds from the armpits of women in the late follicular phase of their menstrual cycles accelerated the preovulatory surge of luteinizing hormone of recipient women and shortened

¹⁷ *Nature* 392, 177-179 (12 March 1998).

¹⁸ See M. Halpern and A. Martinez-Marcos, “Structure and function of the vomeronasal system: an update,” *Progress in Neurobiology* 70:3 (2003), 245-318.

their menstrual cycles.”¹⁹ In other words, these odorless compounds effect the menstrual rhythms of other women.

Many endocrine reflexes involve the nervous system, which overlaps in structure and function. The neuron is the most rapid form of communication within the body, its electrical signals traveling as fast as 120 m/sec, while endocrine signals are slower and for greater duration. Neurons function through chemical reactions that transport ions across cell membranes and thereby propagate electrical signals (sodium Na^+ , chloride Cl^- , calcium Ca^{2+} , and Potassium K^+). If its threshold energy is not reached the neuron will not propagate the signal. A neuron may thus be “on” or “off”.

A special class of hormones called neurohormones are hormones released into the blood by a neuron. The regulation of these hormones is absolutely central physiological reflexes of the hypothalamus and pituitary glands, especially. Many neurotransmitters, such as dopamine and adrenaline (also norepinephrine 301) (266, 377), function as neurohormones when secreted in the blood. The definition of the communicator depends on where the signals originate and terminate and the chemistry of the signals (301).

So hormones are chemicals secreted by endocrine glands into the blood, neurotransmitters are chemicals secreted from neurons to a target cell, while neurohormones are chemicals released by neurons into the blood. The nervous system thus uses a combination of chemical and electrical signals and “the similarities between neurohormones and hormones secreted by the endocrine system blur the distinction between the nervous and endocrine systems, making them a continuum rather than two distinct systems.” (174) Neural, neuro-endocrine, and endocrine reflexes should thus be understood as a continuum.

At a broader level, physiologists divide the motor output systems of the body into three: the sensory system, the cognitive system, and the behavioral-state system. (301) “The sensory system monitors the internal and external environment and

¹⁹ *Nature* 392, 126-127 (12 March 1998).

initiates reflex responses," while the behavioral-state system governs sleep-wake cycles, intrinsic behaviors, and is "an important modulator of sensory and cognitive processing." (304) Part of the behavioral-state system is a collection of neurons known as the diffuse modulatory systems.

The diffuse modulatory systems are classified according to the neurotransmitter chemical they secrete: 1) noradrenergic (nonpinephrine), 2) serotonergic (serotonin), 3) dopaminergic (dopamine), and cholinergic (acetylcholine). The diffuse modulatory systems influence attention, motivation, wakefulness, memory, motor control, mood, and metabolic homeostasis. (305) Dopamine, for example, triggers motivation and reward response, the feeling of pleasure linked to food, sex, and drugs. The fact that food and drugs activate common reward pathways has given physiologists clues concerning the present obesity epidemic.²⁰ Though dopamine is classified as a neurotransmitter, in general motivated behaviors work in parallel with the autonomic and endocrine systems, such as the hypothalamus. (309)

As far as emotion and motivation are concerned, Silverthorn writes:

Emotion and motivation are two aspects of brain function that probably represent an overlap of the behavioral state and cognitive systems. The pathways are complex and form closed circuits that cycle information between various parts of the brain, including the hypothalamus, limbic system, and cerebral cortex. We still do not understand the underlying neural mechanisms... (308)

²⁰ N. D. Volkow and R. A. Wise, "How can drug addiction help us understand obesity?" *Nature Neuroscience* 8:5 (2005), 555-60.

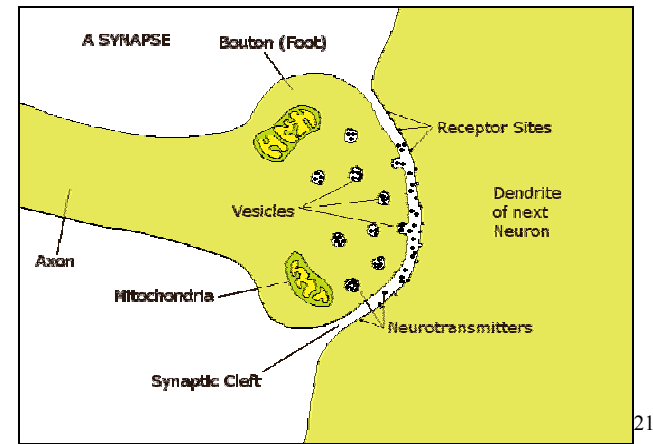


Figure 1. The synapse-neuron connection.

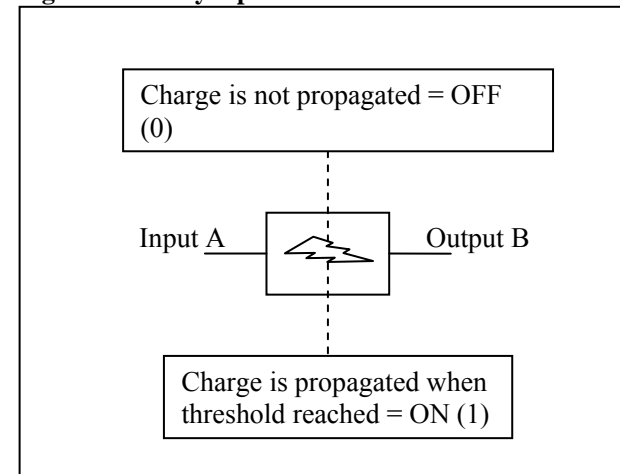


Figure 2. A simple representation of neuron circuit.

Network

From the perspective of the bottom-up, emergent properties are somewhat mysterious. Reflection upon complex

²¹ From <http://www.ship.edu/~cgboeree/theneuron.html>, Copyright 2003, C. George Boeree.

systems requires us to pose properties that are instantiated in those systems. For example, *homeostasis* is a complex concept not found localized in any region of the neuro-endocrine system. The molecules that make up chemical systems know nothing of our concept of homeostasis. Thus if we move one level up from any complex material interaction we find normative properties that are instantiated in the level below. Normative properties or attitudes necessary for robust human communication, folk attitudes like beliefs, intentions, and desires, are instantiated in the material ‘below’ in the same way. If we are to make sense of human actions, it does not make sense to weed these normative elements out, anymore than it does to get rid of the notion of homeostasis.

In this sense we might think of consciousness as a factor of networks or circuits all the way down (or up).²² As noted these circuits are characterized by physical ‘properties’ and architecture. Neuronal or endocrine networks are relatively simple when compared to human network, because the nodes in human networks, embodied minds, are themselves quite complex. But for modeling purposes we may say that at a basic level human networks still hold properties of circuits.

In this section, I will juxtapose Baron-Cohen’s and Davidson’s network theories, which both call *triangulation*. I think it is intriguing that a philosopher of language developing an ‘a priori’ theory of communication and a researcher in autism would come to such similar conclusions. I think it gives us strong reason to support one version of the triangle or another. For both, triangulation is the basis for the ability to attribute normative states, emergent properties, to others (also known as mentalizing abilities). Both scholars think triangulation is a necessary condition of thought where more basic perceptual triangulation by small children develops into the triangulation characteristic of robust communication. Baron-Cohen gives a

²² In the same way, evolution (through natural selection and DNA combination) is now understood as natural computation.

more precise language for the primitive triangle, while Davidson gives a better language for the robust triangle.

In *Mindblindness*, “an essay on autism and theory of mind,” Baron-Cohen argues that autistic people suffer from various degrees of mind blindness; they have trouble seeing or understanding other people’s mental states.²³ Baron-Cohen describes four independent but interrelated developmental mechanisms that support our ability to attribute and predict the mental states of others.

The first is “the intentionality detector,” (ID for short) which is an amodal “perceptual device that interprets motion stimuli in terms of the primitive volitional states of goal and desire.” (32) We automatically tend to interpret an object’s movement in space in terms of goal and desire.

The second mechanism that allows for mindreading is the “eye-direction detector,” (EDD for short) which 1) detects the presence of eyes or eye-like stimuli, 2) computes whether eyes are directed toward it or toward something else, and 3) infers from its own case that if another organism’s eyes are directed at something then that organism sees that thing (38-39). The last function “allows the infant to attribute a perceptual state to another organism (such as ‘Mother sees me’).” (39)

The ID and EDD build “dyadic representations” since they specify the intentional or mental relation between an agent and an object. Representations thus take the form of one place predicates such as “Agent-sees-me.” (44)

The key function of the third mechanism, the “shared attention mechanism” (SAM for short) is the building of “triadic representations” which specifies the relations between three objects (agent, self, object or agent, self, agent, etc...). Thus the SAM involves what philosophers of language call a two place predicate in which the EDD relation is imbedded, such as “Mother sees (I-see-the bus)”. The SAM says “you and I see that we are looking at the same object.” (45) By “sharing

²³ Simon Baron-Cohen, *Mindblindness: an essay on autism and theory of mind* (Cambridge, Mass.: MIT Press, 1995).

attention,” SAM thus “builds triadic representations by using any available information about the perceptual state of another person (or animal).”

SAM is suggested in evidence of “gaze monitoring”, where infants “turn in the same direction that another person is looking and then shows gaze alteration, checking back and forth a few times to make sure (as it appears) that it and the other person are both looking at the same thing.” (48) Also, most toddlers produce “protodeclarative pointing gestures,” while autistic children tend not to.

Finally we have the fourth mechanism, the “theory-of-mind mechanism” (ToMM for short). The first three mechanisms allow us to compute behavior and eye direction in terms of volitional and perceptual mental states (“Mommy wants x”, “Mommy sees x”) and the ability to compute when two agents attend to the same object or event (Mommy sees I see the toy). The theory of mind adds (1) “epistemic mental states:” the full range of propositional attitudes (such as pretending, thinking, knowing, believing, etc...) to the mix and (2) a way of tying volitional, perceptual, and epistemic mental-state concepts together by turning the mentalistic knowledge into a useful theory.

ToMM thus “processes representation of propositional attitudes” in the form [Agent-Attitude-“Proposition”] such as [John-believes-“it is raining”]. These representations allow two related innovations: referential opacity and falsity. Referential opacity is the failure of substitution of co-referential expressions, expressions which refer to the same thing, to preserve truth in certain contexts; for example: Joseph’s brother thought they were bowing down to the prime minister of Egypt, can be true, while Joseph’s brother thought they were bowing down to their brother, may be false (52). “Non-substitutability” allows a space between representation (or “appearance”) and “reality,” in the sense that one recognizes that the attitudes others hold to state of affairs may not be true. That is, people sometimes think things that are true, and sometimes think things that are false. For

Baron-Cohen, this partly explains why “children with autism do not produce much pretend play and have inordinate difficulty understanding false belief.”²⁴

Baron-Cohen’s research describes a developmental picture as follows: from birth to 9 months, the infant has ID, and the basic functions of EDD (dyadic representations). Following Trevarthen,²⁵ Baron-Cohen called this phase “primary intersubjectivity”. From 9 to 18 months the child acquires SAM, something of a qualitative shift, since triadic representations can be built “that make joint attention possible.” (56) SAM links EDD with ID, corresponding to what Trevarthen called “secondary intersubjectivity”. From 18 to 48 months SAM triggers ToMM, heralded by the onset of pretend play. This may constitute another “qualitative shift” or quantum leap, since the child begins to infer epistemic mental states (propositional attitudes) starting with “pretend”, progressing to “knowing” and “believing”.

Baron-Cohen thus argues that SAM triggers ToMM since SAM produces more primitive (perceptual) triadic representations. These representations may then be modified to hold more mentalistic entities once they become available.

Like Baron-Cohen, Davidson does not distinguish between using language and making one’s way around the world more generally. For Davidson, triangulation is a geographical or

²⁴ Boyer describes these abilities more generally as they relate to religion in his discussion of “decoupling” in *Religion Explained: The Evolutionary Origins of Religious Thought* (New York: Basic Books, 2001), 129. He sees the ability to make inferences and reason based on false premises to be central to the origins of religion: “Supernatural concepts are just one consequence of the human capacity for decoupling representations.” (131)

²⁵ Colwyn Trevarthen, “Communication and cooperation in early infancy: A description of primary intersubjectivity,” In M. Bullowa (ed.), *Before speech: The beginning of interpersonal communication* (New York: Cambridge University Press, 1979) and “The Self Born in Intersubjectivity: The Psychology of an Infant Communicating,” in Ulric Neisser ed., *The Perceived Self* (Cambridge: Cambridge University Press, 1993). See also Michael Tomasello, *The cultural origins of human cognition* (Cambridge, Mass.: Harvard University Press, 1999).

astronomical ‘metaphor’ (or ‘analogy’) he uses to show some of the themes in his “third-person approach to language.”²⁶ A surveyor or navigator uses the angles between two fixed points of reference to determine his own position.

Davidson uses triangulation to cut to the chase about a number of points in his philosophy. 1) To make a philosophical point about what is necessary for communication to convey content; 2) A way to talk about communication by getting around epistemic intermediaries; 3) A way to get at his “third person approach to language”; 4) The triangle provides the conditions necessary for the concept of truth to have application; 5) A way to talk about the importance of “sharing” attentions, intentions, reactions, and interests; 6) Perception does not supply special evidence but is often apparent to others and so becomes the basis for communication; 7) finally Davidson, like Baron-Cohen finds that a more primitive triangle develops into a robust one in holistic communication. In doing so both Baron-Cohen and Davidson focus on these issues of error, referential opacity, and truth. Davidson is more interested in the philosophical consequences of triangulation than the physical mechanisms that allow for it.

So what is the triangle? Triangulation “involves two or more creatures simultaneously in interaction with each other and with the world they share.”²⁷ Within this basic situation Davidson locates three kinds of interactions: I) the interaction of the first creature with “the world” and the second creature, II) the interaction of the second creature with the world and the first creature, III) the two creatures’ reaction to the interaction (7). So at two corners of the simplest triangle are two creatures; in the case of robust communication, the creatures have the full repertoire of linguistic concepts. At the third corner is a shared environment.

²⁶ See Donald Davidson, 2001, 105; *Problems of Rationality* (Oxford: Clarendon Press, 2004), 142-143; “Language Philosophy, Writing, and Reading: A Conversation with Donald Davidson,” *JAC* 13:1 (1993)

²⁷ Davidson, 2001, 128-129.

We grasp the normative properties of basic attitudes like belief and desire only once we can recognize them in others. And this last step requires that we participate more or less completely in the holism of the mental. Robust communication thus requires us to take the first, second, and third person perspective all at once; to recognize not just that another has a different perspective but that you are both reacting to your interaction – that is, triangulating, which provides the depth in linguistic communication.

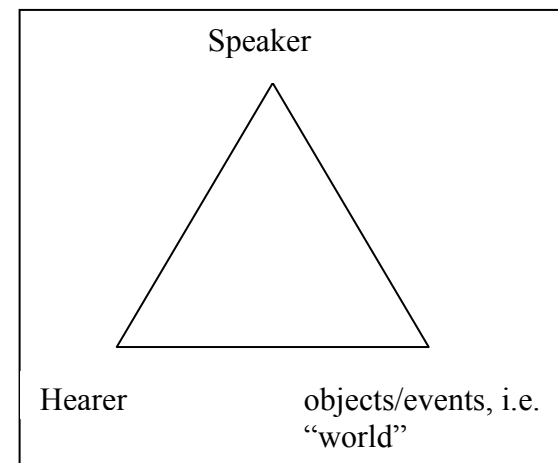


Figure 3. Davidsonian triangulation.

The relations between the corners of the triangle concern what Trevarthen called primary and secondary intersubjectivity; that is, those concepts and attitudes shared between the creatures, such as attention and intentions. Finally, a key feature of the robust triangle that Davidson points out is that the two creatures grasp the interaction within the triangle as a whole. The triangle is thus the basic circuit of robust communication, where the speaker and hearer represent nodes on the network, and where the shared environment provides the constraints for input

and output. The input and output is dependent on theories which Davidson calls prior and passing theories.²⁸

Davidson's version of triangulation also emphasizes iteration. It is a basic idea in elementary electrical engineering that relatively few binary logical expressions or circuits when coupled together billions of times can result in extremely complex non-binary behavior (and binary circuits allow for significantly more complexity than other types). Properties that emerge in these networks are intrinsic to the descriptions of the complex behavior. Similarly, Davidson points out that the theory one uses to interpret the utterances of another could be conceived of as "a machine which, when fed an arbitrary utterance (and certain parameters provided by the circumstances of the utterance), produces an interpretation." Davidson favors a Tarski-style machine,²⁹ which "provides a recursive characterization of the truth-conditions of all possible utterances of a speaker."³⁰

In the case of robust human triangulation, the nodes are embodied minds and the inputs and outputs of the circuit are propositional attitudes that may provide reasons for further actions or beliefs. It is for this reason Davidson rules out reductionism. As he says,

the laws of physics may, if we please, be called causal. The point is that they do not employ causal concepts. The concentration of psychology on the causal role of reasons rules out any hope that the basic mental concepts can be fitted into a closed system of laws. There is one more (much debated) consideration which militates against the nomological or definitional

²⁸ See Donald Davidson, "A Nice Derangement of Epitaphs," (1986) reprinted in Davidson, *Truth, Language, and History* (Oxford: Clarendon Press, 2005)

²⁹ See Alfred Tarski, "The semantic conception of truth," *Philosophy and Phenomenological Research* 4 (1944), 13-47.

³⁰ Davidson, 1986, 468

reduction of mental concepts to those of physics, namely, the fact that propositional attitudes and related events and states are in part identified in terms of their causal and other relations to events extraneous in time and place to the agent they characterize. Thus it is held, correctly in my opinion, that the history of an individual's learning and use of words and concepts is in central cases necessarily a factor in determining what the words mean, and the contents of those concepts.³¹

Davidson's example of triangulation should be understood as the simplest circuit of robust communication. Any circuit requires input, output, and a set of constraints determined by an algorithm and its materials. In the same way robust communication may be thought of as a circuit between a speaker, hearer, and a world of constraints. But it is important to note that like a circuit, communication would be governed by the iteration of such interactions, algorithms, and constraints.

Analysis

So this paper has argued that individual religious cognition must be situated in the material-network relation, between a fully embodied neuron-endocrine background and robust triangulation. Religion is not or not just in the head; it is based on physiological principles and communicative networks of coordinated actions. In terms of the physiological basis of cognition, it is true that the nervous system is very important, however in order to understand religion we need to start talking about how this system integrates with other systems.³²

³¹ Davidson, 2001, 71.

³² To argue this point is to take literally Boyer's (and others) metaphor of religion as epidemic in Boyer, 2001, 46. Boyer, following Sperber's influential notion of the epidemiology of culture, finds physiological processes of viral

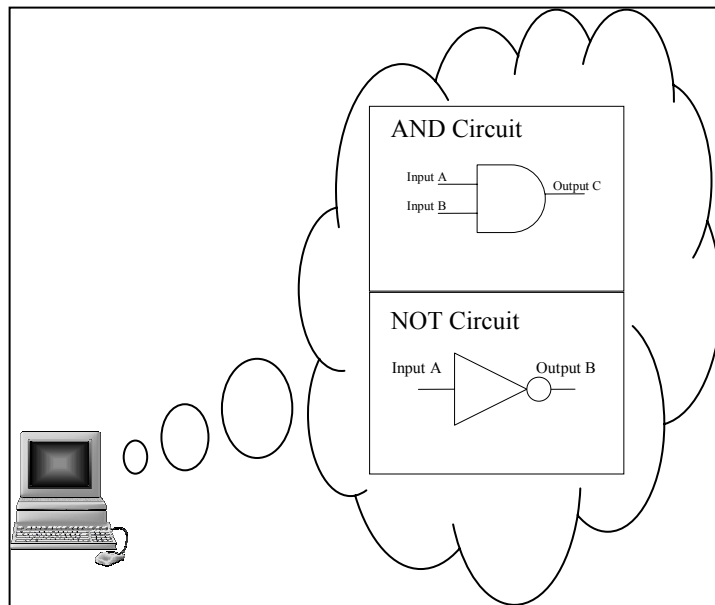


Figure 4. Computer Logic.

Though the neuro-endocrine background provides the constraints for religion, the motivations of religious actors represented in terms of folk psychology (that is their intentions, desires, beliefs, and other propositional attitudes, the network as it were) are not reducible to the background, but rather can only be understood in relation to the background, as those descriptive

transmission are analogous to cultural transmissions such as religion. Boyer goes to great lengths to argue that in order to understand an epidemic such as the outbreak of malaria we need to know a great deal about physiology. When he turns to mental representations such as religion (*sic*), he says we need to know a lot about *psychology*. This paper proposes we need to know a lot about physiology in both cases. Both Boyer and Sperber may thus fall into representationalist fallacies. For example, when Boyer writes that “human minds are inhabited by a large population of mental representations” (46). This statement is patently false.

properties that emerge when one moves between “levels”.³³ In terms of religion then, as Nancy Frankenberry puts it:

Unlike other contexts in which we study people’s economic status or political actions, frequently dispensing with their own intentions, desires, beliefs, hopes, and fears, there is no distinguishable religious context that can be discerned apart from people’s propositional attitudes. Superhuman beings, in other words, cannot be identified by an interpreter apart from people’s beliefs about them, and so in that case it is statements and assertions about superhuman beings that are crucial to the interpretation of any given practice or belief as religious.³⁴

The methodology I advocate is thus a form of anomalous monism in the sense that we should first try to grasp the folk psychological domain in its own terms, at its own level, in what

³³ See John Searle, “Consciousness, the Brain and the Connection Principle: A Reply,” *Philosophy and Phenomenological Research*, LV: 1 (1995). As Searle writes in correcting Jaegwon Kim: “solidity and liquidity are features of physical systems at a level higher than that of molecules, but solidity and liquidity are not parts of the molecules nor are they parts of the system composed of molecules... It is precisely because there are higher level *features* of systems that are not *parts* of the system that we need levelism in the first place.” Searle argues for the idea of “levelism,” or that there can be “different but consistent descriptions of the same system given at different levels.” With this in mind one may say that “all mental states are caused by brain processes, but some mental states cause other mental states...” and furthermore that there can be top-down or “downward causation.” For example, “If someone says to me ‘Secrete acetylcholine at the axon end plates of your motoneurons or I will blow your brains out!’ I will swiftly do some downward causation, e.g. by trying to raise my arm, which I know will cause the secretion of acetylcholine.” (216-217)

³⁴ Nancy Frankenberry, “Weakening Religious Belief: Vattimo, Rorty, and the holism of the mental,” Forthcoming.

has been called a “science of rationality.”³⁵ If it turns out, in the very long run (as we have seen in Fodor’s recent polemics³⁶), that the vocabularies of folk psychology and physiology have success in explaining the same behaviors, it is at that point we should start asking why. To immediately start from the presumption that psychological entities and attitudes are explanatorily reducible to physiology (or ‘cognition’) is profoundly premature.

In this final section I want to briefly lay out three related visions of religion that we can think about in relation to the background-network continuum: they are in terms of 1) ‘mysticism’, 2) addiction, 3) a natural computation model of communication.

As for the first my treatment will be brief. All that I mean to highlight with the term mysticism is the type of argument given, for example, in John Dewey’s treatment of the above continuum (which he calls background-environment) in *Art as Experience*. Dewey finds that there is an optimal condition for human life that we find in art, where the background and environment are in a state of balance. True art, as pure experience, attains symmetry and rhythm, an “equilibrium of counteracting energies.” (179)

As for the second vision, this mystical idea of religion is far less useful to analysis than one that gives us a clear definition. The best we have is “religion is a communal system of propositional attitudes and practices that are related to superhuman agents.”³⁷ Many scholars of religion tend to place too much weight on the concept of superhuman agents, when these agents must always be understood in light of systems of propositional attitudes. Furthermore, *beliefs* in superhuman

³⁵ See Donald Davidson, “Could There Be a Science of Rationality?” reprinted in Davidson, 2004.

³⁶ See note 3.

³⁷ For the latest defense of this definition and other arguments of “The Dartmouth School”, see Nancy Frankenberry and Hans Penner, “‘There needs no ghost come from the grave to tell us this’: a response to Ivan Strenski,” *Religion* 34 (2004) 65–74.

agents are important, but beliefs are just one propositional attitude among many; desire may be just as fundamental to religion.³⁸

Desires involve goals and values, and we recognize them based on actions. Infants understand goal-directed actions before they understand such actions to be the result of intentions or plans. From the theory of mind literature, for example Baron-Cohen’s first mechanism of mind-reading (the amodal “intentionality detector”), we find that the concept of desire developmentally precedes belief.³⁹ Tomasello has also pointed out that the recognition of desire developmentally precedes the recognition of intentionality.⁴⁰

Reading Dennett, Davidson, or any other really meticulous philosopher of mind, we know that content is a problem when we try to isolate it in a single mind. For this reason, the distributed mind is a hot topic, and one perhaps that religious studies can contribute toward. But in order to do so we may need what Davidson and others call a “unified theory of meaning and action,” which will combine semantics and decision theory into one theory. While semantics involves truth as a function of both meaning and belief, decision theory involves preference as a function of beliefs and desires.⁴¹ A unified theory of meaning and action thus involves a “heightened indeterminacy due to interdependence of meaning, belief, and valuing.”⁴²

³⁸ See Frankenberry, Forthcoming.

³⁹ See Baron-Cohen, 1995.

⁴⁰ See Tomasello et al (In Press).

⁴¹ Note on Bayes.

⁴² Donald Davidson, “Reply to John D. Collins,” in Lewis Hahn, ed., *The Philosophy of Donald Davidson* (Peru, IL: Opencourt Publishing, 1999), 530. This statement follows years of thought by Davidson concerning the relation between decisions, actions, and beliefs. Davidson’s early work was on decision theory, but he found he could not make scientific headway into decisions without a well thought out semantics because the research methods for studying decisions rely on implicit semantics. This may apply equally to cognitive ‘research’ on religion where human subjects are asked or tricked to ‘reveal’ their thoughts concerning religion in a ‘closed’ laboratory environment. The

A mental state such as the belief in superhuman agents perhaps should be seen more along the lines of a state of the belief-decision system as a whole at a particular time. I think Scott Atran intimates the latter idea in a recent article, where he writes:

Developmental and cross-cultural experiments indicate that religious beliefs typically involve culturally-developed manipulations of innate and domain-specific cognitive constraints (much as the pornography or fast-food industries typically involve artificial manipulations of innate likings for sexual partners and protein-rich foods). The conceptual foundations of religion are intuitively given by task-specific panhuman cognitive domains, including folkmechanics, folkbiology, folkpsychology.⁴³

In this view religion is thought of partly as a way for institutions (including those that study religion) and the people they serve to manipulate individuals. I suggested above that we should reconsider whether to call these purely "cognitive states," on the basis of the fact that domain specific cognitive networks are still dependent in part on regulation by neurohormones. However, Atran's point still stands. As he intimates, the recent obesity epidemic is commonly explained by biologists as a complex trend involving the mass production of sweet, high carbohydrate or high protein foods that our bodies (and minds) evolved to desire in the context of the contingencies of evolutionary history. Corporations interested in people

semantic dimension of this 'evidence' is rarely explored precisely because it would reveal a heightened indeterminacy. On the basis of this indeterminacy, science of religion should balance psychology with the new resources of the probabilistic sciences and computational semantics.

⁴³ Scott Atran, "Adaptationism for Human Cognition: Strong, Spurious or Weak?" *Mind and Language* 20:1: 53 (see also p49).

becoming dependent on their products have thus found a mechanism to "hijack" neuro-hormonal circuitry that evolved to predispose us to such foods. Similarly, provoking our natural proclivities toward sex has the effect of a mass hypnosis, where this drive can then be turned into purchasing power.

Atran argues for an analogy to religion in terms of our natural proclivity to attribute agency. Religions can take advantage of the slipperiness and invisibility of mental states. Religions can hijack neurological and perhaps neurohormonal propensities to attribute agency, just as addiction hijacks neurohormonal circuitry. Thus religion might be thought of as a proclivity to desire (and take) certain propositions be true.

The third vision is perhaps the most promising, though I can only outline it presently. Dan Sperber, a cognitive anthropologist, and Deidre Wilson, a linguist who specializes in pragmatics, have recently developed a well received theory of communication called "relevance theory."⁴⁴ Similar to

⁴⁴ See Dan Sperber and Deirdre Wilson, *Relevance: communication and cognition* (Oxford: Blackwell, 1995). For my own work I am concerned with the cognitive-physiological differences between oral and written language. I think there were new constraints put on human patterning systems when people began to be massively trained in writing. For one thing, the physiological process is quite different in the two systems. On the one hand, natural language involves a number of integrating centers from hearing, a complex sense that involves the transduction of energy from air waves into 1) mechanical vibrations, then 2) fluid waves, 3) chemical signals and finally 4) action potentials," to reasoning systems. Reading and writing, as is commonly pointed out from Derrida to Dennett, not only involves other mechanics, but is dominated by vision, which is a three step process, 1) the focusing of light on the retina, 2) photoreceptors transducer light energy into electrical signals, 3) processing the signals in the central nervous system. So there are definite differences when humans begin to be trained to recognize and produce the visual patterns of written language. We might say that whole new theoretical objects were invented. Before 2000 BCE no one ever had the concept of an aleph, or gimmel, alpha or gamma. But, this aside, we can say that writing forces many new cognitive constraints on communication. More effort is required in production and processing at the same time there are many cognitive benefits.

Davidson's notion of triangulation, relevance theory tries to account for success in communication. Proponents of the theory of relevance argue that human communication will maximize the ratio of positive cognitive effects, those beneficial inferences one may draw from a speaker's utterances, to cognitive processing, the energy required to process the utterance. They think about communication in evolutionary terms, "that we are designed to look for as many cognitive effects as possible for as little processing effort as possible. The idea is that, as a result of constant selection pressure towards increasing cognitive efficiency, we have evolved procedures to pick out potentially relevant inputs and to process them in the most cost-effective way."⁴⁵

The argument made above should cause us to revise relevance in terms of something like neuro-*endocrine* efficiency. Jean-Pierre Changeux makes a similar point when he says, "it will be useful to broaden the concept of 'relevance'... to include all aspects of the organism. The basic idea is that there is an analogy between the communication that occurs between organisms and that which occurs within the organism, particularly in the course of development."⁴⁶

To translate this into the language of this paper, we may say that biological software/hardware implements algorithms (what is now called natural computation) that involve relevance principles all the way down (or up) the network-physiology continuum. Similarly, Davidson envisions semantics in terms of a circuit board of logical operators under triangular recursion where attitudes, such as beliefs and desires, emerge one level up. The human semantic network is thus built out of logical operators, which any elementary computer circuit can do, in

⁴⁵ Robyn Carston and George Powell, "Relevance Theory – New Directions and Developments," In *The Oxford Handbook of Philosophy of Language*, edited by E. Lepore and B. Smith (Oxford: Oxford University Press, 2005), 1-2.

⁴⁶ *The Physiology of Truth: Neuroscience and Human Knowledge* (Cambridge, Mass: The Belnap Press of Harvard University, 2004), 35.

addition to singular terms (names), predicates, quantifiers, modifiers, and some other operators.⁴⁷ The main difference between 'artificial' and human circuits is that human circuitry and the natural computations that went into it have been constrained by millions of years of evolution.

Semanticists since Frege notoriously thought that propositions refer to truth values, truth or falsity.⁴⁸ Truth and falsity are not quite ones and zeros because they are complex semantic concepts, but when plugged into Davidson's recursive system, we can think of them that way. Truth and falsity may be thought of as input and output values of the semantic network. Middle values, as in basic circuits, can emerge out of binary values. In this vision, understanding consists in recursion.

In semantic theory, true (closed) sentences are those satisfied by every sequence.⁴⁹ If we think of this in terms of the definition of religion presented above, religious beliefs (those that involve superhuman agents) are patently false⁵⁰ because they

⁴⁷ For an introduction to the growing literature on computation, see John F. Sowa, *Knowledge Representation: Logical, Philosophical, and Computational Foundations* (Pacific Grove, CA: Brooks/Cole, 2000). Sowa's summary of the historical background for the development of logical semantics is quite helpful. Leibniz, one of the inventors of differential calculus, was the first to formalize patterns of syllogistic reasoning. He was apparently inspired by the binary patterns in the Chinese *I Ching*, "which he adapted to form the first system of binary arithmetic." (6) Leibniz assigned prime numbers to the primitive concepts, such as material/immaterial or animate/inanimate and "multiplied them to derive the numbers for each composite concept." (7) The next breakthrough came with George Boole (1854), who used numbers to represent truth values rather than categories, thus "instead of large numbers like 546 for Animal or 10, 374 for Human, Boole needed only two small numbers, 0 for false and 1 for true." (8) Next came Peirce who organized the operators (and, or, not, if-then) into truth tables. Quine (1937) eventually showed that "first-order logic plus the membership operator ϵ provides enough power to define all of set theory and the foundations of mathematics." (41)

⁴⁸ Gottlob Frege, "On Sense and Nominatum," in *Readings in Philosophical Analysis*, Herbert Feigl and Wilfred Sellars, eds. (New York: Appleton-Century-Crofts, Inc., 1949).

⁴⁹ Note on Salmon.

⁵⁰ Hans Penner is the only religionist to make this argument based on semantic principles, see Hans Penner, "Why does semantics matter," in Nancy

are open sequences; they are not constrained in the right way. But we may say that religion and knowledge are constituted in relation to one another, because it is the very openness between names and predicates that allow for the complexity of human semantics/pragmatics in the first place; that is, the distinction between names and predicates are in fact "preserved through the recursion of open sentences."⁵¹

Frankenberry and Hans Penner (eds.), *Language, Truth, and Religious Belief: Studies in Twentieth-Century Theory and Method in Religion* (Atlanta: Scholars Press, 1999). Penner argues that "the content of religious language is patently false. This does not mean that people who make mention of superhuman beings from time to time are irrational. Nor does it entail that they are massively mistaken about the world they live in. The mistake is to think or imagine that some people are submerged or enveloped in religious propositional attitudes and actions twenty-four hours a day! ... We must give up the idea that the semantics of religious language has a content or a meaning other than literal meaning, simply because there is none." (504) There are, of course, other versions of logical semantics that could address the fictional nature of religion. Sowa, in an intriguing section called "Facts, Fictions, and Hypotheses" notes that: "Karel Lambert (1967) coined the term *free logic* for logics that allow variables to refer to entities whose existence is dubious. In a collection of papers on free logic, the fourteen authors defined more than fourteen versions." See Karel Lambert, ed., *Philosophical Applications of Free Logic* (New York: Oxford University Press, 1991). See also Nathan Salmon, "Mythical Objects," In *Meaning and Truth: Investigations in Philosophical Semantics*, Joseph Keim Campbell, Michael O'Rourke, and David Shier, eds. (New York, NY: Seven Bridges, 2000), 105-123. Salmon, who is the preeminent semanticist in analytic philosophy, argues that "the solution [to Geach's puzzle] ... takes seriously the idea that false theories that have been mistakenly believed – what I call myths – give rise to fabricate but genuine entities. These entities include such oddities as... the Loch Ness Monster, Santa Claus... Such *mythical objects* are real things, though they are neither material objects nor mental objects ('ideas'). They come into being with the belief in the myth. Indeed, they are created by the mistaken theory's inventor, albeit without the theorist's knowledge. But they do not exist in physical space, and are, in that sense, abstract entities. They are an unavoidable by-product of human fallibility." (112)

⁵¹ Donald Davidson, "Reply to Stephen Neale," in Lewis Hahn, ed., *The Philosophy of Donald Davidson* (Peru, IL: Opencourt Publishing, 1999), 669.

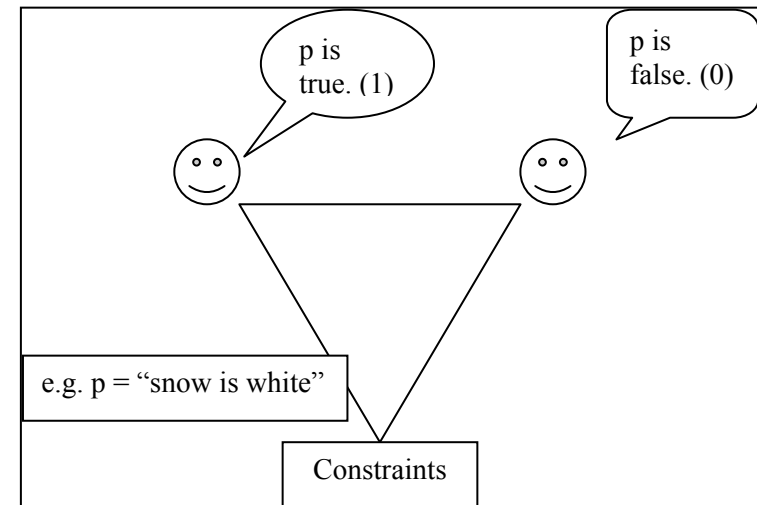


Figure 5. A simple diagram of social circuit.