The Brain on Ritual: How Tantric Puja Shapes the Mind

THE BRAIN ON RITUAL: HOW TANTRIC PŪJĀ SHAPES THE MIND

By

SHERRY L. MORTON

Under the Direction of Dr. Kathryn McClymond

ABSTRACT

Traditional ritual studies approaches to the body are effective for illuminating how the body functions as an entity that absorbs and expresses a variety of social, and political dynamics; however, they are less productive for understanding the body as a physical organism. This interdisciplinary thesis applies theoretical models from cognitive science, social psychology and ritual studies to the Śrī Cakra Pūjā in order to develop a more complete understanding of the ritual body as a physical body. Using Lawrence Barsalou's theory of embodied cognition, which focuses on the impact of human experiences on the creation and integration of neural pathways, this essay, argues that Śrī Cakra Pūjā affects the mind by shaping the neural architecture of the brain. This cognitive perspective on religious ritual practice is compared with the more traditional ritual studies approach of Catherine Bell in an effort to provide a more complete

understanding of the religious ritual body, brain and mind.

INDEX WORDS: Ritual practice, Ritual body, Catherine Bell, Ritualization, Śrī Cakra Pūjā, Tantric ritual, Lawrence Barsalou, Cognitive science, Embodied Cognition, Social psychology, Evolution, Brain, Mind

THE BRAIN ON RITUAL: HOW TANTRIC PŪJĀ SHAPES THE MIND

By

SHERRY L. MORTON

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of

Master of Arts

in the College of Arts and Sciences

Georgia State University

2010

THE BRAIN ON RITUAL: HOW TANTRIC PŪJĀ SHAPES THE MIND

By

SHERRY L. MORTON

Committee Chair: Dr. Kathryn McClymond

Committee: Dr. Jonathan R. Herman

Dr. David M. Bell

Dr. Jeffrey S. Lidke

Electronic Version Approved:

Office of Graduate Studies

College of Arts and Sciences

Georgia State University

May 2010

DEDICATION

This thesis has been powered by the love and patience of my family and friends.

Thank you all for pep talks and countless dinners. Most of all thank you for surviving the process.

ACKNOWLEDGEMENTS

This work required the creativity and support of a large community of scholars, and I am fortunate to be writing in a city populated with many wonderful thinkers. Laurie Patton set me on this path when she suggested I read Lakoff and Johnson and I have never recovered from my initial encounter with *The Body in the Mind.* Brendan Ozawa-de Silva introduced me to Larry Barsalou's work and continues to serve as my social guide in the world of embodied logics. David Bell's introductory class on the psychology of religion was an invaluable immersion course in the conversation on science and religion. Jeffrey Lidke, Robert McCauley, and Larry Barsalou *freely* gave me their expertise and time. Jon Herman's insistence on knowing "what's at stake," has kept this project far more focused than it might otherwise have been and occasionally kept me awake at night. Sandy Dwyer's support made it possible to juggle the responsibilities of teaching critical thinking to freshman while working to master the skill for myself. Thank you all; I hope to repay your generosity.

Those who have undertaken the bloody hard work of thesis writing know that having a mentor is a wonderful thing. Kathryn McClymond has been the best guide and task master I could have imagined. She has a masterful instinct for pushing and pulling at the right moments and helped me exceed my own expectations. Finally, Tim Renick's work has made this thesis and all others in the department of Religious Studies possible. Without Tim's vision and perseverance it is possible that there never would have been a program in religious studies at Georgia State. Tim is a living example of the power that comes from caring about the right things and loving your subject.

Thank you all I have benefitted in ways beyond my imagining from your insight and support.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS.....v

LIST OF FIGURES.....viii

INTRODUCTION 1

Tantric Pūjā 1

Networks of the Mind 2

Ritual Bodies 3

Embodied Theories of Cognition 5

SECTION ONE: RITUAL 6

Śrī Cakra Pūjā: Theology and Context.....6

Ritual Performance 111

Catherine Bell's Ritual Studies Approach 14

Habitus and Schemes of Religious Ritual.....166

Ritual Mastery 18

Ritualization 20

Misrecognition.....21

SECTION TWO: A COGNITIVE REVOLUTION 23

Introduction to Cognitive Models of Religion and Ritual 23

Mithen: The Evolution of the Brain and Mind.....26

Boyer: An Evolutionary Account of Religion and Ritual 28

Connecting Point.....31

Barsalou: A Psychological Theory of Embodied Cognition 322

Barsalou: Feature Maps and Reenactments.....333

Simulators and Simulations 34

Entrenchment, Pattern Completion and Reenactments.....366

Social Psychology Research: The Mind in the Body.....378

Posture 378

Hand Gestures and Arm Movements 39

Connecting Ritual to Cognitive Models of the Mind 40

SECTION THREE: THE RITUAL MIND 42

What Does Social Action Reveal About Ritual Action? 44

Body Posture 45

Hand Gestures.....49

Arm Movements 52

The Brain on Ritual: How Ritual Shapes the Mind.....55

Closing Reflections on Ritual Studies and Cognitive ScienceError! Bookmark not defined.

A Cognitive View of Ritualization 622

REFERENCES..... 66

BIBLIOGRAPHY..... 72

LIST OF FIGURES

Figure 1 Two Dimensional Śrī Cakra Metal Etching, Three Dimensional Crystal.....7

Figure 2 Śrī Ganapati Sachchidanada performing ŚCP using a body posture with extended spine 456

Figure 3 Hand *mudrā* 50

Figure 4 Śrī Ganapati Sachchidanada performing ŚCP using circular arm movements…53

Figure 5 Levels of neural networking in the brain created by ŚCP **Error! Bookmark not defined.**8

INTRODUCTION

Tantric Pūjā

Minutes outside of Mysore, India in a state-of–the-art open air amphitheatre, Swami Ganapati Sachchidananda performs the Śrī Cakra Pūjā in front of hundreds of onlookers. A large silver statue of the Goddess Lalitā Tipurasundarī, heavily draped in orange, yellow and white garlands, sits behind a wooden platform holding a tray that contains a small mountain-shaped crystal. In the background a group of priests continuously chant verses from Sanskrit texts. Swami Sachchidananda sits cross-legged on the platform reciting sacred *mantra*s and making ritual gestures with his hands. At intervals he tosses handfuls of flowers onto the statue and the crystal; he places herbs in a silver bowl mixing them with water or milk and pours the mixture over the small crystal. Maintaining intense focus on the ritual at hand he offers incense, a lighted lamp, food, flowers and oil to the statue of Lalitā and then to the mountain-shaped crystal.

This ritual worship of the Goddess Lalitā is a process by which the practitioner transforms his body and mind into the mind and body of the Goddess. The tradition teaches that when the ritual is complete the human body has been subtly transformed into the body of the Goddess.[1] Once transformed in this way the practitioner has full access to the creative power of the Goddess, the source of all cosmic and material creation.[2]

Networks of the Mind

Psychologist Lawrence Barsalou argues that the mind is a physical component of the body, and the way humans think is directly related to what the body experiences. The mind is the process of information exchange that occurs in the networks of neurons that populate the brain. These neural networks are continuously being developed and refined in response to the body's experiences. When the body has experiences of seeing, touching, moving, feeling or of any other type, it causes the brain to process and store information in different areas of the brain and develops neural networks to connect these stored bits of information. There are areas that store information for the visual appearance of things, sounds, texture, movement and feelings to name only a few. When an individual has an experience the brain records the details in the proper area of the brain and then neurons are generated to connect the areas, creating a map of the entire experience that can be accessed in the future. To form the mental concept of a friend's face requires that different systems generate information regarding the shape of her lips, distance between her eyes, the sound of her voice, her expressions and a host of other details. These systems of information then network together to form a neurological map of the friend's face. Barsalou argues that stimulation of any one of the particular systems in a network can result in the activation of the entire network. This mechanism explains why a stranger can make a facial expression that brings a friend to mind or why a glimpse of a rope coiled in a corner can illicit the same reaction (fear and flight) that occurs at the sight of a snake.[3] From the perspective of cognitive scientists, who study brain function and the process of mind, thinking is

embodied or grounded in the physical body's experiences. This is a radical departure from earlier concepts of cognition that understood the brain as a large data base or encyclopedia of ideal types used by a disembodied mind to generate thoughts in reaction to experiences.

Ritual Bodies

This essay draws material from two different disciplines, the humanities and the sciences. It will use research from cognitive and social psychology to increase understanding of the effect of engagement in religious ritual on the human brain (the physical organ inside the skull) and the mind (the information processing system of neural networks in the brain). In the last half of the twentieth century scholars in disciplines as varied as philosophy, linguistics, neurobiology, psychology, computer science, and anthropology have been rethinking the long held Western belief that the mind and the body are separate entities. This objectivist view is often classified as mind/body dualism and the earliest modern exposition of mind/body dualism is credited to Descartes. The basic tenet of mind/body dualism is that the mind and body exist in a hierarchical relationship where the immaterial mind uses the brain to control the actions of the body. The body is a subordinate conglomeration of cellular systems that lacks consciousness of its own and is dominated completely by the mind. Since the time of Descartes mind/body dualism has dominated Western philosophical thinking regarding human cognition.[4] More recently the field of cognitive science has advanced models of human cognition that counter the assumptions of mind/body dualism. These models explore the way bodily experiences stimulate activity in the brain, which shapes thinking

that affects actions and future experience. Termed "embodied" or "grounded cognition," these models assert that the experiences of the body have causal effects in the brain and that cognition is the result of a dynamic exchange between the brain, mind and the rest of the body.[5] This essay integrates theories from psychology and ritual studies using data from a contemporary example of the public performance of Śrī Cakra Pūjā. Choosing to use a ritual currently in practice allowed me to video tape ritual performances and increased my ability to focus on the actions of the body engaged in ritual. The goal of this thesis is to understand the effects of ritual action on the brain and mind. However, nothing written here intends to suggest that religion or religious ritual can be reduced to a series of bodily states. Religion is a complex physical, social, political and metaphysical entity as is science, and neither is advanced by attempts to reduce one into another. What is offered here is another perspective on religious ritual, one that has a great deal to contribute to understanding the ways ritual affects the human mind, brain and body. As Barsalou states, "To the extent that religious knowledge is like non-religious knowledge, embodiment is likely to play central roles, including many not entertained here."[6]

Both cognitive science and ritual studies recognize that human experiences affect the brain and mind. For almost three decades the human body has been an important category in ritual studies. Inspired by the work of Pierre Bourdieu and others, Catherine Bell argues religious ritual is a means of transforming the body. For Bell, this transformation produces a ritualized body, one that has been socially constructed in a process she calls ritualization. According to Bell, ritualization is a process that instills in

the participant a contextually specific social logic without engaging in conscious discourse, thus creating ritualized social agents who perpetuate the religious and social logic acquired during ritual practice. Bell understands the creation of ritualized social agents as the real aim of ritual.

For Bell the ritualization process is unique because it changes participants in ways they do not recognize; in her words they are "blind" to or "misrecognize" the change that is the genuine outcome of ritual participation.[7] Misrecognition is a key component in the production of ritualized social agents for Bell. The ritualization process instills ritual participants with religious and social dynamics that affect their behavior in wider social contexts. Ritualization does this without engaging the ritual participant's conscious awareness, and as a result the ritualized social agent does not see that she has been changed in ways that will cause her to perpetuate the religious and social dynamics acquired during ritual practice. This lack of awareness is what allows the ritualized social agent to transfer ritually acquired dynamics into other social contexts. The ritualized social agent does not see that she has been redefined according to the religious and social dynamics that inform the ritual or that she perpetuates those dynamics in other social environments.

Embodied Theories of Cognition

For more than half a century cognitive science has been seriously engaged in understanding the physical mechanisms of cognition. The development of computer technologies for robotics and artificial intelligence has advanced research projects

focused on understanding the way humans think and act. Barsalou's model is one scientific well suited for analysis of the ritual body because it focuses on the relationship between the brain and mind to the rest of the body. Section one of this essay will include a thorough description of the Śrī Cakra Pūjā and review of Bell's discourse on the ritual body and ritualization. This will be followed by a brief overview of the discourse on religion from within cognitive science. Section three will focus specifically on cognitive psychology and Barsalou's theory of neurological patterning in the brain and embodied cognition. This thesis will close with a reflection on the Śrī Cakra Pūjā using Barsalou's theory to determine how the ritual uses the body to shape the brain and mind. I argue that ritual practice creates a multi level neural architecture in the brain. Thus, Tantric Pūjā shapes the mind by creating specific neural networks that contain information for the sensory motor and conceptual experience acquired during ritual action.

SECTION ONE: RITUAL

Śrī Cakra Pūjā: Theology and Context

The *śrī cakra* is one of the most famous geometric images in Hindu Tantrism. The image represents the process that the creative principle undergoes as it separates into the binary of masculine and feminine principles. According to the tradition this process continues and results in the creation of all levels of cosmic and material creation.[8] The *śrī cakra* is a balanced and precise mathematical construction that can be rendered in various materials and configurations. The image contains a central dot

(*bindu*) surrounded by nine interlocking triangles. This central dot represents the unity of feminine and masculine principles out of which material reality emerges. The triangles are commonly arranged with four pointing up, representing the feminine principle, and five pointing down, representing the masculine principle. The triangles are encircled by two rings of lotus petals inside and arrangement of outer circles and lines.[9]

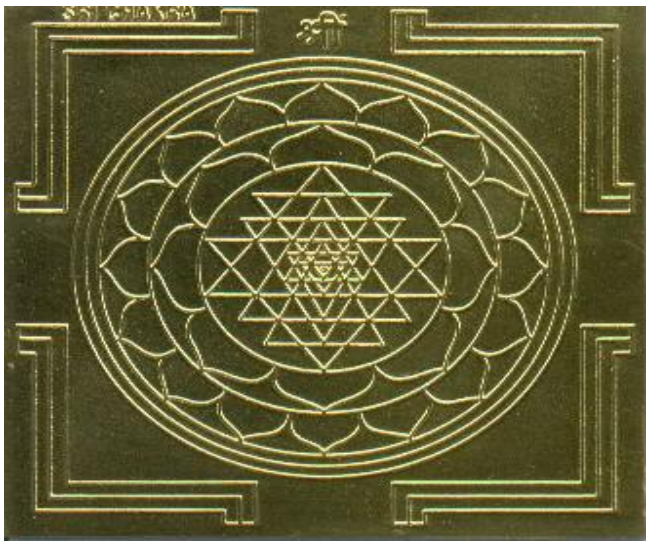

Figure 1 Two Dimensional Śrī Cakra Metal Etching

Three Dimensional Crystal (Images courtesy of Gyrony Consultive)

The nine triangles create an inner geometry of 43 smaller triangles, which are the abodes or seats for the Goddesses' attendants who reside in the *śrī cakra.* This inner structure is encircled by an eight and then a sixteen petal lotus that is enclosed in three concentric circles and then a square arrangement of straight lines with four openings.[10] This geometric shape can be understood as both a symbol of the universe's primordial

structure and the index of the reality that forms this structure.[11] During the *śrī cakra* the practitioner traces the process of all creation back to its original point of undifferentiated creative potential through visualization, *mantra* recitation and ritual action. The ritual process begins by focusing on the outer straight lines and working in towards the central point or *bindu*. The tradition teaches that the triangles of the *śrī cakra* are abodes for many different Goddesses, *śakti*s (female powers) and *yoginī*s (female *yoga* adepts). Each being is individually worshipped through visualization and *mantra* recitation. This is a process through which the power of the deity is ultimately instilled in the body of the practitioner.[12] The transformation of the body that unites the worshiper with the presiding deity of the *śrī cakra,* Lalitā Tripurasundarī, is described by Sanjukta Gupta as the result of self-conscious effort:

> "He [the practitioner] visualizes the deity, his main mantra (iṣta-or mūla mantra) and his guru as all being identical. This resplendent divine personage then enters his heart as his essential self. While thus mentally busy, he thrice utters the formula declaring that his own self is identical with the absolute, divine self."[13]

It should be noted that the envisaged identification is not effected in one step. There are in fact a series of identifications. [14] The transformation of the mundane self into a divine self is accomplished by surrendering ordinary ego awareness and expanding awareness of the divine creative power within.

There are important distinctions between Tantric theology and those of orthodox Hinduism. Tantric theology sees Vedic ideas regarding caste, purity and *dharma* as a form of ignorance. These social limits were seen as the product of the confusion that is characteristic of ordinary life. Paul Müller-Ortega notes that the Kaula Tantrics were not

concerned with defining or maintaining a permanent social reality; they felt that by returning to the primordial plentitude restrictions of caste and purity were eliminated along with any sense of the social ego.[15] Unlike the orthodox Hindu body, the Tantric body is ideally beyond the social and purity concerns of *dharma.*[16] The Śrī Cakra Pūjā (ŚCP) is a process for transforming the mundane social body into a cosmicized body, and as a result during ŚCP the Śrī Vidyā practitioner is more concerned with codes that support the body's ability to channel cosmic energy than with adherence to social codes.

The particular performance of ŚCP discussed in this essay was observed at the Śri Ganapati Sachchidanada Ashram in Mysore where the ritual is performed publically. Śri Ganapati Sachchidanada is a widely recognized Tantric ritual expert and his public performances are representative of other public performances of ŚCP that occur throughout India.[17] The Śrī Vidyā community of Sri Ganapati Sachchidananda in Mysore outwardly appears to be strongly Vaishnava; there is a large temple for the God Venkateśvara (a form of Viṣṇu), and they revere Dattātreya (also related to Viṣṇu). However, during their *śrī cakra* worship reverence is given to the Goddess Lalitā Tripurasundarī. This is an indicator that philosophically this community practices a form of Vedic Śākta Tantra known as Śrī Vidyā. This philosophy asserts that the Vedic tradition is the authoritative foundation of all that is commonly understood as Hindu, and that Tantric practice is the esoteric discipline of Vedic Hinduism. As is common among Tantrics, this Śrī Vidyā community conceals the heart of its practice (Tantric) inside an exterior that is socially and religiously orthodox.[18] Tantric communities have

been sharply criticized by orthodox Hindus for providing religious initiation to women and persons outside the brahmin caste. *Smārta* brahmins make up a significant portion of this community. The *smārta* are self appointed guardians and authorities on Vedic culture and ritual practice, and they are responsible for the creation and perpetuation of Śrī Vidyā.[19] The Śrī Vidyā community, dominated by these self-appointed ritual authorities of Hindu culture, is committed to precise ritual practice.

> [E]very part of the ritual has to be performed without a mistake, because only faultless performance brings the desired result. A complete pūjā is regarded as as an organic whole, and faulty performance in any part of it is a defect disfiguring the whole pūjā.[20]

According to the tradition, it is the practitioner's ability to focus flawlessly on the steps to the goal that assures the achievement of the most powerful states of complete unity in the Goddess. In Śrī Vidyā this is a body that is fully absorbed in the divine creative force and a sense of self that has been subsumed into the divine self-awareness.

Bell's work provides a means to explore the relationship between the Śrī Vidyā tradition and South Asian society. Viewing ŚCP from the perspective of ritualization illuminates the complexity of the relationship between the Tantric practitioner and society. Bell's theory reveals the ways in which ŚCP may express social conventions regarding submission to religious authority and the proper treatment of guests. However, it is also the case that ŚCP challenges and defies other social conventions with regard to caste and gender. Examining ŚCP using Bell's theory reveals that ritual practice can be a tool for the social construction of the individual and that it can also be used to resist and reconfigure social conventions.

Ritual Performance

The ŚCP is the ritual worship or adoration of the Goddess Lalitā Tripurasundarī (Lalitā) in the form of the wheel (*cakra*) of prosperity (*śrī). Cakra*s are often referred to as *mandala*s (circles) because of their visual similarities; however there are tradition specific technical differences between the two. The mundane *cakra* is transformed through ritual into a sacred location for the Goddess's creative power and is an aniconic form of the Goddess.[21] Once ritually prepared the *śrī cakra* is transformed into the material embodiment of the power and process that creates all material and cosmic existence. The *pūjā* is the practical procedure for enlivening the *śrī cakra* and reading the map of creation that it embodies. In order to read this map the practitioner must be an initiate in the esoteric teachings of Śrī Vidyā and its practices.[22] During *pūjā* the practitioner, the ritual location and the *cakra* are gradually moved through a series of purification, protection and transformative rituals using *mantra* recitation, visualization and the application of gestures. In Tantric practice, *mantra* recitation is highly nuanced, including increasingly complex visualizations of deities.[23] *Mudrā*s (ritual hand gestures) are used along with *mantra*s to create shifts in energy of the *cakra* and the practitioner. Worship includes offerings of flowers, food, incense, herbs, spices, fragrant oils, water, and milk, all of which have multiple layers of symbolic meaning. Gupta describes all *pūjā*s as having three stages: purification rites, precautionary rites for protection and the removal of obstacles, and the offering of gifts to and worship of the deity.[24]

The initial stages of the ritual involve the purification of the practitioner's body. Bodily purification is achieved by symbolically dissolving the physical elements of the body with *mantra* recitation and the performance of *mudrā*s. In order to facilitate the movement of energy in the body the practitioner assumes a cross legged seat, with an erect spine during this and other rituals of purification and transformation. The energy of the body is then elevated using the same techniques. *Mantra* recitation as a means for the internal toning of sacred sounds, coupled with visualization and hand gestures, creates changes in the body that increase the ability of the practitioner to harness and transmit higher levels of energy. These energies are then used to mentally ascend toward the source of creative power that is the apex (*bindu)* of the *śrī cakra*.[25] All ritual instruments and ingredients are purified as are the location for the ritual and the practitioner's seat and that of the *śrī cakra*. While Tantrics may not be concerned with Vedic social purity, they are keenly aware of the purity of ritual elements. Along with the rites of purification, salutations and propitiations are made to deities such as Mahālakṣmī, Sarasvatī, Gaṇeśa, Kṣetrapāla, Gaṇga, and Yamunā. Malevolent spirits are banished with glowering glances and *mantra*s. The ritual space and the seat of the practitioner are consecrated with sacralized water, rice, *mantra*s and the drawing of sacred diagrams. Salutations are offered to the ancestors, one's *guru*s and the Sun.[26] These actions comprise the first two stages as outlined by Gupta; however, elements of purification and continued vigilance against malevolent forces and obstacles are included throughout the remainder of the ritual.

The third stage begins with the installation of the divine personality of the cosmic *śrī cakra* into the purified mundane *śrī cakra.* The practitioner begins by envisioning the abode of the Supreme Goddess and her attendants. The divinized *śrī cakra* is visualized as sitting on the throne of the Goddess. Now the practitioner envisions the divine self in his own heart, and fully identifies himself as the divine self. The process of identification with the Goddess continues with the performance of several types of *nyāsa,* the placing the divine power and qualities into the body of the practitioner. This is achieved with the careful control of the breath (*prāṇayāma*), *mantra*s, visualization and the performance of specific gestures. This phase of the *pūjā* is most intense. After a brief meditation on the Goddess the practitioner performs a *kuṇḍalinī yoga* technique for experiencing the Goddess as a flash of pure knowledge that illuminates his spine from the base up through and above the crown of the head.[27] The teachings of the tradition assert that in proper ritual performance the practitioner must fully become the deity he worships.[28] Once the body has been transformed into the divine body the actual acts of worship can be performed. The list of gifts offered to the deity varies by tradition but most include food, flowers, herbs, incense, fragrant oil, water, milk and light. These items are symbolic in that they represent the five elements of creation: fire, earth, air, water and space. They also represent the senses of the practitioner, which are offered as sacrifice to the Goddess in order to make it possible for them to be replaced by divine qualities. Also, included are acts that provide for the comfort of the deity such as offering water for bathing, a comfortable seat, and an umbrella for shade. Any, or all, of this portion of the *pūjā* can be performed internally using visualization

and *mantra* recitation. This is followed by an internal form of fire sacrifice, which fully ignites the practitioner's internal power.[29] At this stage the practitioner's body has become fully cosmicized, all awareness of the mundane self has been removed and only the divine personality remains. The *pūjā* takes the practitioner beyond the realm of the mind to a state of absolute pure consciousness, where existence is experienced as a state of bliss.[30] According to the tradition the practitioner is now in full command of the creative power of the Goddess Lalitā.[31] At the close of the worship apologies are made to the Goddess for any offense that may have been made during the ritual and the power of the deity that has been bound in the *śrī cakra* is released. What remains is the divine illumination of the practitioner.

This ritual contains many physical movements, verbal utterances and visualizations. These ritual actions are a significant part of a process that is intended to change the awareness of the practitioner, and as will be discussed in section four may create specific changes in the brain and mind. This section will close with a review of key elements from Bell's theory of ritual practice. Bell's theory is representative a ritual studies approach that is rooted in sociology.

Catherine Bell's Ritual Studies Approach

Ritual theorist Catherine Bell traces the early anthropological and sociological roots of ritual discourse on the body to scholars such as Mauss, Durkheim, and Douglas. This early scholarship focused on understanding of the symbolism associated with the body, discipline of the body, and the body's role in social construction.[32] Discourse on

the body covers many varieties of domestic, social and religious rituals, and provides a logical point of intersection for study of the body among a number of disciplines including the study of religion. In her 1990 book *Ritual Theory Ritual Practice,* Bell outlines a theory of ritual practice and ritualization based on work from anthropology, feminist studies and the practice theory of sociologist Pierre Bourdieu. Bell is not concerned with providing a theoretical revision of the category of ritual but with the production of a theory for understanding how ritual transforms its participants. She locates ritual activity as a subset of the much broader category of human social activities. Bell's situation of ritual activity in this way allows for ritual practice to be more readily examined in comparison to social practices.[33] Her choice to situate ritual activity in this way helps to create a theoretical point of intersection that I will argue is compatible with the Barsalou's notion of the relation between religious knowledge and non-religious knowledge.

For Bell, when ritual activity/knowledge is located within a broader category of activity/knowledge then the theoretical tools from other members of the category can be applied to religious activity. Focusing on religious ritual in this way allows Bell to engage the work of sociologist Pierre Bourdieu in the development of her theory of ritual practice. Bell uses many of Bourdieu's ideas and adapts them in nuanced ways to religious ritual, which enables her to discuss the relationship between religious and social rituals. In the following paragraphs I will unpack Bell's use of the terms habitus, schemes of ritual, ritual mastery and misrecognition.[34] These terms will be important

for this work's closing discussion of Bell's theory in from the perspective of cognitive science.

Habitus and Schemes of Religious Ritual

Bell adopts Bourdieu's concept of habitus, the habit of acting in ways that both structure and manage an environment to reflect social hierarchies and power dynamics, and applies it to religious rituals.[35] Bell stresses that to fully understand the effects of ritual action it must be considered in its religious, social and historical context. For example, many of the actions in *pūjā* are the same as those that one would offer to any honored guest, thus an understanding of the social nuances of guest relations is required in order to understand the actions of the ritual. This understanding is in opposition to approaches to ritual that treat it as an object or an inner subjectivity to be mined for esoteric knowledge.[36] She states,

> Confronting the ritual act itself, and therein eschewing ritual as some object to be analyzed or some subjectivity to be fathomed would involve asking how ritual activities, in their doing, generate distinctions between what is or is not acceptable ritual. From this perspective one could not seek to construct a theory or model of ritual practice. Rather one could attempt to describe the strategies of the ritualized act by deconstructing some of the intricacies of its social logic. [37]

Internal mental states and external social constructions are aspects of ritual, but in order to understand ritual the focus must be on the activities and social strategies of the body that expresses them. For both Bell and Bourdieu, habitus does not simply refer to the repetition of ritual actions, but also includes the strategies and social logic that are used to organize ritual actions.

The strategies and social logic that motivate ritual action are what Bell calls schemes of ritual. Strategies are the ways that ritual agents structure environments and social logic is the systems of social and religious oppositions that provide the context in which ritual functions and to which it reacts. Awareness of the schemes of religious ritual, which are at work in habitus, helps to explain how it is possible for members of a society to improvise rituals such as birthday parties, weddings and funerals. Learning to celebrate weddings includes activities such as deference to a host, gift exchange, and sharing a communal meal. Experiencing these ritual activities teaches broad ritual schemes that can be mapped onto other religious and social rituals. Bell notes that this learning occurs through action and not through mental reflection or explicit discussion; this point is central to the process of ritualization according to Bell and will be the final subject discussed in this section. Habitus is the set of actions that expresses the schemes (strategies and social logic) of ritual. Repetition habituates an individual to the schemes of ritual and causes them to be internalized. Once the schemes of ritual are internalized they can be transferred from one setting to another in a manner that appears to be unconscious or automatic. Habitus achieves this transfer through a circular process. First, the habituated individual organizes an environment according to ritual schemes. Then, the ritually ordered environment is managed with actions learned during ritual practice, actions motivated by the same ritual schemes used to structure the environment. Habitus is a necessary first step toward the achievement of ritual mastery and the overall ritualization processes that Bell describes.

Ritual Mastery

For Bell ritual mastery is the adaptation of Bourdieu's practical mastery specifically for religious contexts, and the distinctions between the two are minimal. [38] Like practical mastery, ritual mastery is the projection of ritual action as the appropriate action for a given circumstance. Commenting on Bourdieu's practical mastery Bell notes, "They [the strategies and social logic of practical mastery] come to be embedded in the very perceptions and dispositions of the body and hence are known only in practice as the way things are done."[39] Ritual mastery has two characteristics in addition to those it shares with practical mastery. First, it exists only as a moment within the larger cycle of ritualization. Secondly, it intimates the real "work" of the ritualization process, shaping individuals who have internalized schemes of religious ritual, and who will transfer these schemes into wider religious and social environments.[40]

The schemes of religious ritual center on the establishment of systems of oppositions organized hierarchically. Inherent in these systems is a tension where some schemes qualify, appropriate, and dominate others.[41] The Catholic eucharistic meal, with its distinctions between higher (sacred) and lower (profane), as well as inner (sacred) and outer (profane), is an illustration of the schemes of ritualization. In the course of the ritual meal, via the positioning of the individual below the altar, through standing and kneeling, the opposition of higher- lower is highlighted. The most sacred objects and the priest, who represents religious authority, are placed at the highest level of the altar, while the more profane congregants are positioned below them. The

higher-lower opposition is also demonstrated through the physical movements of kneeling and standing. Congregants stand less and kneel more during the ritual than the priests do. Thus by locating objects and persons in different levels of higher and lower space the opposition of higher and lower is embodied, as is a hierarchy between the sacred and the profane.[42] Later in the ritual the higher-lower opposition is subordinated by and inner-outer opposition. The inner-outer opposition is embodied via the ingestion of the ritual meal. The final ritual act is the ingestion of the ritual meal; this reflects an idea prevalent in much of Western theology that internal religious experience is more sacred than external experience. Due to the positioning of the inner-outer opposition as the final ritual act it comes to dominate the higher-lower opposition.[43] Ritual mastery establishes and manages these oppositions, making them appear as if these ritual priorities are the proper or natural order of things. Habituation leads to ritual mastery, which is the internalization of religious ritual priorities that allows for the seemingly unconscious transfer of these priorities into wider religious and social contexts. The religious ritual priorities are experienced as the way things are done. As will be discussed next, ritualization is the process that shapes an individual into a ritualized social agent who can transfer these priorities into wider religious and social contexts.

Ritualization

Bell understands religious ritualization as ultimately a process for the production of ritualized persons. Through habitus and the development of ritual mastery, ritualization allows the ritualized social agent to structure and manage environments

according to the schemes (strategies and social logic) of ritual. Ritualization focuses on the production of individuals who will perpetuate the process of ritualization. Bell offers this functional definition of ritualization:

> [W]hat ritualization does is actually quite simple: it temporarily structures a space-time environment through a series of physical movements (using schemes described earlier), thereby producing an arena which, by its molding of the actors, both validates and extends the schemes they are internalizing.[44]

As discussed earlier the schemes of religious ritual are focused on maintaining a hierarchy among religiously important oppositions.[45] Again the Catholic eucharistic meal provides an example in the form of its opposition with an ordinary meal. Bell notes that multiple strategies are employed to distinguish the ritual meal from the ordinary meal and these distinctions serve to symbolically demonstrate that the ritual meal exists at a level that is dominant over the level that an ordinary meal inhabits. The ritual meal will be conducted at times not associated with eating and includes an amount of food that is too small to provide nourishment. The ritual meal is constructed to stand out as not serving the same functions as an ordinary meal; it is an important variation in the category of meals.[46] Bell notes that; "Ritualization appreciates how sacred and profane activities are differentiated in the performing of them, and thus how ritualization gives rise to (or creates) the sacred by differentiating it from the profane."[47] By focusing on the differences between what is sacred and what is profane ritualization identifies (or determines) what is sacred. It also structures environments so that what is sacred has authority over what is profane. This structuring renders the

environment more coherent for the ritual participants and is thus better able to mold their perceptions.

According to Bell the true purpose of ritualization is the molding of the perceptions of the ritual participants. Ritualization's real aim is to produce bodies that through practice have the schemes of ritualization in them, "ritualized social agents."[48] These agents then have the ability to transfer schemes of ritualization (focused on the perpetuation and management of religiously defined oppositions) into other ritual contexts as well as into wider social contexts.[49] Ritualization is not only the process that animates the schemes of ritualization, but is more importantly the process that produces ritualized social agents who perpetuate these schemes.[50] According to Bell the production of ritualized social agents is the actual goal of ritualization. One of the most important aspects of the ritualization process according to Bell is that the ritualized individual does not recognize that ritual participation changes the way she acts outside the ritual arena. The ritual participant is unaware that she is being ritualized because ritual practice does not include open dialogue about the schemes and priorities that inform the practice or that the individual is internalizing. Misrecognition is one of the most significant elements of ritualization and it is the final point of Bell's discussed here.

Misrecognition

Misrecognition is a type of "blindness" that occurs because of a lack of open dialogue about the schemes of religious ritual being worked through in ritualization, and about the impact of ritualization on an individual. For Bell, the most profound aspect of

ritualization is that ritual participants are not consciously aware of the changes in their social behavior that result from ritual practice. Ritual participants do not recognize that they are internalizing the schemes of ritual and that they will transfer these schemes into other religious and social contexts. According to Bell, the ritualization process "is designed to do what it does without bringing what it is doing across the threshold of explicit discourse or systematic thinking."[51] Because the schemes of ritualization are grounded in and expressed by the body, it is not necessary (or even preferred) that they engage in conscious discourse. The absence of conscious verbal and analytical processing renders the tension between purpose and meaning of ritual invisible. This blindness prevents the ritualized social agent from recognizing the effects of ritual participation on their behavior.

Bell's focus on the power of misrecognition indicates one of the limits of ritual theories that focus on the body as a text that reveals details about social strategies and priorities. The traditional approach to the "ritual body" as a socially constructed entity provides some insight into the problems and complexity of the discourse on the ritual body. These theories focus on particular aspects of the social meaning of the ritual body's actions and not the ritual body's physiology As a result, ritual studies theories have largely ignored two of the most crucial body parts, the brain and the mind. Moving forward, I will use the phrase "ritual body" specifically to refer to the physical body engaged in the ritual actions of ŚCP. While limitations in the observational techniques of sociology, anthropology and religious studies do not lend themselves to looking inside the human skull, those of the cognitive sciences are intended to provide

insight into the inner workings of the brain and mind. The following section will use the work of cognitive anthropology, psychology and research from social psychology to explore the relationship between the brain and the rest of the human body. This next step towards understanding the ritual mind requires a brief overview of the evolutionary development of the brain and its impact on the development religion and religious rituals, and this is where section two will begin. Following this introduction the work of cognitive psychologist Lawrence Barsalou will be employed to unpack the concept of embodied cognition and the working mechanisms of the mind. Section two will close with a review of some of the research from social psychology that demonstrates the types of effects that actions and experiences of the physical body have on the brain and mind.

SECTION TWO: A COGNITIVE REVOLUTION

Introduction to Cognitive Models of Religion and Ritual

This section reviews the work of scholars in cognitive anthropology and psychology who specifically address topics of religion and ritual. Evolutionary anthropology provides a foundation for much of the current theoretical thinking that concerns cognitive science and religion. Key questions in this section concern: the evolution of the human brain and mind; the nature of cognition and its relationship to culture; the relation between religion, religious ritual and the brain; and the role of human experience on cognition and behavior. This evolutionary foundation will provide a point of focus for the exploration of a cognitive psychology theory of grounded cognition. Theories of grounded cognition situate the cognitive processes in the human

body via the brain, and seek to understand the impact of experiences on these processes.[52] Toward this end the final portion of this section will focus on research from within social psychology that demonstrates the influence of the body on the mind. Research on grounded cognition is a product of a cognitive revolution that began in the late 1950's, and is partly a response to efforts to produce computers and machines that think and function the way that humans do.

The cognitive revolution has engaged in serious critique of theories of mind/body dualism. This dualism claims the mind exists outside the physical body over which it maintains top down control. The relationship between the mind and the body in dualistic models is much like that between an individual with a remote control (mind) and the airplane (body) she operates. The plane has no volition of its own and mechanically does the bidding of its operator. If the operator causes the plane to crash and burn she along with her remote control remains intact. To the contrary theories of grounded cognition locate or ground the mind in the human brain. Theories of grounded cognition are a radical departure from the dualistic theories that have dominated Western philosophy since the time of Descartes.[53] Catherine Bell, in her work on the ritual body, identifies the reaction to the tradition of Cartesian mind/body dualism as one of the key influences on scholarship of religious ritual.

To provide a foundation for understanding the shift from dualist models of cognition to models grounded in the body it is necessary to review scholarship on the evolutionary origins of the brain and the mind. The following sections focus on two of the most influential evolutionary anthropologists writing in cognitive science today,

Steven Mithen and Pascal Boyer, both of whom devote considerable attention to the topic of religion. This section will close with a review of cognitive psychologist Lawrence Barsalou's work on embodied cognition and research from social psychology that support some of his claims. Barsalou argues that experiences (such as seeing a face) create networks of neural activity and information in the brain that are used to drive cognition. A neural network can be reactivated and drive human behavior long after the original experience is over. In closing I conclude that Barsalou's work offers tools that can help to explain the process of ritualization that Bell describes. Barsalou's work can help illuminate the cognitive mechanisms that allow religious ritual activity to be transferred into non-ritual environments. It is appropriate at this point to reiterate a claim stated earlier that at no time does this work intend to suggest that religious phenomena can be reduced to scientific or material explanations. One of the chief criticisms of Barsalou's work focuses on theoretical aspects of psychology. Barsalou is currently engaging in research to test his theories. What is intended is a careful dialogue between science and religion in order to determine how science might contribute to a more rich understanding of religious ritual and its impact on human culture. In applying the work of cognitive science to the study of religious ritual this work intends to increase the number of theoretical tools available for understanding religious ritual.

A number of technical terms will be used in the following discussion, thus it is important to begin with a few working definitions. First, the "brain" refers to the physical organ inside the human skull. The "mind" refers to the activities or processes

of perception and cognition that occur in the brain. An important tenet of embodied cognition is that the body includes the brain and its processes (the mind); the mind is not a disembodied central controller for the body but part of the body. In theories of embodied cognition the brain, mind and body are understood as functioning in a process of dynamic information exchange. Thus, the mind is embodied as are its cognitive processes, and both of them are affected by the experiences of the body.

Mithen: The Evolution of the Brain and Mind

Evolutionary anthropologist Steven Mithen's work is representative of the main-stream view that the modern brain and mind emerged during the transition between the Middle and Upper Paleolithic Periods 60,000 to 30,000 years ago.[54] He argues that factors such as bipedalism, meat consumption and social interaction all contributed to an increase in brain size, which resulted in improved brain function.[55] According to Mithen brain development progressed through three phases. To quote:

> Phase 1. Minds dominated by a domain of general intelligence – a suite of general-purpose learning and decision – making rules.
> Phase 2. Minds in which general intelligence has been supplemented by multiple specialized intelligences [technical, linguistic, social and natural history], each devoted to a specific domain of behavior, and each working in isolation from the others.
> Phase 3. Minds in which the multiple specialized intelligences appear to be working together, with a flow of knowledge and ideas between behavioral domains.[56]

The defining property of the modern mind for Mithen is the flow of knowledge between various domains in the brain that results in the ability to form generalizations, a property he refers to as cognitive fluidity. An architectural example will help to explain this process. A medical center often begins as a single general purpose hospital. As

the medical profession develops, buildings dedicated to specialized areas of medicine, such as oncology, mental health and women's health are constructed. Later, these separate care facilities are connected via a network of tunnels and skyways that allow patients and healthcare providers to move between buildings in order to maximize patient care. Phase one of brain/mind evolution began as a single "hospital building" where all forms of general intelligence were housed. No complex conceptual patterns were possible in phase one, and cognition was a process of stimulus and response. In phase two separate buildings were constructed for each of what Mithen describes as the four basic specialized intelligences: technical, linguistic, social and natural history. At this phase knowledge expanded rapidly within each intelligence domain, but there was no exchange among the domains. In the final phase, the separate specialized domains were connected by a series of tunnels and skyways that allowed the specialized forms of intelligence housed in the individual domains to be shared among them. This is the phase where cognitive fluidity began and the human mind became able to make generalizations using its specialized intelligences.[57] This is the most significant stage of mind evolution for Mithen:

> [We] can be confident that religious ideologies as complex as those of modern hunter-gathers came into existence at the time of the Middle/Upper Paleolithic transition and have remained with us ever since. This appears to be another consequence of the cognitive fluidity that arose in the human mind, which resulted in art, new technology and a transformation in the exploitation of the natural world and the means of social interaction.[58]

After the development of cognitive fluidity and the ability to make generalizations, the growth of culture in the forms of science, art and religion was rapid. For Mithen the process of sharing knowledge among the various mental domains and of moving

between specialized and general forms of intelligence was important for the production of complex phenomena such as religion. As will be seen in the following section Boyer asserts that the key to social behaviors such as religion and religious ritual are the result of the brain's organization around basic categories.

Boyer: An Evolutionary Account of Religion and Ritual

In contrast to Mithen's notion of generalized knowledge that results from cognitive fluidity, Pascal Boyer sees intelligence as a process of decision making based on basic ontological categories such as animate/inanimate. For Boyer the mind is organized in "inference systems" focused on specific categories of knowledge necessary for survival.[59] He likens this system to the large country estate of Pemberley in Jane Austin's *Pride and Prejudice.* The elegant life of the manor appears to flow smoothly from one elaborate event to another; what is not apparent is the hurried hard work of the staff of specialists in the basement of the house whose efforts make the life upstairs appear elegant and effortless. For Boyer inference systems are the hurried workers in the human brain:

> The most banal scenes of everyday life are replete with facts that seem obvious or simple only because we have a veritable Pemberley in the head, a huge mental basement filled with extremely efficient servants, whose activities are not available for detailed conscious inspection. Each of these specialized systems only handles a limited aspect of the information available about our surroundings but produces very smart inferences about that aspect. This is why all these systems in the brain are called inference systems.[60]

Inference systems are constructed around categories of knowledge important to survival of the species, such as face recognition, danger detection, recognition of goal

directed motion, understanding physical properties and the identification of causative agents. Inference systems are not available for conscious examination, and are activated and deactivated based on the type of objects and actions that need to be interpreted. This concept of inference systems counters the long held notion that the brain and mind are enormous encyclopedias that carefully catalogue the exhausting amount of data that is accumulated through human experience. The human mind as a series of inference systems allows for multiple bits of data to be processed in a variety of ways, and this makes the mind fast and flexible enough to respond to diverse human experiences. The flexibility of these systems allows for categories of knowledge to be integrated into each other in ways that produce social phenomena such as art, science and religion. As will be discussed below, Boyer sees inference systems as key for the production of religion and religious ritual.

For Boyer religion and ritual are successful phenomena because of the knowledge made possible by the processing that occurs in inference systems. Information exchange in and among inference systems allows for the blending of ontological categories, which creates novel concepts, and novelty is attention grabbing. Religious phenomena are particularly novel and attention grabbing according to Boyer. For example, blending categories makes phenomena such as trees that talk and mountains that eat, intelligible to the human mind. The mountain that eats stands outside the general category of mountains and grabs the mind's attention because it blends categories (animate and inanimate).[61] Category blending is an effective means for capturing the mind's attention, because evolution has organized the human brain to

detect anomalies in order to promote survival.[62] Boyer argues that religious rituals have been successfully transmitted throughout history, because they employ several means for capturing mental attention such as entities that look human, but never need sleep or food, and are all knowing.

According to Boyer the more important attention grabbing gadgets include supernatural agents (gods, ancestors, and other spirits). As a result of their attention grabbing power they have helped to insure the success and survival of religious ritual.[63] The agent detection is one of the most important inference systems, Boyer states:

> What matters to rituals and makes them relevant is that one construes the social effects as the *result* of the actions prescribed. This inevitably creates a causal gap. Because of the massive salience of agency in our mental systems, most humans fill in the gap with concepts of agents; but an abstraction like "our tradition" or "society" can play much the same role as gods or ancestors.[64]

Because of our survival needs, Boyer and Mithen agree that humans are hyperaware of agency. What caused the bush to move? Is it something that may eat me or that I might want to eat? What causes the kin relation of two unrelated people to be changed to a familial relationship? Religion and religious rituals are successful according to Boyer primarily because they provide answers to these questions, especially when no causative agent in visible. By including a supernatural agent in a ritual event, the event becomes more attention grabbing and it fills the explanatory gaps in human experience. This heightened state of awareness makes rituals seem important and results in their preservation and transmission.

This brief discussion of just two views from evolutionary anthropology and sociology highlights some of the more influential ideas on the development and transmission of religion and ritual. These evolutionary views are rooted in the assumption that human behavior (including religion and religious ritual) reflects the basic evolutionary development of the brain and mind. As Boyer states, "Evolution does not create specific behaviors; it creates mental organization that makes people behave in particular ways."[65] In different ways and at different levels theses arguments are materialist. For Mithen and Boyer religion and religious rituals are developed and perpetuated because of the types of brains and minds humans are equipped with.

It is important to remember that these theories only explain a proclivity for certain behaviors.[66] These scholars are realistic about the limitations of their claims and yet their work is the foundation that supports much of the cognitive perspective on religion and ritual. They argue that religion and religious ritual are prominent components of human culture because these types of behavior are agreeable to the human brain.

Connecting Point

This final section focuses on the work of Lawrence Barsalou and his theory of embodied cognition. Barsalou offers a description of the way human experiences may affect the brain and mind. His work, coupled with research from social psychology, provides support for the argument that mental processes (mind) are firmly grounded in the brain, and are directly affected by the activities of the entire body. I argue that Barsalou's model offers tangible means for beginning to understand how ritual shapes

the mind by creating networks of information in the brain. The following section begins by outlining Barsalou's theory that cognition is the process of networking among the various areas where information is stored and processed in the brain. This will be followed by a review of a number of studies from social psychology that demonstrate the types of effects that physical actions have on human cognition and behavior.

Barsalou: A Psychological Theory of Embodied Cognition

Lawrence Barsalou's work in cognitive psychology provides a discrete description of the way the brain transforms experiences into neural networks that it then uses for cognition. Like many other theorists of embodied cognition, Barsalou understands the brain to contain systems or areas dedicated to specific categories of information. For Barsalou the mind is the process of information sharing among the various systems in the brain. Different systems of the brain are associated with categories of information such as sensory motor, visual, aural, emotional, linguistic, and spatial orientation. The general view is that the brain records information in the various systems, and that the process that produces cognition is the result of information sharing among these systems. There is considerable debate regardign the way in which the information sharing process occurs, and Barsalou's feature maps do not lend themselves to the type of incremental research that has dominated neuroscience in the last two decades.[67] This section will focus on five key aspects of Barsalou's theory: feature maps, simulators, simulations, entrenchment and patterning.

Barsalou: Feature Maps and Reenactments

Barsalou describes cognition as the product of the creation of mental maps of the body's experiences. Within individual areas of the brain feature maps of the various low level features associated with vision, audition, taste and the like are created. For example, a visual feature map would include color, shape, orientation, simple directional motions, etc. Individual feature maps join together and form a larger neural structure that represents the various dimension of an entire experience.[68] Barsalou is in line with a growing list of scholars working on embodied theories of cognition who argue that human cognition is the product of information exchange among a variety of neural networks in the brain. From this perspective the mind is the neural architecture and the information exchange that occurs through it. Facial recognition provides a good example of the way feature mapping occurs, and of its role in larger neurological structures. The face activates areas of the brain that record the shape, size and proportion of facial features, color and texture of the skin, these are the low level feature that make up the feature map of the face. As will be discussed in the following section, this pattern connects with other areas of the brain associated with facial expressions, the sound of the voice, responses to feelings about the face such as like/dislike, comparisons with other faces and so forth. The mental concept of a face is not simply a linguistic description of the face, but is a multidimensional representation of the actual experience of a face. This multidimensional representation consists of the feature map for a particular face connected to other associated neural structures that are important for its recognition such as emotions and comparisons to other faces.

The stimulation of a feature map in the brain results in the reenactment in the brain of the experience of an encounter with a face. The concept of reenactment distinguishes Barsalou's theory from others that focus on cognition as a process of cataloging information for future recall. Barsalou describes the reactivation of feature maps as follows: "[O]nce a set of conjunctive neurons captures a feature map pattern; the set can later activate the pattern in the absence of bottom up stimulation."[69] In other words feature maps can be reactivated in the absence of the actual experience that created them, in a process Barsalou refers to as part-to-whole inference. Stimulation of any portion of a feature map can start a chain reaction that causes reactivation of other parts of the feature map and of the larger associated structure of neurons it connects with. For example a friend's smile is an important feature in her individual feature map. An encounter with a smile that looks like a friend's smile can result in the reactivation of the memory of the friend's smile and literally bring her to mind when she is nowhere in sight.

Simulators and Simulations

The network of a feature map in conjunction with other associated neural networks results in larger networks of information that Barsalou calls a simulator. Simulators are the neural networks used for the conceptualization of broader categories of knowledge, such as the category of human face. A simulator for the category human face would include general characteristics for faces including appearance, the sound of human voices, the feelings they elicit and the proper way to respond and interact with them.[70]

Simulators represent the broad knowledge base out of which cognition arises. The activation of a simulator results in the simulation of previous experiences and simulations are how human minds create categories and concepts. Human cognition is a process of mental simulation of previous experiences. It is important to note that the simulation process is dynamic, as Barsalou states:

> Simulations can go considerably beyond the information stored originally—they are not mere reenactments of previously experienced events. Information stored on different occasions in a simulator may merge together at retrieval, thereby producing reconstructive and averaging effects…Furthermore, intentional attempts to combine simulations from different simulators productively can produce infinite simulations never experienced.[71]

Thus, during reactivation the pattern may be distorted in some way that causes it not to be an exact reenactment of the original experience but a variation on it. This process of consolidation, averaging and distortion allows for the development of many variations on the concept of face. For example: red face, dog face, game face.[72] As Boyer pointed out, religion and religious rituals employ a great deal of novelty in an effort to capture attention. The ability of ritual to affect behavior in consistent yet novel ways, and to do so without engaging ordinary consciousness are also important aspects of Bell's notion of ritualization. Ritual's apparent ability to bypass conscious awareness is related to the speed with which the brain processes information. The next section will explore entrenchment and pattern completion as they provide insight into cognitive speed.

Entrenchment, Pattern Completion and Reenactments

Entrenchment occurs when a particular neural process is stimulated repeatedly. The more frequently an action is repeated, the faster the reaction time within the feature map, and the faster the feature map interacts with other associated networks through out a simulator.[73] Entrenchment explains the speed with which the mind can integrate the experiences of the body, according to Barsalou:

> Eventually the situated conceptualization [embodied concept] becomes so well established that it comes to mind automatically and immediately as a unit when the situation arises. After a parent frequently experiences an angry child, for example, the situated conceptualization for this situation becomes entrenched in memory, with minimal cuing bringing it all to mind on subsequent occasions.[74]

Action and experience create feature maps and simulators in the brain and repetition makes the connections within the networks and to other associated networks become stronger and faster. As a result stimulation of any one of the well entrenched features in a feature map or a simulator can produce a response so quickly that the response appears to be automatic, and that which is automatic may appear to be unconscious.[75] Thus, when the habitually angry child has a frustrating or challenging experience their "automatic" reaction can be to become angry.

For Barsalou the entrenchment of embodied concepts gives humans a proclivity for pattern completion that can lead to automaticity in reactions to stimuli.[76] He describes the role of pattern completion as follows:

> Because part of this pattern matched the current situation initially, the larger pattern became active in memory. The remaining parts of the pattern—not yet observed in the situation—constitute inferences, namely educated guesses about what might occur next. Because the remaining parts cooccurred frequently with

> the perceived parts in previous situations, inferring the remaining parts from the perceived parts is reasonable.[77]

When the habitually angry child begins to show any strong emotion the parent can automatically complete the pattern developed from previous experiences and react as if the child were angry.

The above review of Barsalou's work on embodied cognition provides a way of imagining the process through which experiences affect the brain and mind. In summary an experience causes the creation of a feature map that conjoins with associative neural networks to create a simulator of the entire experience. With time and repetition the neural networks become more developed and process information with greater speed. According to this model experiences shape the mind by creating and improving neural networks. By observing behavior, research in psychology (particularly social psychology) provides many examples of the ways the experiences of the body influence cognition. The following section will highlight examples that demonstrate the effects of human experiences on the mind.[78]

Social Psychology Research: The Mind in the Body

Posture

The following paragraphs review research that features activities commonly encountered in religious rituals: body posture, arm movement and hand gestures. In a study on body posture, Ducalos et. al. (1989) lead subjects to believe the research measured the differences in brain activity during the performance of a physical task.[79]

The "task" consisted of moving in a systematic way into postures associated with sadness, fear and anger. After attaining and holding the posture, the subjects were asked to report their emotional state by selecting from a list of eight emotions: fearful, sad, angry, happy, agreeable, interested, disgusted and surprised. The subject's self reports of fear, anger and sadness positively correlated with the posture they adopted during the experiment.[80] A separate study by Riskind and Gotay (1982) demonstrated that body posture influenced cognition long after the posture had been abandoned. Subjects were placed in a slumped or upright position under the guise that muscle tension was being measured. Upon completion the subjects moved to a separate room where they engaged in a task that determined their levels of persistence for completing a frustratingly difficult task. Those who had previously assumed and held a slumped posture were less persistent in completing the task than those who experienced the upright posture. In a different experiment the same researchers showed a positive correlation between tense postures and increased perception of stress, and relaxed postures with decreased perceptions of stress. Subjects in a relaxed posture were told they would be given an intelligence test. These subjects reported feeling less stressed than those who received the same information while sitting in a tense posture. When subjects were given less stressful news (they would be given a test that did not reflect their intelligence), those with a tense body reported more stress than those whose body was relaxed.[81] This research provides evidence that body posture affects emotions as well as the ability to achieve goals.

Hand Gestures and Arm Movements

Hand gestures and subtle arm movements have significant effects on the mental receptivity, recall and learning, and these effects continue well after the activity has stopped. Cacioppo, Priester, and Bernston (1993) showed subjects a series of Chinese characters while having them press up (a gesture of approach and receptivity) or down on a table (a gesture of avoidance or rejection). After completion of the task the subjects performed a review of the series of images. Subjects expressed a preference for the images they saw while pressing up on the table. The same task resulted in subjects expressing more negative attitudes toward images viewed while their arms were pressing down on the table. [82] From this research was concluded that arm flexion and extension have effects on cognitive and emotional processes.

Stevanoni and Salmon took children through a dramatic pirate adventure, with many story lines: becoming a pirate, making a treasure map, finding the treasure. One group of children was instructed to gesture along with the teacher, one group was allowed to gesture if they wished but not encouraged to, and another group was not allowed to use gestures. The children instructed to use their hands to gesture recalled twice as much information as children who did not gesture or who gestured very little, and their accuracy in reporting was greater as well.[83] In another study, Cook and Goldin-Medow (2006), asked whether children used their hands to change their minds. In a learning experience children were given instructions for solving a complex math problem in speech and in speech+gesture. Following their instruction the children were asked to repeat the instructions in speech alone or in speech+gesture. In a post test

the children were then given similar types of complex math problems to solve.[84] Children who were instructed in gestures and speech completed a greater number of math problems than those who did not. These children also performed a greater number of the math problems correctly than children who did not receive instructions with gestures. This study considers that there are several possibilities for the cognitive effects of gesture. Gesturing may free working memory, making more memory available for problem solving or it may increase mental imagery, action memory or linguistic processing. The authors of this study argue that regardless of which mechanism is engaged it is clear that the use of gesture changes the mind.[85]

Connecting Ritual to Cognitive Models of the Mind

In a work focused on religious knowledge, Barsalou notes that religion employs various methods to make the abstract ideas of religion more concrete. Linking the abstract to the physical through ritual use of the body and environment is only one of these methods.[86] Barsalou concludes that while embodied theories of cognition may not explain all religious knowledge, to the extent that religious and non-religious knowledge are the same, embodiment plays a central role in religious knowledge.[87] To the extent that ritual action is like mundane action, ritual action should have effects on the formation of cognition that are similar to those discussed in the previous paragraphs, and that cognitive theories that explain these actions can provide insight into the effects of ritual actions on the brain and mind. Embodied theories of cognition like Barsalou's offer a theoretical description of the mechanism by which experiences may shape the brain and mind. Applying Barsalou's model, the experiences of ordinary

and religious life create specific neural networks in the brain, which can be reactivated when any part of the network is stimulated. Once reactivated a network can change based on information received from the new experience, thus experiences such as religious ritual may shape the mind by creating and modifying neural networks.

Recent developments in brain imaging have invigorated discourse between science and religion. Despite current excitement, this discourse remains controversial and has inherent challenges. Scientific research requires that problems be parsed into discrete and precisely measurable elements, and this often results in the reduction of religious phenomena into artifacts devoid of any culturally specific meaning. Ritual studies scholars have developed well contextualized research on religion, and incorporating this scholarship with that of science may provide a way to avoid the pitfalls of reductionist treatments of religion. In recent decades a number of scientists have addressed this problem by collaborating with scholars of religion to produce much more nuanced research. The list includes but is not limited to: Richard Davidson, John Dunn, Antoine Lutz, Thomas Lawson, Robert McCauley, Charles Raison, Edward Slingerland, and Evan Thompson.

Over the last two years there have been many articles focused on these types interdisciplinary topics published in the *Journal of the American Academy of Religion.*[88] Edward Slingerland's recent book *What Science Offers the Humanities: Integrating Body and Culture* generated an extensive debate over reductionism in scholarship on science and religion. In spite of its challenges, discourse in science and religion is moving forward at an ever increasing pace and with careful use of tools from both sides of the

disciplinary aisle it may be possible for scholars to come forth with a greater understanding of the human body physical, social and religious. In the following section I will make a contribution to this endeavor by reflection the ŚCP using Barsalou's theory of cognition.

SECTION THREE: THE RITUAL MIND

This essay has placed ritual studies in conversation with cognitive science in order to address the possible effects of ritual practice on the mind. The body is an important focus of study in both disciplines and as a result is a logical point of intersection for interdisciplinary discourse. For decades the study of religion has recognized the importance of the body as an instrument for the expression of religious ideas. Religious concepts govern a wide variety of the body's activities such as what it eats and how it acts ritually and socially. However, for almost a century scholarship in ritual studies has avoided discussing certain parts of the body, specifically the brain and mind. This avoidance of the brain and mind is partly the product of specific issues within the debate between the myth and ritual schools of ritual theory.

At the turn of the twentieth century the debate between the myth and ritual schools dominated the study of religion. The core issue in the debate was over which emerged first as a cultural phenomenon, myth or ritual. As part of this debate, the French sociologist Émile Durkheim identified religion with society in a way that deemphasized the role of belief and doctrine. Durkheim is credited with bringing ritual to the forefront of the debate, and as a result scholars began to focus more intensely

on the body.[89] However, despite a new interest in the social significance of bodily actions, scholarly focus on the body avoided discussion of the psychological elements of the brain and mind. At this time, the brain and mind were associated with the construction of myth, doctrine and the formulation of beliefs. In the sociological view, the body was seen as a vehicle for absorbing and expressing social values regarding gender, class, power and the like.[90] As scholarship in ritual studies progressed, the term "body" came to refer to the body as an instrument that expressed and absorbed social ideas, a social body. As a result of recent scholarship in cognitive science, focus on the body has changed, and a new understanding of the body is emerging, one that emphasizes the mind as a component of the physical body.

Over the last six decades, research in cognitive science has focused intensely on the relationship between the brain and mind, their roles in cognition and their effects on behavior. Much of this work began by criticizing dualistic understandings of the relationship between the mind and the body known as mind/body dualism. Dualistic models of the mind and body argue that the mind is fundamentally distinct and separate from the physical body. In a dualistic model the mind is a non-material controller of the physical body, and the physical body is seen as an inanimate collection of flesh and bones.[91] Contemporary cognitive science holds a different view of the relationship between the mind and the body, one where the mind is considered a part of the physical body. From this point of view, the mind is considered the process of information exchange that occurs in the networks of neurons that populate the brain. Based on this view, human cognition is understood as embodied, and as a process that

occurs in the body it is affected by the experiences of other parts of the body.[92] Embodied views of cognition therefore argue that if the mind is physical, then it is available for investigation using techniques from psychology and other sciences designed to address the physical body.

In the following section I reflect on the ritual practice of the ŚCP from the perspectives of cognitive science and social psychology on embodied cognition. Two questions will be considered. First, do ritual and social actions correlate to a degree that allows research in social psychology to be applied productively to ritual practice? Second, what might cognitive science models of embodied cognition reveal about the effects of ritual practice on the mind? I begin by exploring the correlation between ritual and social use of body posture, hand gestures and arm movements as analyzed by social psychologists. In this section the practices of ŚCP will be examined using research findings from social psychology. Following this the ŚCP will be explored using the model of embodied cognition developed by Lawrence Barsalou. I will argue that Barsalou's model of embodied cognition provides a productive way to understand how ritual practice might shape the mind. By observing the movement of the body during ritual it may be possible to understand the inner mechanisms of the ritual mind.

What Social Actions May Reveal About Ritual Actions

Research in social psychology shows that body posture influences thought and emotion; hand gestures can be used to shape the mind; and arm movements affect attitudes. ŚCP incorporates ritual use of a variety of actions including: body posture,

hand gestures, and arm movements. In this section, ritual actions will be correlated with similar social actions to determine what research findings on social action might reveal about ritual action.

Body Posture

The Śrī Vidyā tradition adopts understandings of the physical body from *yoga* philosophies, which focus on the movement of energy within the body. According to the tradition, ŚCP emphasizes a sitting posture that promotes a straight spine because it allows the free movement of energy in the body. For public performance of the ŚCP the ritual space is arranged by priests and other assistants. An image of the deity, adorned with garlands of flowers, is placed on an elevated platform. Below the image of the deity sits a platform with ritual items including the *śrī cakra.* The practitioner sits on a mat placed on this lower platform with his legs crossed so that his hips are open to provide a strong base from which to extend his spine fully. The practitioner's hands rest on his knees with palms turned up forming *mudrā*s, hand gestures. According to the tradition, this sitting posture assures that energy travels freely through the body, which is important during transformative practices such as meditation, self identification with the deity, *mantra* recitation, and breathing practices.[93] (see Figure 2).

Social psychology research on body posture has shown that mood, emotional states, stress levels and the ability to complete mental tasks are all influenced by body posture. Postures where the body is erect were correlated with positive emotional states in research by Ducalos, et. al. (1989).[94] In this study subjects were placed in erect or

slumped postures for a period of time. Following this phase of the research subjects were asked to evaluate their emotional state, and those who sat with an erect posture reported more positive emotions than those who sat in a slumped posture.[95] Ina

Figure 2 Sri Sachchidananda Ganapati performing ŚCP with an erect body posture. Mysore, India, May 2006 (photograph by authro)

related study, Riskand and Gotay's (1982) research demonstrates that an erect body posture increases the ability to think critically and to manage emotional stress. Subjects in their study who maintained an upright posture during the first phase of the research completed more puzzles during follow up testing than those who were placed in a slumped posture. Also, subjects who maintained an erect body posture reported fewer mental and physical symptoms of stress.[96] These studies and others demonstrate that body posture affects the aspects of the brain and mind that govern critical thinking, emotion and stress response.[97] Based on these studies I hypothesize that maintaining an erect posture during ritual practice may increase the practitioner's mental stamina

and motivation to perform a detailed and lengthy ritual. Performing a lengthy ritual sequence like ŚCP requires memorizing substantial amounts of oral and written textual material for use in meditation and visualization. For example, in one segment of the ŚCP the practitioner mentally reverses the process used to create the universe by visualizing various aspects of the *śrī cakra*. Each of the *śrī cakra*'s outer lines, circles and nine interlocking triangles are said to house specific deities who aid in the process of creation. The practitioner must visualize each deity, his or her adornments, weapons and associated powers. During this visualization the deities' *mudrā*s and *mantra*s are also performed. A large amount of ritual and textual knowledge is required for the proper performance of these ritual actions. Consequently, practice of ŚCP can be considered a challenging mental task. An erect body posture is important in the ritual, I suggest, because it improves mental stamina and reduces the stress of ritual performance. Research on body posture also shows that body posture has a measurable impact on emotional states. However, the Śrī Vidyā tradition (and traditional ritual studies approaches) does not provide this explanation. The tradition places great emphasis on experiencing the deity as a flash of insight that occurs in conjunction with a feeling of great bliss. As Shankaranarayanan states, "The great offering is the union of I-ness and This-ness churned out of the higher regions of the mind. Thus dissolving everything into the great Light, one's body becomes full of bliss and one becomes the Light itself."[98] In order to achieve this experience of insight and bliss, the tradition teaches the practitioner to assume a precise body posture and visualizes the movement of divine energy from the base of the spine out through the

crown on the head. Cognitive science suggests the experience of pleasurable emotions may be an important motivator for human behavior, and research from social psychology asserts that certain body postures facilitate these experiences. [99] The experience of pleasurable emotions may motivate the practitioner to complete a complex and demanding ritual. Thus, complex rituals may benefit from incorporating specific bodily postures (e.g. and erect spine) that facilitate pleasure.

Reflecting on ŚCP from the perspective of social psychology reveals that the use of body posture in ritual may have developed because these postures promote the types of mental states, including a still mind, that support successful ritual performance. In an article on religious knowledge, Barsalou notes that the ritual prescription for a still posture reflects a religious tradition's understanding that stilling the body stills the mind.[100] The effect of the physical body on the mind is difficult to recognize if the body is considered from the metaphysical view of the Śrī Vidyā tradition or the sociological view of ritual studies. The Śrī Vidyā tradition asserts that body posture is important for the proper movement of the energy of the body that is understood to be necessary for the acts of transformation that occur during ŚCP. The tradition also stresses the importance of a still body for creating a still mind. Thus while it does not articulate this focus on the mind in the same terms that are used in cognitive science there is some overlap between science and religion on the use of body posture. From a ritual studies perspective, choosing to use the body to execute ritual actions expresses a submission to social priorities that privilege physical submission to authority. A still body may promote a more submissive attitude in the practioner and as a result he may be more

susceptible to the social construction that some traditional ritual studies approaches argue ritual is designed to promote.

Hand Gestures

ŚCP also emphasizes the use of precise ritual hand gestures. During the critically important bodily purification ritual that begins the process for self identification with the deity, the practitioner touches the tip of each finger to the thumb (each finger represents a sensory system in the body) as he surrenders his ordinary sensory awareness. Hand gestures are also used to install the deity in the mundane *śrī cakra*. The practitioner sits with an erect body posture, focusing on a visualization of divine energy and pointing his fingers toward the *śrī cakra.* As the practitioner exhales with a strong breath he sees the divine energy extend from his fingers and enter the *śrī cakra*. Throughout the ritual the fingers are occasionally placed in a variety of specific gestures, all of which are believed to have an important effect on the transformation of the practitioner, ritual objects and the ritual's outcomes. (see Figure 3).

Research on hand gestures in learning provides evidence of the impact of gestures on cognition. Cook and Goldin-Medow specifically addressed the question of whether or not children use hand gestures to shape their minds. Instructions for complex math problems were given to groups of children; one group of children was

Figure 3 Hand *mudrā* (photograph courtesy of Kali Ray Triyoga)

instructed with speech alone and one group with speech and gestures. The two groups of children were then asked to repeat the exact instructions they were given. Following this learning task, the children were tested using the type of math problems they had just received instructions for. Children who were instructed with and expressed instructions using speech and gesture performed better on the post instruction math test than children who were instructed with and expressed themselves in speech alone.[101] Similar results were reported in the work of Stevanoni and Salmon (2005). Groups of children were taken through a dramatic pirate adventure, one group was instructed to gesture during the experience; another was instructed not to gesture during the experience.[102] Several days after the adventure, children were interviewed and asked to recall as many details about the adventure as possible. The group of children allowed to gesture during the original adventure was also allowed to gesture during recall, and the group of children not allowed to gesture during the adventure was not allowed to gesture during recall. Children allowed to gesture recalled a greater

number of details with fewer errors than children who were not allowed to gesture.[103] Both of these studies suggest that gesture improves action and image memory, and reduces demand on working memory by reducing the amount of data that must be processed internally. While the particular cognitive mechanisms affected by gesture were not identified, these studies concluded hand gestures influence mental processing in a way that facilitated memory, and learning. As Cook and Goldin-Medow state:

> Whatever the mechanism, it is clear that including gesture in instruction encourages children to produce gestures of their own, and that producing one's own gestures is associated with learning. Children may thus be able to use their hands to change their minds.[104]

Prior to this type of research on gesture it was thought that gesture may actually be a drain on mental resources. However, this research provides evidence that hand gestures enhance the minds ability to process information necessary for learning. Thus, Cook and Goldin-Medow suggest that gestures should be intentionally employed to promote learning.

Social psychology demonstrates that seeing and using hand gestures improves memory, and critical thinking. Research has not revealed the exact cognitive mechanisms affected by gesture, but demonstrates that gestures have significant effects on the brain and mind such that learning is noticeably improved. The Śrī Vidyā tradition asserts that gestures affect the mind's ability to focus and also contribute to the movement of energy. A ritual studies understanding of hand gestures recognized as symbols that communicate social information. The communicative role of gestures links them with language, and language is known to require extensive working memory

and other cognitive resources. However, in the traditional ritual studies approach of avoiding the brain and mind, the connection between gesture and language is rarely explored. The Śrī Vidyā tradition's understanding of the ritual hand gestures overlaps with the scientific view in that the tradition recognizes there is some connection between hands and mental focus.

Arm Movements

Along with specific hand gestures, the ŚCP employs many arm movements that are often large and sweeping. During the actual worship segments of the ritual items are offered to the *śrī cakra* with sweeping motions, the most dramatic of which might be the fire offered with large circular motions in front of the *śrī cakra* using a lamp that resembles a small candelabrum. It is possible that these movements are exaggerated simply for dramatic effect. However, this ritual was created by *smārta* brahmans who believe correct ritual performance is important to all aspects of the material world and the cosmos. Given this intense focus on ritual performance, it is unlikely that dramatic effect is the sole motivation behind any action performed during ŚCP.[105] Like posture and hand gestures, it is likely that dramatic arm movements are used because they are believed to support the proper outcome of the ritual. (see Figure 4).

Social psychology has established that arm movements directed toward the body or in an upward direction are associated with thoughts and attitudes of approach and acceptance, while those directed away from the body or down are associated with

Figure 4 Śrī Ganapati Sachchidanada performing ŚCP using circular arm movements. Kerala, India 2003 (photograph courtesy of Dattapeetham)

avoidance or rejection. Cacioppo, Priester, and Bernston (1993) instructed a group of subjects to simulate moving their arm in an upward direction while viewing images of Chinese characters. Another group was asked to simulate moving their arm in a downward direction while viewing the same characters. Subjects who simulated the upward motion remembered the images with more positive and accepting attitudes than subjects who viewed the images while simulating downward motion. They concluded that physical movement of the arm impacts evaluative and emotional cognition. Chen and Bargh (1999) designed a study to examine the impact of both approach and avoidance arm movements on cognition. In their study subjects were shown a list of words and asked to evaluate them as positive or negative by moving a lever on a computer toward or away from the body. One group was asked to pull the lever towards their body (approach) if the word was positive and to push it away (avoidance) if the word was negative. A second group was given the opposite

directions, to push the lever away for positive words and pull in for negative words. In the first group, where motor movements matched the cognitive choice, the reaction time was shorter than in the group where the motor movement contradicted the cognitive choice. As a result, Chen and Bargh concluded that the link between arm movement and cognition is specific; when movement and cognition operate in agreement with one another less time is required to perform cognitive evaluations and the physical movements that result from them. The authors of this study conclude that these results could be explained on evolutionary and adaptive grounds; the ability to judge and move quickly is necessary for survival. The speed of cognition and response is crucial for making flight or fight choices. When thought and action are congruent it speeds up and may intensify desired outcomes.[106]

Research from social psychology demonstrates that intentional use of the arms affects mental states. As with the use of hand gestures, using the arms may reduce the need to process information in working memory. Incorporating arm movements during religious ritual may aide the practitioner in remembering linguistic descriptions and religious ideas; embodiment may also provide a way to make abstract ideas concrete.[107] The Śrī Vidyā tradition does not address arm movements with the specificity that it does posture and hand gestures. However, it may be the case that the tradition views precise and careful use of the arms as necessary for ensuring that the practitioner achieves the desired ritual experiences and to ensure the ritual's overall efficacy. Here again, the tradition's understanding overlaps with the cognitive views on embodiment that the body effects the mind and that the body may be consciously used

to effect particular mental states. From a ritual studies perspective these movements are viewed for what they reveals about social priorities. In the South Asian context these circular arm movements are used to show respect to important people and deities. When considered from the traditional religious studies view, performing these arm movements can be understood as communicating and reinforcing the social hierarchy.

The Brain on Ritual: A Theoretical Model for Shaping the Mind Through ŚCP

According to Barsalou, the mind is shaped when bits of information about an experience are stored and processed in the brain. Each experience includes sensory, emotional and conceptual elements that are stored in different parts of the brain. These stored bits of information are then connected together by neurons, which act like highways that allow information to travel back and forth. These interconnected bits of information are what Barsalou calls a simulator. In this way each experience forms its own simulator and the creation of a simulator is the shaping of the mind. Once a simulator has been created it then forms neural connections with simulators of other experiences, creating much more complex networks of information.

ŚCP may construct simulators using information about a variety of ritual actions, recitation of *mantra*s, images of deities and emotions. For example, after the body is purified the practitioner begins to visualize an elaborate retinue of deities that inhabit the lines, outer circles and triangles of the *śrī cakra.* These deities are associated with specific qualities that have to do with protection from harm, removal of obstacles,

granting knowledge, and fulfilling desires to name only a few.[108] The practitioner visualizes an image of each deity in detail while experiencing the deity's attributes and power being absorbed in various locations in his own body. In the Śrī Vidyā tradition, each deity also has a mythology that the practitioner would be familiar with and use in constructing his ritual experience. The features of any one of the deities would include the deity's myth, appearance, power, weapons and *mantra*, along with the thoughts and sensations the practitioner experiences as he performs this segment of the ritual. These bits of information would then be connected by neurons to form a simulator of this ritual segment. The creation of a particular simulator is the first level on which the mind is shaped by ŚCP.

ŚCP, like many other rituals is a series of smaller rituals sequenced to form a more complex ritual; it is a series of first level simulators that are connected to form a more complex simulator network or a second level simulator. Barsalou writes, "When a pattern becomes active in a feature map during perception or action, conjunctive neurons in an association area capture the pattern for later cognitive use….A population of conjunctive neurons together codes a particular pattern, with each individual neuron participating in the coding of many different patterns."[109] The networking of first level simulators within a ritual sequence represents a second level on which ŚCP may shape the mind. In this way, first level simulators of individual ritual segments become part of a second level simulator that represents the ŚCP as a whole. The process of shaping the mind does not end with the creation of a second level simulator.

Once a second level simulator of ŚCP is created it is available to shape the mind on a third level by connecting with simulators from other experiences. An example of this third level of networking can be seen when a ritual simulator connects with a social ritual simulator. In the worship segment of ŚCP the *srī cakra* is shown the same tokens of respect an honored guest would be offered. The practitioner offers the *śrī cakra* water for washing, a comfortable seat, an umbrella for shade, fire, flowers and the like. These are examples of the items that customarily one offers an honored guest. The ritual creates a simulator for the proper treatment of an honored guest and social custom creates a simulator for their treatment as well. The ritual simulator and the social simulator can connect to form another larger network of simulators. In this way ŚCP and social ritual practice can share information. As a result of networking, simulators change each other, when information is changed in one simulator it changes the simulators it networks with by changing their information resources. If social rituals are created out of the same pool of knowledge that religious ritual actions are created out of, then this may help explain why it can be challenging to determine the line of demarcation between the two. Based on this model it becomes apparent that ŚCP may shape the mind in multiple ways: through the creation of individual first level simulators; through their connection to form a more complex network or second level simulator; through the connection of this simulator network to simulators from other experiences third level simulators; and through the continual change in simulators that results from further experiences.[110] ŚCP, like other ritual activities, is a process that

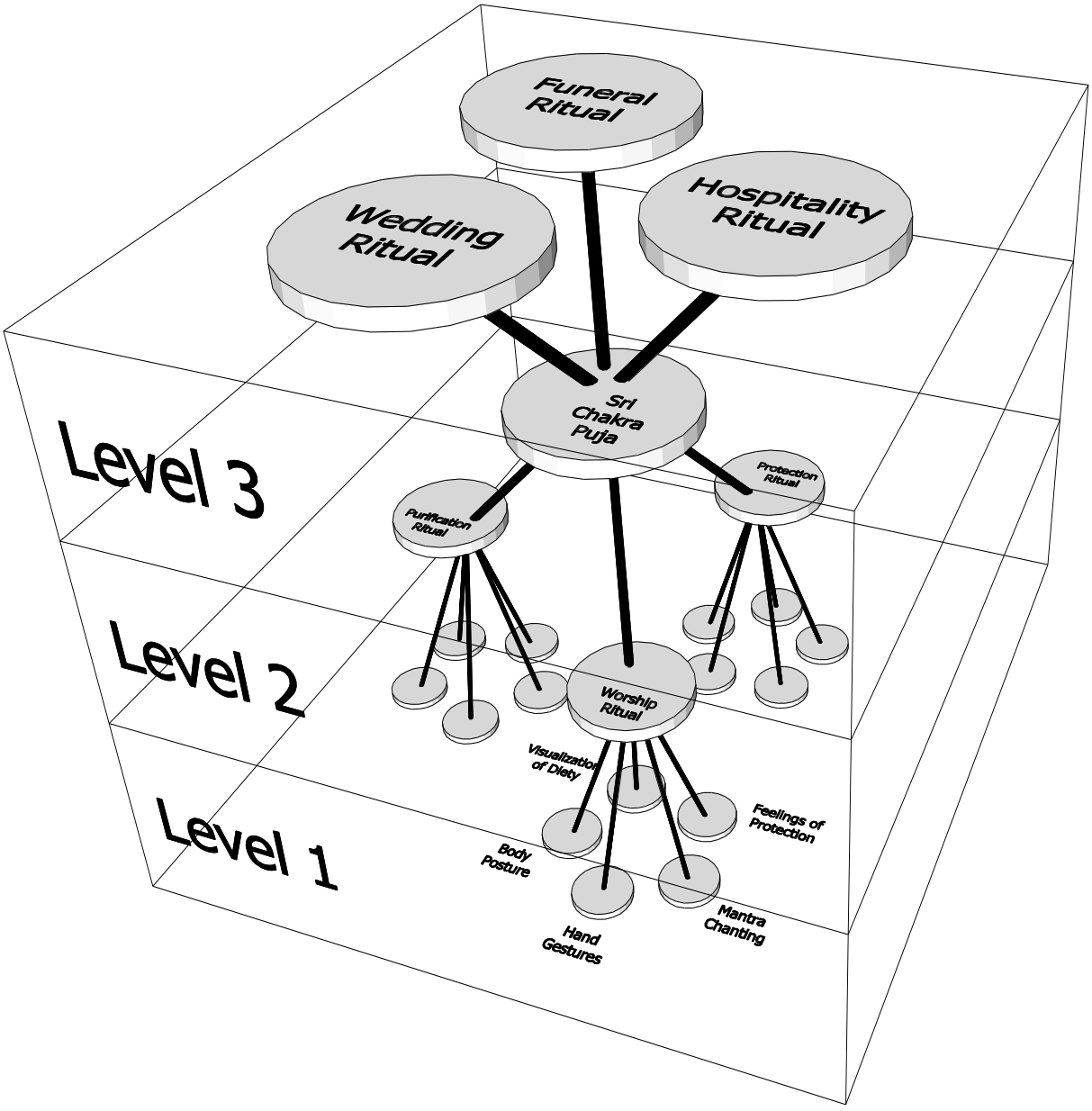

Figure 5 Levels of neural networking created by ŚCP. Level 1 simulator consists of the features of individual ritual segments. Level 2 is the simulator of the ŚCP. Level 3 is the network of connections where the ŚCP simulator interacts with other like kind simulators. (image by Gyrony Consultive)

may progressively shape and reshape the mind (see Figure 5).

Barsalou's model of cognition provides a means for imagining the brain on ŚCP. Accordingly, ŚCP is a complex ritual constructed out of a sequence of smaller rituals which create networks of information in the brain that connect with other networks.[111] Imagine a large road map of the United States laid out on table. Individual towns and cities have their own systems of road ways; these represent the simulators of the individual ritual segments of ŚCP, level one. These systems of road ways connect and form a large metropolitan area; this is the simulator for the ŚCP as a whole, level two. The interstate highways that connect metropolitan areas to each other are the simulator network of an entire region of the country; this is the simulator of all the experiences that connect with the ŚCP, level three. It is likely that ŚCP shape the mind by creating and updating the road map of the brain that is the mind.

Closing Reflections on Ritual Studies and Cognitive Science

This essay has focused on the integration of ritual studies with cognitive science, particularly theories of embodied cognition. I have argued that important elements of the ritual body, its brain and mind, need to be reintroduced into the discourse on ritual studies, and offered a model describing how this might be achieved using Barsalou's theory of embodied cognition. The intention has been to provide a detailed examination of ŚCP from the perspective of Barsalou's work on embodied cognition in an effort to imagine how ŚCP may shape the mind. Barsalou argues that the mind is a complex arrangement of neural networks that exchange information in the brain

by creating webs of religious and social information that communicate with other information groups in the brain.

This work has addressed ŚCP from the perspective of cognitive science; however it is also possible to reflect on theories of embodied cognition from the perspective of the Śrī Vidyā tradition. The tradition asserts that ŚCP is a practice that transforms the practitioner's sensory awareness allowing him to experience reality from perspective of the divine creative principle. One of the goals of the ritual is to enable the practitioner to literally see, hear and interact with the world as the divine does. The tradition also asserts that repetitive ritual practice can ultimately cause this transformation to become permanent. For the tradition, ŚCP is a ritual partly designed to permanently change the neurological networks that make up the practitioner's sensory perceptions. These traditional assertions correlate with claims made in theories of embodied cognition that the actions of the body affect the mind and that repetition entrenches neural networks. It may be productive for cognitive science to look to other traditional assertions about ritual's effects on the body, including claims that specific ritual practices elevate the energy of the body, create specific mental states and facilitate the attainment of certain types of consciousness. In this way the traditional assertions about the effects of ritual practice can provide new categories and concepts for research in embodied cognition, illuminate the strengths and weaknesses of traditional and cognitive claims, and test the limits of the discourse on embodied cognition and religious ritual practice. Given that religious ritual practices such as ŚCP function based on principles that overlap in some

cases with those of embodied cognition, it may be the case that religious ritual practice represents a particular category of embodied cognition.

At this juncture I return to Catherine Bell's theory of ritual practice and reflect on it using the ideas developed about the cognitive impact of ŚCP. Bell's theory is representative of the type of sociologically driven approach that has dominated ritual studies scholarship for almost a century. One of the limitations of this type of approach is that it is not particularly useful for discussion of the impact of ritual practice on individual physical bodies or their brain and the mind. This may be a problem that can be remedied by a change in terminology. In order to more precisely represent the sociological focus of traditional ritual studies it may be productive to replace the phrase "ritual body" with a phrase such as "the ritually constructed social person." A clarification of terminology could clarify the focus of traditional ritual studies scholarship, and open the discussion to the possibility that there is something meaningful to be gained by focusing on the physical body.

In general, Bell was not interested in integrating discourse on science and ritual studies; however, there is a foreshadowing of this type of interdisciplinary work in her chapter on the ritual body.[112] In the introduction to this chapter, Bell identifies the work of cognitive linguists George Lakoff and Mark Johnson as representing an emerging trend in discourse on the body and ritual studies. At the time of Bell's writing, Lakoff and Johnson's work was at the leading edge of cognitive understandings of the mind as grounded in the physical body. Speaking on Lakoff's work, Bell writes:

> Lakoff provides a particularly provocative formulation of the perspective [on the embodied mind], *one with relevance for the issue of ritual action*. Interspersed with a careful critique of traditional objectivism [mind/body dualism], Lakoff demonstrates how the concepts and conceptual categories that both comprise and organize knowledge are neither abstract in nature nor independent of the body. [my italics][113]

The italicized portion indicates that Bell recognizes the work of cognitive science as having implications for ritual studies. Johnson's view on the role of the body in cognition is that "as animals we have bodies connected to the natural world, such that our consciousness and rationality are tied to our bodily orientations and interactions in and with our environment."[114] Johnson's is one of the early articulations that the mind is grounded in the body, and as such is affected by the actions and experiences of the body. While Bell may not have fully recognized it, she identified theories of embodied cognition as providing new tools for discussion of the ritual body, tools that allow for understanding the ritual body more fully.

A Cognitive View of Ritualization

Bell's theory of ritualization explores the way participation in religious ritual socially constructs the participant. She focuses on repetitive ritual action and the internalization of social strategies for shaping the practitioner into a specific type of social agent. According to Bell, ritualization is a productive method for social construction. Bell argues that ritual's ability to use the body and bypass the participant's conscious mental awareness is one of ritualization's most potent qualities; the practitioner does not recognize that ritual participation changes the way he acts outside the ritual space or that he internalizes specific social priorities through religious

ritual practice. In the following paragraphs, Bell's theory will be discussed with a focus on the ideas developed previously on the cognitive impact of ŚCP on the brain and mind. It is not my intention to make universal claims about the nature of all religious rituals or to be reductionist with regard to the myriad of cultural and religious nuances of religious practice. Rather, what is intended is an exploration of what the previous analysis of a Tantric ritual practice might have to offer for the study of other types of religious rituals and to ritual studies scholarship.

For Bell ritual causes an individual to act without engaging in conscious decision making, and as a result of this his behaviors appear to be automatic. Barsalou's concept of part-to-whole inference offers insight into the mechanisms that might be at work in this apparently automatic behavior. As seen earlier, repetition of ritual actions entrenches neural networks, and given the mind's propensity for pattern completion this makes information processing in these networks occur quickly. According to Barsalou, when any aspect of a particular neural network is activated it can cause the entire network to reactivate creating mental processes that drive behavior. For example, in ŚCP the tradition holds that the practitioner's sensory awareness is replaced by that of the deity, thus they experience the world as the deity would. When the practitioner is in a social environment that shares elements of the ritual environment any one of the shared elements can activate the simulator of the ŚCP. This activation can cause the practitioner to experience the social event from the perspective developed during ŚCP. Using Barsalou's model, rituals like ŚCP can be understood as generating a type of bodily experience and expertise that can be reactivated in ritual

and non-ritual environments through part-to-whole inference. As a result the practitioner's behaviors are driven by the religious and social priorities internalized during ŚCP. This process may occur so rapidly that the practitioner appears to act automatically and unconsciously. Bell refers to these as unconscious behaviors, but it may be more productive to think of them as differently conscious, a consciousness that is bodily as opposed to a linguistic or consciously analytical. Thus, ritualization and the behaviors that it generates can be understood d as something other than a type of social construction. Ritual practice may be a method for constructing a type of "embodied logic." [115]

Bell's theory of ritualization appreciates the complexity of ritual practice and its relationship to social practices. Socially driven theories of the ritual body on their own are not well suited for engaging the physical body directly, and as a result these theories are limited in their ability to address the internal psychological mechanisms of the brain and mind that generate much of the practitioner's behavior. By incorporating the work of cognitive science it may be possible to engage the physical body more directly and to gain insight into aspects of ritual practice that are beyond the reach of the socially focused analysis of traditional ritual studies.

While I have argued that ritual practice of ŚCP creates a specific neural architecture in the brain, and suggested that this provides a possible explanation of elements of the process of ritualization, a much more thorough analysis is required. The majority of the cognitive science research on religious practices has been focused on meditative practices. In order to explore the ideas suggested here research needs to

be done on the cognitive effects of other types of ritual actions, some of which are used to support and frame meditative practices.

By integrating cognitive science with ritual studies, I intended to demonstrate that analysis of religious ritual practices using the tools of cognitive science is a productive endeavor. First, it addresses one of the weaknesses of the traditional ritual studies approaches that focus on the body primarily as a social construction and provides a means to discuss the importance of the physical body in ritual practice. Second, addressing the ritual body as a physical body allows ritual theory to focus on the psychological elements of ritual practice without engaging the ideas of religious belief that were problematic for early ritual theorists. Finally, understanding the ritual body as a physical body allows for the integration of ritual practices such as ŚCP into the discourse on embodied cognition. This expands the tools available for ritual studies and makes available to cognitive science the extensive corpus of research on ritual actions that ritual studies has amassed over a century of research.

REFERENCES

---

[1] Sanjukta Gupta, Dirk Jan Hoens, and Teun Goudriaan, *Hindu Tantrism* (Leiden: Brill, 1979), 133.143.146.

[2] Nityāṣoḍaśikārṇavaḥ 1.6 and 1.10. Translated by Jeffrey Lidke in *The Goddess Within and Beyond the Three Cities: Śākta Tantra and the Paradox of Power in Nepāla-Maṇḍala* (New York: The Edwin Mellen Press, in press).
Sthaneshwar Timalsina, "Meditating Mantras: Meaning and Visualization in Tantric Literature," in *Theory and Practice of Yoga: Essays in Honour of Gerald James Larson* (Leiden: Bill, 2005), 213-236.216.

[3] Lawrence W. Barsalou et al., "Social embodiment.," *The psychology of learning and motivation: Advances in research and theory, Vol. 43.* (2003): 64-65..

[4] Numerous authors writing in cognitive science (and a host of other disciplines) address the issue of Cartesian mind/body dualism. See: Edward Slingerland, *What Science Offers the Humanities: Integrating Body and Culture*, illustrated edition. (Cambridge University Press, 2008).: Paul M. Churchland, *Matter and Consciousness: A Contemporary Introduction to the Philosophy of Mind*, Revised. (The MIT Press, 1988).: Mark Johnson, *The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason* (Chicago: University of Chicago Press, 1987).

[5] Lawrence W. Barsalou et al., "Grounding conceptual knowledge in modality-specific systems.," *Trends in Cognitive Sciences* 7, no. 2 (February 2003): 84-91. Lawrence W Barsalou, "Grounded Cognition," 2008.
Lawrence W. Barsalou et al., "Social embodiment.," *The psychology of learning and motivation: Advances in research and theory, Vol. 43.* (2003): 43-92.
Lawrence W Barsalou, "Simulation, situated conceptualization, and prediction," 2009.

[6] Lawrence W. Barsalou et al., "Embodiment in Religious Knowledge.," *Journal of Cognition and Culture* 5, no. 1, on Psychological and Cognitive Foundations of Religiosity (2005): 48.

[7] Catherine M Bell, *Ritual Theory, Ritual Practice* (New York: Oxford University Press, 1992), 108-110.

[8] Brooks, *Auspicious Wisdom*, 115.

[9] Bolton, Nicolas J. and D. Nicol G. Macleod, "The Geometry of the Śrī-Yantra," *Religion* 7 (1), (Spring 1977): 66.

[10] Bolton, "Geometry," 66-85.

[11] Brooks, *Auspicious Wisdom*, 115.

[12] In this particular ritual the *mantra*s are recited internally, this type of recitation is held by the tradition to be of a higher order than audible chanting. Internal recitation allows the practitioner to feel the mantra inside the body and to thus merge into the divine consciousness. Gupta, *Hindu Tantrism,* 136-137. Nityāṣoḍaśikārṇavaḥ 1.5, 1.11, and 5.7-17. Translated by Jeffrey Lidke in *The Goddess Within and Beyond the Three Cities*. Timalsina, "Meditating Mantra," 214-216.

[13] Gupta, Hoens, and Goudriaan, *Hindu Tantrism*. 143.

[14] Nityāṣoḍaśikārṇavaḥ 5.7-5.17. Translated by Jeffrey Lidke in *The Goddess Within and Beyond the Three Cities.*

[15] Śrī Vidyā Tantrics share a common philosophical heritage with the Kaula Tantrics. Muller-Ortega, Paul, "The Power of Secret Ritual," *Journal of Ritual Studies* 4/2 (Summer 1990): 50-52.

[16] Tantric practicioners like other practitioners hold forth ideals that they may find difficult to express fully in ordinary daily life.

[17] Dr. Jeffrey Lidke, in discussion with the author, April 2, 2010.

[18] Gupta, Hoens, and Goudriaan, *Hindu Tantrism*., 124.

[19] Brooks, Auspicious Wisdom, xiv.

[20] Gupta, Hoens, and Goudriaan, *Hindu Tantrism*., 125.

[21] The material in the thesis on the Śrī Cakra Pūjā was collected during field research undertaken by the author in 2006-2007 in Mysore India. During this time I recorded several public performances of the Śrī Cakra Pūjā at the Sri Ganapati Sachchidananda Asharam.

19 Douglas Renfrew Brooks, *Auspicious Wisdom: The Texts and Traditions of Śrīvidyā Śākta Tantrism in South India*, SUNY series in tantric studies (Albany, NY: State University of New York Press, 1992), 117..
[23] Timalsina, "Meditating Mantras," 219.
[24]Gupta, *Hindu Tantrism,* 135.
[25] Khanna, *Yantra,* 101. Timalsina, "Meditating Mantra," 230.
[26]Gupta, Hoens, and Goudriaan, *Hindu Tantrism*., 141-142.
[27]Gupta, Hoens, Boudriaan, *Hindu Tantrism* 145. Nityāṣoḍaśikārṇavaḥ 4.12-13. Translated by Jeffrey Lidke in *The Goddess Within and Beyond the Three Cities*.
[28] Khanna, *Yantra* 102. Tamalsina, "Meditating Mantra," 230.
[29] Gupta, Hoens, and Goudriaan, *Hindu Tantrism*., 145-146. For a description of this ritual see Nityāṣoḍaśikārṇavaḥ 5.6. Translated by Jeffrey Lidke in *The Goddess Within and Beyond the Three Cities*.
[30] Shankaranarayanan, S., *Sri Chakra,* 88.
[31] Knut, Theory and Practice of Yoga, 216-217.
[32] Bell, *Ritual Theory, Ritual Practice,* 94.
[33] Bell, *Ritual Theory, Ritual Practice*, 4.
[34] The term "habitus," while originally Latin, has been absorbed into the English language and no longer requires italicization.
[35] Pierre Bourdieu, *Outline of a Theory of Practice*, Cambridge studies in social anthropology 16 (Cambridge: Cambridge University Press, 1977), 78.
[36] Bell sees in Bourdieu's concept of habitus an important shift in perspective with regard to the study of ritual. To engage ritual as habitus is to experience ritual as neither subject nor object. Bell, *Ritual Theory, Ritual Practice,* 80-81.
[37]Bell, *Ritual Theory, Ritual Practice,* 80.
[38] Bell emphasizes that ritual mastery is contingent to particular contexts where individuals are being ritualized according to specific religious and social dynamics that vary according to community. Bell, *Ritual Theory, Ritual Practice*, 107.
[39] Bell, *Ritual Theory, Ritual Practice*, 107.
[40] Bell, *Ritual Theory, Ritual Practice*, 107.
[41] Bell, *Ritual Theory, Ritual Practice*, 104.
[42] It is interesting that in this Catholic ritual internal religious experience is privileged. Among all the Christian traditions the Catholic tradition engages in and relies on ritual the most. Yet in this ritual internal experience that leads to transformation of the human body is the final sacred act. Bell, *Ritual Theory, Ritual Practice*, 101-102.
[43]Bell, *Ritual Theory, Ritual Practice*, 102.
[44]Bell, *Ritual Theory, Ritual Practice*, 107-110.
[45] Both ritualization and ritual mastery focus on differences, because they are important determinants for ritual oppositions. Ritualization and ritual master also create a constant system of deferral that deflects attention away from the meaning and the purpose of the processes of ritualization and ritual mastery. This deferral of attention helps to ensure that ritualization and practical mastery can do what they do under the radar of conscious awareness and analysis. Bell, *Ritual Theory, Ritual Practice,* 108.
[46]Bell, *Ritual Theory, Ritual Practice,* 90.
[47]Bell, *Ritual Theory, Ritual Practice,* 91.
[48]Bell, *Ritual Theory, Ritual Practice,* 107.
[49]Bell, *Ritual Theory, Ritual Practice*, 80.
[50] Bell, *Ritual Theory, Ritual Practice* , 107-108..
[51]Bell, *Ritual Theory, Ritual Practice*, 93.

[52] In the essay the term "embodied cognition" has been chosen to represent the body (pun unavoidable) of research on human cognition that has arisen since the late 1950's. Other terms commonly used to refer to this work are situated and embodied.
[53] The list of scholars in cognitive science who have rebutted the arguments for mind/body dualism is extensive. See Paul M. Churchland, *Matter and Consciousness.* Mark Johnson, *The Body in the Mind.* George Lakoff and Mark Johnson, *Philosophy in the Flesh.* Giles Fauconier, *Conceptual Blending.* Almost anyone who has written on embodied cognition has directly addressed Descartes. This critique is not unique to the cognitive science and can also be found in the work of Merlue-Ponty, Bourdieu and many others.
[54] Mithen represents the classical model of evolutionary anthropology. Archeologist Shelia Coulson's 2006 discovery of a ritual site at Python Rock, Botswana is changing the mainstream view expressed by Mithen and others. This African ritual site has been dated at around 70,000 BCE and provides evidence that as far back as the Stone Age people were engaged in the type of abstract thinking necessary for the production of ritual and religion. As a result of this discovery archeologist and anthropologists now think that ritual behavior may extend much further back into human history than the Stone Age. Dr. Robert N. McCauley, in discussion with the author, October 5, 2009. 10/5/09
http://www.sciencedaily.com/releases/2006/11/061130081347.htm
[55] Steven J Mithen, *The Prehistory of the Mind: The Cognitive Origins of Art, Religion, and Science* (London: Thames and Hudson, 1996), 194, 204.
[56] Steven J Mithen, *The Prehistory of the Mind*Ibid., 64.
[57] Mithen argues that the alternation between general and specialized forms of knowledge is required for the production of complex phenomena. Computer programs are built first in as a basic program that will run operations related to the desired final program. Second, layers of complexity are added to the foundational program. These layers are tested and validated independently and then integrated with one another. This process prevents debugging to occur at each stage so that during integration the system does not crash. The production of complex phenomenon such as science, religion, airplanes and laptop computers mirror the overall process of the evolution of one of two of the more complex phenomenon in existence, the brain and the mind. Steven J Mithen, *The Prehistory of the Mind,* 212-213.
[58] Steven J Mithen, *The Prehistory of the Mind,* 177-178.
[59] Pascal Boyer, *Religion Explained: The Evolutionary Origins of Religious Thought* (New York: Basic Books, 2001), 98.
[60] Boyer, *Religion Explained*, 101.
[61] Knowing whether or not an object is animate or inanimate can be the difference between having lunch and being lunch.
[62] Boyer, *Religion Explained,* 24.
[63] Boyer, *Religion Explained* 235-236.
[64] Boyer, *Religion Explained,* 262.
[65] Boyer, *Religion Explained,* 234.
[66] Although the work of Andrew Newberg attempts to argue there is a region of the brain devoted to experiences of god, science has identified the "god spot" or the "ritual domain."
[67] For more detailed discussion of debates regarding the specifics of modularity in the mind see: Churchland, *Matter and Consciousness*. and Jerry A. Fodor, *The Modularity of Mind* (The MIT Press, 1983). Dr. David Bell, conversation with the author April 21, 2010.
[68] Lawrence Barsalou, e-mail message to author, March 24, 2010.
[69] Barsalou et al., "Social Embodiment," 66.
[70]Barsalou et al., "Social Embodiment," 67.
[71]Barsalou et al., "Social Embodiment," 69.

[72]Barsalou et al., "Social Embodiment.," 69.
[73] Barsalou et al., "Social Embodiment," 72-73.
[74]Barsalou et al., "Social Embodiment," 72.
[75]It is possible to bring automatic processes to the level of conscious awareness and indeed this is the work of many forms of contemplative practice. Within social psychology there is an extensive body of work on automaticity see: Zachary Estes and James S. Adelman, "Automatic vigilance for negative words is categorical and general.," *Emotion* 8, no. 4 (2008): 453-457.: Felicia Pratto and Oliver P. John, "Automatic vigilance: The attention-grabbing power of negative social information.," *Journal of Personality and Social Psychology* 61, no. 3 (1991): 380-391.: Mark Chen and John A. Bargh, "Consequences of automatic evaluation: Immediate behavioral predispositions to approach or avoid the stimulus.," *Personality and Social Psychology Bulletin* 25, no. 2 (February 1999): 215-224.
[76] Mithen, Boyer and others working in evolutionary models of mind argue the importance of pattern completion in a variety of ways. This process is crucial to human survival as it is a necessary skill for predicting outcomes in novel situations, particularly when what is at stake is whether one is eats lunch or is lunch.
[77] Barsalou et al., "Social Embodiment," 74.
[78] Social psychology literature on the relationship between the mind and body is extensive. The research highlighted here was chosen because it deals with physical actions that are used in the ŚCP. There is also research on head movements, eye movements, facial mimicry and the like.
[79] Each study discussed in this work included a control group.
[80] Sandra E. Duclos et al., "Emotion-specific effects of facial expressions and postures on emotional experience," *Journal of Personality and Social Psychology* 57, no. 1 (July 1989): 100-108.
[81] John H. Riskind and Carolyn C. Gotay, "Physical posture: Could it have regulatory or feedback effects on motivation and emotion?," *Motivation and Emotion* 6, no. 3 (1982): 273-298.
[82] John T. Cacioppo, Joseph R. Priester, and Gary G. Berntson, "Rudimentary determinants of attitudes: II. Arm flexion and extension have differential effects on attitudes," *Journal of Personality and Social Psychology* 65, no. 1 (July 1993): 5-17.
[83] Elizabeth Stevanoni and Karen Salmon, "Giving memory a hand: Instructing children to gesture enhances their event recall.," *Journal of Nonverbal Behavior* 29, no. 4 (December 2005): 217-233.
[84] The skill developed during this task was one the children did not previously posses. In pretests none of the children in any of the groups was able to perform this type of complex math problem. S. M. Cook, and Susan Goldin-Medow, "The role of gesture in learning: Do children use their hands to change their minds?," *Journal of Cognition and Development* 7, no. 2 (2006): 211-232.(2006): 211-232.
[85]Stevanoni and Salmon, *"Giving memory a hand,"* 228-230.
[86] Barsalou et al., "Embodiment in Religious Knowledge.," 46.
[87] Barsalou et al., "Embodiment in Religious Knowledge," 15.
[88]Cho Francisca and Richard Squier, "Reductionism: Be Afraid, Be Very Afraid," *Journal of the American Academy of Religion* 76, no. 2 (June 2008): 412-417. Cho Francisca and Richard Squier, "Reply to Slingerland," *Journal of the American Academy of Religion* 76, no. 2 (June 2008): 455-456.Cho Francisca and Richard Squier, ""He Blinded Me With Science': Science Chauvinism in the Study of Religion," *Journal of the American Academy of Religion* 76, no. 2 (June 2008): 420-448. Stephen Kaplan, "Grasping at Ontological Straws: Overcomind Reductionism in the Advaita Vedanta-Neuroscience Dialogue," *Journal of the American Academy of Religion* 77, no. 2 (June 2009): p238-274. L. Kimerer, "What Bodies Know About Religion and the Study of It," *Journal of the American Academy of Religion* 76, no. 3 (September 2008): 573-601. M. Geraci Robert, "Apocalyptic AI: Religion and the Prmoise of Artificial Intelligence," *Journal of the American Academy of Religion* 76, no. 1 (March 2008): 138-176. Edward Slingerland, "Who's Afraid of Reductionism? The Study of Religion in the Age of Cognitive Science.," *Journal of the*

American Academy of Religion 76, no. 2 (June 2008): 375-411. Edward Slingerland, "Response to Cho and Squier," *Journal of the American Academy of Religion* 76, no. 2 (June 2008): 449-455.

[89] Catherine M Bell, *Ritual: Perspectives and Dimensions* (New York: Oxford University Press, 1997), 24.

[90] In the late nineteenth century the brain and the mind were the purview of the medicine and the science of psychology.

[91] René Descartes is credited with the most strident expositions on the radical difference between the mind and the body. His focus on the subject was the result of his desire to show that the ideas of science were not in conflict with religious ideas. Scientific truths governed the material world and material objects like physical bodies. Religious truths governed the non-material world of the soul and the mind. Therefore there was no conflict between religion and science as the two were concerned with distinctly separate things, mind and body.

[92] The terms "grounded cognition" and "embodied cognition" are used interchangeably. They refer to the cognitive view of the mind as part of the physical body and that cognition is a process of the body.

[93] Brooks, *Auspicious Wisdom,* 92. Nityāṣoḍaśikārṇavaḥ 1.5. Translated by Jeffrey Lidke in *The Goddess Within and Beyond the Three Cities*.

[94] Duclos et al., "Emotion-specific effects of facial expressions and postures on emotional experience." 100-108.

[95] Each study discussed here includes a control group. There is no mention of them here as they were discussed in the background section on social psychology.

[96] Riskind and Gotay, "Physical posture" , 259.

[97]Cacioppo, Priester, and Berntson, "Rudimentary determinants of attitudes," Duclos et al., "Emotion-specific effects of facial expressions and postures on emotional experience" Autumn B. Hostetter and Martha W. Alibali, "Visible embodiment: Gestures as simulated action," *Psychonomic Bulletin & Review* 15, no. 3 (June 2008): 495-514. Estes and Adelman, "Automatic vigilance for negative words is categorical and general.." Kristine M. Knutson, Erin M. McClellan, and Jordan Grafman, "Observing social gestures: An fMRI study.," *Experimental Brain Research* 188, no. 2 (June 2008): 187-198. Britta Lorey et al., "The embodied nature of motor imagery: the influence of posture and perspective," *Experimental Brain Research* 194, no. 2 (April 2009): 233-243. Pratto and John, "Automatic vigilance" Gary L. Wells and Richard E. Petty, "The effects of overt head movements on persuasion: Compatibility and incompatibility of responses," *Basic and Applied Social Psychology* 1, no. 3 (1980): 219-230.

[98] Sri S. Shankaranarayanan, *Sri Chakra* (Samata Books, 1971), 121-122.

[100] Barsalou et al., "Embodiment in Religious Knowledge.," 43.

[101] Cook, and Goldin-Medow, "The role of gesture in learning: Do children use their hands to change their minds?" 216-225.

[102] A control group was not encouraged to gesture or prohibited from gesturing.

[103]Elizabeth Stevanoni and Karen Salmon, "Giving memory a hand: Instructing children to gesture enhances their event recall," *Journal of Nonverbal Behavior* 29, no. 4 (December 2005): 217-233.

[104] Cook, and Goldin-Medow, "The role of gesture in learning: Do children use their hands to change their minds?," 230.

[105]In conversation with Manasa Datta one of the highest ranking assistants to Sacchidanada Ganapati in Mysore, I asked what a *smārta* brahman was, a question I now recognize as not only naive but in rather poor taste. He replied: "We believe ritual is everything." The implication is that ritual practice is necessary to maintain a balanced working order for all areas of worldly existence and the cosmic order as well. Manasa Datta, in discussion with the author, May 20, 2006.

[106] Chen and Bargh note that in order to understand movement, its cultural context and meaning must be accounted for. Different cultures use the body in different ways. The sweeping circular arm motions of ŚCP may express a religious understanding of the cyclical and all encompassing nature of time and the

cosmos; tossing flowers could be associated with the "giving" of devotion as opposed to avoidance. Understanding the contextual elements of specific movements in ritual is important and something that ritual studies is well disposed for.

[107] Barsalou et al., "Embodiment in Religious Knowledge," 45.

[108] Shankaranarayanan, *Sri Chakra*, 56-58.

[109]Barsalou et al., "Social embodiment," 65.

[110]Understanding how changes in mental architecture work to effect change in one another has been a topic of much debate. The positions that best support my understanding are the computational and extended models of cognition. See the work of Paul and Patricia Churchland and Andy Clark.

[111]Barsalou notes that the process of shaping the mind is dynamic; the system is continually being updated and changed. There are also models of neural plasticity that address the malleability of the mind from the level of the DNA that makes up the neurons. For more on neural plasticity see the work of Sharon Begley and Dr. Jeffrey M. Schwartz.

[112]I may recognize something in Bell's work that she did not recognize. In a conversation with Robert McCauley he indicated that Bell was not particularly enthusiastic about scientific discourse on religious ritual.Robert McCauley in conversation with the auther October 2009.

[113]Bell, *Ritual Theory, Ritual Practice*, 95.

[114] Johnson, *The Body in the Mind,* xxxviii.

[115]I have borrowed the phrase "embodied logic" from Dr. Brendan Ozawa-de Silva at Emory University.

BIBLIOGRAPHY

Autumn B. Hostetter, and Martha W. Alibali. "Visible embodiment: Gestures as simulated action." *Psychonomic Bulletin & Review* 15, no. 3 (June 2008): 495-514.

Barsalou, Lawrence W. "Grounded Cognition." *Annual Review of Psychology,* Vol. 59 (2008): 617-619.

———. "Simulation, situated conceptualization, and prediction." *Philosophical Transactions of the Royal Society of Biological Sciences* 364 (2009): 1281-1289.

Barsalou, Lawrence W., Aron K. Barbey, W. Kyle Simmons, and Ava Santos. "Embodiment in Religious Knowledge." *Journal of Cognition and Culture* 5, no. 1. on Psychological and Cognitive Foundations of Religiosity (2005): 14-57.

Barsalou, Lawrence W., Paula M. Niedenthal, Aron K. Barbey, and Jennifer A. Ruppert. "Social embodiment." *The psychology of learning and motivation: Advances in research and theory, Vol. 43.* (2003): 43-92.

Barsalou, Lawrence W., W. Kyle Simmons, Aron K. Barbey, and Christine D. Wilson. "Grounding conceptual knowledge in modality-specific systems." *Trends in Cognitive Sciences* 7, no. 2 (February 2003): 84-91.

Bell, Catherine M. *Ritual Theory, Ritual Practice*. New York: Oxford University Press, 1992.

———. *Ritual: Perspectives and Dimensions*. New York: Oxford University Press, 1997.

Bourdieu, Pierre. *Outline of a Theory of Practice*. Cambridge Studies in Social Anthropology 16. Cambridge: Cambridge University Press, 1977.

Boyer, Pascal. *Religion Explained: The Evolutionary Origins of Religious Thought*. New York: Basic Books, 2001.

Brooks, Douglas Renfrew. *Auspicious Wisdom: The Texts and Traditions of Śrīvidyā Śākta Tantrism in South India*. SUNY series in tantric studies. Albany, NY: State University of New York Press, 1992.

Cacioppo, John T., Joseph R. Priester, and Gary G. Berntson. "Rudimentary determinants of attitudes: II. Arm flexion and extension have differential effects on attitudes." *Journal of Personality and Social Psychology* 65, no. 1 (July 1993): 5-17.

Chen, Mark, and John A. Bargh. "Consequences of automatic evaluation: Immediate behavioral predispositions to approach or avoid the stimulus." *Personality and Social Psychology Bulletin* 25, no. 2 (February 1999): 215-224.

Churchland, Paul M. *Matter and Consciousness: A Contemporary Introduction to the Philosophy of Mind*. Revised. The MIT Press, 1988.

Cook,, S. M., and Susan Goldin-Medow. "The role of gesture in learning: Do children use their hands to change their minds?" *Journal of Cognition and Development* 7, no. 2 (2006): 211-232.

Duclos, Sandra E., James D. Laird, Eric Schneider, Melissa Sexter, Lisa Stern, and Oliver Van Lighten. "Emotion-specific effects of facial expressions and postures on emotional experience." *Journal of Personality and Social Psychology* 57, no. 1 (July 1989): 100-108.

Estes, Zachary, and James S. Adelman. "Automatic vigilance for negative words is categorical and general." *Emotion* 8, no. 4 (2008): 453-457.

Fodor, Jerry A. *The Modularity of Mind*. The MIT Press, 1983.

Francisca, Cho, and Richard Squier. ""He Blinded Me With Science': Science Chauvinism in the Study of Religion." *Journal of the American Academy of Religion* 76, no. 2 (June 2008): 420-448.

———. "Reductionism: Be Afraid, Be Very Afraid." *Journal of the American Academy of Religion* 76, no. 2 (June 2008): 412-417.

———. "Reply to Slingerland." *Journal of the American Academy of Religion* 76, no. 2 (June 2008): 455-456.

Gupta, Sanjukta, Dirk Jan Hoens, and Teun Goudriaan. *Hindu Tantrism*. Leiden: Brill, 1979.

Johnson, Mark. *The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason*. Chicago: University of Chicago Press, 1987.

Kaplan, Stephen. "Grasping at Ontological Straws: Overcomind Reductionism in the Advaita Vedanta-Neuroscience Dialogue." *Journal of the American Academy of Religion* 77, no. 2 (June 2009): p238-274.

Kimerer, L. "What Bodies Know About Religion and the Study of It." *Journal of the American Academy of Religion* 76, no. 3 (September 2008): 573-601.

Knutson, Kristine M., Erin M. McClellan, and Jordan Grafman. "Observing social gestures: An fMRI study." *Experimental Brain Research* 188, no. 2 (June 2008): 187-198.

Lorey, Britta, Matthias Bischoff, Sebastian Pilgramm, Rudolf Stark, Jörn Munzert, and Karen Zentgraf. "The embodied nature of motor imagery: the influence of posture and perspective." *Experimental Brain Research* 194, no. 2 (April 2009): 233-243.

"Meditating Mantras: Meaning and Visualization in Tantric Literature." In *Theory and Practice of Yoga: Essays in Honour of Gerald James Larson*, 213-236. Leiden: Bill, 2005.

Mithen, Steven J. *The Prehistory of the Mind: The Cognitive Origins of Art, Religion, and Science*. London: Thames and Hudson, 1996.

Pratto, Felicia, and Oliver P. John. "Automatic vigilance: The attention-grabbing power of negative social information." *Journal of Personality and Social Psychology* 61, no. 3 (1991): 380-391.

Riskind, John H., and Carolyn C. Gotay. "Physical posture: Could it have regulatory or feedback effects on motivation and emotion?" *Motivation and Emotion* 6, no. 3 (1982): 273-298.

Robert, M. Geraci. "Apocalyptic AI: Religion and the Prmoise of Artificial Intelligence." *Journal of the American Academy of Religion* 76, no. 1 (March 2008): 138-176.

Shankaranarayanan, Sri. S. *Sri Chakra*. Samata Books, 1971.

Slingerland, Edward. "Response to Cho and Squier." *Journal of the American Academy of Religion* 76, no. 2 (June 2008): 449-455.

———. *What Science Offers the Humanities: Integrating Body and Culture*. Illustrated edition. Cambridge University Press, 2008.

———. "Who's Afraid of Reductionism? The Study of Religion in the Age of Cognitive Science." *Journal of the American Academy of Religion* 76, no. 2 (June 2008): 375-411.

Stevanoni, Elizabeth, and Karen Salmon. "Giving memory a hand: Instructing children to gesture enhances their event recall." *Journal of Nonverbal Behavior* 29, no. 4 (December 2005): 217-233.

Wells, Gary L., and Richard E. Petty. "The effects of overt head movements on persuasion: Compatibility and incompatibility of responses." *Basic and Applied Social Psychology* 1, no. 3 (1980): 219-230.