Learning & Knowledge Production in North Carolina Sea Turtle Conservation Communities of Practice

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Abstract

Kathleen Carol Martin: Learning & Knowledge Production in
North Carolina Sea Turtle Conservation
Communities of Practice
(Under the direction of Dorothy C. Holland, Ph.D.)

This dissertation focused upon non-formal and informal learning practices and knowledge production amongst [adult] participants involved in local sea turtle conservation practices along the US Atlantic coast. In the United States, adult learning and adult education has historically occurred within non-formal settings (e.g., through community-based organizations) and/or as informal education (e.g., self-directed). In recent years, research focused upon non-formal and informal sites of learning and knowledge production has increased and includes learning experiences specific for different age groups. These increases in research on informal and non-formal learning practices and knowledge production have occurred within the field of education (proper) and within non-education fields and disciplines of study as well.

This dissertation project was an ethnographic study of three North Carolina communities of practice (scientists, state park employees and citizen volunteers) that emerged concomitant with their respective concerns about sea turtle conservation along North Carolina's Atlantic coast. The community of practice concept belongs to an intellectual tradition of social learning theories that regards the following elements as potential features affecting learning: identity formation, practice, social structure, and situated experience.

The study focused upon how ecological knowledge was learned and produced by participants in three, local North Carolina sea turtle conservation communities of practice. Additionally, what kinds of collective senses of interaction between humans and non-humans were developed in the conservation activities undertaken by the State, scientists, and citizen volunteers? And how did individuals learn and develop these concepts and practices of connection in their daily lives?

The study is significant for interdisciplinary research interests in cultural anthropology, ecology, cognitive science, and for research interests in education with foci centered upon non-formal and informal learning practices. Specific, area topics addressed by this study are learning, knowledge production, and human development in complex, ecological systems.

To my parents...

Barbara Denice Van Welzen
and
Francis Henry Martin (1938-2004)

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I met Dorothy Holland and Lynda Stone when I began my master's program of study at the University of North Carolina at Chapel Hill. The promise of continuing my studies with each one of them inspired me to enroll in the school of education's *Culture, Curriculum, and Change* interdisciplinary doctoral program of study. To both Dorothy and Lynda I owe many thanks. I value the different opportunities I have had to work with and to learn from each of these two individuals.

In Dorothy Holland, I was fortunate to find a mentor. I also looked to her as a role model while developing my teaching practices as a graduate teaching assistant in UNC's

department of biology, in honing my writing and research skills, and in the more general art of being human.

As a graduate teaching assistant, I was rewarded with many years of invaluable experiences working with Jean DeSaix Ph.D. and Barbara Stegenga M.S.. Barbara was also a fellow microscopist and aquarist. Together we enjoyed taking care of the aquaria in Coker Hall. I miss swapping stories with Barbara about the lives and times of the *Pomacea bridgesii* residents in the Coker Hall aquariums. With much gratitude I recognize Jean and Barbara and the UNC-Chapel Hill department of biology for the abundance of opportunities they granted me as a graduate teaching assistant. The stipend I received from the department of biology provided financial support for the entirety of my doctoral studies.

Most certainly my field research would not have occurred without the participation of a number of the individuals involved in (or affiliated with) the *North Carolina Sea Turtle Protection Project*. I am grateful to these individuals and offer them many thanks for their contributions to my research study.

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Preface

I embarked upon my graduate studies during a period in my life when, seeking a career change, I contemplated applying to veterinary school. My day-jobs during the years immediately preceding my anticipated application to veterinary school included work as a wildlife specialist, volunteer work as part of an emergency animal rescue team, and work as a veterinary technician. I had pursued these work experiences so that I might enhance the competitiveness of my application to veterinary school. At the same time I had also become increasingly interested in how humans, in their engagements and encounters with non-human animals, conceived of their relationships with non-human beings in a broader ecological sense.

Eventually, in lieu of studies in veterinary medicine, I chose an interdisciplinary graduate program of study that would enable me to explore how people understood and envisioned ecological relationships. The program of study in which I enrolled was the *Culture, Curriculum and Change* Ph.D. program in the School of Education at the University of North Carolina at Chapel Hill. This interdisciplinary graduate program generously afforded one the opportunity to create a plan of study that would enable one to pursue research in an area of interest as it related to education. I also chose to include an anthropology minor in my program of study at UNC-Chapel Hill's School of Education.

My dissertation research focused upon how adults learned and produced ecological knowledge while participating in activities and practices associated with the *North Carolina*

Sea Turtle Protection Project. The practices of the *North Carolina Sea Turtle Protection Project* are situated within the dynamic and complex sociocultural and ecological setting of North Carolina's coastal and barrier island ecosystems. In addition to the immediate activities of providing sea turtle protection, the practices of the *North Carolina Sea Turtle Protection Project* also included other socially-mediated activities like teaching, instruction, learning, discourse, and the acquisition of knowledge, specific skills and recognized competencies. In this way, it seemed to me that the *North Carolina Sea Turtle Protection Project* was also a possible site of non-formal education.

Contents

List of Tables

List of Figures

Introduction 1

This study explored how ecological knowledge was learned and produced in non-school communities of practice. Derived from the Greek word for household (*oikos*), the concept of *ecology* achieved recognition in popular discourse in the United States (US) during the late-1960s with the emergence of the US environmental movement. Prior to this period, concerns about nature and conservation and the environment oscillated in and out of various historical moments, but the 1960s' culture of activism catalyzed the organization of the environmental movement into a form most similar to the current environmental movement in the United States today. To date, ecology's resonance as a discursive object remains evident in academia and popular culture alike.

Meanwhile, ongoing attention to ecology in this 21st century has been accompanied by expanding visions of sites of knowledge production and learning. In the current global era, education is being re-defined by multiple extra-curricular parties; scholars of education as well as the general US public are moving away from equating education with schooling. Twenty-first century trends in US education include the development of networks and alliances between schools, businesses, services, government bureaus and non-profit organizations.

Bearing in mind these contemporary features of the 21st century "environment" in the United States, this study focused upon the following, central, research question: *How is*

ecological knowledge learned and produced in non-school communities of practice? Moreover, *what kinds of collective senses of interaction between humans and non-humans are being developed in conservation activities undertaken by the State, scientists, and grassroots volunteers?* Lastly, *how do individuals learn and develop these concepts and practices of connection in their daily lives?*

Generally speaking, this study sought to explore how individuals developed concepts and practices of connection. My theoretical approach in this study may best be described as "interdisciplinary". By this I mean, for the purposes of this study, I researched and included theories from a number of disciplines. And, in my analyses, I sought to relate the study's findings to these multiple disciplinary perspectives and to make visible any plausible connections between these multiple universes of discourse. The nature of the research undertaken in this project was *pure* or *basic* research. Correspondingly, the study was anticipated to be significant for pure or basic interdisciplinary research interests in education (especially, those focused upon settings of *non-formal* and *informal learning* practices), for research interests in cultural anthropology, in ecology, and in cognitive science. Specific, area topics addressed by this study were learning, knowledge production, and human development in social practice in complex, ecological systems.

This 14-month ethnographic study was conducted over a three-year period in one of the Atlantic coastal ecosystems in the United States (US) southeast. Specifically, I studied three *communities of practice* that emerged concomitant with their respective concerns about

sea turtle conservation along the North Carolina coast.[1] Under the *US Federal Endangered Species Act* (1973), the North Carolina Wildlife Resources Commission (NCWRC) established the *North Carolina Sea Turtle Protection Project* in cooperation with the US Fish and Wildlife Services (USFWS). While there are seven species of sea turtles known to exist, the Loggerhead (*Caretta caretta*) is the sea turtle most commonly encountered along the Atlantic shores of North Carolina. Organically and symbolically, *Caretta caretta* is a keystone species; a large predator in the marine food web, the Loggerhead sea turtle is important to the structure and health of the marine community, and it is the totem of the environmental and anti-globalization movements (Figure 1.1).[2]

In North Carolina's coastal Onslow and Carteret counties, the interests of sea turtles and humans alike are threatened by pollution, developmental pressures, and the use of intensive fishing practices to compete in the global market. One community I studied was located in the Carteret county town of Emerald Isle--off the coast of North Carolina--where local, citizen volunteers monitored sea turtle nests during the yearly sea turtle nesting season. The Emerald Isle volunteers also collected sea turtle and nesting data and, in cooperation with state and federal sea turtle biologists, provided aid to injured or stranded turtles. This group's focus was on nest protection and upon assisting sea turtles' safe hatching and successful departures from their nests into the wide open sea. For the Emerald Isle

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[1] A "community of practice" is an informal, (yet, organized) site of social learning. In a community of practice, learning is accompanied by "changing participation" and "identity transformation" (Wenger 1998, p.11). See also the primary text Lave & Wenger (1991) . Community of practice theory belongs to an intellectual tradition of social learning theories--a set of theories which I address in Chapter 2 of this manuscript.

[2] Sea turtles became a symbol of WTO protests. Recognizing this, the Smithsonian Institute requested a donation of one of the WTO turtle costumes for its collection. http://www.historylink.org/index.cfm?DisplayPage=output.cfm&file_id=2871. See also Campbell (1997).

volunteers, the task of insuring nest departures has become more difficult with each passing year due to the increases in pollution, beach crowding, and the loss of nesting habitat that has accompanied competing real estate development interests.

Figure 1.1 Activist Ben White in sea turtle costume at WTO protests Seattle, WA. USA. © 1999 Animal Protection Institute.

Meanwhile, the second community of practice I studied was comprised of marine and sea turtle biologists affiliated with either state (NC) or federal (US) marine concerns or with non-governmental organizations. The activities of the biologists included: pure and applied scientific research on sea turtles and factors related to sea turtle morbidity; development and implementation of environmental impact studies; coordination of the practices and the US federal permitting of the activities of the *North Carolina Sea Turtle Project;* provision of continuing education for *Project* members; provision of first aid to injured or ill sea turtles; investigation of cases of sea turtle strandings and deaths; coordination of research and of

protection activities among affiliated state and federal agencies and with related, international research and/or governmental bodies.

State park rangers and staff at Hammocks Beach State Park in Onslow county North Carolina represented the third community of practice that I studied. The park rangers and the staff at Hammocks Beach State Park managed and protected nearby Bear Island, an undeveloped barrier island located one mile offshore from the town of Swansboro and one mile (across Bogue Inlet) from Emerald Isle. Hammocks Beach State Park staff collected data on, monitored, and protected nesting Loggerhead turtles on Bear Island. Additionally, park staff protected incubating turtle nests on Bear Island and they worked in cooperation with state and federal sea turtle biologists to aid injured or stranded turtles as well. Hammocks Beach State Park's role in local sea turtle conservation efforts and its education programs about sea turtles helped promote public awareness about the broader ecological issues, mentioned above, that plagued both humans and sea turtles.

Significance of the Study

> One of our greatest hopes is young people, those who will inherit the earth and the challenge of restoring its balance - the ones who will live long enough to know surely whether this peaceful battle for the planet is finally being won.
>
> --Al Gore (1993) *Earth in the Balance*

The ecological issues that plague both humans and sea turtles in this 21st century may be of little interest, or no interest, to some readers. On the other hand, I mentioned in the opening paragraphs of this chapter that specific area topics of research addressed in this study include: learning, knowledge production, and human development in sociocultural practice within complex, ecological systems. Hence a reader having little to no interest in ecological issues nor in the *North Carolina Sea Turtle Protection Project* may, nonetheless, find this

study to be of interest if his or her scholarly work is related to the areas of basic research with which the present study articulates. In terms of specific disciplinary audiences, this study bears significance for pure or basic interdisciplinary research interests in education (especially, those focused upon settings of non-formal and informal learning practices), for research interests in cultural anthropology, in ecology, and in cognitive science.

Historically, learning about ecology and the environment has occurred in non-formal sites of education. Presently, formal institutions of education now frequently offer curricula related to ecology and to the environment. Yet, to a great extent learning about ecology and the production of ecological knowledge continues to occur in non-formal sites of education. These non-formal sites of education include: social movements, conservation activities, restoration ecology projects, state and national parks, museums, internships and volunteer work. Like these non-formal sites of education, it appeared to me that the *North Carolina Sea Turtle Protection Project* might also be a possible site of non-formal education. For, in addition to the immediate activities of providing sea turtle protection, the practices of the *North Carolina Sea Turtle Protection Project* also included other socially-mediated activities like teaching, instruction, learning, discourse, and the acquisition of knowledge and specific skills and recognized competencies.

The focus in this study on the social, cultural, and environmental contexts of learning and local knowledge production articulates with some of the US National Science Foundation's (NSF) recent basic research programs and funding opportunities related to "learning" and to the "coupled dynamics of human and natural systems".[3] Significant in a

[3] http://www.nsf.gov

scholarly and a timely sense, the content and the completion of this dissertation study coincides with the American Educational Research Association's (AERA) theme for its upcoming annual meeting "Understanding Complex Ecologies in a Changing World." Topics taken up in the present study are topics that have been proposed for the AERA's 2010 spring meeting: non-formal sites of education, learning in dynamic, adaptive and complex settings, the distributed nature of cognition, and the significance of identity in learning.[4]

This study is singularly unique in its focus upon how ecological knowledge is learned and produced within the context of local sea turtle conservation practices in the United States. It is also notably unusual in its analytic application of community of practice theory to related issues of eco-literacy and education about ecological issues.[5] Finally, this study is significant for audiences interested in North Carolina history and culture. While activities associated with sea turtle protection occur worldwide, North Carolina's practices of sea turtle conservation are nonetheless a significant form of local culture in North Carolina's social and ecological history.[6]

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[4] See http://www.aera.net/Default.aspx?id=7588
Note: in Chapter 2, I attend to these topics within my review of related literature from the field of education.

[5] Recently (November 2009), I discovered that physicist Fritjof Capra Ph.D. published a book called *The Hidden Connections: Integrating The Biological, Cognitive, And Social Dimensions Of Life Into A Science Of Sustainability* (2002). In this particular text, Capra employs Lave & Wenger's (1991) community of practice theory for some of his analyses. Based upon my review of the literature to date, Capra's (2002) work is the only other monograph that relates community of practice theory to issues of eco-literacy or learning and knowledge production related to ecologic concerns.

Wolff-Michael & Stuart's (2004) article, "Science education as/for participation in the community" in *Science Education* 88(2) pp. 263-291, describes a 3-year study of eco-science literacy. In their study, Wolff-Michael and Stuart employ the analytic frame of *activity theory,*

[6] One other PhD thesis project has focused upon North Carolina sea turtle conservation: *The biology and conservation of sea turtles in North Carolina* by Deborah Townsend Crouse (1985). Crouse's thesis focused primarily upon the relationship between local biological and environmental factors and sea turtle nesting and sea turtle morbidity.

In the next section I outline a brief history of the idea of ecology. Anglo-European histories of science generally acknowledge the mid-19th century as the period during which ecology emerged as a field of scientific study. Interestingly, the science of ecology developed across multiple sites--sites that, in today's academic parlance, would be regarded as non-formal and informal sites of learning and knowledge production.

A History of the Idea of Ecology

Whether or perhaps, to what degree, human beings live in the household of nature remains to date a contested question. Mid-19th century, the philosophic viewpoints of Bacon, Hobbes and Descartes, as well as the reign that Newtonian physics secured during the Anglo-European scientific revolution, persisted unabated and thusly influenced ecology's initial adoption of a mechanistic view of nature and the view that humans existed apart from nature. On the other hand, during this same period, Darwin' s *Origin of the Species* (1859) and *The Expression of the Emotions in Man and Animals* (1872) suggested that humans indeed resided in nature's household. Likewise, the work of intellectuals outside of science during this same mid-19th century period, e.g., Emerson, Thoreau, and the romantic poets, promoted ideas of kinship with nature and holism.[7] Over the course of the next 140 years, social concerns and paradigm changes within the physical and natural sciences would congeal and prove to be the collective work, that produced and continues to produce the discipline of ecology.

For example, in the United States, ecology became linked to the conservation movement in 1872 upon the opening of Yellowstone National Park (Worthington 1983, p.vii).

[7] Creation myths and religious creation stories situate humans in the household of nature. Humans' insolence therein and their disrespect for non-human others may result in death, disaster, or an undesirable metamorphosis.

Also in the United States, ecological studies articulated with the agricultural and economic crises that emerged during the 1930's Dust Bowl. And in this same period public outcries about the already well-established United States predator control program would demand of this ecologic and agro-economic partnership some ethical redress concerning the scientific studies and allied governmental policies supporting this program.[8]

If from time to time social movements, public opinion, and/or intellectuals in non-science fields challenged conventional views about humans' relationships with non-human nature, the mid-1920s to early-1940s' scientific ferment of quantum physics produced an epistemological paradigm change that insisted upon the co-creative reality of human and non-human nature. Quantum physics' revolution has made evident the uncertainty of knowledge, the complementarity of possible realities, and the potential of the observer to change the observed. "The quantum scenario forced a change in worldview to a far greater extent than did the statistical mechanics of Maxwell and Boltzmann (Ulanowicz 1997, p. 32)."

With the arrival of the 21st century, the quantum paradigm continues to influence our understandings of reality and how we think. What this paradigm suggests is that we enter into and participate in bringing forth a world of which there exist complimentary possible realities. We can and often do participate in multiple realities. Transformation and disturbance are features of the environments in which, as both subjects and objects, we participate. Yet, while the uncertainty of our knowledge at any place in time derives from its

[8] The *US Animal Damage Control Act* (1931) was implemented to protect agribusiness and forestry interests and areas of the US National Parks system from designated predators: coyotes, snakes, wolves, gophers, mountain lions and foxes. The *Animal Damage Control Act* continues to be implemented throughout the United States today. Non-lethal methods and lethal methods of control are employed. These methods include: ariel hunting, calling and shooting, fencing, snares and leg-hold traps, guard and hunting dogs, scare devices, spotlighting and poisoning. http://www.gao.gov/archive/1996/rc96003.pdf

incompleteness, increased is the likelihood of its crystallization through our engagements with one another.

Physicist Erwin Schrödinger's "cat paradox" illustrates these quantum principles (Figure 1.2).[9] Upon one's peering into the theoretical box that contains Schrödinger's cat, one might discern the cat as either dead or alive. But until that moment of observation, Schrödinger's cat exists for the would-be-observer in an indeterminate state where the infinite realities of the cat are equal and produce what quantum physicists refer to as a " superposition of states". The cat's reality is not static and crystallizes for the human observer only at that point in time during which one observes the cat.

Figure 1.2 Schrödinger's Cat Paradox

...[I]magine a box that contains a radioactive source, a detector that records the presence of radioactive particles, a glass bottle containing a poison such as cyanide, and a live cat. The apparatus in the box is arranged so that the detector is switched on for just long enough so that there is a fifty-fifty chance that one of the atoms in the radioactive material will decay and that the detector will record a particle. If the detector does record such an event, the the glass container is crushed and the cat dies; if not, the cat lives. We have no way of knowing the outcome of this experiment until we open the box to look inside (in Gribbin 1984, p.203).

I segued to consider this "ineffable effable" cat because the ideas of the quantum revolution changed how ecologists observed and thought about ecosystem micro-processes and macro-phenomena. The ontological and epistemological issues that were taken up in ecology (because of the quantum revolution)...some of these same issues were also necessarily addressed in the social sciences following this rupture in intellectual history (Capra 1996, Prigogine 1997, Prigogine & Stengers 1984, Ulanowicz 1997, Von Bertalanffy

[9] Schrödinger's thought experiment, the cat paradox, appeared in print in *Naturwissenschaften*, vol 23 (1935). Note: this was never an actual experiment; it was only a thought experiment (i.e., a paradox or riddle).

1976, Widdows 2004). *The Copenhagen Interpretation* of quantum theory (1927) and the paradoxes it inspired (e.g. Schrodinger's Cat) changed the ways physicists, chemists, natural scientists (including ecologists), social scientists, and philosophers contemplated and studied the world.[10] In philosophy and the social sciences, postmodern critiques of "truth", "foundations", "representation", "identity", and "science", bear features that recall the insights of *The Copenhagen Interpretation*. Whereas in ecology, for example, studies of ecological succession now recognize the significance of "disturbance" and "transformation" in historical analyses of ecological communities.

Finally, the idea of *ecosystem* is the conceptual keystone that provides structure for ecology and for research therein that characteristically focuses upon one or more integrative levels, i.e., the individual, the population, and/or the community. I define *ecosystem* as "a field of interactions between the living and non-living entities that constitute, yet also produce, the ecosystem itself." This definition of ecosystem is compatible with the quantum paradigm and it reflects current ideas about ecosystems within the discipline of ecology (Margalef 1963, Pickett, Kolasa & Jones 1994). "The meaningful information generated by an ecosystem" is, I propose, potentially *ecological knowledge*. Moreover, I suggest that within an ecosystem the interplay of ecological knowledge functions to maintain--but also bears the potential to modify--the very system of its origin.

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[10] In Spring 1927 at the Solvay Conference in Brussels a consistent interpretation of quantum theory was recognized and designated *The Copenhagen Interpretation*. According to Heisenberg (1958) the interpretation received its most crucial and rigorous tests at the 1927 conference. States Heisenberg, "Those experiments which had always led to the worst paradoxes were again and again discussed in detail, especially by Einstein. New ideal experiments were tested to trace any possible inconsistency of the theory, but the theory was shown to be consistent and seemed to fit the experiments as far as one could see (1958, p. 43)."

Ecological Knowledge

The definition of ecological knowledge that I have proposed recognizes the incompleteness of our knowledge and the possibility of its crystallization through our engagements. By not specifying particular content or domain knowledge, this definition also recognizes that within our engagements with one another there exist complimentary possible realities. Going into my field work it was also appropriate that I not specify a particular system of ecological knowledge for ethnographic research proceeds via induction.

There are of course multiple systems of ecological knowledge. The system of ecological knowledge that I briefly historicize in the previous section is Eurocentric. For example, two alternate systems of ecological knowledge include *traditional ecological knowledge* (TEK) and *local ecological knowledge* (LEK). While reviewing the literature for this study, I observed that definitions of "traditional ecological knowledge" generally specified a body of knowledge connected with the experiences of indigenous populations. By contrast, I found that the knowledge systems defined in the literature as "local ecological knowledge" did not specify that the local people producing the knowledge need also be indigenous people. The excerpt quoted below, from the US National Ocean and Atmospheric Administration National Marine Fisheries Service (NOAA NMFS), adeptly compares and contrasts local ecological knowledge (LEK) and traditional ecological knowledge (TEK).

> LEK is similar to TEK in that it is tied to place (e.g., specific hunting or fishing grounds) and is knowledge acquired through experience and observation. It can be acquired over a single lifetime or over many generations. LEK differs from TEK in that it does not require an ancient or even a multi-generational accumulation of knowledge, it does not require that the population be indigenous, and it does not require embedding in a broader

> shared culture. In other words, an individual can accumulate LEK over the course of one lifetime interacting with a local environment.[11]

Whose knowledge but also what kind of knowledge can factor into how one defines ecological knowledge. Knowledge about the ecology of a particular species (e.g. *Caretta caretta*), it's interactions with other species, and *Caretta caretta's* relationships to its ecological community, would all be potentially relevant types of ecological knowledge for efforts intent on the conservation of Loggerhead sea turtles. Additionally, the US National Research Council recommends that species conservation projects also attend to the size and shape of available habitat, the population size of the species needed to ensure its survival for acceptably long periods, and knowledge of environmental and demographic variability (1986, p.10).[12]

Analytic purview--or, *joint enterprise*--and social power can frame which knowledge is culturally recognized and is socially produced. A "joint enterprise" is essentially a community of practice's specific negotiated response to its situation in spite of all the forces and influences beyond their control (Wenger 1998, p. 77). In Chapter 4 of this study a conflict between two communities about the relocation of sea turtle nests on Emerald Isle highlights the sometimes contentious nature of knowledge production. Contention in this instance may arise when communities' joint enterprises differ.

The Eurocentric system of ecological knowledge is the form of ecological knowledge that informs my perspective. Likewise, my perspective reflects conceptualizations in the field

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[11] http://www.st.nmfs.noaa.gov/lfkproject/02_c.definitions.htm The US National Ocean and Atmospheric Administration National Marine Fisheries Service (NOAA NMFS) is currently conducting a research project titled "Local Fisheries Knowledge". I briefly describe this NOAA project in Chapter 4 of the current study. The paragraph I cite is taken from NOAA's "Local Fisheries Knowledge" webpage.

[12] National Research Council (1986). *Ecological knowledge and environmental problem-solving: Concepts and case studies*. Washington DC: National Academy of Sciences

of ecology that developed after the quantum revolution in physics. Unavoidably, this will affect how I discuss ecological knowledge. The sole language of ecology with which I am familiar employs concepts like *ecosystem, trophic structure*, *species*, *habitat*, and *community*. Therefore these ideas will appear in my analyses and discussions of the study's findings as a function of communicating in the one language of ecology that I know. All the same, the definition of ecological knowledge that I have proposed is framed in such a manner as to be permitting of observing how ecological knowledge might be learned and produced from the ground up.

Consider once more the definition of ecological knowledge I proposed: ecological knowledge is the meaningful information generated by an ecosystem and within an ecosystem the interplay of ecological knowledge functions to maintain--but also bears the potential to modify--the very system of its origin. Here, *information* (or, a *message*) can be auditory, biochemical, tactile, or visual. According to Claude Shannon's "theory of communication", an interchange of information requires that within a system the following five elements be present: a source of information, a channel, a transmitter, a receiver and a destination (Weaver & Shannon 1963). If we are talking about an ecosystem, for example, a source of information might be a sky filled with rain clouds. Light energy transmitted in the form of waves and photons would be the channel through which this information was sent. The rod and cone cells in the eyes and the various nerve cells in the nervous system of a human being would be the receivers of the transmitted message. The human being would be a destination for the source of information. Noise may interfere with the message at the site

of transmission, along the channel of communication, and at the site of the receiver. Shannon defines "noise" as entropy (Weaver & Shannon 1963). *Entropy* means chaos is imminent.

If the information is also meaningful then it is a semiotic form. Semiotic forms can also be understood as forms of knowledge. For example, one could observe clouds in the sky and conclude that they are rain clouds of the type *nimbostratus*. This knowledge of clouds if learned outside of practice could be strictly content or domain knowledge in which case, from a Marxist perspective, it has *exchange-value*. Whereas this same knowledge of clouds learned while situated in practice has *use-value.* In the former case, knowledge as exchange-value is knowledge as commodity. In the latter case, knowledge as use-value is not alienated from practice, i.e., from the the *activity of persons-acting-in-setting*, and therefore has the potential to be a tool and to contribute to a change in social consciousness.[13]

Knowledge as use-value is *knowing* (Lave & Wenger 1991) or *knowing as effective action* (Maturana & Varela 1992). "Knowing," according to Maturana & Varela, "is *effective action*, that is, operating effectively in the domain of existence of living beings (1992, p 29)." In other words, as use-value, one's knowledge of *nimbostratus* enables one to recognize when to carry an umbrella and in effect arrive at one's destination in dry clothes. Lastly, I conclude this section by noting that my proposed definition of ecological knowledge also recognizes knowledge as use-value. Ecological knowledge learned and produced within the situated setting of an ecosystem can help maintain--but also bears the potential to modify--the ecosystem (living beings and non-living entities).

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[13] See also Lave and Wenger's (1991) comments about the differences between knowledge as use-value and knowledge as exchange-value. Also note: *activity of persons-acting-in-setting* is the unit of analysis for a theory of cognition in practice as well as community of practice theory (Lave 1988, and Lave & Wenger 1991).

A Life of the Shore:
North Carolina Sea Turtle
Conservation Communities of Practice

> To understand the life of the shore, it is not enough to pick up
> an empty shell and say "This is a murex" or "That is an angel wing."
> True understanding demands intuitive comprehension of the whole life
> of the creature that once inhabited this empty shell: how it survived amid
> surf and storms, what were its enemies, how it found food and reproduced its kind,
> what were its relations to the particular sea world in which it lived.
> --Rachel Carson, *The Edge of the Sea* (1955)

I begin chapter 2 of this manuscript by considering education's possible locations. Following this, I present some theories that focus upon processes of cognition--especially, distributed and embodied processes of cognition. Next, I present a brief history of theories about learning that emphasize the significance of experience as well as theories that recognize the experience of learning in non-formal sites of education. I explore these sites of learning as an historical introduction to ideas in the field of education concerning the significance of experience and learning (in general) and then I turn to a discussion of experiential learning as non-formal education. Lifelong adult learning, for instance, often occurs within non-formal sites of education. An example of a non-formal site of experiential education for all ages is The US National Parks System. I conclude my discussion of experiential learning in non-formal situations of education with an overview of community of practice theory. Learning and knowledge production, from a communities of practice perspective, occurs in locations situated between non-formal and informal sites of education.

The next portion of chapter 2 focuses upon learning and knowledge production in practice. Here, I return to a discussion of community of practice theory and then subsequently discuss the topics of *practice* and *identity*. Some of the theorists whose works I cite in this portion of chapter 2--Holland et al (1998), Holland & Lave (2001), Lave (1988),

Lave & Wenger (1991), Wenger (1998)--have distinct historical intellectual links to the Russian Cultural-Historical School of Psychology. The Russian Cultural-Historical School of Psychology, emerging in the 1920s, emphasized humans' individual and collective learning in the experiences of praxis and activity.

The final section of chapter 2 provides a brief introduction to the idea of *semiotics*. "Semiotics" is the science of signs. All living beings communicate and share their knowledge and learning with one another via semiotic processes or sign systems.[14] My use of semiotic theory in this study relies in part upon the works of Thomas A. Sebeok (1972, 2000, & 2001) to explore how individuals developed concepts and practices of connection in their daily lives. That is, what kinds of experiences contributed to individuals' learning and understanding and senses of connection with the sea turtles?

Chapter 3, "Barrier Island Synergy", opens with my account of how I chose the topic and location for this dissertation project. Following this I provide a detailed account of the study: a description of each of the North Carolina sea turtle conservation communities of practice, a detailed description of the study timeline and its location, and a description of the study design. The description of each community of practice introduces the reader to the individual participants in each community as well as each community's mutual engagements (or practices), joint enterprise (community vision), and shared repertoires (cultural artifacts). These three features: *mutual engagements*, *joint enterprise*, and *shared repertoires* are the defining dimensions of a community of practice (Wenger 1998).

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[14] Holland et al (1998), Holland & Lachicotte (2007), Holland & Lave (2001), discuss semiotic mediation as it relates to the works of Vygotsky (1960, 1978) and Bahktin (1981, 1986) and as it occurs within [the sign system of] human language.

Both chapters 4 and 5 focus upon the study's findings in relation to the supporting research question: *what kinds of collective senses of interactions between humans and non-humans were developed in conservation activities undertaken by the State, scientists, and grassroots volunteers?*. These interactions might be potential sites of knowledge production and learning.

Chapter 4, in particular, first examines how knowledge production in North Carolina's sea turtle conservation communities of practice was connected with the life history of the sea turtle and the social histories of the state and federal agencies that began to collaborate on sea turtle protection efforts with the establishment of the *US Endangered Species Act* (1973). Individuals within the scientist and the state park communities of practice were employed by one of these state and federal agencies. After analyzing how knowledge about the turtle, and knowledge about the practices of protecting the sea turtle, was produced and distributed via structural couplings of the sea turtles' activities and a community's practices--or the practices of a community's participants--I relate one more history significant in the development of the *North Carolina Sea Turtle Project.* This history features in the next section of chapter 4 titled*, "*Anchoring the *NC Sea Turtle Protection Project* and Development of its Communities of Practice*."*

Titled "Anchoring the *NC Sea Turtle Protection Project* and Development of its Communities of Practice," the events related in this section of the chapter unfolded during a time frame in which the North Carolina Wildlife Resources Commission (WRC) had started hiring state sea turtle biologists on a contract basis. It was during this period of time that the development of the sea turtle communities of practice began to accelerate. Following upon

this history the final section of Chapter 4 focuses upon a conflict between two of the communities of practice over the relocation of sea turtle nests. This conflict provides an opportunity to observe the negotiations of meaning that can take place within individual communities of practice and between two communities of practice that do not share the same joint enterprise.

Like Chapter 4, chapter 5 also focuses upon the study's findings in relation to the supporting research question: *what kinds of collective senses of interactions between humans and non-humans were developed in conservation activities undertaken by the State, scientists, and grassroots volunteers?*. Chapter five's specific focus in relation to this question is "Identity & Learning in Practice." Within these local communities of practice was there evidence of identity formation coupled with knowledge production? What kinds of identities were important in participants' involvement in these sea turtle conservation communities (e.g. volunteer, environmental activist, educator, etc…)? Were there examples of contested identities experienced in practice?

Accompanying discussions about identity and learning in chapter 5, the subject of nature and the difficulties of defining "natural" are foregrounded themes. The idea of nature was central especially for participants involved in the Hammocks Beach State Park community of practice. In this community of practice ideas about nature were related to staff members' contested identities as preservationists or conservationists. The final section of chapter 5 highlights the experiences of one volunteer from the Emerald Isle community of practice who recognizes that she has become in practice a "nature girl".

Chapter 6 focuses upon the second supporting research question: *how did individuals develop concepts and practices of connection in their daily lives?* The chapter begins by relating how individuals' senses of connection with the sea turtle developed. Generally the chapter highlights participants' practices and experiences in the world of barrier islands. The embodied character of learning and knowledge in practice is a significant topic in the chapter.

I begin the chapter highlighting the kinds of circumstances that initially encouraged individuals to become involved with sea turtle conservation. Also featured in this section are participants' discussions about the meanings and/or significances of the sea turtle in the local communities of practice. Following this initial discussion I highlight, in the next section of the chapter, participants' impressions upon encountering sea turtles in the world of barrier islands. Here too, the topic of boundaries appears in this chapter--boundaries in terms of boundary trajectories and boundary practices.

The embodied character of learning and knowledge in practice is the topic that I turn to in the section titled "The World of Barrier Islands". Here, I examine two examples from the study: a shared alike a cognitive model concerning the ecological significance of sea turtles for North Carolina's coastal communities, and a second example detailing how in practice and in activities with the sea turtles participants learned and produced a model of "habitat".

Distributed & Embodied: Theories of Knowledge and Learning in Network Societies 2

Within the field of education's literature, the frequent usage and the (re-)appearance of terms like "non-formal education" and "experiential learning" are indicators of a growing exchange between multidisciplinary research programs on learning and knowledge production and research on teaching and instruction within the field of education that recognize cognition to be a distributed process.[15] Distributed processes are those in which individual nodes and patterns of activities are scattered throughout an environment but are also connected to one another as in a web or a network. Relationships within a network are complex, i.e., tending to be non-linear, linked multi-directionally and across multiple integrative levels, responsive to both negative and positive feedback, and necessarily heterogeneous. Network societies' significant relationships are not limited to the private sphere by traditional ties of family or kinship nor are they restricted to a single cultural universe. Rather, evident in a network society is the interpenetration of private and public realms, the formation of local and global linkages, and individuals' participation in multiple cultural worlds. Additionally, activities such as learning and knowledge production are multi-sited and multivalent.

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[15] See for example, the National Research Council (1999), *How people learn: brain, mind, experience and school*. See also this abridged list of scholars that view cognition as a distributed process: Bateson (1972), Hutchins (1995), Minsky (1986), Rumelhart & McClelland (1986), Salomon & Perkins (1997), Strauss & Quinn (1997), Vygotsky (1978), Wertsch (1998).

If cognition is a distributed process, what does this suggest about the location of knowledge production, and learning--and cultural definitions of education--within the global, network societies that make up the United States (US) today? In the pages that follow, I begin by considering education's possible locations. Following this, I present some theories about processes of cognition. Next, I present a compact history of theories about learning that emphasize the significance of experience and about learning in non-formal sites of education. The latter portion of this chapter is devoted to a discussion of ideas about learning and knowledge production in practice.[16]

Education_Location@settings.edu

The practices of the *North Carolina Sea Turtle Protection Project* are situated within the dynamic and complex sociocultural and ecological setting of North Carolina's coastal and barrier island ecosystems. In addition to the immediate activities of providing sea turtle protection, the practices of the *North Carolina Sea Turtle Protection Project* also included other socially-mediated activities like teaching, instruction, learning, discourse, and the acquisition of knowledge, specific skills and recognized competencies. In this way, it seemed to me that the *North Carolina Sea Turtle Protection Project* was also a possible site of non-formal education.

Amidst the broad subjects of education and learning, how do topics of informal and non-formal education fit in? To address this question one necessarily consider the following set of related queries: "What is education?", "Where does education occur?", "When does education occur?", "How does education occur?"and "Who defines education?". These are

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[16] The learning and the production of knowledge that are part of the practices of the *North Carolina Sea Turtle Project* could be classified as an example of non-formal, adult education.

not new questions. Scholars in the history, philosophy, and sociology of education have made many return visits to these questions. Seeking to narrow by some degree the scope of the question of "education", I consulted the 1989 second edition of the online *Oxford English Dictionary* (OED). The OED defines "education" as:[17]

1. The process of nourishing or rearing a child or young person, an animal.

2. The process of 'bringing up' (young persons); the manner in which a person has been 'brought up'; with reference to social station, kind of manners and habits acquired, calling or employment prepared for, etc.

3. The systematic instruction, schooling or training given to the young in preparation for the work of life; by extension, similar instruction or training obtained in adult age. Also, the whole course of scholastic instruction which a person has received. Often with limiting words denoting the nature or the predominant subject of the instruction or kind of life for which it prepares, as classical, legal, medical, technical, commercial, art education.

4. [From sense 3, influenced by sense 2 and sometimes by the quasi-etymological notion 'drawing out'.] Culture or development of powers, formation of character, as contrasted with the imparting of mere knowledge or skill. Often with limiting word, as intellectual, moral, physical.

"Education" as described in the above-cited edition of the *Oxford English Dictionary* (OED) is an activity in which the young and the mature may participate. Processes of education may include: nourishing, rearing, bringing up an individual with reference to social station and habit, systematic and delimited instruction, formation of character, training, and imparting of knowledge or skill. The location of education is not directly specified but the idea of education as systematic instruction is connected to the idea of schooling and/or training.

Consider the OED's definitions numbered 1 and 2. They define education in terms of "human development". Shifting from people to turtles and back again, a question may persist

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[17] http://dictionary.oed.com.libproxy.lib.unc.edu/cgi/entry/50072205

as to "how practices and activities in the interest of ecological conservation is a topic of concern for human learning and development?". The significance of practices of sea turtle conservation for human development rests in part upon one's conceptions of *what kind* of environment is conducive to human development as well as one's definition of "valued futures". Conceivably, a valued future might be understood as *Earth in the Balance*.

Broadly defined, the field of developmental psychology concerns itself with the enhancement and maintenance of human life. The simplicity of this statement belies the political issue of *who defines development and to what end* . Attention having been accorded this latter issue, then questions regarding "what develops", "how developmental change occurs", and the relative influence of "nature or nurture" in development, all become important.[18]

Psychologist Urie Bronfrenbrenner's (1979) ecological systems theory of human development readily comes to mind when linking the ideas of ecology and psychology. But, the current study has significance for research in *ecopsychology* rather than research in human development historically connected to Bronfrenbrenner's intellectual work. In the latter case, research about human development with an ecological systems perspective is necessarily structured around Bronfrenbrenner's concept of "ecosystem" or environmental setting (as micro-, meso-, exo-, macro-, or chronosystem). By contrast, ecopsychology's focus is upon "humans and nature".[19] Leff's (1978) *Experience, Environment and Human*

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[18] Questions about "development", related to the maintenance and enhancement of human life, were very much a part of everyday conversation of study participants and the locals in general. Questions of "development" from a human development perspective were entwined with questions about "development" from a "political ecology" perspective.

[19] Ecopsychology is also distinct from *environmental psychology*; environmental psychology focuses on issues related to "humans' well-being in artificial or human-made environments."

Potentials is one of the earlier texts in the area of ecopsychology. A decade later, Kahn's (1999) research supports the premise that "humans' interactions and perceptual experiences in natural settings *do* enhance human life."[20] Gene Myers' (1998) study, *Children and Animals,* supports the idea that non-human animals are significant others in the development of identity and moral cognition.

As one might intuit, practitioners in the field of education often define "education". After all, "Normal science," Kuhn reminds us, "is predicated on the assumption that the scientific community knows what the world is like (1970, p. 5)." However, in practice, education and learning and scientific knowledge do exist outside of the paradigmatic confines of specific research fields. In the United States, education has not always been available to all people. Class, race, gender, (dis)ability, ethnicity, and cultural identity have all impinged upon individuals' access to formal education, whether one is recognized as educated and which practices count as education. Worldwide, this is the case. Consequently, of necessity and/or resistance, processes of education have frequently occurred (and continue to occur) outside of systematized sites of instruction, i.e., in non-formal and informal sites of education and learning.

The activity of "learning" does not appear in the online *Oxford English Dictionary's* (1989) definitions of education. "Learning", traditionally within the purview of psychology,

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[20] Kahn (1999) opens his book with a well-thought critique of Wilson's (1984) *Biophilia*. Wilson's hypothesis in *Biophilia* (1984) is [that] humans are genetically inclined toward living and dwelling in nature. Here, Kahn's criticism of Wilson aims at Wilson's reduction of human desires and experiences to the level of the gene.

To date, control of gene expression is not yet fully understood by molecular biologists. As such, determinations about genes and their expression need be cautiously stated. It is also interesting to note that the field of biology in the United States assiduously focuses upon the phenotypic level in organismic interactions. Chilean biologists Maturana & Varela (1992) critique what they consider to be U.S. biology's myopic analyses of gene and environment. Rather, Maturana and Varela propose that (in addition to phenotypic analyses) more studied focus is indicated concerning the [whole] organism's activity in the environment. I more thoroughly address Maturana & Varela's (1992) research in subsequent sections of the current chapter.

became a curricular objective in US institutions of education during the mid-1960s education reform movement in the United States that called for the inclusion of behavioral objectives and measures of accountability in curriculum and instruction design (Pinar et al 2000, p.166). During this 1960s era of education reform, Carroll's (1963) article "A Model of School Learning" and Gagne's (1965) text *The Conditions of Learning* were influential in new designs, developments and implementations of curriculum and instruction that specified behavioral objectives and measures of accountability (Pinar et al 2000, p. 167).

Leap forward forty years and witness the formalization of interdisciplinary research programs in the learning sciences and the explosion of research on the mind, the brain, and cognition. Research in educational psychology, computer science, social psychology, cognitive science, neurobiology, medicine, anthropology, and human development, have all contributed to current theories about knowledge as knowing and about how learning transpires. The focus of this study on, "how people learn and produce ecological knowledge in practice in the *North Carolina Sea Turtle Protection Project",* is contemporary with ongoing research on learning and knowledge formation in non-formal and informal settings.[21]

Research contributing to the learning sciences has been distinctly interdisciplinary. The fact of this coincides with a wide variety of research institutions' promotions of interdisciplinary, cross-disciplinary, and multidisciplinary research. As an example, the US National Research Council (2004) holds fast to the opinion that advances in the learning

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[21] Later in the current chapter, I expand upon how this research study articulates with the intellectual works of scholars in education, anthropology, and cognitive science. Throughout the manuscript, I provide additional references and analytic connections to these fields as well.

sciences have benefited from interdisciplinary and multidisciplinary research.[22] In the same monograph, The National Research Council advocates continued support for research in the learning sciences and suggests that further developments in this area of research could benefit from "an initiative to make educational research an integrative activity."[23] Their recommendation acknowledges the value of education research to the development of the learning sciences.

Kuhn reminds us that due to large-scale paradigm destruction and major shifts in the problems and techniques of normal science ambiguity accompanies the emergence of new theories (1970, pp. 67-68). Compounding this ambiguity, are ancillary complicating factors including: the slow, accumulative nature of research (especially basic research), the availability of resources necessary to facilitate integrative research activities, and the relative (in)compatibilities of discourses and the possibilities of their reconfigurations. Assuming the amplitude of resource and discourse difficulties abated, the field of education's history of innovation in learning necessarily recommends its participation in the ongoing development of integrative research activities in the learning sciences.

In the upcoming sections of the chapter that attend more specifically to issues of learning and knowledge, the theoretical antecedents to the theories to be reviewed will become evident. Concepts, that is, can scarcely be invented independent of context (Kuhn 1970, p.142). As an example, theories of enactive cognition, neuroconstructivism, and situated learning, resonate with some of the scholars and theoretical ideas that preceded

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[22] See the US National Research Council monograph (1999) *How people learn: brain, mind, experience and school*.

[23] ibid US NRC (1999) *How people learn*.

them.[24] However, the theories of enactive cognition, neuroconstructivism, and situated learning, are also distinct from historical constructivist theories in that the theories of enactive cognition, neuroconstructivism, and situated learning also view knowledge as characteristically embodied. Each of these theories, that is, specifies as their analytic unit some variation of person-acting-in-setting. Classroom applications of constructivist theories that neglect the embodied character of knowledge can result in classroom activities that reflect the culture of the school rather than the culture of the learner.[25] I illustrate this distinction with a story in Figure 2.1.

Finally, over the course of the last 30 years, many scholars in the field of education have remarked on the significance of attending to learning and knowledge activities in non-formal and informal sites of education (Barab & Plucker 2002, Brown, Collins & Duguid 1989, Lave 1988, 1996, Mehan 1980, Resnick 1990, Resnick & Hall 1998, Salomon & Perkins 1997, Schoenfeld 1999). Additionally, curriculum content, design, and implementation (Greene 1994, 1997 and Grumet 2009) and definitions of intelligence and intelligence's manifestation (Gardner 2001) vary with the nature of the education setting.[26]

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[24] For example, Dewey and "experiential learning", Piaget and "construction of knowledge".

[25] See Barab & Plucker (2002) and Brown, Collins & Duguid (1989).

[26] For Gardner paper (2001) "The Three Faces of Intelligence" see Howard Gardner's website: http://www.howardgardner.com/Papers/documents/Three%20Faces%20of%20Intelligence.pdf [downloaded 11/30/09]

Figure 2.1 The House that Cricket Built

Early in my graduate studies I worked one summer for the Durham NC Museum of Life & Science as a science instructor in their science camp program. I taught 5th grade students. In the spirit of summer camp, the curriculum consisted of exclusively hands-on activities and I was their guide-on-the-side. The goal for each lesson was student's construction of scientific knowledge. The lessons were very creative and engaging and each lesson was designed to encourage student's learning about a specific scientific concept.

One day we were learning about crickets and where crickets live (i.e., cricket habitat). First, we took turns talking about the sorts of things in our surroundings that made it a good place for us to live. Next, we talked about crickets and shared ideas about their behaviours and their habits. In turn, this conversation led to the topic of where crickets lived and what kinds of things would be important to a cricket in the place that he or she lived.

Our activity of the day--outdoors, no less--was to create a cricket habitat or a place suited for a cricket to live. To this end, each student was given a clear, plastic container with a live cricket in residence. Crickets in hand the students went outside to set about gathering things that the cricket might need and prefer in its living space. After about 20 minutes all of the students, except for a girl named Ruby Jean, returned to the classroom with their cricket domes filled with mounds of grass and other things like twigs, leaves, dirt and rocks.

Ruby Jean and her cricket returned with the cricket hopping around in the still bare, clear plastic receptacle he/she had been issued. We gathered in a circle once again and the students talked about the features of their cricket habitats. Ruby Jean didn't comment but it was evident that she thought that her cricket habitat was just right.

The rest of that week we had more outdoors science camp activities. Ruby Jean, as I would learn, was not inclined towards the outdoors and on a daily basis she spent very little time outdoors. Rather, Ruby Jean spent all of her time indoors playing, completing her school work, and doing the sorts of indoors activities that 5th graders like to do.

Ah! I thought. Crickets do sometimes live indoors. Usually, we are only aware of them in our houses if we hear them chirp. We might also see them if they are out in the middle of the bare floor or a bare space--a bare space not unlike where Ruby Jean's science camp cricket lived. In that moment, I realized that the cricket habitat science activity reflected the culture of the Museum (and my own). And "where" Ruby Jean's cricket lived reflected the culture practices and the embodied knowledge of the learner, Ruby Jean.

Generally-speaking, education technologies have contributed to a vast number of new locations of education--in alternate settings--and to new possibilities of education (e.g., on-line college degrees). The design of these technologies from a Human-Computer Interaction (HCI) perspective recognizes the situated nature of learning and the distributed character of knowledge (Dourish 2001, Nardi 1996). Lastly, in higher education service-learning

programs, learning communities, student teaching experiences, internships and medical residencies, all point to the significance of learning and knowledge production in non-formal settings of education (as recognized by educators).

Cognition as Both Distributed & Embodied

> Distributed cognition as applied to socio-cultural systems suggested an answer to the question of how low-level processes create high-level cognition. The idea is that high-level cognition is produced by the culturally orchestrated application of low-level cognitive processes to cultural materials, that is, elements of language, sign systems, and inscriptions of all sorts
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> --Edwin Hutchins [27]

A variation upon models of distributed cognition are models that recognize cognition as both distributed and embodied. One such model is the theoretical model of embodied-enaction (or *enactive cognition*) proposed by Varela, Thompson & Rosch (1991). In this model, cognition depends upon bodily experience whereby "individual sensorimotor capacities are themselves embedded in a more encompassing biological, psychological, and cultural context (1991, p. 173)."[28] Knowledge and related cultural artifacts emerge via distributed processes and these distributed processes occur both bodily (e.g., at the level of brain neurons) and extra-bodily (e.g., at the level of socio-cultural interactions). Using the everyday example of a jigsaw puzzle, Brown, Collins, and Duguid (1989) describe the distributed nature of knowledge in this manner:

> So, knowledge, which comes coded by and connected to the activity and the environment in which it is developed, is spread across its component parts, some of which are in the mind and some in the world much as the final picture jigsaw is spread across its component pieces (1989, pp. 36-37).

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[27] See Vygotsky 1986, Norman 1994, Hutchins 1995, Clark 2001. See also Hutchins (n.d.) at his course website [downloaded 09/ 26/09] http://hci.ucsd.edu/234/234ExtraReading/A64EnactionImaginationInsight.pdf

[28] A theory of enactive cognition is a "developmental" theory and significant for research in human development.

Additionally, Varela et al (1991) note similarities between their conception of embodiment and the ideas of H. Dreyfus (1979), M. Johnson (1987), G. Lakoff (1987), and M. Merleau-Ponty (2003).

Additionally Brown, Collins and Duguid view knowledge as tools. As tools, knowledge can

> only [be] fully understood through use, and using them entails changing the user's view of the world and adopting the belief system of he culture in which they are used (1989, p.33).

Varela et al, describe cognition as *enaction*: " a history of structural coupling that brings forth a world through a network consisting of multiple levels of interconnected sensorimotor subnetworks (1991, p. 206)." The idea of a creative bringing forth of a world is a key concept in phenomenology. Merleau-Ponty's (2003) *Phenomenology of Perception* links the idea of a creative bringing forth of the world with processes of perception. [29] Effective perceptually guided action or "know how" is a hallmark of enaction.

To help clarify some of these distinctions, I include here an example of enactive cognition related to the experience of learning how to play the guitar. I do not know how to play the guitar, but one day I was talking about embodied knowledge with a friend who is a classical guitarist. I described a few instances of embodied cognition and she quickly connected what I was saying with a "cognitive" situation she regularly encounters in teaching guitar. The beginning guitar student's embodied knowledge of "high" and "low" is frequently challenged when he/she is learning to coordinate notes read on a music staff with corresponding hand position on the guitar.

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[29] Likewise, this theoretical focus corresponds with the quantum paradigm's view that we enter into and participate in bringing forth a world.

The idea that perception is a key feature in knowledge formation is being re-visited in the late 20th- and early 21st-centuries philosophy and sciences. Perspectives on cognition aligned with the idea of representation, assume that knowledge of an external world--or, world as object--is created upon a subject's "re-presentation" of said world to him-/herself. In this case, the individual subject may or may not be actively participating in the world.

By contrast, in cognitive theoretical perspectives that emphasize both perception and representation, knowledge is understood as developing within a dialectical relationship between actor and environment. That is, conception cannot be separated from perception (Lakoff 1987, Lakoff & Johnson 1991, Maturana & Varela 1992, Varela, Thompson & Rosch 1991).

> When teaching my beginning guitar students to read music, I always begin by teaching them the notes of the six open strings. I find that some students are confused initially because of the seeming contradiction between the way the relative pitch of the notes is written on the musical staff and the actual location of these notes on the guitar. Notes on a musical staff are written so that the higher a note sounds, the higher it appears on the staff. However, as the notes are played on the guitar, the higher sounding notes are played on the strings that are lower in physical space on the instrument, that is, the higher notes are played on the strings that are closer to the floor. (Ellen S. Whitaker, personal communication March 2009.)

Finally, Varela et al (1991) suggest that identity formation is significant for enactive cognition.[30] However, Varela et al (1991) do not make it clear how identity formation is important in enactive cognition. For example, do they recognize identity as the seat of the individual in a dialectical relationship with the environment? Or, do Varela et al (1991) see the role of identity more in terms of a mediating or cultural artifact? Perhaps a more refined conceptualization is contained in the following observation made by Varela (1999). Varela suggests that "in a manner that can only be called post-Cartesian…knowledge appears more and more as being built from small domains composed of microworlds and microidentities (1999, p18).

Mareshal et al (2007) propose a neuroconstructivist model that, like Varela et al (1991), integrates biological, psychological, and socio-cultural processes. By contrast, whereas Varela et al (1991) emphasize the perceptual nature of cognition, the neuro-constructivist model detailed by Mareschal et al depicts cognitive development as a progressive increase in the complexity of representations (2007, p. 5). Mareschal et al stress that in addition to the better use of pre-existing (or already existing abilities) genuinely new

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[30] Varela et al note identity formation is not fully incorporated into the theory of enactive cognition. Concerning this cognitive [and developmental] issue of identity formation, the authors make a rhetorical request for assistance from social scientist readers of *The Embodied Mind* (1991).

cognitive abilities are also created (2007, p. 6). Mareschal et al (2007) specify the situatedness of embodiment. For, depending upon one's definition, embodiment could simply suggest that the brain is in the body and the two are functionally integrated. But by specifying that embodiment refers to a process of both embodiment and situatedness, Mareschal et al note that

> the brain and the body are located within, and closely coupled to, an environment. Not only are the problems of an agent defined with reference to that environment, but the solutions often involve taking advantage of natural structures in the environment (2007, p. 73).

Forthcoming in Chapter 4, I highlight examples of the distributed nature of ecological knowledge's production located at the intersection between the geography of the sea turtle's life cycle and the activities of the federal and state agencies (and their agents) responsible for sea turtle protections (see Chapter 4 and see also Appendix IV, Figure 4.1 & Table 4.2). Here, knowledge was distributed across time and space. At the analytic level of "activity of person acting in setting", the intersection of the sea turtle's activities with a community's practices (or participants' practices in a community) figured into the distribution and production of ecological knowledge. Notably, at this intersection of activities, each agency's conceptual ecological locus of social practice differed. The US NOAA Fisheries, for example, conceptualized its practices in terms of "ecosystem". "Species" was the NC Wildlife Resources Commission's (NCWRC) conceptual ecological locus. And, "habitat" was the NC Division of Marine Fisheries' (DMF) conceptual ecological locus.

The embodied nature of learning and knowledge production in practice is highlighted with examples in Chapters 5 and in Chapter 6. Learning in practice involves legitimate

peripheral participation or dispositional adaptivity.[31] In this sense, learning's embodiment in practice can be discerned in the formation and the reformation of identities.

One way that embodied conceptual knowledge may be discerned is in dialogue as a cognitive model. In chapter 6, I include examples of an embodied cognitive model that was used by 3 participants (a scientist, a park ranger, and a local volunteer) in the current study.[32] In my analyses of these interview transcripts I related Lakoff's (1987) theory about *idealized cognitive models*. The formation of idealized cognitive models (ICM) is one of three main cognitive processes that contribute to human beings capacity for abstract reasoning (or conceptualization). The use of metaphor and image-schemas are other ways in which human beings develop concepts. I cite below, the opening two paragraphs from Johnson and Lakoff's (2002) article "Why Cognitive Linguistics Requires Embodied Linguistics". These two paragraphs offer a concise description of the nature of their research in the last three decades.

> In our book *Metaphors We Live By* (1980), we presented evidence that taking the existence of conceptual metaphor seriously would require a massive rethinking of many foundational assumptions in the Western philosophical tradition concerning meaning, conceptualization, reason, knowledge, truth, and language. In the twenty years between that book and *Philosophy in the Flesh* (1999), a mushrooming body of additional empirical evidence from linguistics, psychology, cognitive neuroscience, and anthropology became available, which not only reinforced our original claims about the pervasive, constitutive nature of conceptual metaphor, but also revealed implications for traditional philosophy that were even more devastating than we at first imagined.

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[31] The phrase "dispositional adaptivity" is borrowed from Lave & Wenger (1991) as is, of course, the idea that learning occurs in "legitimate peripheral practice".

[32] In Chapter 6, in addition to Lakoff (1987) and Lakoff & Johnson (2002), I also include Sebeok's (1972, 2000) and Sebeok & Danesi's (2001) semiotic and semiotic modeling systems theories to help highlight some of the everyday interconnections occurring between the sea turtles and human participants in my study. In this chapter's section on "learning and knowledge production in practice" I situate Sebeok's work amidst the work of others in the field of semiotics.

> What we saw, especially in light of sweeping, rapid developments in cognitive neuroscience, was that meaning is grounded in our sensorimotor experience and that this embodied meaning was extended, via imaginative mechanisms such as conceptual metaphor, metonymy, radial categories, and various forms of conceptual blending, to shape abstract conceptualization and reasoning. What the empirical evidence suggests to us is that an embodied account of syntax, semantics, pragmatics, and value is absolutely necessary for an adequate understanding of human cognition and language. You cannot simply peel off a theory of conceptual metaphor from its grounding in embodied meaning and thought. You cannot give an adequate account of conceptual metaphor and other imaginative structures of understanding without recognizing some form of embodied realism (Johnson & Lakoff 2002).

Lastly, the embodied cognitive model that I will discuss in Chapter 6 is also of particular interest because during his interview one of the participants switched metaphors mid-sentence. This particular participant's self-conscious, mid-sentence switch of metaphors provided a brief glimpse of the organic connection between ecological knowledge as embodied experiential practice and ecological knowledge as theoretical discourse.[33]

Sites of Learning

Before the present cognitive revolution in science and research, early to mid-20th century philosophers and educators were advocating in theory and in practice a link between "experience and education" or "experience and learning". Indeed, researchers in education have contributed much to our understanding of sites of learning. John Dewey, founder of the University of Chicago Lab School, and Outward Bound Schools co-founder Kurt Hahn, remain profoundly influential in this regard. The combined features in experiential learning that Hahn advocated included: active service and first aid training for the saving of lives,

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[33] A glimpse, perhaps, in terms of neural activity. A switch of conceptual metaphors may indicate a switch of (neural) cognitive structures. According to Lakoff & Johnson, "What we call *concepts* are neural structures that allow us to mentally characterize our categories and reason about them (1999, p. 19)."

expedition, and academics. Dewey stressed the importance of educational experiences for individuals' development of useful, everyday skills. Dewey also noted that the outcome of a particular experience would vary with each individual depending upon what previous experiences and personal history that individual brought to the current experience. Acknowledging the works of Lewin and Dewey and Piaget, Kolb (1984) proposed that experiential learning be conceived as a process rather than an outcome.

Mid-20th century, the benefits of "non-formal education" were recognized and debated. Paolo Freire's *Pedagogy of the Oppressed* (2000) and Ivan Illich's *Deschooling Society* (1972) were classic works from this period. During this same period Coombs, Prosser, and Ahmed (1973) developed and outlined criteria to distinguish types of education: "formal", "in-formal", and "non-formal" (as cited in Merriam & Caffarella 1999). In the closing decades of the 20th century, research continued to supply evidence that education occurs in multiple cultural locations and to build theories about the significance of local forms of education (Ginsburg 1995, Levinson & Holland 1996). Likewise, on into the 21st century research about informal education and local forms of education persists. In the United States, institutional validation of the significance of this research has been made evident by the National Science Foundation's (NSF) establishment of its crosscutting, interdisciplinary research initiative "Science of Learning Centers". As a part of this initiative the NSF awards competitive funds for university-sponsored research programs titled "Learning in Informal and Formal Environments" (LIFE).[34]

[34] see http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5567&org=NSF&sel_org=XCUT&from=fund

Merriam & Caffarella (1999) note that adult education has historically occurred as informal education (e.g., self-directed) or in non-formal settings (e.g., through community-based organizations). An example of adult education, in non-formal settings, is environmental education. Environmental education in the US grew out of the conservation education movement (1920s and 1930s) and as a result of the conservation education programs initiated by state and federal natural resource agencies during these same two decades. In the 1920s the US National Parks Service began providing "Interpretation" programs for parks visitors (see Figure 2.2).[35] To date, the US state and national parks continue to practice interpretation as part of their ongoing mission to inform the public about the environmental, socio-cultural, and historical, value and significance of its US state and national parks. Additional conservation education programs, created for adult learners, were initiated in response to the environmental devastation wrought by the 1930s Dust Bowl in the United States.[36] This [1930s] example of conservation education also typifies another feature of adult education, i.e., education for social change. The pairing of objectives for social change with education-related activities originated with government and non-governmental organizations. However the pairing of objectives for social change with education-related activities also occurred as components of social movements in the 1950s and 1960s--the US

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[35] Also introduced during this period was the concept of the parks as educational media: "The educational, as well as the recreational, use of the national parks should be encouraged in every practicable way." http://www.nps.gov/history/history/online_books/mackintosh2/origins_nps_assumes_responsibility.htm

[36] The term "environmental education" was first introduced in 1948 in a Paris meeting of the International Union for the Conservation of Nature. In 1970 the US Congress passed the National Environmental Education Act in order to provide funding for environmental education curriculum and program development (EETAP 2006).

To date, many important contemporary sites for learning about ecology continue to be located in non-school government agencies.

Civil Rights Movement, and the environmental movement--as well as the 1980s international AIDS movement.[37]

Figure 2.2 from The US National Park Service...

What is Interpretation?
The word Interpretation means many things. It can mean the translation of languages, perceptions about poems or novels, how a person feels about a historic building, or thinks about a scientific theory.

In the National Park Service, other agencies and many zoos and aquaria around the world, Interpretation is the process of providing each visitor find an opportunity to personally connect with a place. Each individual may connect to the place in a different way...some may not connect immediately, but everyone should have an opportunity to explore how that special place is meaningful to them.

It might be that a ranger 's discussion of a scenic vista inspires an emotional connection for some. In the mind of another, an interpretive sign describing the geologic history of the same landscape might provoke a more intellectual connection. The goal of all interpretive services is to increase each visitor's enjoyment and understanding of the parks, and to allow visitors to care about the parks on their own terms.
http://www.nps.gov/learn/

A *Learning organization* is another social entity in which adults may be engaged and that can function as a social forum fostering change (social and individual). According to Merriam and Caffarella (1999) the conceptualization of a learning organization is located in the early works of Argyris and Schon (1974, 1978). Within a learning organization collective inquiry, dialogue, and action, contribute to the ongoing learning that is a central value and defining feature of these types of organizations.

Communities of practice could be classified as learning organizations--the concept, communities of practice, was first used and described by Lave and Wenger (1991). A community of practice is an organized form of social learning but one that is potentially more informal than a traditionally defined learning organization (see Figure 2.3). Unlike

[37] Here again a related connection to Freire (2000).

community of practice theory, notes Wenger, in organizational learning theories tantamount are the ways that individuals learn in context as well as the way that the organization is said to learn as an organization (1998, p.280). Additionally, some of the defining features of a learning organization include: global dialogue teams, measurement of objectives and assessments of performance gaps (Merriam & Cafarella 1999, pp. 41-42). These key features

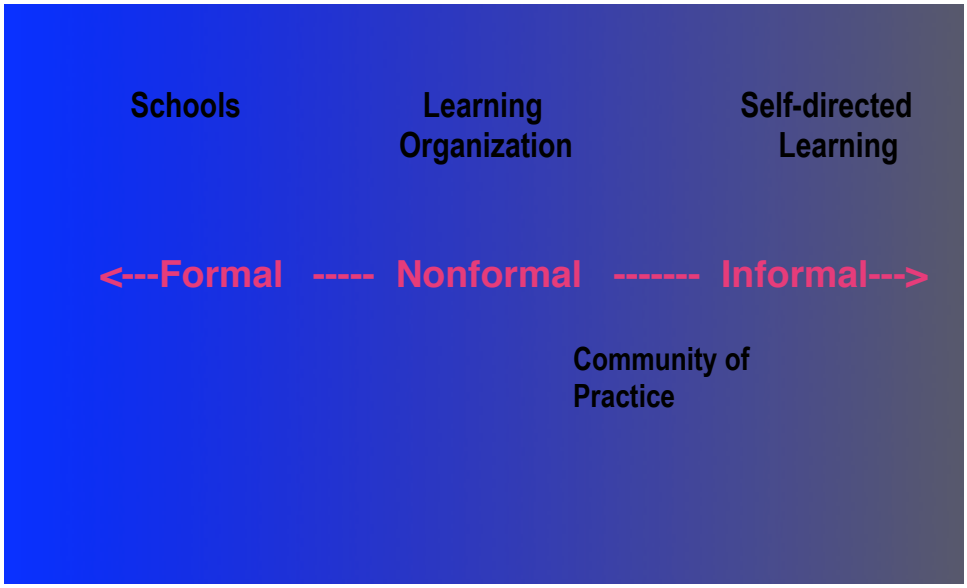

Figure 2.3 Location of "Community of practice" along spectrum of education sites (formal to informal).

of learning organizations make evident--along a spectrum of formal to informal sites of education--learning organizations' closer proximity to schools.

The community of practice concept also bears the hallmarks of social learning theories that regard the following concepts as potentially relevant to learning: identity formation, structure, activity, and experience. At the same time, Lave and Wenger's (1991) conception of a community of practice can also be distinguished from some of these social learning theories with which it shares these features. For example, learning in a community is

thought to be accompanied by "legitimate peripheral participation" and "identity formation". This particular perspective is unique to a community of practice theory.

And, finally, a community of practice characteristically possesses these three key dimensions: a joint enterprise, mutual engagement and a shared repertoire of resources accumulated over time (Wenger 1998, p. 126). A *joint enterprise* is essentially a community's specific negotiated response to its situation in spite of all the forces and influences beyond their control (Wenger 1998, p. 77). *Mutual engagement*, as practice, concerns the social complexity of relations in a community and it is the set of activities shared by members in the same community. Community cohesion is maintained through shared mutual engagements.[38] The third dimension of a community of practice, *shared repertoire(s),* includes: stories, historical events, concepts, artifacts, actions and discourse (Wenger 1998, p.73). How some of these features matter in terms of learning and knowledge, and the collective senses of interactions among community members, will become more apparent in Chapters 4, 5, and 6, upon discussion of the study's findings.

Learning & Knowledge Production in Practice

Community of practice theory and a set of related contemporary theories have a distinct historical intellectual link to the 1920s Russian Cultural-Historical School of Psychology. Theoretical works derived of the Russian Cultural-Historical School of Psychology, locate [humans'] individual and collective learning within the experiences of

[38] In a section of Chapter 3 titled, "Descriptions of the NC Sea Turtle Conservation Communities of Practice: the State Park the Scientists, & the Volunteers", I describe each community's dimension of mutual engagements.

praxis and activity.[39] Moreover, activity systems include: subjects, objects, mediating artifacts, a recognizable community (or coordinated group) and some sort of "labor" (owing to the theories' Marxist bearings). Contradiction can be a source of dynamism and change within a particular system, while historicity, integrative social levels, heterogeneity, and the idea of interconnection appear as additional Marxist traits. Recent theorists influenced by this school of thought include: Engeström (1999), Holland et al (1998), Holland & Lave (2001), Lave (1988), Lave & Wenger (1991), Wenger (1998), and Wertsch (1998).

Lave (1988) focuses upon "cognition in practice" (or situated learning) whereby learning is understood as a process of entry into a community of practice.[40] Lave's years of study and research on apprenticeships in different parts of the world inspired the insights she developed concerning cognition in practice. Learning and knowledge formation in apprenticeships is markedly a de-centered, social process bearing elements of changing membership in a community, mastery, and changing knowledge and skills indelibly connected with changing identities.

Learning occurs as a process of entry into a community of practice and is accompanied by "legitimate peripheral participation"--a concept unique in the theories of *cognition in practice* and *community of practice* authored by Lave (1988), Lave & Wenger (1991) and Wenger (1998). Explaining the concept of legitimate peripheral participation, Lave & Wenger remark that,

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[39] Members of the Russian Cultural-Historical School of Psychology included: Leont'ev, Luria, Vygotsky. Vygotsky's concept the "zone of proximate development" and his theoires about self-regulation and the internalization of knowledge have been very influential in education research that focuses upon social learning and/or human development.

[40] Brown, Collins, & Duguid's (1989) article in *Educational Researcher* provides an illuminating discussion of situated learning. Kirshner & Whitson's (1997) edited volume is another valuable resource addressing the situatedness of cognition.

> Indeed, the concept of legitimate peripheral participation provides a framework for bringing together theories of situated activity and theories about the production and reproduction of the social order. These have usually been treated separately, and within distinct theoretical traditions. But their is common ground for exploring their integral, constitutive relations, their entailments, and effects in a framework of social practice theory, in which the production, transformation, and change in identities of persons, knowledgeable skill in practice are realized in the lived world of engagement in everyday practice (1991, p. 47).

Lave (1988) defines the unit of analysis for situated learning as "the activity of persons-acting-in-setting". This particular unit of analysis may be employed by other theorists who, like Lave, are influenced by the scholarly work of the Russian Cultural-Historical School of Psychology. Wertsch (1998), for example, also specifies that methods and analyses foundationally related to the theories of the Russian Cultural-Historical School of Psychology do not disassemble the complex of "activity and person-acting-in-setting". Because the action complex does remain analytically whole within a situated learning model, the conceptualization of "person" in this model may be distinguished from other constructivist models--constructivist models, that is, that overlook the significance of embodied activity. If one views learning as an embodied activity, occurring within a sociocultural and historically grounded world, Lave suggests that

> Such a view invites a rethinking of the notion of learning, treating it as an emergent property of whole persons' legitimate peripheral participation in communities of practice. Such a view sees mind, culture, history, and the social interrelated processes that constitute each other, and intentionally blurs social scientists' divisions among component parts of persons, their activities, and the world (1991, pp. 63-64).

Of course, theories of situated learning and community of practice are not without their critics. Anderson, Reder & Simon's (1996) critiques of Lave (1988) and Lave & Wenger (1991) are especially acrimonious and tending toward straw-man argumentation. Anderson et

al (1996) attack Lave & Wenger on questions of knowledge transfer, the value of knowledge in abstraction, and instruction in complex social environments. Neither the possibility of knowledge transfer nor the use of knowledge in abstraction is denied by Lave (1988), Lave & Wenger (1991) or Wenger (1998). In Wenger (1998) knowledge in abstraction-- understood as "reification"--is clearly linked with "participation". In settings of situated learning, and in communities of practice, learning and the production of knowledge do not occur within the context of instruction but rather within social and cultural practices. At the same time, Lave & Wenger (1991) address the very real possibility that didactic instruction can occur in apprentice-like settings of learning just as it can possibly occur in classroom settings. Neither communities of practice nor today's schools encourages practices of didactic instruction.

Practice

As I mentioned at the beginning of the previous section, concepts of practice and activity are significant in the works of contemporary scholars (cited above) and in the intellectual tradition of the Russian Cultural-Historical School of Psychology.[41] Generally, practice theory explores the relations between sociocultural structures and social practices.

More specifically, Lave and Wenger state that

> [A] theory of social practice emphasizes the relational interdependency of agent and world, activity, meaning, cognition, learning, and knowing. It emphasizes the inherently socially negotiated character of meaning and the interested, concerned character of the thought and action of persons-in-activity. This view also claims that learning, thinking, and knowing are relations among people in activity in, with, and arising from the socially and culturally structured world (1991, pp. 50-51).

[41] DeCerteau (1984), Foucault (1972, 1995) and Lefebrve (1984) are also well-recognized in anthropology and cultural studies for their unique perspectives on the subject of practice.

Both Lave and Wenger (1991) and Holland et al (1998) note the influence of Pierre Bourdieu's theory of practice in their works and in anthropology more generally.

In *Outline of a Theory of Practice* (1977), Bourdieu suggests that these relations--sociocultural structures and practices--are features of fields of activity. Bourdieu's concept of "field" describes a structural realm of discourse, activities, and relationships through which power is negotiated and social positionality is acquired and contested. *Misrecognition* is a necessary pre-condition to one's acceptance and participation in a field of activity; the practice of misrecognition upholds the legitimacy of the otherwise arbitrary beliefs collectively recognized by a particular field (Bourdieu 1977). Misrecognition also serves to mute the economic hue of one's social relations, by making less apparent the symbolic capital one seeks to secure within the exchange of everyday social relations and social practices.

Bourdieu employs the concept of *habitus* to describe a type of embodied, life-in-practice sense that an individual develops in the context of his/her socio-cultural experiences. Habitus is also explained as a set of durable dispositions that are out-of-awareness and that constitute the embodiment of a person's culture. Body and [social] structure encounter one another as habitus and field, respectively. Finally, while habitus and social positioning each tend toward durability in temperament...within each disposition there also resides the potential for change. The occasion of such a change may be likened to the idea of a rupture.

According to Wenger (1998), practice is the source of its own boundary throughout the three dimensions of a community of practice--a joint enterprise, mutual engagement, and shared repertoires (1998, p. 113). Boundaries between communities of practice and between

a community of practice and the larger world outside of that community of practice are sites where power and meaning are negotiated. The character of these boundary experiences varies. Some boundary experiences, for example, may entail the opening of a periphery. These experiences can provide opportunities for recruitment of new community participants. This type of boundary practice regularly took place between the Emerald Isle volunteers and the general public along Emerald Isle's beaches. The practice of "nest sits", or the volunteers' overnight monitor of turtle nests ready to hatch, and the volunteers' practice of constructing "hatchling runways" when a sea turtle nest had hatched were volunteer repertoires that also entailed the type of boundary practice that occasionally created an opening of the periphery between the community of volunteers and the public. Chapters 3, 4, and 6, each provide details and observations about these practices.

Overlapping practice is a second type of possible boundary practice. Here, although multiple communities' practices may overlap, each community continues to maintain its joint enterprise and distinct practices of mutual engagement. Data collection, nest protection, and sea turtle protection were forms of overlapping practices in which each community (scientists, volunteers, and park staff) regularly participated. Yet, despite the overlapping character of these practices each community remained distinct due to the nature of its joint enterprise and the nature of its mutual engagements (see Figure 3.2 and in chapter 3 and the descriptions of the communities of practice that precede and accompany Figure 3.2).

The third type of boundary practice that can occur between communities of practice is practice in which there is an identifiable *boundary object* or *boundary enterprise* and conflict

may also be present in negotiations of meaning and power.[42] The topic of "nest relocation" discussed in Chapter 4 is an example of this third type of boundary practice. The initial conflict over nest relocation emerged during Summer 2005 between the scientist and the volunteer communities. Reified, the conflict became a boundary object.[43] As a boundary object, the conflict over nest relocation would become one of the main topics for the Spring 2006 annual statewide meeting of the *North Carolina Sea Turtle Protection Project*.

When boundary practices accompany conflict or are associated with contentious issues some of a community's members may participate in these boundary practices as brokers. Brokers are individuals who can introduce or connect elements of one practice to another (Wenger 1998, p.105). Individuals' social locations, identities, and competencies can be factors that influence the identification of brokers among communities of practice. In Chapter 6, I note a few examples from the study in which the practice of brokering occurred. Meanwhile, the next section focuses upon the subject of identity.

Identity

Community of practice theory recognizes that identity formation can be a nexus of multi-membership whereby one's sense of membership is likely to be experienced within and without the community of practice and to be experienced locally and globally.[44] In communities of practice, identity formation is intimately connected with learning as a

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[42] Here, Wenger (1998) employs [sociologist of science] Leigh Star's concept *boundary object*. Boundary objects are "objects that serve to coordinate the perspectives of various constituencies for some purpose (Wenger 1998, p. 106)."

[43] Wenger defines *reification* as "the process of giving form to our experience by producing objects that congeal this experience into 'thingness' (1998, p. 58)."

[44] Note in Chapter 5 my observations about Cal's and Will's senses of identities. These are examples of identities as possible nexi of multi-membership.

trajectory (or "a constant becoming") that is temporally complex and that combines past and future into a meaning of the present (Wenger 1998, pp. 154-155). "Learning," note Lave and Wenger, "thus implies becoming a different person with respect to the possibilities enabled by these systems of relations (1991, p.53)."

There are a number of types of trajectories or movements within a community of practice that accompany learning and identity formation. *Peripheral trajectories* can provide access to a community of practice. An *inbound trajectory* is experienced by newcomers who may have peripherally constructed identities but these newcomers are also inclined toward future participation. The inbound and future-oriented tendency of this trajectory suggests that identities in this realm of experience are characteristically a constant becoming. Wenger (1998) also describes an *outbound trajectory* that is coincident with one's exit from a community. That is, on the way out of a community one continues to learn--seeing the world and oneself in new ways (Wenger, p. 155). *Insider trajectories* are experienced by full members of the community. While, *boundary trajectories* span boundaries and can connect different communities of practice.[45] Finally, Wenger posits that within communities of practice identities represent "forms of competence" involving a mutuality of engagement, one's accountability to an enterprise and one's negotiability of repertoires (1998, pp. 152-153).

Whereas the nucleus of activity for Lave & Wenger (1991) and Wenger (1998) is a community of practice, the core of activity in Holland, Lachicotte, Skinner & Cain (1998) is a *figured world*. A figured world is a "socially and culturally constructed realm of inter-

[45] Being a newcomer one of my trajectories was a peripheral trajectory. But, I was also situated within a boundary trajectory (see Chapter 6 for more detail about my boundary positioning).

pretation in which particular characters and actors are recognized, significance is assigned to certain acts, and particular outcomes are valued over others (Holland et al 1998, p. 52)." Identities are produced in one's personal and socio-cultural interactions described by four contexts of activity: figured worlds, social positionality, space of authoring, and making new worlds (1998, p. 271).

Social positionality is an aspect of identity formation interfaced with the geography of individuals' social relationships. The economic nature of individuals' relations with one another, and the exchange of power and symbolic capital in these relationships, informs actors' relative social positions and in turn influences their production of identities.[46] A *space of authoring*--a space in which one author's the self--is defined via a combination of one's everyday acts of improvisation, personal and public histories, and one's interactions with others--interactions, similar to that which Vygotsky describes as occurring within a zone of proximal development (Holland et al 1998, p. 272). Vygotsky's emphasis on the importance of play to one's personal and social development influences the fourth facet of identity formation that Holland et al (1998) describe, i.e., *making worlds*. Through "serious play" new figured worlds are imagined, and in turn, may be realized (Holland et al 1998, p. 272).

Identities constitute a durable standpoint or point of view from which to act. Hence, agency becomes possible with identity formation and the realization of the "as if realms" of figured worlds.

This focus upon identity as a point of view from which to act--and, as possibly contributing to agency--differs from theories about identity in studies of human development

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[46] Here one can see the influence of Bourdieu's theory of practice on Holland et al's (1998) conception of positionality .

that emphasize identity's significance for the successful integration of one's self over the course of one's progression through different developmental lifestages. For example, Holland & Lachicotte (2007) distinguish their research on identity from research on identity in human development that articulates with the work of Erik Erikson. Rather, Holland & Lachicotte (2007) note that the works of Mead, Vygotsky, Bakhtin and Bourdieu are primary resources for them in their theoretical work on identity and identity formation.[47]

Holland & Lachicotte (2007) contrast Erikson's theoretical focus upon the integration and development of a person's stable identity with what they term a "Meadian" identity--i.e, identity as a self-understanding that forms within socio-cultural relationships. In terms of a Meadian identity, one's identity or senses of selves contributes to motivation, agency, action, and organization of affect (Holland & Lachicotte 2007, p. 104). From a Vygotskian perspective one's identity develops in activity with others. In shared activities cultural artifacts are the semiotic tools that if applied to oneself can contribute to one's formation of identities in practice. Holland et al note that,

> Vygotsky drew an analogy between tools and signs, suggesting that the use of signs altered not only the "social" environment but also the very behavioral architecture of the users (1998, p. 35).

Mediating artifacts are imbued with collectively constructed meaning. In practice these meanings become internalized and can be experienced by the self as inner speech or inner activity. This inner speaking contributes to the organization of one's self.[48]

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[47] Mead's ideas stimulated the theoretical tradition of Symbolic Interactionism.

[48] Concerning the activity of inner speech, Holland et al (1998) compare Vygotsky's and Bahktin's conceptualizations noting that Vygotsky's writings about inner speech suggest a more monologic inner speech. Whereas, Bahktin describes inner speech as a dialogic process.

Lastly, in chapter 5, I introduce Holland & Lave's (2001) concept of history in person. "History in person," explain Holland & Lave, "indexes a world of identity, action, contentious practice, and long-term transformative struggles (2001, p. 30)." History in person provides a framework for exploring issues of "contested identities".

Semiotics

Semiotic mediation features in theories about identity by Holland et al (1998), Holland & Lachicotte (2007), Holland & Lave (2001). These theories discuss semiotic mediation as it relates to the works of Vygotsky (1960, 1978) and Bahktin (1981, 1986) and as it occurs within [the sign system of] human language. While not necessarily using the sign system of human language, all living beings communicate and share their knowledge and learning with one another via semiotic processes or sign systems. The works of Swiss linguist Ferdinand de Saussure and American philosopher Charles Pierce were influential to the foundation of semiotics as a field of study.[49] My use of semiotic theory in chapter 6 of this study relies upon the works of Thomas A. Sebeok (1972, 2000) and Sebeok & Danesi (2001) in order to explore how individuals developed concepts and practices of connection in their daily lives. That is, what kinds of experiences contributed to individuals' learning and understanding and senses of connection with the sea turtles?[50]

Sebeok was influenced by the Estonian linguist Paul Ariste (1905–1990), Yuri Mikhailovich Lotman (1922–1993)--a Russian semiotician and founder of the Tartu Moscow Semiotic School--and by the Estonian biologist Jakob von Uexküll (1864–1944).[51]

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[49] The term *semiotics* was first coined by Hippocrates to alert medical practitioners to the value of recognizing bodily symptoms in making accurate diagnoses and formulating prognoses (Sebeok & Danesi 2000, p. 13).

[50] Sebeok (2001) catalogues six species of signs: *signal, symptom, icon, index, symbol*, and *name*.

[51] http://www.ut.ee/SOSE/sss/pdf/Sebeok26.pdf

A theoretical biologist first, some of Jakob von Uexküll's ideas and theories would become significant for semiotic theory as well. For example, von Uexküll was one of the first individuals to document manifestations of different types of semiosic behaviors exhibited by different phyla (Sebeok &Danesi 2000, p. 17). von Uexküll (1957) also maintained that non-human animals, as interpreters of their environments, participated in the world of meaning-making. Eventually, von Uexküll's work would become the foundation of studies and research in *biosemiotics*--the study of signification in living systems (Sebeok & Danesi 2000). In 1963 the term *zoosemiotics* was coined by Sebeok to extend the theory of meaning so as to recognize the designative processes in speechless beings (Seebeok & Danesi 2000, p.41)

On a midweek trip to the grocery store, late-winter 2004, I ran across a newspaper article about sea turtle conservation in North Carolina. I knew sea turtles were an endangered and/or threatened species and that they lived in the Atlantic Ocean off the coast of North Carolina. But, the article caught my attention because local [coastal] residents monitored and collected data on the sea turtles. According to the article, although scientists and state employees were involved with North Carolina's sea turtle protection project, during sea turtle nesting season local volunteers did much of the daily work collecting data, setting up protected nesting areas, and monitoring soon-to-hatch nests. I was intrigued with the fact that non-scientists were collaborating with scientists in activities typically reserved for scientists.

For a number of weeks, I continued to think about the sea turtle program and its practices. I was curious, for example, how the various individuals in these communities--working with one another and working with the turtles--learned and thought about ecology, more generally. Subsequently, I talked with my advisor about my growing interest in studying North Carolina's sea turtle conservation communities for my dissertation research. Then, a few months later, following a weekend camping trip to Bear Island I unexpectedly had a summer job as a sea turtle intern with the *North Carolina Sea Turtle Protection Project*.

Mid-April 2004, I accompanied my dissertation advisor Dorothy Holland and her colleague Rachel Willis on an overnight camping trip to Bear Island North Carolina with each of their freshman seminar classes. "Navigating America" was the theme for Rachel's

american studies seminar and Dorothy's anthropology seminar focused on environmental activism. The students in Rachel's seminar were primarily responsible for organizing the trip: budgeting, transportation, food, borrowing camping gear from campus recreation, and securing university approval of a first aid plan. Rachel borrowed a bunch of Girl Scout tents from her daughter's Girl Scout master. And Dorothy, with a list of environmental activist contacts, gathered an eclectic group of speakers to share with us their experiences with environmental activism along North Carolina's coast. My role on this weekend trip included: "insuring against risk", i.e., being a responsible adult with camping and backpacking experience, and bringing a camp-style coffee percolator and coffee for Dorothy, Rachel and me. All told, about 25 of us made the sojourn to Bear Island that blustery April weekend.

It was actually a warm spring North Carolina Saturday when we departed the mainland for our island stay. But the wind blowing off the Atlantic Ocean into our primitive camp site made "warm" feel "chilly". Once the tents were erected we had the afternoon to relax, explore the island and collect sea shells. Many of the students were impressed with the island's lack of man-made structures. Bear Island remains one of the few North Carolina barrier islands that has not been developed for quotidian human habitation. Also contributing to the island's spartan horizon, the State had just resumed its seasonal ferry service to the island the Saturday we arrived. Consequently, the number of visitors to the Park was lower than normal and we ended up being the only humans temporarily inhabiting the Island that April evening.

Sunday morning we tripped out of our tents into a very cold Atlantic morning. Quickly breakfast was under way. One of Dorothy's camping-experienced students brought a

cook stove and started making pancakes for anyone wanting to experience pancakes in a camp setting. While the cookstove was warming both pancake batter (and people's hands) I managed to get my can of Sterno lit and the coffee brewing. Rachel, Dorothy and I stood quietly staring at the little camp percolator perched on its Sterno can. Curious, and collecting observations for their trip logs, some of Dorothy's and Rachel's undergraduate students joined us in watching the percolator. People started joking and placing bets as to whether the coffee would actually brew before we departed for the mainland.

After a breakfast of pancakes and coffee I decided to walk to the bathhouse so that I might brush my teeth and wash my face. En route, I saw a park ranger measuring and recording ocean temperature. Momentarily, I considered asking him if the park was hiring anybody for the summer sea turtle nesting season. But I hesitated because I remembered I was still in my pajamas and that I hadn't brushed my teeth. As the park ranger started to pack his equipment I flashed on Rachel's pancake and coffee-infused exhortations to her students; she encouraged them to not be shy about asking for scholarships, travel grants, and internships. I seized on this advice and gathered my self-presence all-the-while trying to ignore my state of dress. I introduced myself to the park ranger and we began talking about the *North Carolina Sea Turtle Protection Project*.

The weekend trip ended on a high note for all of us. We successfully navigated camping on Bear Island, shared some new experiences, ignited new friendships, and we listened to some inspiring individuals talk about their lives and their environmental activism. I also had the great fortune and the promise of returning to Bear Island in six more weeks to work as a sea turtle intern and to begin my dissertation research.

Descriptions of the NC Sea Turtle Conservation Communities of Practice: the State Park staff, the Scientists, & the Volunteers

The three local North Carolina sea turtle conservation communities of practice that I studied included: park rangers and staff at Hammocks Beach State Park in Swansboro North Carolina, marine biologists affiliated with the *North Carolina Sea Turtle Protection Project*, and local volunteers in Emerald Isle North Carolina who participated in the *NC Sea Turtle Project*. Approximately 80 individuals were involved in this two-county division of the NC Sea Turtle Project.[52] I anticipated interviewing 30 of the 80 (total) individuals involved in these three, local North Carolina sea turtle conservation communities of practice. That is, I planned to interview 10 people from each community (sea turtle biologists, Hammocks Beach State Park staff, and Emerald Isle volunteers).

Potential participants included individuals active in one of the three, identified, sea turtle conservation communities of practice. Within each community I insured that participants' social locations varied. Individuals outside these communities of practice—yet involved with one or more of these communities because of shared or contested, related interests—were also considered as potential study participants. (An individual's "lack of significant involvement with local sea turtle conservation efforts and related issues" was the criterion of exclusion employed.) My efforts to include participants with varied social locations--within the community and outside the community--were aimed at enhancing the opportunities I might have for triangulation of the study data in my analyses.[53]

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[52] Swansboro (site of Hammocks Beach State Park) North Carolina is located in Onslow county. Emerald Isle (site of volunteer activities) and Morehead City (site of biologists laboratories and offices) are located in Carteret county North Carolina.

[53] For example, see in my upcoming description of the scientist's community of practice, my discussion of the relative social locations of scientists (Noel, Peter and Wesley) in this community.

Within the process of analyzing the data, various themes and topics began to appear and re-appear with consistency upon each re-reading of my field notes and the interview transcripts. The interview transcripts that I ultimately chose to highlight in this manuscript were the interviews that tended to have more expansive coverage of a common theme. Sometimes, too, I might have chosen an interview because the individual speaking in that moment was most articulate on the topic that seemed widely significant. Having noted this, I was impressed with the breadth and depth of ideas, insights, and histories that all participants contributed to this project.

I transcribed the transcripts verbatim. By this I mean, I included all the pauses and hedges and re-phrasings that in speaking we all practice. Sometimes these interruptions or digressions in dialogue can be difficult to follow from the perspective of the reader. On the other hand, my approach to transcribing the interviews in this manner contributed to the study's ecological validity.

Participants were diverse with respect to ethnicity, age, education, and socioeconomic class (see Appendix I, Table 1.1). Study participants in these three communities were adults ranging in age from 18 to 60+ years. Participant race was predominantly white but diverse with respect to ethnicity. Educational background varied (high school graduate to Ph.D.) as did occupation and socioeconomic status. Some of the individuals involved in local sea turtle conservation efforts have lived in local and nearby coastal communities all of their lives while others were transplants from other parts of North Carolina or from other parts of the United States.

In the next several pages I describe each community of practice and provide some biographical background about each community's participants. Located in Appendix I is a graphic (Table 1.2) displaying each participant's relative social locations within his/her community and with respect to the other communities of practice..

THE STAFF at HAMMOCKS BEACH STATE PARK was the first community of practice to which I was introduced in Summer 2004. For three turtle nesting seasons I resided in the Park's barracks located on Bear Island. During Summer 2004 I worked for the Park as a sea turtle intern.[54] The staff at Hammocks Beach State Park had been involved in North Carolina's sea turtle conservation efforts as early as 1981. Bear Island is located within zone 206 to zone 209 of North Carolina's sea turtle management zones. This zone system was initially established for the purpose of recording the location of sea turtle nests along North Carolina's coast. In subsequent decades, with the arrival of Global Positioning System (GPS) technologies, the collection of nest location data was also recorded using coordinate measures of longitude and latitude.

In this community of practice sea turtle interns employed for the summer nesting season were responsible for: monitoring sea turtle activity on the Island's Atlantic beachfront from dusk until dawn, tagging and gathering data on nesting female turtles, marking and inventorying nests, and assisting in the provision of first aid to stranded turtles (Figure 3.1). The Park provided each sea turtle intern a copy of the *Handbook for Sea Turtle Volunteers in North Carolina*. This instructional *Handbook* was authored by North Carolina's state sea turtle biologists. Sea turtle interns were trained on-site on Bear Island by the park rangers.

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[54] My first day of work and my introduction to this community of practice is detailed in an upcoming section of this chapter titled "Time & Place".

Figure 3.1 Verifying the presence of eggs in a freshly laid nest. © KCMartin 2004

During the period in which I was a sea turtle intern, interns also had an afternoon training session with state sea turtle biologist, Humberto, in the Beaufort NOAA laboratories. Continuing education for the park rangers was provided at an annual state-wide meeting convened by the state sea turtle biologist and open to all individuals (park staff, scientists, and volunteers) involved with the *North Carolina Sea Turtle Project*. In the early years of the *North Carolina Sea Turtle Project* and in subsequent years when a summertime sea turtle intern was not employed the Hammocks Beach State park rangers would be responsible for the activities (cited above) usually performed by the sea turtle interns.[55]

A total of 11 individuals in the state park community of practice participated in my study (see Appendix II, Table 2.2). Dewey, Carl, Kurtis, Sandra, and Jackson, were all park

[55] All activities except for the nightly monitoring of Bear Island's Atlantic beachfront. Full-time Park staff did not reside in the Bear Island barracks during sea turtle nesting season.

rangers. Consequently, out of the 11 members of the park staff that participated in the study these 5 people were the individuals that spent the largest number of their work hours on Bear Island (the site of sea turtle activities) and they were the individuals most directly involved with the *North Carolina Sea Turtle Project* and its related interests. I introduce each of the 5 park rangers in later chapters.

Meanwhile, I will introduce here the other members of the Park staff that participated in my study. Daisy had been a former sea turtle intern at Hammocks Beach State Park in the early 1990s and then worked for a few years after this as a naturalist with the North Carolina Aquarium. Also during this same period, Daisy worked on a NOAA-sponsored project with NOAA scientist, Rachel, and a group of local fishermen. The project concerned local fisheries and sea turtle interactions.

Rocky and George were seasonal summertime employees at the Park. Both men worked for the state park as ferry [boat] captains. Although they spent nearly their entire work day on the Intracoastal waterway and the waters of the salt marshes between the mainland and Bear Island, the boat captains were in regular, frequent contact with all of the Park staff (e.g., office staff, park rangers, boat repair and maintenance). Before retiring, both Rocky and George had been commercial fishermen and local businessmen. Rocky had also been significantly involved in Onslow County politics; he had served as a negotiator on the city of Jacksonville's community-military relations board, and he was a civil rights activist.

Kay, a retired school teacher, was also a seasonal employee and worked for the Park each summer as a naturalist. Kay presented a variety of interpretive programs for Park visitors. Depending on the content of a particular interpretive program, Kay gave her

presentations in the Park's visitor center or on Bear Island.

Jerry was a sea turtle intern during my second summer of field work. He was born and raised in eastern North Carolina and familiar with the social and cultural issues of most concern to North Carolinians resident in this part of the state. Jerry was also an undergraduate student at the University of North Carolina at Wilimington. There, he studied marine biology. In his spare time, Jerry liked to surf and to fish. An articulate young man, Jerry also enjoyed conversing with people on a wide variety of topics.

Retired from the military, Maria worked full-time as an administrative assistant in the Park's mainland office and sported a sea turtle tattoo. Maria also coordinated communications between the different groups of staff members. And during summer 2005, on her days off work, Maria worked as a sea turtle volunteer on Emerald Isle.

THE SECOND COMMUNITY of PRACTICE was comprised of marine or sea turtle biologists affiliated with either state or federal marine concerns or with non-governmental organizations (see Appendix II, Table 2.2). In the *Introduction*, I briefly described the activities of the biologists. These activities included: pure and applied research on sea turtles and factors related to sea turtle morbidity, development and implementation of environmental impact studies, coordination of the practices and the Federal permitting of the activities of the *North Carolina Sea Turtle Project,* continuing education for *Project* members, provision of first aid to injured or ill sea turtles, investigation of cases of sea turtle strandings and deaths, coordination of research and protection activities among affiliated state and federal agencies and with international research and/or governmental bodies (also involved in sea turtle protections).

The location of the biologists' activities varied depending upon the agency or organization with which a scientist was affiliated and depending upon the geographic locations of the sea turtles' activities.[56] Generally speaking, the biologists commonly worked in the Atlantic Ocean, in the salt marshes and tidal creeks situated between barrier island and the North Carolina mainland. They also worked on the local mainland and island beaches, in laboratories, in offices and conference rooms, on fishing boats, and sometimes in airplanes and helicopters. Using airplanes and helicopters scientists could conduct ariel surveys of the turtle populations along North Carolina's Atlantic Ocean coastline.[57]

Rianna, Humberto, and Megan were sea turtle biologists affiliated with the North Carolina Wildlife Resources Commission (NCWRC). Rianna was North Carolina's first permanent state sea turtle biologist. Humberto and Megan were the sea turtle biologists currently working for the NCWRC during the period of my field research. Humberto and Megan were also the scientists responsible for implementation and oversight of the Bogue Banks Beach Nourishment and Nesting Study. Upcoming, in Chapter 4, I describe this study (and local related conflicts concerning it). In Chapter 4, I also describe the development of North Carolina's sea turtle communities of practice during Rianna's work with the NCWRC.

Rowdy Madison, a marine biologist, was head curator of the North Carolina Aquarium. During the early years of the *North Carolina Sea Turtle Protection Project,*

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[56] In Chapter 4, I describe at length the different agencies with which each of the biologists was affiliated. There too, I describe each agency's mission and activities and I describe the ecological locus of practice for each agency (e.g., ecosystem, habitat, or species). Although the agencies (and the scientists) were required by the *US Endangered Species Act (1973)* to collaborate on sea turtle protection efforts each agency's participation in this collaborative effort also reflected its practices and mission as an autonomous agency.

I also discuss in the same chapter how the sea turtle's life cycle and the geographic locations of sea turtle activities contributed to the structuring of these collaborative efforts. See also Appendix IV

[57] Recently, too, scientists were using satellite tags to track and map turtle activities and migrations.

Rowdy and the Aquarium staff often assisted Rianna in rescue and recovery of injured or stranded sea turtles. As space permitted, the Aquarium also hospitalized rehabilitating turtles during these early years. Rowdy Madison and the next scientist I introduce, Jonah, were both affiliated with North Carolina's Department of Environment and Natural Resources (DENR) via the Division of State Parks. As curators of an aquarium or a museum, the virtual location of Rowdy's and Jonah's (see next paragraph) offices were located in North Carolina's Division of State Parks. I've mentioned this to highlight how people's social locations and identities may be potentially experienced as nexi of multi-membership.[58]

Another marine biologist and museum curator was Jonah. Jonah was curator of the *North Carolina Maritime Museum* and director of the *Cape Lookout National Seashore Studies*. Jonah's work with the *North Carolina Sea Turtle Project* was primarily located on Cape Lookout National Seashore. Jonah participated in activities associated with sea turtle nestings and/or sea turtle strandings on the Cape. A sea turtle *stranding* event can be precipitated by a number of factors (e.g., disease, old age, entrapment in fishing gear, drops in temperature during the fall and winter months). Weak, sick, or injured sea turtles no longer able to swim nor navigate may wash ashore and "strand" or float aimlessly in the water and "strand". A dead sea turtle discovered on-shore or off-shore may also be labelled as a "turtle stranding".

During one of the last seasons of my field research, a late-Fall afternoon in 2006, I met with a US Fish and Wildlife Services (USFWS) named Peter. Peter was a biologist with the State's regional USFWS Ecological Services office. The USFWS is responsible for

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[58] "Identity" described as *nexi of multi-membership* is Wenger's (1998) idea.

enforcing the *US Endangered Species Act*. Not at all a particularly "green" structure, the tiny USFWS Raleigh office was located in a squat brick office building surrounded by a barren and hot asphalt parking lot. A small staff of wildlife biologists occupied this tiny office. About my age, Peter was also doing research for his Ph.D. dissertation. (Peter's research focused upon reproduction habits in North Carolina's red wolf populations.) Peter and I had a lengthy conversation about the USFWS Ecological Services' work with federally protected species. Peter worked on sea turtle issues and concerns related to several other protected species. Like his colleagues, some of Peter's work occurred in the field but much of it centered around responsibilities that required working in the Raleigh office (e.g., write-up of studies and reports, coordination of USFWS enforcement efforts, public outreach).

A NOAA biologist named Rachel also participated in this project. Rachel was one of the marine biologists who actually spent some of her time working in helicopters and airplanes conducting ariel censuses of sea turtles. Rachel also coordinated Fisheries Observers projects with local fishermen. On these projects, NOAA biologists worked in cooperation with area commercial fishermen. Accompanying the fishermen on their daily fishing trips the NOAA biologists were able to collect data on sea turtles and to conduct studies related to sea turtle and fisheries interactions. Fishermen that participated in these NOAA sponsored projects were given monetary compensation and they were contributors to the ongoing dialogue and problem-solving initiatives related to local fisheries and sea turtle conflicts.

Recognizing that sea turtles occupy a number of the same oceanic habitats as fish, and aware of reported conflicts between fishermen and individuals involved in sea turtle

protection, I contacted the director of the *North Carolina Division of Marine Fisheries*. I wanted to insure that I learned first-hand the fisheries' points-of-view about local conflicts that embroiled the sea turtle groups' and the fisheries' interests. The director of the North Carolina Division of Marine Fisheries was a fisheries biologist named Wesley. When I met Wesley he was anticipating his retirement (in the spring) after a long and productive career with the NC Division of Fisheries. Wesley was one of the authors of the *Coastal Habitat Protection Plan*.[59]

One of the local newspapers provided me my first introduction to Wesley and to Noel (a former ocean and coastal policy scientist with the NGO, *Environmental Defense Fund*). The newspaper happened to announce a public meeting that had been organized by a group of local scientists. The focus of this day-long meeting was the US Navy's intent to locate a sonar practice range about 70 nautical miles offshore North Carolina's mid-Atlantic coast. Individuals from Carteret and Onslow county (including some of the scientists) wanted to know more about the environmental impacts of the planned sonar field. And, a number of organizations and groups of individuals had concerns that the sonar range could be harmful to fin fish and shellfish fisheries, sea turtles, and marine mammals. The newspaper printed a full-page itinerary and bios about the speakers scheduled to speak at the conference. Wesley and Noel were among the speakers.

Noel's office at *Environmental Defense Fund* was located in Raleigh (NC). Her field work and research and speaking engagements brought her to North Carolina's coast on a fairly regular basis. Noel also had a number of colleagues and acquaintances in the area

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[59] "Habitat" was the ecological locus of practice for North Carolina's Division of Marine Fisheries. I discuss this in Chapter 4 in the section titled *The Agencies*.

having lived in this part of North Carolina for many years while completing her PhD studies at Duke University's Nicholas School of the Environment. "Finding the Ways that Work" was the motto that the *Environmental Defense Fund* (EDF) adopted to describe its approach to addressing environmental issues. That is, EDF strived to build practical partnerships with the government, business, and community stakeholders confronted with environmental problems and/or conflicts. Hence, in conflicts like the one concerning the US Navy's plan to situate a sonar field offshore North Carolina's mid-Atlantic coast, Noel's social location was often at the nexus of government, business, and community interests.

As members of the scientist's community of practice, Noel's and Wesley's and Peter's social positions were located closer to the periphery of the community. Noel, Wesley, and Peter were each obviously competent and identified as a scientist and they each shared mutual relationships and mutual engagements with the other scientists in the community. Yet in some ways neither Noel, Wesley, nor Peter fully participated in the community as a sea turtle conservationist. They were accountable to the scientist community of practice's *joint enterprise* of science. Noel's, Wesley's, and Peter's ownership of meaning was in some measure constrained by the fact that they shared less in many of the community's repertoires. This limited their experiences of belonging and others' senses of them as belonging. The liminal character of Noel's, Wesley's and Peter's belonging (and therefore different ways of knowing) made them valuable informants as concerns data triangulation.

A GROUP of SEA TURTLE VOLUNTEERS on EMERALD ISLE was the third community of practice that participated in the study (see Appendix II, Table 2.2). Maxine, Cal, Will, and Elaine were all old-times in the sense that they had been a part of the *North*

Carolina Sea Turtle Protection Project during the period in which Rianna (the first full-time state sea turtle biologist) was also part of the *Project*. Rebecca, Alex and Patty were all relatively newcomers in the community. Newcomers were generally identified as "walkers" whereas the old-timers were often identified as "beach coordinators" (or former beach coordinators). The location of the community's activities was Emerald Isle's beaches.

The activities of the Emerald Isle volunteer group included: record sea turtle activities or evidence of sea turtle activities; morning walks in each nest management zone of the beach to locate and mark nests that had been laid overnight; inventory nests; assist with data collection, and with first aid and recovery of stranded turtles; "nest sits" or overnight monitor of nests ready to hatch; crowd control and construction of a "hatchling runway" when a nest hatched; assist state biologists with on-site necropsies; maintain regular communications with state sea turtle biologists; recruit, teach, and mentor new volunteers; informal education of public about sea turtles and local sea turtle activities.

As a group the volunteers were all 60+ years old and each volunteer (except Patty) was a retiree. Patty was a commercial artist and longtime Onslow county resident. Like the EDF scientist, Noel, Patty's social location was situated at the nexus of multiple local interests. Patty enjoyed swapping stories and was acquainted with many people in Swansboro and Emerald Isle. A civil rights activist and a local community activist Patty had, over several decades, been involved in local politics and local conflicts. She often related her Serbian ethnicity to her identity as an activist. Patty had only been a sea turtle volunteer on Emerald Isle for one nesting season. She lived on the mainland and said that increasing parking restrictions on crowded Emerald Isle made it too difficult for her to get to the nest

management zones where she needed to walk each morning. Patty's twenty-something neighbor volunteered during his summer breaks from college. Through her neighbor, Patty kept up with the Emerald Isle sea turtle news. Self-employed, Patty worked in the evenings and spent her afternoons on Bear Island sea-shelling, picking up trash, and visiting with the park staff.

Elaine, like Patty, was a one-time New Jersey resident. Before retiring, Elaine had worked in the New Jersey circuit court system. Elaine and her husband had joined the Emerald Isle volunteer group so that they "might get to know people". Over the years, Elaine's work with the *North Carolina Sea Turtle Protection Project* became a significant part of her life for many reasons beyond her initial interest in the possibilities of friendship.

Old-timers and leaders in the volunteer community, Elaine, Cal, Will and Maxine, negotiated (and debated) with the sea turtle biologists about communities' practices of sea turtle conservation and protection. Cal was a former geology professor at Virginia Tech. He was also an avid birder and he and his wife also volunteered at the North Carolina Maritime Museum. Will was a retired US Army colonel. He was also an avid hunter and fisherman and as a concerned citizen he was involved in local politics. Maxine was a former high school math teacher. She too volunteered with other local area groups. Maxine also authored many of the handouts that the old-timer volunteers used when teaching new volunteers.

Alex was a retired Dupont engineer. He spent much of his free time with his church doing outreach and service work. Like Will, he was also an avid hunter. Alex wrote a weekly column about hunting for the local paper, *The Tideland News*. Alex participated in the Emerald Isle volunteer community for two nesting seasons (walking a beach zone each

morning). I was introduced to Alex when I was living on Bear Island. In addition to hunting, writing, and his other volunteer activities, Alex volunteered with Hammocks Beach State Park. During my third summer at the Park Alex assisted me with the Bear Island oral history project that I was working on for the Park in summer 2006.

I met Rebecca in Spring 2006 at the annual, statewide spring meeting for participants in the *North Carolina Sea Turtle Project*. Rebecca had volunteered with the Emerald Isle community for a number of nesting seasons. A competent and fully participating member in the volunteer community, Rebecca had recently been assigned by the old timers in the volunteer community to be one of the volunteer beach coordinators. Rebecca was a Boston Red Sox fan and she enjoyed fishing with her husband. Her husband was well-known on Emerald Isle and in the surrounding area as a local "fishing expert". He also wrote a regular column for the *Tideland News*. He wrote about fish and pole fishing and provided updates about the latest fish activity at specific fishing piers along Bogue Banks and Emerald Isle.

In Figure 3.2 (next page), I have listed for each community of practice its j*oint enterprise* and its *shared repertoires*. Recall, in Chapter 2 I noted that Wenger defined three dimensions of a community of practice: mutual engagement, a joint enterprise, and shared repertoires. Mutual engagement, as a practice, concerns the social complexity of relations in a community and it is the set of activities shared by members in the same community. I have described in the text above each community's dimension of mutual engagement. Community cohesion is maintained through shared mutual engagements. A joint enterprise is essentially a community's specific negotiated response to its situation in spite of all the forces and influences beyond their control (Wenger 1998, p. 77). Seeking to clarify this, Wenger states

that “It [a joint enterprise] is not just a stated goal, but creates among participants relations of mutual accountability that become and integral part of the practice (1998, p.78). The third dimension of a community of practice, it’s shared repertoire(s) includes: stories, historical events, concepts, artifacts, actions and discourse (Wenger 1998, p.73). At this juncture in the

Figure 3.2 Communities’ Enterprises and Repertoires

	Joint Enterprise	***Repertoire(s)***
Park staff	Bear Island: 1 of few remaining undeveloped NC barrier islands	pristine nature, cow channel dredge, turtle flag, nest calendar
Scientists	Scientific method	necropsies, statistics, hatchling sex ratios, turtle strandings
Volunteers	Maximize hatchlings success of nest departure	hatchling runways, nest sits, habitat, crowd control

dissertation the contents in Figure 3.2 may not make sense or may seem to demand more explanation. How some of these features matter in terms of learning and knowledge, and the collective senses of interactions among community members, will become more apparent in Chapters 4, 5, and 6, as the practices of the communities begin to unfold.

Time & Place: Study Description

Spanning more than three sea turtle nesting seasons, the total length of time of my field research for this study was 14 months. I collected approximately 60 hours of audio interview material and I amassed a plethora of notecards and several file folders filled with handwritten and typed field notes. This was a multi-sited ethnography. According to Marcus (1995), the perspective adopted in multi-sited ethnography is the recognition that neither individuals nor cultures are geographically-bound and that traditional ethnographic foci such as place, identity, and forms of exchange, may be produced across multiple and potentially distant sites. The use of multi-sited ethnography fit well the needs of this study for, as I

mentioned in the *Introdution*, I studied three communities of practice that emerged concomitant with their respective concerns about sea turtle conservation along North Carolina's mid-Atlantic coast.

I began preliminary fieldwork, in the form of participant observation, in Spring 2004 upon securing a four-month internship with Hammocks Beach State Park. During this first spring and summer, I lived full-time on Bear Island (state park property) along with one other sea turtle intern named Tina. Tina and I resided in the Park's barracks on the Island. With the exception of Park facilities (a ferry landing, a barracks, a garage, a bath house) and 14 primitive campsites, Bear Island remains one of North Carolina's few undeveloped barrier islands. The barracks were located in the middle of Bear Island within its dune fields. Dune fields are comprised of very large, mature, dunes covered with patches of maritime forest. Dune fields are a common topographic feature of undeveloped barrier islands (Neal et al 2007).

Situated at the bottom of a bowl of gigantic sand dunes, the barracks were significantly protected from hurricanes.[60] The barrack's exterior further served to blend the building proper into the surrounding environment. The barracks' exterior was wood-siding painted gray and trimmed in white. Because so much white sand had blown into the pores and crevices of the siding since it was last painted "gray" the wood siding actually appeared more white-washed than gray. Thus, that first summer when I arrived at the barracks I thought it looked like an old, faded gray seashell long ago discarded by a storm or a park visitor (or both). By contrast, the interior of the barracks was dark but richly-colored in wood

[60] In August 2004, when Hurricane Alex roared past us approximately 40 miles off-shore, I learned first-hand how well the dune fields provided protection from the damaging winds, exceptionally high tides, violent rainstorms, and flooding that accompany a hurricane.

pine panelling and trim. With its pine wood walls and institutional green-and-white tiled floor, inside the barracks I felt like I was bunking in a 1970s camp lodge.

Within the barracks there were 6 small bedrooms and each bedroom had a closet and one set of twin bunk beds. The barracks also had a shower, a toilet, a common room for eating and visiting, and a kitchen complete with a stove, a refrigerator, a burned out toaster oven, a pantry, a coffee-stained coffee-maker, a standard issue first aid kit, and a first aid kit specific for attending to jelly-fish stings. Little more than pine panelling, a fish scaler, and the dried splatterings of food too quickly cooked and too quickly eaten, adorned the walls in both the kitchen and the common room. A stack of old phonebooks and a cork board with emergency contact information and a map of the Island decorated one end of the common room. At the other end of the common room perched above the couch was an enlarged, well-composed, black and white photograph of a white egret and its nestlings. This photographic piece was obviously treasured by the Park for it was secured above the couch with a bolt that prevented its removal from the pine walls. We also had a push-button telephone for local telephone calls, but no television nor telecommunications of any other sort. Transportation on and off the Island, to run errands and to shop for groceries, was via the state-run ferry used to carry park visitors to and from the Island during the park's daily visiting hours.

During spring and summer of 2004 I worked along-side park rangers and with the other sea turtle intern studying and monitoring local sea turtle activities on the Island. As an intern my specific responsibilities included: monitoring sea turtle activity on the Island from dusk until dawn; tagging and gathering data on nesting female turtles; marking and inventor-ying nests; providing first aid to stranded turtles (see Figures 3.3 and 3.4). During this first

summer I gained valuable knowledge and experience working with the turtles themselves. At the same time, residing all summer on Bear Island granted me opportunities to explore the local, geographic area and to become familiar with some aspects of local history, culture, and politics. Moreover, my entry into the local turtle community as a participant was facilitated by living and working on Bear Island. I became acquainted with my coworkers--many of whom were also seasonal employees--whose eclectic lives included off-season experiences in the local schools, the military, commercial fishing, scuba diving instruction, crop dusting, and hotel management. In turn, my acceptance as part of the Park staff introduced me to the two other groups involved in local sea turtle conservation that I had hoped would participate in my study: grassroots volunteers in Emerald Isle, and the marine and sea turtle biologists whose work and research intersected with the concerns of the *NC Sea Turtle Project*.

I met one of the state sea turtle biologists, Humberto, unexpectedly on the day of my arrival at Hammocks Beach State Park. Our meeting was unexpected for no one had communicated with me about the afternoon meeting. All that I knew of the day's plans was that I was to show up at the Park's mainland office some time on the seventeenth of May 2004. Instead, my afternoon unfolded like this. *I arrived at the mainland office with my gear and some frozen food. The administrative assistant in the main office called for the ferry but I was summarily advised to head out to the NOAA (National Oceanic & Atmospheric Administration) labs in Morehead City. There, I was to attend a training session about tagging sea turtles. NOAA is about 35 miles north of the Park. So, after driving 176 miles southeast from Chapel Hill to Hammocks Beach State Park for what I thought would be an*

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Figure 3.3 An all-terrain vehicle (ATV) was used to carry equipment, and to facilitate nightly monitoring of sea turtle activity along the length of the 3-mile Island.

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Figure 3.4 A female, Loggerhead sea turtle (*Caretta caretta)* returning to sea after laying a 2a.m. nest atop a sand dune.

uneventful first day, I stowed my just-purchased frozen food in the office refrigerator and grabbed my daypack and a notebook and a piece of fruit and hopped back in my car. At NOAA we--me, the other sea turtle intern (who had been advised of the meeting) and the two park rangers directing the Park's local sea turtle program-- met with Humberto, a state sea turtle biologist. Humberto was responsible for coordinating the state and federal-supported NC Sea Turtle Protection Project. Because I arrived unaccompanied (and later than the others) I was treated with some suspicion by the NOAA personnel. Though, I was not certain, I imagined their suspicions derived in part due to historically elevated security concerns about acts of terrorism in laboratories and in public spaces throughout the US and the world post-911 and with the current US occupation of Iraq.

After signing in at the front desk, I was eventually led to the necropsy laboratory where I was introduced to Humberto and to my co-workers from the state park. I joined right in to a presentation already started about the use of sea turtle identification tags. Identification tags used on sea turtles were of two types: semi-round and flattened metal clips placed like a pierced earring on the turtle's front flipper, and indwelling microchips or "pit" tags. Using a sea turtle carcass, Humberto demonstrated how to attach a metal tag to the the turtle's front flipper by piercing the outer edge of the flipper between "either the 1st and 2nd or 2nd and 3rd scales." Mind you, this looked relatively simple in a well-lit laboratory on a dead turtle. I wondered how easy it would be to perform the same feat on the beach in all kinds of weather, during the middle of the night, with no bright lights save the occasional full moon. And, the turtles I would be tagging would be alive and presumably moving! Next, Humberto showed us how to attach the more-difficult-to-place microchip or pit tag in the

sensitive skin area between the turtle's neck and the shoulder portion of the turtle's front flipper. In this area, the microchips were inserted sub-cutaneously using a syringe with a large bore needle. Humberto cautioned us that a turtle might react to placement of this tag because it is closer to the turtle's head and she would likely view our close approach as a threat. I suspected that a misplaced microchip might also hurt and cause the turtle to react as well. In either case, if a sea turtle were to bite one of us, Humberto promised that it would be painful. For emphasis he showed us a picture of an anonymous human's forearm--a severely bruised and indeed painful-looking forearm that clearly bore the marks of "bite by sea turtle."

We returned to the Park late-afternoon. Once there I re-gathered all of my gear and my frozen food and we sped over to Bear Island in one of the skiffs used by the park rangers. Tina and I dropped our bags at the barracks and Ranger Stephen quickly proceeded to give us a tour of the garage and the storage shed where the vehicles and the equipment we would be using were stored. Tina and I each took turns practice driving a 4-wheel pick-up truck and a Honda ATV through the loose sand on the high tide section of the beach. Driving the truck through loose or wet sand was, I discovered, like driving through deep, wet snow.

At 10pm the same day we made our first real turtle run down the eastern length of Bear Island's oceanfront. Almost one mile down a stretch of the Island, near the Boque Inlet end of the Island, we encountered tracks where a female sea turtle had apparently come ashore but then returned to sea without nesting. This was called a "false crawl". Because a crawl on land of any sort is so arduous for a sea turtle, I doubt that the sea turtle would concur with calling its investigation of a potential nesting site a "false crawl" (Figure 3.5).

Figure 3.5 Early morning "false crawl" © KCMartin 2004 .

Although a nesting turtle was not present upon our arrival it was exciting all the same to see her tracks! The span of her front flippers appeared to be about 1 yard. The day's introduction to my new job began with looking at dead turtles in an artificially lit laboratory that stunk of formaldehyde. But the day ended with a sign on the beach left by an obviously large, living sea turtle. Our first day of training over, Stephen dropped Tina and I off at the barracks around midnight. I chose a bunk and then I put a frozen pizza in the oven for dinner.

I returned to, and lived on, Bear Island part-time during spring and summer 2005 and continued my research as a participant observer. Necessarily, I was also earning money by teaching in the biology department at the University of North Carolina--Chapel Hill (UNC-CH) during the spring and early summer months of this period. The Park did not have funding available during the 2005 nesting season for me to return once again as a sea turtle intern. Rather, they were provided two sea turtle internships through a state-wide internship

program available only to North Carolina undergraduate students. For the 2005 season I would live with these new interns (Jerry and Dee Anne). I was happy for them that, like me, they each had earned the unique and fascinating opportunity to work as a sea turtle intern for a nesting season on Bear Island. The Park was kind enough though to house me in the barracks for another season so that I might continue the research I had started the previous summer. In exchange for housing at the Park I conducted a "colonial shore bird hatchling success rate" study for the Park. From mid-May through late-July I collected and analyzed data about the Black Skimmers, the Least Terns, and the Common Terns that nested in a shore bird colony on the Bogue Inlet end of Bear Island. I commuted between Chapel Hill and Bear Island during this period so that I might teach during the first part of the week and find nests and count shorebird hatchlings the second part of the week. In between nest and hatchling counts I continued participant observation for my dissertation study.

I made arrangements to complete some participant observation in Emerald Isle around mid-August when a few of the early season turtle nests were expected to hatch. I have included here an excerpt from my field notes that described how a nest hatches and how the nest, anticipated to hatch, was attended to by the Emerald Isle volunteers and by the staff on Bear Island.

On Emerald Isle (as well as many of North Carolina's other developed beaches) sea turtle volunteers begin to sit all night with a nest around the time of its expected "boil". A "boil" is the term used to describe the appearance of a sea turtle nest hatch as some 80-200 baby sea turtle hatchlings simultaneously, in a scrambled rush, appear to bubble to the surface of their 24 inch deep sand nest. The hatchlings' combined efforts to climb to the top

of the nest loosens the relatively moist and packed sand in which the egg-enclosed hatchlings had been developing for roughly 60 days. Alone or in small numbers, the hatchlings would not otherwise successfully escape their underground sandy nest for each turtle hatchling is relatively small and a sea turtle's flipper does not work well as an earthen spade. Once the sea turtles surface they begin to crawl around and eventually orient themselves toward the ocean's shoreline. At the water's edge they quickly intuit how to dive below the crashing surf and begin their 100+ mile swim to the Atlantic Gulf Coast Stream.

As a matter of practice the Park did not post its sea turtle interns alongside nests as the nest boil date approached. The Park could take a more "natural", non-interventionist approach to nest hatches than the developed beaches like Emerald Isle. Hatchlings on beaches heavily populated by human beings encountered more hazards on their dash to the Atlantic's twinkling shoreline than those hatchlings born on less human-impacted beaches. In both instances, heat and non-human predators are shared threats. Loggerhead sea turtles tend to emerge from their nests after sunset. Their nocturnal nest emergence explains why sea turtle volunteers up and down North Carolina's coast spend the night huddled around small areas of sand near beach foredunes between the months of August and late-October. Hatchlings may emerge after sunrise too but tend to do so in the cooler early morning hours. Non-human predators of sea turtle hatchlings include: birds, snakes, raccoons, opossums, fox, and ghost crabs.

On beaches more heavily populated with humans, human beings may also prey on and capture turtle hatchlings. Alternatively, human beings unaware that sea turtles are nesting nearby may unintentionally harm sea turtle hatchlings by stepping on them. And, a

third human-related hazard is the artificial lighting associated with human traffic, businesses, and residences that can outshine the light of the moon and the stars reflecting on the ocean's surface. The natural starlight and moonlight, and the sound of the ocean's waves, are two types of cues thought to be used by sea turtle hatchlings as they attempt to find their way from nest to shoreline. The brighter, artificial light associated with human activities can disorient and confuse sea turtle hatchlings and cause them to crawl toward the artificial light sources in favor of the ocean's beacon. Earnest sea turtle hatchlings may also be waylaid by humans' sandcastles and the gigantic sand pits they dig (perhaps, in search of buried treasure), Volunteers at some of the developed beaches (including Emerald Isle) have creatively circumvented these hazards--and thereby aided the hatchlings beach escape--by constructing relatively smooth runways for the turtles.

My opportunities to help construct a sea turtle hatchling runway and to sit huddled with the Emerald Isle volunteers around a small area of dune-side sand was unexpectedly thwarted. Two summers in a row I missed out on participant observation at a nest sit due to circumstances beyond my control. In summer 2004 Hurricane Alex washed away the nests for which I had time available in my schedule for nest sits. And then in summer 2005, human poachers stole all of the egg from the two nests for which I had volunteered to sit. While nest boils can happen as late as December in North Carolina I was unable to attend any projected nest boils beyond late-August due to the start of UNC-CH classes and my return to Chapel Hill to resume teaching in the biology department.

Mid-May 2006, I began formal interviews with study participants (see Appendix II, Table 2.1 and Table 2.2). At this point my relationships with key informants from each

community had been established and additional, potential participants were recruited late-Spring to early-Summer 2006. I returned to Bear Island a third and final Summer (2006) to live and to work at Hammocks Beach State Park. Again finances required that I teach Summer School at UNC in Chapel Hill. But, I took on half the teaching load I had in the previous summer 2005. For, I wanted to set aside sufficient time to interview people involved in the three sea turtle communities of practice that I had proposed to study. Again, in exchange for housing in room #6 of the barracks, I conducted another study for Hammocks Beach State Park. This summer the Park requested that I organize and begin data collection for an oral history project about Bear Island and the Park more generally. The text box on the next page provides a summary of some of the 20th century events significant in the establishment of the Park (see Figure 3.6). While the Park had already documented much of its history, with the oral history project they wanted to interview long-time residents able to recollect stories about Bear Island and the mainland hammocks from the early-20th century onward. One of the Emerald Isle volunteers also eager to volunteer with the Park (Alex) helped me gather oral stories, photographs, and some video footage for the project. I had wondered if while collecting stories for the Park's project whether I would also hear some interesting tales relating how sea turtles figured in to the Island's history. But, no turtle tales were volunteered. Most of the stories related to farming (corn, cotton, cows, and watermelon), fishing, a once vibrant shipping commerce, tourism, and tales about Dr. William Sharpe.

That summer, the park-proposed oral history project reminded some area residents about the racial hatred and segregation pervasive in Onslow county North Carolina prior to the mid-20th century. For some of the elderly black residents, reminders of this era re-kindled feelings of fear. While, some of the elderly white residents I spoke with openly expressed bitterness and some still lingering prejudices.

Figure 3.6 A Hammocks History, Onslow County N.C.
Early in the 20th century Dr. William Sharpe, a New York brain surgeon and philanthropist purchased 4,600 acres of land in Onslow county North Carolina. This area was known by locals as the "Hammocks". Sharpe's purchase included a small barrier island 1-mile offshore, i.e., the island that would eventually be named Bear Island. Sharpe hired hunting guide John Hurst and his wife Gertrude Hurst (a local school teacher) to manage the Hammocks during his absences. Sharpe's decision to employ the African-American Hursts to manage his land infuriated the racist, local populace. An advocate of civil rights, Sharpe refused to be intimidated by the locals and even managed to diffuse locals' threats to harm him and the Hursts.

In the decades that followed, Sharpe and the Hursts became close friends and regarded one another as family. Sharpe discussed with the Hursts his desires that they inherit the Hammocks. Believing the land too much for them to manage alone, the Hursts urged Sharpe to will the land to the North Carolina Black Teachers Association. Sharpe followed through with the Hurst's recommendations.

During the 1950s the North Carolina Black Teachers Association (NCBTA) inherited the deed to Bear Island and the Hammocks. Also during this same period, the NCBTA entered into negotiations with the state of North Carolina to make Bear Island a state park. In 1961, while racial segregation was still being practiced in the United States Hammocks Beach State Park opened for blacks only. With the installation of the US Civil Rights Act (1964), Hammocks Beach State Park then became open to all races.

Formal interviews for my dissertation research continued into Fall 2006. Therefore, as my teaching schedule permitted, I lived and worked part-time on Bear Island and part-time in Chapel Hill during the months of September, October, and November 2006. In October, the State ferry between the mainland and Bear Island operated on Fridays and Sundays only. And in November the State suspended its ferry operation altogether for the duration of the winter months. Fortunately I had a kayak. Late-Fall 2006 I completed portions of my commute between Chapel Hill and Bear Island via kayak (Figure 3.7). Late-May 2007 I completed all the formal interviews for my project (and the State ferry resumed its in-season schedule).

Figure 3.7 Bear Island via kayak **© KCMartin 2006**

Upon completion of the formal, in-person interviews, I sent each study participant via US mail a "self-identity" questionnaire and an accompanying set of 3 short answer questions. I followed up on each of the primary, individual interviews (n = 27) by mailing to each participant the brief questionnaire about "self-identity" and the set of 3 short answer questions (see Appendix II, Table 2.3 and Table 2.4). This "self-identity" questionnaire was an adaptation of the self-identity survey instrument developed by Kuhn & McPartland (1954). Included with the questionnaire (on a separate sheet of paper) was the set of three, short answer questions concerning 3 related, local topics of interest brought to my attention by a significant number of study participants during their formal interviews. I requested that participants provide brief answers to each of these 3 short answer questions.

Interviews

The interviews with study participants were semi-structured. The semi-structured interview focuses upon a few general topics calling for participants to answer a set of open-ended questions. The semi-structured format establishes a working outline that encourages the interview to unfold similarly across all the interviews included in a study. In this way, the semi-structured interview method offers a nod to experimental research design and its insistence that all research subjects receive equal experimental treatment. Parallels between the two research methods end here. Questions in a semi-structured interview are open-ended thus granting participants the opportunity to develop in-depth their ideas and to discuss interview topics so that they may relate their world experiences and interpretations. This latter feature of the semi-structured interview protocol highlights the significance and meaning of the research topic in individuals' lives and in so doing serves to facilitate linkage of local experiences with global experiences.

Within each community of practice, the initial interview with each participant was the "Involvement" interview (see Appendix II, Tables 2.1 & 2.2). This interview focused upon participants' awareness of conservation issues related to sea turtles and how participants became involved in the local *North Carolina Sea Turtle Project*. Some of the study participants also participated in an "Organization" interview (Appendix II, Tables 2.1 & 2.2). This interview focused upon a community's practices, structure, types of knowledge valued, and work relationships with other communities of practice and/or state and federal agencies. Multiple individuals from each community of practice participated in this second type of interview as well. Criteria for asking individuals this set of interview questions were: length

of time of one's participation in a particular community, an individual's range of knowledge about the community's structure and goals, and an individual's role within a particular community. Finally, a third set of interview questions, the "Ecological Issues" interview (Appendix II, Tables 2.1 & 2.2), addressed a controversy ongoing amongst the three sea turtle conservation communities of practice and the interview also provided additional opportunities for individuals to talk about more general ecological issues. All of the individuals from each community of practice (state park staff, sea turtle biologists, local turtle volunteers) participated in this third type of interview.[61]

Overall, the interview questions focused upon: general topics about local ecosystems; specific, content-based questions about the sea turtle protection activities; hypothetical (or "possible worlds") scenarios; questions about practices; questions about beliefs; questions concerning values. Indexing the interview data was accomplished by focusing upon narrative themes, participants' motivations, metaphor usage, shared cognitive models, indices of historic durability, and cultural artifacts. I also reviewed my collected observations and interview transcripts for patterns of relationships amongst social actors (human and non-human, alike).

Survey & Short Answer Questionnaire

If one's sense of *identity* can function as a mediating or cultural artifact then might identity and its formation may be coupled with knowledge production.? To begin to explore this possibility, I included in the current study an adaptation of Kuhn & McPartland's (1954) "Who Am I?" survey instrument see Appendix II Table 2.3). Kuhn & McPartland derive their

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[61] Local meetings, public notices, local media, and the Internet were valuable sites for triangulating details in information related to local controversies and local histories.

understanding of *self-attitude* from Mead's ideas about the self as an object and Mead's notion of objects as plans of action (1954, p.68). I employed an adapted version of Kuhn & McPartland's survey instrument so that I might obtain a baseline recording of individuals' senses of self-identities.

In my study, I mailed surveys to each individual that participated in a formal interview.[62] Accompanying each survey questionnaire was a set of 3 short answer questions (see Appendix II, Table 2.4). Each question was related to a topic raised by a significant number of study participants, each, during his or her interview. I considered it beneficial to include the short answer questions because it provided participants an alternate format for expressing their ideas. For instance, I reasoned that writing rather than speaking one's thoughts might be preferred by shy or more inhibited participants. Additionally, I thought participants' responses to the short answer questions might contribute to my analyses of the historical durability of ideas and issues because ach short answer question was based upon a topic discussed previously, during the formal interview stage of the study. Finally, I viewed it as potentially beneficial to include the short answer question instrument in the study because I could also use it for purposes of data triangulation.

Ethnographic Research & Writing

During the 1960s the field of anthropology directed self-critical attention to its historical relationship with colonization projects.[63] Related to this self-critique and brought to the foreground were questions about the objectivity of data, representation, and the

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[62] Two participants (1 volunteer and 1 state park employee) declined to complete and return the survey questionnaire and attached short answer questions, and 4 participants (scientists) never responded.

[63] During this period the project of science in general began to be criticized and evaluated for its potentially deleterious impact on human subjects. The Institutional Review Board (IRB) regulating the treatment of human subjects in scientific studies was established and necessarily installed in 1979.

practice of essentializing cultures. Anthropology's self-critique was coextensive with the larger philosophic ferment of postmodernist and poststructuralist movements during this period.

Postmodern critiques of truth, foundations, representation, identity, and science and technology, undermined previous claims to objectivity, knowledge, and the existence of identities and cultures. Post-structuralists by contrast critiqued science from the perspectives of power, knowledge, and discourse. Post-structuralists also criticized structuralists' penchant for macro-level social analyses (to the exclusion of micro-level processes), as well as structuralists' assumptions about social regularities and these regularities guarantee of closed societies and cultures.

Davies (1999) thoughtfully addresses how practicing ethnographers can accommodate in their work the valuable insights realized with these philosophic critiques. Davies recommends that the ethnographer practice reflexivity in his/her everyday research activities. In this manner, Davies advises that the ethnographer make visible to his/her self and the research community alike his/ her philosophic orientation. For one need always be aware how this philosophic visioning can influence what one recognizes as salient observations, how one represents the other, and how one constructs knowledge about the other. Beginning with this study's introduction and, as indicated throughout this study, I have attempted to make evident my assumptions and the theoretical perspectives that have informed my research vantage and research practices.[64]

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[64] Here too, I would add that I understand the ultimate fields of [our] interactions to be Earth's ecosystems. I also understand ecosystem interactions to be occurring within and between multiple, differentiable (but integrated) levels of experience (e.g., individuals, populations or cultural groups, communities, cellular, and abiotic).

Davies also addresses issues of validity, reliability and generalizability, in ethnographic methods. Criticisms along this line are directed at anthropology from the vanguard of the physical and natural sciences and practitioners therein of experimental design techniques. Anthropology cannot make claims to generalizability vis-a-vis statistical inference. Rather, it's generalizability is founded upon theoretical inference. Thus, anthropology's focus upon the local as it relates to the general features of a more global theoretical frame is in keeping with the postmodern admonishment of totalizing claims.

Related to generalizability is the issue of reliability, i.e., the repeatability of results. The replicability of observations collected by different ethnographers is unlikely and certainly doubted, again from a postmodern perspective. Rather what must be used as a point of comparison, insofar as reliability is concerned, are the results of multiple related ethnographic studies.

Finally, ethnographic studies tend to be recognized for having relatively high ecological validity. Ethnography's studied focus upon what people say in their everyday practices buoys the possibility of "truth in measure". Triangulation of recorded data with direct observation, archival resources, and the interviews of a variety of other informants, all contribute to enhancing the validity of measure. In this study, data triangulation was practiced on two levels. On a macro level data was triangulated by cross-referencing archival resources (texts on sea turtle conservation, local news media, Web resources, State fisheries publications) with interview and participant-observation data. At a micro level, I cross-referenced the interviews with one another, with the survey and short-answer questionnaires and with observations gained through participant observation.

In closing, it is apt to cite Clifford and Marcus' work on *Writing Culture* (1986). Clifford and Marcus remind would-be-ethnographers that ethnographic writing always finds itself addressing the following issues: institutionality, fictionality, historicity, and conventions of expression. For me, institutionality and conventions of expression have been two challenges in writing this dissertation. In part, some of the difficulties stemmed from getting used to (and therefore reminding myself about) writing in the 1st person singular. At times, too, I wrestled with conventions of expression because the intended audience for this project is an interdisciplinary audience. Despite affirmations and encouragements of "inter-disciplinary study" by the University, I find it remains challenging to write for an audience of faculty from diverse academic departments. Likewise, I imagine it can be challenging for faculty to read interdisciplinary work. One reason for this, I suggest, is that in multiple ways academic programs' sponsored curricula and research initiatives continue to be structured within traditional disciplinary universes of discourses.

> To say that science (most especially environmental science) only makes sense for policy within an enveloping moral and social order is not to deny the value of scientific knowledge. It is to reaffirm that science is but one of the productions of human imagination, and scientific beliefs cannot operate independently of other forms of social production if they are to under-gird our conceptions of the good society or the good environment.
>
> --S. Jasanoff in *Saving the Seas* (1997)

In the current chapter, and in Chapter 5, I discuss the study findings in relation to the supporting research question: *what kinds of collective senses of interactions between humans and non-humans were being developed in conservation activities undertaken by the State, scientists, and grassroots volunteers*? These interactions had the potential to contribute to the production of knowledge in these communities of practice. Moreover, if the knowledge produced contributed to the organicism of the sea turtle conservation communities of practice and surrounding ecosystem then this knowledge was potentially identifiable as ecological knowledge.

The sea turtle's life cycle played a role in structuring the local and global division of labor that affords protections for the sea turtle. Historically, multiple agencies, at both the state and federal levels, have divided the labor of protecting sea turtles in US waters and on US land. It is with a summary of the sea turtle's life cycle that I begin the chapter. Then, following my introduction to the sea turtle's life cycle, I include a brief description of the network of state and federal agencies affiliated with the sea turtle communities of practice that I studied. Each community of practice's affiliation with one or more of these institutions contributed to the social contexts and social memories implicit in its [the community's] historical development. The development of these sea turtle communities of practice would

likely not have occurred without the installation of the *US Endangered Species Act* (1973) and without the state and federal agencies' combined, initial efforts to put into practice the protection of sea turtles.[65]

I describe each agency's mission and activities and I describe the ecological locus of practice for each agency (e.g., ecosystem, habitat, or species). Although the agencies (their agents) were required by the *US Endangered Species Act* (1973) to collaborate on sea turtle protection efforts each agency's participation in this collaborative effort also reflected its practices and mission as an autonomous agency. The individuals practicing in both the scientist and the state park communities of practice were employed by one of the state or federal agencies. Following the discussion of the agencies and their histories, I introduce some findings from the study that demonstrate how knowledge about the turtle, and knowledge about the practices of protecting the sea turtle, was produced and distributed via structural couplings of the sea turtles' activities and a community's practices or the practices of a community's participants.

After my discussion about the distribution of knowledge about the practices of protecting sea turtles among the three communities of practice, I then relate some history about the development of the *NC Sea Turtle Protection Program* and I begin to attend to some of the details and processes specific to the three communities of practice. I highlight some of the collective senses of interactions developed in conservation activities taking place between members of the three, interrelated communities of practice (i.e., development of practices, negotiation of meaning, formation of identities and learning). These interactions, as

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[65] The *US Endangered Species Act* (1973) specified interagency collaboration. Thus, individuals in the state park and in the scientists' communities of practice each bore responsibilities to his/her respective community of practice *and* his/her state or federal institution.

I mentioned in the opening paragraph to this chapter, also bore the potential to contribute to the production of ecological knowledge.[66]

A Life Cycle

As with all seven sea turtle species, the Loggerhead sea turtle (*Caretta caretta*) is circumglobal, occurring throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans.[67] Sea turtles complete annual migrations the distances of which oft-times range in excess of several thousand miles per one-way trip. The environmental issues that articulate with the concerns of sea turtles are also circumglobal: coastal development, deforestation, disappearance of marine fisheries and coral reefs, pollution, global warming, and exploitive fishing and hunting practices. In the United States, sea turtles are protected under the US *Endangered Species Act* (1973). But possible guarantee of these protections is limited to land and water within US national territories.

Over the course of their lives Loggerhead sea turtles, for example, occupy three different ecosystems: terrestrial, oceanic, and neritic (see Appendix IV, Table 4.1). Loggerhead sea turtles are oviparous; the young hatch from eggs laid by the female turtle in sandy beach nests. Upon hatching, the baby sea turtles crawl and scurry to the ocean's edge. After momentarily adapting to the crush of waves the hatchlings dive below the water's surface and begin a 150-mile swim to the Atlantic Gulf Stream. Riding the currents of the Atlantic Gulf Stream, the Loggerhead hatchling eventually arrives at the Sargasso Sea (Figure 4.1).

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[66] Mediating and cultural artifacts can contribute to meaning-making. Additionally, they belong in part to the-world-as-perceived and in part to the-world-of-social-activity (and social practice). As a result, mediating and cultural artifacts can be indicators of learning and knowledge production. Identities and identity formation may also be significant for learning and knowledge production. In chapter 5, I not only address whether identity was significant but also what sorts of identities were important in participants' involvement in these sea turtle conservation communities. In Chapter 7, I talk about plastic trash as a mediating cultural artifact.

[67] http://www.nmfs.noaa.gov/pr/species/turtles/loggerhead.htm

Loggerhead sea turtles spend the first decade of their lives in the Sargasso sea. This first decade or so spent in the Sargasso Sea is sometimes referred to as "the lost years" because data detailing this particular lifestage is limited. Floating rafts of Sargasso seaweed thought to be a source of food and protection for the hatchlings and early juveniles (Fig. 4.2).[68] Upon completion of this early lifestage, juveniles return to the neritic zone (the inshore marine environment) and continue maturing for roughly another decade until reaching sexual maturity as an adult. Thereafter, depending upon their activities and the season, within a given year-long period adult Loggerhead sea turtles may reside in all three ecosystems (e.g., ocean migration, in-shore breeding and foraging, beach-nesting).

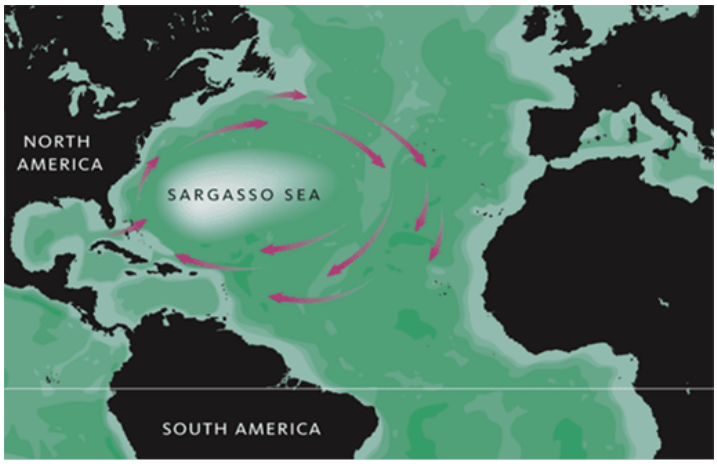

Figure 4. 1 Atlantic locale of the Sargasso Sea[69]

In North Carolina, the labor of protecting sea turtles throughout these three ecosystems is divided between the US Fish & Wildlife Services, the National Ocean and Atmospheric Administration Fisheries, and the North Carolina Department of Environment & Natural Resources. In Appendix IV Table 4.2), I have displayed the interrelationship between the geography of the sea turtle's life cycle and the geography of sea turtle protections in conjunction with North Carolina and US federal agencies' jurisdictions.

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[68] Photo credit: S. Ross et al., Univ. North Carolina Wilmington. www.safmc.net/.../tabid/230/Default.aspx

[69] http://www.fws.gov/northeast/images.html

Figure 4.2 Shelter of Sargassum seaweed

In the next section, I provide a brief description of the network of state and federal agencies affiliated with the sea turtle communities of practice that I studied. I describe each agency's mission and activities and I describe the ecological locus of practice for each agency (e.g., ecosystem, habitat, or species). Within Appendix IV, Table 4.2 I encapsulate the main characteristics of each agency that is described in the upcoming section.

The Agencies

The US Fish & Wildlife Services (USFWS) is responsible for the enforcement of federal wildlife laws and the administration of the *US Endangered Species Act*. The USFWS also "manages migratory bird populations, restores nationally significant fisheries, conserves and restores wildlife habitat such as wetlands, and helps foreign governments with their conservation efforts."[70] At a local level, the regional USFWS Ecological Services office seeks to foster area partnerships and collaborations and to promote "reasonable science-based conservation" measures with the goal of maintaining healthy fish and trust species populations and the protection of their habitats.

The National Ocean and Atmospheric Administration (NOAA) traces its roots to the 19th century with the establishment of the United States' first scientific agency, The Survey

[70] http://www.fws.gov/southeast/director/mission.html

of the Coast (est. 1807). Today, NOAA's services and scientific research--"from the surface of the sun to the depths of the ocean floor''--affects more than one-third of the United States' gross domestic product.[71] The labor of protecting sea turtles is assigned to NOAA's National Marine Fisheries offices and laboratories. NOAA Fisheries' national objectives include: the recovery and maintenance of protected species populations and the reduction of the conflicts that involve protected species. Basic and applied scientific research activities are some of the strategies NOAA employs to meet these objectives.

In the area of ocean and marine concerns, NOAA has been proactive in its development of ocean education programs and by involving the public in its scientific research endeavors. In the latter situation, a few examples with which I am familiar include: the marine fisheries observers and tagging programs (local fishermen regularly take scientists out on fishing trips to collect various types of data); oral histories research project about fishing; local fishermen's knowledge project (high school students interview local fishermen and others in fishing-related industries). NOAA's oral histories project, *Voices from the Fisheries*, "an archive of oral histories of recreational and commercial fishermen, and the communities and families that rely on them, documents the human experience with the nation's coastal, marine and Great Lakes environments and living marine resources."[72] And, NOAA's *Local Fisheries Knowledge Project* utilizes a place-based curriculum that teachers can integrate into their classes. Students enrolled in this project "explore the connection between fisheries, the marine environment, their communities, and their own lives. In the process, students document and preserve the rich knowledge and experiences of these individuals for future

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[71] http://www.noaa.gov/about-noaa.html

[72] http://www.nefsc.noaa.gov/press_release/2008/SciSpot/SS0817/Voices%20spotlight.pdf

generations."[73] I have highlighted the oral histories project, and the fisheries knowledge project, because each project also recognizes the significance of non-formal and informal learning sites.

Described on the NOAA Fisheries' webpage, the NOAA Fisheries scientists that are involved in sea turtle protection,

> ...implement research to support the conservation and recovery of threatened and endangered sea turtle species by conducting population assessments; research on stock structure (age and genetics); assessments of sea turtle mortality, strandings, and unusual events; and revision of Stock Assessment Reports for populations of sea turtles in the western North Atlantic Ocean. They also participate in research to reduce the bycatch of sea turtles and conduct in-water studies to evaluate population trends and habitat requirements. They participate in technology transfer of successful bycatch reduction measures."[74]

NOAA Fisheries' interests in sea turtles overlap with the interests of three, state-level divisions in North Carolina's Department of the Environment and Natural Resources (NCDENR): the North Carolina State Parks, the North Carolina Wildlife Resources Commission (WRC), and the North Carolina Division of Marine Fisheries (DMF). The mission statement for the North Carolina State Parks states that,

> The NC State Parks system exists for the enjoyment, education, health and inspiration of all our citizens and visitors. The mission of the state parks system is to conserve and protect representative examples of the natural beauty, ecological features and recreational resources of statewide significance; to provide outdoor recreational opportunities in a safe and healthy environment; and to provide environmental education opportunities that promote stewardship of the state's natural heritage.[75]

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[73] http://www.st.nmfs.noaa.gov/lfkproject/

[74] http://www.sefsc.noaa.gov/seaturtlesprogram.jsp

[75] http://www.ncparks.gov/About/agency_mission.php

The second agency within the NC DENR, the NC Wildlife Resources Commission (WRC), was the state agency in which the state sea turtle biologists (Humberto and Megan) held offices. Installed in 1947, the Wildlife Resources Commission's environmental concerns have focused upon the use, conservation, and management of the State's fish and wildlife resources. The two State sea turtle offices were a relatively recent addition to the WRC structure for prior to the *US Endangered Species Act (1973)* the WRC Wildlife Diversity Program did not exist.[76]

The protection of threatened and endangered sea turtles species by a state commission historically charged with managing the use of fish and wildlife game struck me as an odd match. I asked Humberto about this and he proceeded to outline for me the historic details:

> The Wildlife Resources Commission is the state agency responsible for managing wildlife in the State. And like many other states it's the traditional hunting and fishing agency. And that was their purview for many, many years; it still is their purview. But, as society becomes more urbanized, and more people are becoming more interested in non-game animals, they're beginning to put more time and effort into managing non-game wildlife. That's where sea turtles come in. The sea turtle program at the NCWRC is one of the oldest non-game programs. It's been around since the '80s I believe. And back in those days there were maybe 1 or 2 people that worked with the NCWRC that were responsible for all non-game species. So they did turtles, birds, eagles, salamanders, bats. And things have developed since then and they're really starting to develop now. I think we've just hired something like 5 to 10 new people recently in the non-game program. We call it the "Wildlife Diversity Program" now. And so now we have dedicated staff just for sea turtles (like me…and there's another person, Megan). And there's a dedicated person for shorebirds, there's a dedicated person for Cockaded Woodpeckers, for bats, for other herps [reptiles & amphibians]. The list goes on and on.

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[76] Created in 1983, this program was originally called the *Nongame and Endangered Wildlife Program*. The program "strives to prevent species from becoming endangered".

http://www.ncwildlife.org/pg07_WildlifeSpeciesCon/NONGAM~1.HTM

Humberto paused momentarily and I took the opportunity to ask, "how well have individuals from the different divisions worked together?"

> Well, there's some tension because the people who manage game lands and deer populations and hunters and duck hunters (and things like that), they're very traditional in their ways. But, they see society changing. The percentage of people in North Carolina who actually go out and hunt is going way down. So they see that as a threat to their livelihoods. And they feel frustrated because people in urban areas want to do more for the non-game species. I think that they feel a little frustrated because they don't get as much attention, maybe. OR…. I'm not sure how to describe it. But, they definitely feel the pressure that their worth is…has diminished in the eyes of the average citizen. Whereas, even though we're fewer in number in the agency—our section and our work is becoming more, more and more vital and responsive to public requests and things like that. But, you know, I think that with time as they get used to it things will get better. One-on-one, everything is great; I get along with everybody in the agency. We work together really well. Lots of people (who traditionally work on game lands) whenever they come to the coast they'll email me or call me (or Megan, or somebody) and say "oh, I want to see a sea turtle…how can I do that?" Generally, things are fine.

In my quest to learn something about the history of the various state agencies and their introductory forays into the protection of threatened and endangered sea turtles another question came to mind. "When does a sea turtle become a ward of the fisheries?" The answer to this, I discovered, depended on whether the turtle was dead or alive and whether the turtle was on the land or in the sea. In practice, turtle-related problems were actively addressed by more than one agency at a time.[77] For example, if a dead sea turtle washed ashore Bear Island with the cut-away of a gill net wrapped around its front flipper and its neck, the USFWS and the NC Wildlife Resources Commission coordinated their investigations of the turtle's death with the local NOAA Fisheries lab.

[77] Likewise, turtle-related difficulties were also addressed by more than one community of practice.

NOAA Fisheries, introduced earlier, stated that it managed its recovery and research efforts from an *ecosystems* perspective (http://www.noaa.gov/about-noaa.html). Whereas, in the last decade the North Carolina Division of Marine Fisheries (DMF) has implemented the NC *Coastal Habitat Protection Plan* (CHPP).[78] *Habitat* was the level of ecological analysis from which the DMF most currently managed its concerns. But, the DMF mission statement also indicated a period in time when the work was divided based upon species designations.

> The North Carolina Division of Marine Fisheries (DMF) is responsible for the stewardship of the state's marine and estuarine resources. The DMF's jurisdiction encompasses all coastal waters and extends to 3 miles offshore. The DMF can trace its roots back as early as 1822, when the North Carolina General Assembly enacted legislation to impose gear restrictions on oyster harvest. That was later followed by separate fish and shellfish commissions, which were combined in 1915 to form a commercial regulatory body. In 1965, the scope of the commission was expanded to include regulatory authority over recreational fishing activities in coastal waters.[79]

During the period in which I conducted my research on the *North Carolina Sea Turtle Protection Project,* I observed that the historical practice of species management was also, in practice, a present history. This history was evident in discourses, participants' interview comments, and in utterances made during casual conversations. Likewise, the North Carolina Wildlife Resource Commission's distinction between "game" and "non-game wildlife" underscored the Wildlife Resources Commission's ongoing practice of *species* management.

Finally, when I asked state and federal scientists and state employees outside of the NC Division of Marine Fisheries' what they thought about the Division's *Coastal Habitat Protection Plan* (CHPP) only one federal scientist and one state employee were familiar

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[78] Mentioned in the preceding paragraphs the North Carolina Division of Marine Fisheries was the third state-level agency (within the NCDENR) that collaborated in sea turtle protection efforts.

[79] http://www.ncdmf.net/ncdmf/whoisdmf.htm

enough with the CHPP to offer any insights.[80] Indeed, at the time, it seemed odd to me that there was so little recognition of the CHPP by the turtle biologists and the state park employees outside of the NC Division of Marine Fisheries. This was the case despite regular meetings (often announced as "open to the public") on fisheries and turtle bycatch. Clearly, knowledge production about the sea turtle, and about the practice of protecting sea turtles, was distributed. The distribution of knowledge was not the outcome of a specific community of practice's mutual engagements and shared repertoires. Additionally, the distribution of knowledge was also not an isomorphic product shared by all three communities of practice. Rather, the distributed nature of the knowledge about the sea turtle and about the practices of protecting sea turtles was a product of the structural couplings of the sea turtle's activities (as related to its life cycle and its seasonal migrations), an institution's ecological locus of practice, and a community of practice's mutual engagements and shared repertoires.

The Distributed Nature of Knowledge Production Concerning Chelonioidea and the Practices of Protecting Chelonioidea

Along with their shared knowledge of the sea turtle's life cycle and seasonal activities, it seemed to me that "habitat" would be the least common denominator around which the various agency stakeholders and their agents (i.e., scientists and state park staff) could best address turtle protection while also attending to some of the environmental issues of concern specific to each agency. However, the obviousness of "habitat" as a rational problem-solving focus assumed that the distribution of knowledge production (represented below in statements 1, 2, & 3) would be true for each scenario in Figure 4.3.

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[80] "Habitat", as I mentioned on the previous page, was the CHPP's focus of research, analyses, and environmental remediation.

1. Turtle ∩ (State Park ∪ DENR) = (Turtle ∩ State Park) ∪ (Turtle ∩ DENR) **False**

2. Turtle ∩ (Scientists ∪ DENR) = (Turtle ∩ Scientists) ∪ (Turtle ∩ DENR) **False**

3. Turtle ∩ (Volunteers ∪ Emerald Isle) = (Turtle ∩ Volunteers) ∪ (Turtle ∩ Emerald Isle) **True**

As in algebraic set theory:
∩ = **the intersection of activities**
∪ = **the union of activities**

Also:
= practices of a community
= practices of a community's participants

Figure 4.3 Distribution of Knowledge Produced at Intersection Between Communities and Sea Turtle Activities

Albeit post-structural, a community of practice is a structural entity. Throughout his text Wenger describes communities of practice as structures. For example, Wenger observes that,

> "To assert that learning is what gives rise to communities of practice is to say that learning is a source of social structure (1998, p.96)."

This is one of the many observations in which Wenger defines the structural nature of communities of practice.[81] Lastly, a community of practice may be recognized as a structure because it is self-regulating (*mutual engagements*), it is self-efficacious (*joint enterprise*) and its activities and practices are characteristically transformative (*shared repertoires derived of the duality of participation and reification*).[82]

Returning to Figure 4.3, although the sea turtles' activities were subject to changes based upon season, and transformations associated with its life cycle, the sea turtles' activities on the whole occurred regularly. If we consider the {sea turtles' activities} as they intersected with the {practices of a community} or {the practices of a community's participants} only in scenario number three did the distribution of knowledge produced

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[81] The cited comment is taken from Wenger's (1998) discussion of learning in communities of practice as an emergent phenomenon. Emergent processes are also a trait of structures more generally.

[82] For example, see the text by Piaget (1970) *Structuralism* and the chapter in Varela (1979) titled "The Idea of Organizational Closure". See also the chapter titled "Community" in Wenger (1998) for detailed discussion of three dimensions of community of practice: mutual engagement, joint enterprise and shared repertoires.

emerge from practices at the community level. This continuity in knowledge's distribution was evident despite occasions of transformation and discontinuity in the volunteer community or amidst the practices of the Emerald Isle participants. By contrast, in scenarios one and two the production of knowledge in these settings was not wholly distributed at the level of each community.[83] [84]

The findings represented in Figure 4.3 do not suggest that the scientist community and the state park community were not communities of practice. They fit the measure of a community of practice (Wenger 1998, p. 125). Rather, to understand the distribution of knowledge produced at the intersection of sea turtle activities with the scientist community and with the state park community respectively, one's analyses need reflect a quantum logic. Additionally, to pursue further a formalized quantum analysis of this extant structural tension between continuity and displacement--present, in matters of cognition in practice--my recommendation would be to conduct such an analysis with the employ of *non-distributive concept lattices*. This analysis is beyond the scope of the present manuscript. However, the works of Widdows (2004) and Varela (1979) are both excellent resources for initiating endeavors in this direction.

At this point, turning to two interviews from the study I want to show how knowledge about the sea turtle and knowledge about the practices of protecting sea turtles was

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[83] From an analytic perspective, Wenger (1998). defines the concept of community of practice as a "mid-level category" (or structure). To clarify his observation Wenger states, "It is neither a specific, narrowly defined activity or interaction nor a broadly defined aggregate that is abstractly historical and social (1998, pp. 124-125)." In other words, I suggest, it is a post-structural structure.

[84] Recall from the previous section, "The Agencies", that the scientists and park staff affiliated with North Carolina's DENR hailed from three different sub-agencies of the DENR: Rianna, Humberto & Megan were scientists with the Wildlife Resources Commission (WRC), Wesley was a scientist with the Division of Marine Fisheries, (DMF) and the Hammock's Beach State Park staff were affiliated with the DENR's Division of State Parks. "Species" was the ecological focus of practice for the Park staff and for the WRC scientists while "habitat" was the ecological focus for DMF scientists.

distributed. The example from the study that I include here concerns the topic of shrimp trawling and the use of Turtle Excluder Devices (TEDs) by shrimp fishermen to eliminate sea turtles' deaths by drowning.[85] Additionally, it is an example of the study's findings related to the distribution of knowledge produced in the scientist community as represented in statement number 2 in Figure 4.3:

Turtle ∩ (Scientists ∪ DENR) = (Turtle ∩ Scientists) ∪ (Turtle ∩ DENR)

The study example I include here is taken from the transcripts of interviews I had with two scientists: Wesley (a scientist from North Carolina's Division of Marine Fisheries) and Humberto (a scientist from North Carolina's Wildlife Resources Commission). It is important to recall that the NC Division of Marine Fisheries and the NC Wildlife Resources Commission were each part of the larger North Carolina agency, the North Carolina Department of Environment and Natural Resources (DENR).

The context of my conversation with Wesley was centered upon the Division's *Coastal Habitat Protection Plan* (CHPP) and the protection of sea turtles and the Division's education activities. In the narrative below Wesley was educating me about the CHPP and the practices of sea turtle protection.

> There's an area off Topsail Island from New River Inlet down to Rich Inlet (which is the New Hanover-Pender County line). Out from right off the beach to a mile (or a little bit more off the beach) is a traditional trawl area where turtles were taken as well. And, we have a Section 10 Permit which we [DMF] manage that. And it is a very unique fishery (there's not too many boats left in it). But they trawl in—I can't remember the name of the species—in a macro-algae bottom and the shrimp are in the algae. The shrimpers trawl the algae and the shrimp. They can only trawl 15-20 minutes at the most and their nets

[85] Sea turtles have lungs and are therefore air-breathers. Sea turtles can remain underwater for an extended period of time but eventually they need to re-surface and gulp some air. If a sea turtle is accidentally caught in a shrimp trawlers nets, i.e., they are "bycatch", the time a sea turtle remains caught underwater in these nests may exceed the amount of time a sea turtle can survive underwater before surfacing for more air.

> fill up. They bring 'em aboard and dump them on deck and sort the fish and shrimp out and everything goes overboard.
>
> So, it's a very short tow time and turtles are not hurt. And if and when a turtle is captured then over he goes. There haven't…there's been virtually no mortalities that I'm aware of. The unique thing about it is they [the shrimpers in this fishery] don't have to use TEDs because their tow times are short and because they're [the turtles] easily observed in the water ('cause they're close in to the beach).

In this narrative passage, knowledge about sea turtles was shared:

> *So, it's a very short tow time and turtles are not hurt.*
>
> *The unique thing about it is they [the shrimpers in this fishery] don't have to use TEDs because their tow times are short...*

By shared, I mean that knowledge about the relative risks to sea turtles due to relative lengths of trawling times was knowledge shared alike by all of the communities (scientist, state park staff, and volunteer) involved in the *North Carolina Sea Turtle Protection Project*.

At the same time, Wesley also related knowledge about practices of sea turtle protection from the perspective of *habitat*, i.e., his and his agency's ecological locus of practice:

> *And it is a very unique fishery (there's not too many boats left in it). But they trawl in—I can't remember the name of the species—in a macro-algae bottom and the shrimp are in the algae. The shrimpers trawl the algae and the shrimp. They can only trawl 15-20 minutes at the most and their nets fill up [with algae and shrimp].*

Now, consider a narrative from one of my interviews with Humberto--the biologist affiliated with North Carolina's Wildlife Resources Commission (WRC). The topic here also centered on TEDs and sea turtles and algae.

> [KC]: I saw a film that promoted the economic benefits (to the fisherman) of using TEDs (they save on gas, they catch more of what is intended, etc…). Are the TEDs fairly effective?

[Humberto] Um…yes, they are when they are used properly. Like anything, there's pros and cons. So TEDs do work if they're installed properly. They're not always installed properly and there are various reasons for that. But, really what that means is that you need some kind of enforcement and spot-checking —which, we don't have here in North Carolina for various arcane reasons. STUPID REASONS, and I hope that changes in the future. But it's just another indication of how crazy administrative problems--small administrative problems--can get in the way of effectuating decent management.

But, there's also the issue of a turtle that is caught and then excluded through this device. If it's re-caught again and again and again, there is some…there have been some studies that suggest that repeated capture and release does negatively impact turtles and can still kill them eventually.

The fishermen actually trawl in a line off-set along the coast and then turn around and come back and then go back again. So, they could potentially catch and release the same turtle 4, 5, or 6 times. And that cumulatively could have a negative impact. So it's not, it's not a perfect solution I don't think. But, ah, it's better than nothing…that's for sure. And not just turtles but general bycatch—in reducing general bycatch they're great.

[KC] The film suggested that with TEDs fishermen are able to catch more of what is intended. Is that true?

[Humberto] Their target species...yes, that's true. Although, I have to tell you that North Carolina has the only exemption zone where shrimpers can get away with not using TEDs legally. And that's off of Bear Island, actually. And that's because the DMF has requested from NOAA NMFS this exemption, saying that, "there's too much algae in the water and that the algae will clog up the TEDs and make them inefficient." Just one of our special little details in North Carolina!

Undoubtedly there was ongoing conflict over North Carolina's coastal Atlantic commons. As in the narrative with DMF scientist, Wesley, knowledge about the sea turtle was evident throughout WRC scientist Humberto's transcript. On the other hand, this last interview transcript related knowledge about the practices of sea turtle protection from the perspective of *species*. The WRC biologist Humberto's focus upon "species" in this latter case corresponded with the Wildlife Resources Commission's ecological locus of practice,

i.e., species. The WRC biologist concluded that administrative problems were the causes of disconnect between how practices of sea turtle protection were understood in the science community

> *But it's just another indication of how crazy administrative problems--small administrative problems--can get in the way of effectuating decent management.*

Problems of knowledge practices can be "crazy administrative problems" if primacy is granted the global perspectives of either institutional stratification or of traditional structuralism. Alternatively, if we adopt the analytic perspective of Lave's (1988) "activity of persons-acting-in-setting" then we avail ourselves of the additional possibilities of understanding how knowledge is produced and distributed in practice.

Connections and contentions between and among the sea turtle conservation communities of practice surfaced in additional material from the study. At the end of this chapter I detail a conflict about practices of [sea turtle] nest relocation. Before embarking on this final section of the chapter, I relate in the upcoming section a third part of the history contributing to the creation of the *NC Sea Turtle Protection Project.*

Already in this chapter I have discussed the life history of the sea turtle and the social history of the state and federal agencies that began to collaborate on sea turtle protection efforts with the establishment of the *US Endangered Species Act* (1973). All of the people practicing in both the scientist and in the state park communities of practice were employed by one of these state and federal agencies. Toward the latter portion of the discussion of these histories I introduced some findings from the study that demonstrated how knowledge about the turtle, and knowledge about the practices of protecting the sea turtle, was produced via

structural couplings of the sea turtles' activities and a community's practices or the practices of a community's participants. According to Varela (1979) structural couplings of this type can cause perturbations the likes of which can affect structures associated with cognition in practice. These perturbations can translate into emergent practices of connection and disconnection that--when formally viewed outside of quantum logic--appear to produce distributions of knowledge practices unlike one would expect when conducting post-structural analyses that employ the same techniques of Boolean algebra that have been used in more traditional structuralist analyses.

The events of this next history transpired during a period of time in which the North Carolina Wildlife Resources Commission (WRC) began to entertain the possibility of employing a sea turtle biologist. It was during this period of time that the development of the sea turtle communities of practice began to accelerate.

Anchoring the NC Sea Turtle Protection Project and Development of its Communities of Practice

Late in Fall 2006, I took a road trip to the Eastern Shore of Virginia to meet with North Carolina's first full-time state sea turtle biologist, Rianna. It had been several years since Rianna had left her post for Virginia's Eastern Shore. But the long-time Emerald Isle volunteers remembered working with her, and Rianna easily recalled the five years she worked with them in helping to buttress the already established *NC Sea Turtle Protection Project*.

In the mid-1990s Rianna was hired by North Carolina's Wildlife Resource Commission (WRC) for six months on a contract basis. She renewed her contract with the State a number of times and during her tenure succeeded at making the office of the state

biologist a permanent full time position. She was the only state sea turtle biologist during the yeas she worked with the WRC and only occasionally was she assigned an assistant. In the NOAA Fisheries lab Rianna did meet some other sea turtle biologists doing work in North Carolina's coastal waters. In contrast to the initial focus of Rianna's work, the NOAA scientists' work dealt primarily with fisheries and sea turtle mortalities. Toward the end of the five years that Rianna worked with the WRC she began collaborating with North Carolina's Division of Marine Fisheries (DMF) on gill net regulations.

> Toward the end there, I did start to work with DMF regarding gill net regulations for the fall gill net flounder fishery because we were seeing huge spikes in mortality in the fall. And they were in denial for the longest time. The last year I was there [the WRC], in January 2001 I gave a talk at the first annual sea turtle meeting that the Division of Marine Fisheries held. Which, that was a major step for them because they finally recognized it as a big enough issue that they had to deal with it. North Carolina had just unbelievable sea turtle mortalities.
>
> I asked Rianna what were the goals of her office. Laughing she replied,
>
> Well, when I first started the only direction I received was "Here's a list of volunteers." I had started in April and they said, "And you have to hold a state sea turtle meeting in May" [laughs]. And, I had no data and I'm scrambling to get stuff together for it [the May meeting]. So, truly it evolved as I worked through it.
>
> And I remember the first live sea turtle stranding I had to deal with. I had no idea who to call! I ended up bringing it to the North Carolina Aquarium. And Rowdy Madison who is the curator is good buddies with a veterinarian at the vet school [in Raleigh]. So, there was this immediate connection with the vet school and that ended up being extremely profitable for everyone involved. Because not only did we get good baseline information on the physiology of sea turtles--and we were able to rehab a lot of animals successfully--but it was also great for the students at the vet school because they got experience working with sea turtles.
>
> That was really...it was like this killer...it just developed into this great program and Jean Beasley [of Topsail Island Sea Turtle Hospital] was able to

> take advantage of the vet school and developed a very close relationship with them. And, there was also a veterinary graduate student who was very instrumental in getting a nice program going with the *Sea Turtle Project*. He showed us so much on-the-ground rehab stuff to do!
>
> And, it was so good for the volunteers too. Because finally the whole effort of rehabilitation was finally being taken seriously. Whereas before, there was never anyone to call and the Aquarium really didn't have the staff nor the resources nor the know-how to deal with them (or the desire a lot of times). Anyway, it was a great fit!

To date, the connection has remained strong between the veterinary school and the Topsail Island Sea Turtle Hospital and the *NC Sea Turtle Protection Project*. The veterinary school's involvement has increased and expanded. As a regular part of their program of study, for example, veterinary students interested in the exotic medicine curriculum do rounds at the Topsail Island Sea Turtle Hospital.[86]

Eager to learn about the experiences she shared with the volunteers, I asked Rianna to tell me about her first meeting with the volunteers. Rianna burst out laughing.

> Oh it sucked! That first meeting was so bad because I had no clue! I wasn't familiar with the data, I didn't know any of the people.... And, I think they felt slighted because there wasn't a permanent position in place. So, they felt like they weren't being taken seriously enough and they had an attitude. And me being completely clueless...I think some walked out early. It was horrible!
>
> So, the next year I was bound and determined to not have that happen again [laughs]. They probably saw me as just another person who's going to stick around for 6 months and then leave. And, literally...I had the data, I knew how to interpret it. But it wasn't anything I was real familiar with. And I had no idea where they were coming from and what they expected or anything like that.

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[86] In 1997, the Karen Beasley Sea Turtle Rescue and Rehabilitation Center (i.e., the Topsail Island Sea Turtle Hospital) was founded by retired school teacher, Jean Beasley, in memory of her daughter who had died of cancer. The Center is staffed by all volunteers and each summer it offers several student internships. Jean Beasley was named *Animal Planet's* "2007 Person of the Year". Prior to receiving this honor, Jean was also officially recognized by the international community of sea turtle scientists as a fellow sea turtle expert. This was particularly remarkable because Jean never trained as a sea turtle biologist. Her learning and her expertise developed in practice.

Listening to Rianna, I was surprised to learn that the volunteer program had been established before the WRC had started to hire contract sea turtle biologists. A former wildlife biologist with the WRC had helped establish the volunteer program. According to Rianna the biologist "did what he could, but he had other responsibilities." Rianna went on to expand about this.

> The volunteer program was initiated in a sort of haphazard way in 1980. But there wasn't really a huge effort to do a lot of training. They would be issued permits and beyond that there wasn't a whole lot. When my predecessor [a contract sea turtle biologist] came on board, she actually solidified the program greatly and did a lot to pave the way so that when I came on there was something in place.

I asked Rianna, "In what kinds of practices did you have the volunteers participate?"

> Initially, we got slammed right away with strandings. I was forced right away out of necessity to focus on strandings and mortality issues. So, I immediately started getting them calipers and stuff that they needed to start collecting information and reporting in a timely fashion. NOAA started requiring weekly reports, so I had to get on them to call immediately and I held a lot of stranding training workshops at all of the different beaches. I felt bad that I couldn't spend a lot of time on nesting. But, once we got the stranding reports going I started giving necropsy workshops so that those people who were interested we could give them some basic information. Some got into and others didn't [laughs]. But, I think they enjoyed being shown how to do it. It wasn't until my third year that I was able to focus on collecting information on the beaches--nesting information, getting them GPS instruments. What I had started to increasingly see was that the number of nests getting moved. (Probably, for not a lot of good reasons!) So, I needed to work on changing that mindset and hammer that home a bit more. That was a bitter fight that I'm sure Humberto is still dealing with.

Nest Relocation: Negotiation of Meaning and Some evidence for Learning

In terms of sea turtle conservation and methods of protection, a freshly laid sea turtle nest may be relocated if the nest is likely to succumb to erosion, high tide flooding, predation, poaching, or damage due to foot or vehicular traffic. Relocation of a turtle nest can

also introduce problems and compromise hatchling success. For example, bacteria and viruses may be introduced by individuals handling the eggs. More immediately eggs may be damaged during relocation. And, with nest relocation temperature change may be introduced. A temperature change can affect the relative sex ratio of a nest. Eggs exposed to cooler temperatures result in more male hatchlings whereas warmer temperatures promote the development of more female turtles. The biologists with the NC Wildlife Resources Commission and the sea turtle coordinators at Hammocks Beach State Park considered nest relocation a last resort conservation practice. It was best to let nature run its course.

However, as during Rianna's tenure with the state of North Carolina, nest relocation was a point of contention between the scientists and the volunteers during the period in which I conducted my research. Because Bear Island was undeveloped, relatively uncrowded, and Hammocks Beach State Park prohibited vehicular traffic on its beaches, sea turtle nests on Bear Island were less likely to be destroyed by human activities than sea turtle nests on Emerald Isle. Extensive commercial and residential development on Emerald Isle had flattened and eliminated many of Emerald Isle's sand dunes. (Without sand dunes, barrier island beaches erode and disappear.) Consequently, sea turtles often ended up laying their nests below the high tide line on Emerald Isle's foreshortened and dune denuded beaches. These nests were subject to being inundated by regular high tides and eventually the drowning and death of all the developing sea turtles within. Additional motivations to move sea turtle nests on Emerald Isle included: seasonal vehicular traffic and the heavy foot traffic associated with summertime tourists and visitors. From the perspective of the volunteers--responsible as they were for protecting the nests and insuring the sea turtle hatchlings' safe

passage to the ocean's edge--"letting nature run its course" was not the best axiom. Greater human intervention in the protection of Emerald Isle's nests and nestlings was necessary.

Unlike Bear Island, volunteers would begin to sit around a nest within the days right before its estimated hatch date. On Bear Island nests hatched unattended and approximately 5 days post-hatch we excavated the former nest(s) in order to assist any remaining live hatchlings out of the nest and on their way to the water's edge.[87] We also tallied the total number of eggs hatched, eggs not hatched, and recorded the number of hatchling deaths (if any). Once a nest hatched on Emerald Isle volunteers immediately assisted the hatchlings to the water. First, they would comb a runway into the sand leading from the nest down to the shoreline. The runway smoothed over all of the footprints, sandcastles, and various craters and holes in the sand created by people playing on the beach...seemingly harmless topographic features. For a sea turtle hatchling (about the size of the top of a soda can) sand holes dug with plastic shovels and pails, adult-size footprints, and sand castles, were formidable impediments and could easily hinder a hatchling's successful scramble to the surf. The hatchling ramp also encouraged the baby sea turtles to orient toward the light that naturally reflected off the surface of the ocean (moonlight, starlight, or sunlight).[88] The significant backdrop of artificial light on Emerald Isle bore the potential to disorient the turtles and cause them to crawl away from the surf.

Additional human intervention in the lives of Emerald Isle's sea turtles was indicated and was condoned by the sea turtle biologists. Nest sits and hatchling ramps were acceptable interventions for potentiating survival of these threatened and endangered reptiles. Yet,

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[87] Emerald Isle volunteers also conducted post-hatch nest excavations.

[88] As with many other species, including human beings, sea turtles utilize light to navigate.

concerning nest relocation, a line was drawn in the sand. This line of contention between the scientists and the volunteers was a site for the negotiation of meaning between communities of practice--especially, the volunteers and the scientists. An historical and rich boundary process ongoing between the scientists and the volunteers, the contest over nest relocation between the two communities could provide evidence for learning.[89]

Emerald Isle's foreshortened beaches increased the necessity of nest relocation but the state of the beaches also gave reason for not relocating the turtle nests. Emerald Isle was one of the locations included in North Carolina's 50-year shore protection plan--a plan designed by the US Army Corp of Engineers. During Summer 2005 phase III of the shore protection plan was being implemented on Emerald Isle. Almost completely financed via voter-approved bond referendums, Emerald Isle's beaches were to be nourished and Bogue Inlet was to be to be re-aligned to avert erosion of the west end of the island caused by Inlet currents. Foreshortened island beaches may be replenished and widened via beach nourishment.

Nourishment is accomplished by pumping dredged sediment on to existing beaches. The quality of the sediment placed on the beach depends upon the source of the dredged sediment (e.g., offshore, on land, inlets, etc...). Sediment may vary in color, texture, and relative content (e.g., sand, sand and rock, sand and broken shell matter). An entire near shore ecosystem can be ravaged by pumping dredged sediment on to beaches (Neal et al 2007, p.205). And, all kinds of organisms--including sea turtles--may be maimed or killed if sucked into the dredge pump (see Figure 4.3).

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[89] According to Wenger, a community of practice's longtime existence also serves as evidence of learning (1998, p. 256).

During the summer 2005 Bogue Inlet dredge and nourishment project some adult sea turtles were inadvertently caught in the dredge pump and killed. That summer the state sea turtle biologists also insisted that the Emerald Isle volunteers not relocate turtle nests. In connection with the beach nourishment project, the state sea turtle biologists were charged with conducting a study of the possible effects of beach nourishment on the sex ratio of sea turtle hatchlings.[90] Sand dredged from Bogue Inlet was being pumped on to Emerald Isle's

Figure 4.4 Dredge re-location of sand and sand inhabitants.[91]

beaches and the Inlet sand was darker in color than the original beach sand. If the sand was darker in color, it could conduct more heat and raise the temperature of sea turtle nests. Warmer temperatures could contribute to the increased development of female hatchlings.

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[90] County and federal agencies funded the beach nourishment turtle study (Godfrey & Holloman 2005).

[91] Photo credit: www.dcsc.tudelft.nl/.../ Old/project_rb_jb.html

Other potential impacts included the possibility that the dark sediment could create nest temperatures that were too hot for successful incubation or that the nourished material was too compact for successful nest construction (Godfrey & Holloman, 2005). To insure adequate study sample size, the biologists instructed volunteers that turtle nests were not to be moved. Consequently, low-lying nests were inundated with water and a number of Emerald Isle sea turtle hatchlings were presumed drowned that summer.

By the time I returned to Bear Island late spring 2005, the contest between the Emerald Isle volunteers and the state sea turtle biologists was already under way. Several Emerald Isle volunteers had quit and the nesting season had just started. State employees at Hammocks Beach State Park were beseeched to aid the remaining Emerald Isle volunteers on their days off work. Having unpacked my gear and settled into the Bear Island barracks for the summer once again, I caught up on some of the nesting news. Emerald Isle volunteer, Elaine, was one of the first individuals to give me some details:

> We volunteers look after these nests: we stake 'em off, we keep 'em safe, we look at them everyday. And if there's a nest close to a tide line…. I mean after a while you can look at a nest and know whether it's going to get over-washed and drown. We've had so many nests when we dug into a nest on day 90 or whatever and found, you know, a hundred drowned hatchlings.
>
> So, its kind of like, because we can't do that because...we're precluded from doing that even when we request it—"This nest is really in a bad spot,"... The scientist's reply, "No, you can't move it", because they're doing their project.
>
> It's their scientific project: the biologists, the State supervisors, the project coordinators with the State. The scientists <u>are</u> the project people. And so, you know, excuse their "stats". If a nest gets moved they can't really count it as a successful hatch because it's been manipulated by moving. But, it's also a zero hatch if it gets over-washed and drowned.

Elaine was a veteran sea turtle volunteer. She was a volunteer before Rianna had taken the helm as the North Carolina's first full-time state sea turtle biologist and therefore had years of experience as a turtle volunteer without much support from the state nor involvement from the scientific community. To the point, Elaine rejected the biologists' recourse to "their stats" to buttress their position. At the same time, Elaine was also well aware that some of the biologists' power to sway the debate derived of alliances with economic and cultural forms of institutionalized power. "The scientists are the project people," Elaine observed.

Cal, another longtime turtle volunteer and volunteer coordinator, reiterated the volunteers' convictions and confirmed their joint enterprise:

> It's hard to see—to stand by under orders—and say you can't move that nest and watch that thing wash away (you know, all the little turtles get killed). "Let's take it out of the study." If we think it's going to drown and lose all the study evidence it has—let's just move it out. Call it "drowned" if you like—but, we're going to have some live turtles! That suggestion has been made many times—LOUDLY.

In addition to outright rejection of the scientists' claims to statistical necessity, the volunteers criticized another element of the scientists' repertoire: the study "control". During summer 2005 Bear Island was designated as the study control. Bear Island beaches had not been nourished and were therefore regarded by the scientific community as a suitable control for comparing nesting outcomes on Emerald Isle's nourished beaches.

On two counts, I was impressed by the volunteers' critique of the designated study control. First, except for Cal--a former professor of geology--no member of the volunteer community of practice had been a professional scientist. Second, the concept of a scientific "control" is not easily comprehended by students of science and non-scientists. I have

concluded this after years of teaching an introductory biology laboratory course at the University of North Carolina. A control sample is the sample to which one compares the experimental case. Upon introduction of the independent variable and comparison to the experimental sample the control is expected to demonstrate “no change” or the “absence of change”. A control helps to insure that the measured effect in the experimental case is due to the independent variable and not some other intervening variable. Confounding variables should be held constant for experimental and control cases alike.

In the 2005 nesting study, the independent variable was “beach nourishment”. The control, Bear Island, had never been nourished. Presumably hatchling sex ratios and hatchling success would not vary from the norm. Upon comparison, the experimental case of nests laid on Emerald Isle’s nourished beaches was expected to show sex ratios and hatchling success rates that differed from the norm as a result of the non-beach sand introduced with nourishment of Emerald Isle beaches. The volunteers criticized the use of Bear Island as a control because turtles that nested on Bear Island were unlikely to also have nested 1 mile east on Emerald Isle. Adult sea turtles return to their native beaches--the beaches upon which they hatched--to lay their nests. The volunteers’ critiques revealed both content knowledge about sea turtle nesting habits and conceptual understanding of the purpose of a scientific experimental control.

At the same time, the state sea turtle biologists were trying to mitigate extraneous variables by insuring an adequate sample size and placing a moratorium on nest relocation. I asked Humberto, one of the state sea turtle biologists, if he could tell me more about the study.

On almost all developed beaches in the State there are [beach] re-nourishment projects that have either recently occurred or are going to occur in the near future. Our, agency [WRC] set up with the [US Army] Corps of Engineers to do an environmental impact assessment study specifically on sea turtles (for nourishment) to see if by putting new sand on the beach that has an impact (a) on the number of turtles nesting (b) on the hatching success and (c) on the sex ratio because darker sand will give you warmer temperatures.

So, you know, that's a lot to study. And so when we started this off in 2002—that was the first year I started—one of the ways to study it, I said, "we have to minimize any extraneous factors that could have an impact." You know…to minimize the variables.

And one of those variables is [nest] relocation. So, I said, "on Emerald Isle for the duration of the study we're not going to move ANY nests." And that did not go over too well. At first it did not go over well at all. There was quite a bit of negative response to that. Which, you know, I can understand. And, and I have never thought that…thought that relocation is a bad thing. I think it is a proper tool; I think it's a tool that can be properly used in certain cases.

But, I think in North Carolina it's overused. Um, there have been some years when up to 60% of the nests have been relocated. Which, [that] is "crazy". Because that means that…I mean how could turtles survive that long if they were laying their eggs in the wrong place.

So, anyway, I said "for the duration of the study, no relocation." It took a few years—I'd say at least half of the volunteers tell me that they accept it and understand "why". I know that there are several—a handful of people—that are still really upset about it. And I understand that. I know it's hard when you're working—you're putting your time in—and you feel like there's an action (a simple action) done to save a turtle.

But—and I've tried to explain this many times—on the larger scale, if we lose a few nests we're learning more about [beach] nourishment (which will occur again and again and again). If the information helps us to maximize the benefit of the nourishment, or minimize the negative impact, that will have a larger effect than saving one [nest].

If you relocate a nest and it doesn't have a good hatch rate you don't know if it's because of relocation, if somebody didn't wash their hands that morning, somebody had sunscreen on, or due to the new sand on the beach. It's just one of those variable that's difficult to deal…, deal with.

I responded by introducing the volunteers' suggestions to relocate threatened nests, remove the nests from the study, and to not count the turtles that hatched from those nests. "There is also the 'threatened species' factor," I began, "you have a [research] project but then there's the *Endangered Species Act* (1973). So, would it impact the study to just pull those [moved] nests out and not count the turtles?" Humberto replied,

> So, why not do that? Ah, because sample size is too low. See, if this were Florida I would have no problem with that. Unfortunately this is not Florida; we're really struggling to have a decent sample size to make our analyses work.
>
> You could ask the larger question: yeah, these species are "protected"…why don't we do everything we can? You know, back in the old days (like 30 years ago) people would just take all the eggs, put them in Styrofoam boxes, put them in incubators, and they would get nearly 100% hatch rate and then they just let them go in the water. Well, that's really invasive: one, it's really invasive; two, we've discovered since then that all those eggs incubated in Styrofoam boxes were very cold and therefore produced nearly all males. So, you're skewing the sex ratio; we don't know its affects on fitness. So, our philosophy and the philosophy of the Federal agencies is to try to—when we're managing these animals—is to try to make the programs emulate the natural system cycle as much as possible.
>
> Now, turtles, naturally they lay a few nests too close to the water. And that just happens and that's the way it goes. Strictly speaking I'm sure if—in a perfect world where there were no other threats—we would never have to relocate any nests. And the populations would be fine. In fact, Florida has very limited relocation and they lose…they probably lose 10,000 nests a year to erosion. So, I mean it's all a question of—I mean, what scale you're looking at and how broad you want to consider the issue.
>
> I think one of the problems on Emerald Isle is that people become so focused on "the one nest", or "the one egg", that they lose sight of the big picture. And, I keep trying…I try…I try to draw them out to look at the larger picture. It's worked with some people; definitely it hasn't with others. And it probably will never work with some people. That's fine, you know, I…I'm glad that people have their own opinions—are willing to fight for what they think. But, on the other hand, they do…we have to follow the rules and regulations.

> They will call me every year. They call me every year and say, "hey, we've got this nest we really think you should come look at it." I'll go talk to them and we'll discuss it.

The scientists never viewed the volunteers as "anti-science". It was evident in the interview transcripts--of which, some examples I have included--that the veteran volunteers participated in the discourse of science. And, the scientists re-affirmed this observation for me in Spring 2006 at the annual state sea turtle meeting. The schedule of presentations and the presenters themselves clearly recognized that the scientific community was cognizant of the volunteer community's scientific literacy.

However, on a few different occasions the two state sea turtle biologists remarked that the volunteers needed "to look at the larger picture".

> [WRC biologist, Megan]: I think a lot of the volunteers would like to see huge numbers of turtles nesting on their beaches and hatchlings that make it safe to the water and beaches that aren't littered with garbage and people with flashlights and things like that. So, in their ideal world there'd be a beach where everybody complied with a lighting ordinance and turned off their lights and it was really dark. And, people behaved themselves at night when they were just walking around at night on the beach [laughs]: people didn't set off fireworks, and they left the turtles alone. Turtles would be in such great abundance that there would be just nests everywhere.
>
> But, at the same time I think there's sort of this drive to become a little too focused on sea turtles. You know, to the point where…people hate foxes and they hate ghost crabs, a lot of things that are completely "natural." If you lose a nest to a hurricane, it's horrible! Of course, if you're trying to save sea turtles you don't want to lose 120 eggs. But, that's been happening for millions of years and there's not a lot we can do about it.
>
> So, I think sometimes it's hard to get too focused on wanting to save every single turtle and forgetting that the reason "why" we need to save the turtle when we can is because of the "human involvement". And we can focus on ways to improve that as opposed to getting mad at every fox that has messed up a nest and chasing ghost crabs down the beach (throwing shells at them).

> I think ideally, you know, a lot of the people we work with they're just…they love it when we have lots of nests and they complain when we don't have very many. And, I think that they feel they have control over potentially… "well, if we didn't have foxes on the beach," "…if we could just cage all the nests," and, "we could kill all the ghost crabs," "…if we could move all the nests every time a hurricane comes then, you know, we'd be in better shape."
>
> But, that's not really…that's kind of a very short focus. I think that the problem lies elsewhere but that's not as fun to focus on and that's a little more confrontational [laughs].

Setting aside the discourse of science and "larger pictures" momentarily, Wenger's (1998) idea of *boundary practices* restores the level of analysis to the activity of persons-acting-in-setting. Boundary practices combine participation and reification (Wenger 1998, p. 115).[92] Those that occur between communities of practice often involve an identifiable *boundary object* or *boundary enterprise* and conflict may also be present in terms of negotiations of meaning and power. As a boundary enterprise, nest relocation was a figurative crossing of the human-nature boundary. Here, the practice of nest relocation recognized the intertwining lives of humans and turtles on Emerald Isle's foreshortened beaches. The volunteers' reification tended to be *Edenic*--everyone was permitted to stay on the beach as long as they behaved. The scientists, too, were not without their politics of reification in this boundary enterprise. The tools of their politics were "their stats" and "the rules and regulations".

Wenger cautions that while reification can mobilize people to take a stand via interpretation and coordination there is a risk of its embodying and reinforcing the very boundaries it is meant to cross thus confirming the cynicism of the intended audience (1998,

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[92] The negotiation of meaning that occurs at the site of boundary practices is a product of the mutuality of participation and reification. See Wenger's (1998) chapter titled "Meaning."

p. 111). Indeed, the volunteer community's determined focus on sea turtle nests to the exclusion of people cavorting and misbehaving on the beach prompted some of Megan's observations about the volunteers as noted earlier.

> *...beaches that aren't littered with garbage and people with flashlights and things like that.*
>
> *...a beach where everybody complied with a lighting ordinance and turned off their lights and it was really dark. And, people behaved themselves at night when they were just walking around at night on the beach: people didn't set off fireworks, and they left the turtles alone.*

The volunteers' reifications unintentionally reinforced the human-nature boundary it was intended to cross. The cavorting and misbehaving humans were cast off the beach and out of nature. Megan's and Humberto's critiques of the volunteers' "short focus" and their need to "look at the larger picture" likewise confirmed that the volunteers' reification of nest relocation had served to reinforce the human-nature boundary it was intended to cross.

Lastly, in terms of this chapter's overall focus upon *the collective senses of interactions between humans and non-humans that developed in conservation activities undertaken by the State, the scientists and the grassroots volunteers*, what was the meaning of Humberto's pronouncement "they do...we have to follow the rules and regulations."? It was a reminder that the power and influential politics of a larger social and economic constitutive order could not be denied nor assumed to have little or no effect upon the negotiations of power that occurred within and between these local sea turtle conservation communities of practice.

Wenger states that "the texture of continuities and discontinuities of [a community's] landscape is defined by practice, not by institutional affiliation (1998, p. 118)" In the sense

that science is a cultural institution I disagree with Wenger on this point. Earlier in the chapter, for example, I highlighted how (in this study) the scientists' approaches to knowledge about the practices of sea turtle protection were influenced by their respective affiliations with state-level agencies. Each scientist's ecological locus of practice matched the ecological locus of practice of his/her affiliated state agency.

Wenger remarks that issues of social power are addressed through formations of identities and explains that he allies his conception of power with theorists who have emphasized in their works the symbolic realm as the location of social power, e.g. Bourdieu, Foucault, and Gramsci (1998, p. 284). Additionallly, Wenger proposes that this conception of power "does not directly address the concerns of traditional theories of institutionalized power in economic and political terms (1998. p. 284)." If by "traditional theories of institutionalized power" Wenger means *repression* then I agree with his conception of power.

Having said this, the practice of science is undeniably mediated by the fabric of society.[93] Consider for example these observations by UC Berkeley physicist, Charles Schwarz, in his essay titled *Political Structuring of the Institutions of Science*.[94]

> The work of science, when it is not just an exercise in idle curiosity by some individual, is generally integrated into the social and economic structure of society. That is to say, science is not separated from politics. In a world where knowledge is power, one should thus expect that the activities of science are largely under the control and direction of those sectors of society that hold dominant power (1996, p.150).

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[93] Gramsci, for example, allows that "The relationship between the intellectuals and the world of production is not as direct as it is with the fundamental social groups, but is, in varying degrees "mediated" by the whole fabric of society and by the complex of super-structures, of which the intellectuals are precisely the "functionaries" (1971/2003, p. 12)."

[94] Schwarz was a founder of the activist organization "Science for the People". See his bio in Nader's edited volume, *Naked Science*: *Anthropological Inquiry into Boundaries, Power, and Knowledge* (1996).

Closing Ideas

In practice, Lave and Wenger remind us that one of the fundamental tensions that persists is "a basic social contradiction of social reproduction, transformation, and change (1991, p. 114). Continuing, Lave and Wenger expand upon this observation:

> In recent accounts of learning by activity theorists (e.g. Engstrom 1987), the major contradiction underlying the historical development of learning is that of commodity. Certainly this is fundamental to the historical shaping of social reproduction as well as production. But we believe that a second contradiction--that between continuity and displacement--is also fundamental to the social relations of production and to the social reproduction of labor. Studies of learning might benefit from examining the field of relations generated by these interrelated contradictions. For if production and the social production of persons are mutually entailed in the reproduction of the social order, the contradictions inherent in reproducing persons within the domestic group and other communities of practice do not go away when the form of production changes, but go through transformations of their own. How to characterize these contradictions in changing forms of production is surely the central question underlying a historical understanding of forms of learning, family, and of course, schooling (1991, pp.114-115).

The tension between social reproduction, transformation and change, and the contradiction between continuity and displacement, appeared throughout this chapter. Addressing the tension between social reproduction, transformation and change, Wenger introduces his idea of a *constellation of practices*:

> In the course of producing their own histories, therefore, communities of practice also produce and reproduce the interconnections, styles, and discourses through which they form broader constellations (1998, p.130).

A constellation is a group of stars or objects perceived as a configuration but the elements in this group are not otherwise necessarily connected by distance or kind. Communities of practice are not constellations although they may, as Wenger (1998) proposed, be located within their configuration of practices. Wenger (1998) depicts constellations as relatively

diffuse and relatively far removed from the social locations of individuals' activities in practice. In other words, a gap persists between individuals' in practice and the practices and activities of constellations. This gap, it seems, is not unlike the more familiar gap recognized as being situated between individuals in practice and social structures like agencies, institutions, conglomerates and corporations.

The idea of a constellation of practices may address the tension between social reproduction, transformation, and change. Yet another model is necessary, I suggest, to *also* address the contradiction of continuity and displacement as described in Lave & Wenger (1991). The contradiction between continuity and displacement may be identified with the structural changes that occur within the context of legitimate peripheral participation in communities of practice. This contradiction can manifest, for example, in the learning and the production of knowledge that is accompanied by changes in relative social locations between old-timers and new-comers in a community of practice.

Midway through the chapter in the section titled, "The Distributed Nature of Knowledge Production Concerning Chelonioidea and the Practices of Protecting Chelonioidea", I alluded to a possible analytic technique for [mathematically] exploring this extant structural tension between continuity and displacement in matters of cognition in practice. My recommendation was to use the analytic tool of non-distributive concept lattices. I also recommended consulting the works of Widdows (2004) and Varela (1979) in this matter.

As a resource for learning more about the topic of structural coupling I recommended Varela (1979) and here, too, I would recommend Maturana & Varela (1987). Structural

couplings can cause perturbations which can affect structures associated with cognition in practice. The potential for this is possible in both biologically and socially-mediated contexts. A disconnect between the biological and social aspects of cognition is suggested by my last statement whereas in reality there a gap or disconnect does not exist. The disconnect is an artifact of the observer's (my) use of language. Finally, the perturbations associated with the structural coupling of multiple spheres of activity can translate into emergent practices of connection and disconnection that--when formally viewed outside of quantum logic--appear to produce distributions of knowledge practices unlike one would expect when conducting post-structural analyses that employ the same techniques of Boolean algebra that have been used in more traditional structuralist analyses.[95]

[95] Ideas discussed in this final chapter section bear significance for educators with research interests focused upon learning. Similarly, education researchers already using theories of situated learning and communities of practice may find useful the topics in this section

> Knowing is inherent in the growth and transformation of identities
> and it is located in relations among practitioners, their practice,
> the artifacts of that practice, and the social organization and
> political economy of communities of practice.
> --Jean Lave & Etienne Wenger (1991)

In the last chapter I noted that Wenger's (1998) interpretation of community of practice theory assumes that traditional institutional economic and political authorities' capacity to influence social relations of power in communities of practice is relatively attenuated. Yet Humberto's incantation "to follow the rules and regulations" seemed to suggest otherwise in the case of the sea turtle communities of practice I studied.

Wenger (1998) emphasizes issues of social power through formations of identity. He proposes that learning can also occurs as "identity in practice" (Wenger 1998, p. 95). In this sense, the veteran volunteers' engagements with the state scientists, the volunteers' shared accountability to the enterprise of defending the well-being of the sea turtle nestlings and hatchlings, and the repertoires, styles, and discourses shared by members within each community of practice, could also be indicators of learning--learning, understood as "identity in practice".

In Chapter 4, I discussed the development of sea turtle conservation practices in North Carolina and some of the negotiations of meaning within the sea turtle communities of practice, and I cited an example of learning within a boundary practice local to the sea turtle conservation communities of practice I studied. Like Chapter 4, chapter 5 also focuses upon

the study's findings in relation to the supporting research question: *what kinds of collective senses of interactions between humans and non-humans were being developed in conservation activities undertaken by the State, scientists, and grassroots volunteers?*. In the current chapter, I focus on the significance of a fourth type of collective sense of interaction between people in the turtle conservation communities of practice: formations of identities in practice.

Chapter five's specific focus in relation to this question is "Identity & Learning in Practice." Within these local communities of practice was there evidence of identity formation coupled with knowledge production? What kinds of identities were perhaps important in participants' involvement in these sea turtle conservation communities (e.g. volunteer, environmental activist, educator, etc…)? Additionally, were there examples of, what Holland and Lave (2001) term, *contested identities* experienced in practice?

Accompanying discussions about identity and learning in chapter 5, the subject of nature and the difficulties of defining "natural" are foregrounded themes. The idea of nature was central especially for participants involved in the Hammocks Beach State Park community of practice. The final section of chapter 5 highlights the experiences of one volunteer from the Emerald Isle community of practice who recognized that she had become in practice a "nature girl".

Do You Need an Identity of "Environmentalist" to Think Like an Environmentalist?

Self recognition is one hallmark of being a living entity. But, from the perspectives of a number of intellectual and cultural traditions, self-organization in human beings persists as a combination of selves and identities. In these perspectives, identity is one's sense of

one's social self and the concept of human identity figures in numerous theories about education, life-long human development and in theories about human agency.

Going in to my fieldwork I mused on whether identity was coupled with learning. Would learning and producing ecological knowledge be conditioned upon having or developing an ecological identity of sorts--for example, maybe an identity as an environmentalist? Alternately, would other identities be significant for learning in practice?

The term "coupling" describes how an intentional reference is made effective. I first encountered the concept in Maturana & Varela (1987) and Varela et al (1991). But, it was when I encountered it again later in Dourish's (2001) work, *Where the Action Is*, that I more thoroughly began understood its implications. According to Dourish, our actions are directed through a chain of associations (2001, p. 138). These associations or relations can be social, linguistic, or activity-based. At the same time, many of our local actions may be connected to remote out-of-awareness actions. Dourish emphasizes that coupling is crucial to the effective use of tools because it involves a continual process of engagement, separation, and re-engagement (2001, p. 139).[96] These latter observations made by Dourish (2001) parallel Wenger's (1998) less explicit descriptions of the processes of engagement, separation, and re-engagement, ongoing in communities of practice. Additionally, that some of the associations and relations in the process of coupling may be out-of-awareness lends some insight about the formation of out-of-awareness entities like *habitus* and *identity*.[97]

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[96] I would include as tools: instruments, semiotic signs, senses of self, concepts and cultural artifacts.

[97] The idea that coupling involves associations between local actions and remote out-of-aware actions can be appreciated in a number of neurocognitive models (Hofstadter 1979, Maturana & Varela 1992, Minsky 1986, Varela et al 1991).

To begin exploring possible links between identity and learning in practice I asked participants to complete an adaptation of Kuhn & McPartland's (1954) "Who Am I?" survey instrument (Appendix II, Table 2.3). Following Kuhn & McPartland's (1954) protocol, participant responses in the present study were initially categorized dichotomously either as *consensual* references or as *sub-consensual* references.[98] Kuhn & McPartland define a consensual reference as one in which the limits or conditions of class membership in a referenced group or class is common knowledge; by contrast, a sub-consensual reference describes a group, a class, an attribute, or a trait, which would require interpretation by the respondent to be precise or to place him/her relative to other people (1954, p. 69). Examples of consensual references could be "daughter", "fisherman", and "volunteer". Whereas, examples of sub-consensual references might be "good person", attractive individual", and "disenfranchised employee".

In other words, "consensual references are references to subjective identification by social position (Kuhn & McPartland 1954, p.71)." As Kuhn & McPartland (1954) specify, each consensual reference was scored and each sub-consensual reference was treated as "no response". The next step in my analysis was to sort individual, consensual references into categories of self-identity: spiritual, advocate, disposition, age, gender, hobby, community, family, and occupation. (Appendix III, Tables 3.1 & 3.2). These categories became evident to me as I sorted each consensual reference with like references. For example, an identity of "a

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[98] My use of this instrument was based upon a conversation with Dorothy Holland in which she mentioned that she and Willett Kempton and others had used the survey in their study of identities and the environmental movement. However, my evaluation of the survey results in my study is not at all linked to the article by Kitchell, Kempton, Holland & Tesch (2000). I was not aware of this article until some time after I had completed my analyses. Therefore my analyses in this study did not benefit from the insights of this (2000) study. As I've stated above, I attempted to follow Kuhn & McPartland's (1954) protocol.

mother", "a son", "a father", etc... I designated each of these references as a type of family identity.

If an individual included in his/her survey variations of the same identity I scored the identity once using its most general name. This situation arose solely on one occasion: the identity category of "occupation". Here, one of the volunteers (Cal) identified himself as "a retired professor", "an academic chair", and "an award-winning professor". Essentially, these all represent the idea of "professor". I listed Cal's variations upon "professor" in the *Group ID* table (Appendix III, Table 3.1). But, in the graph titled *Identities* (Appendix III Figure 3.3), the total number scored for the volunteer community's occupation identities reflected my condensation of Cal's three variations of "professor". That is, I condensed "retired professor", "academic chair", and "award-winning academic", into the single identity of "professor".[99]

Table 3.2 in Appendix III shows the number of identities in each category for each community (scientist, volunteer, and state). Table 3.2 also displays for each category of identity its (%) of the sum total identities in a particular community. In the scientist community, identities in the "family" category of identity were the largest percentage of identities claimed by members of this community. The category of identity designated as "community" was the identity most often claimed by members of the volunteer community. And in the community of state park employees, the "hobby" category of identity had the greatest percentage of declared identities.

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[99] Cal was a professor of geology. He listed in his survey the identity of "geologist". I treated this as an identity separate from "professor". He also identified himself as a "scientist". A geologist may be a scientist but not all scientists are geologists. Also, Cal identified himself as a "scientist" in connection with his volunteer work in a local community group (i.e, not a university or institutional scientist). Thus, I included both "scientist" and "geologist" in the volunteer community's sum total for the identity category of titled "occupation".

Within these three categories of identity ("family", "community" and "hobby") no one identified him-/herself as an "environmentalist". At the same time, among the volunteers, two individuals each claimed an identity perhaps relatable to the idea of "environmentalist". Cal, the former professor, identified himself as a "turtle volunteer coordinator". Meanwhile another veteran volunteer and former turtle volunteer coordinator, Will, identified himself as a "conservationist". Upon reviewing Cal's and Will's interviews, each of their short answer questionnaires, and comments about Cal and Will from volunteers' interviews, it remained unclear to me what sort of meaning Cal and Will attached to these identities. For example, was Cal's identity as a turtle volunteer coordinator meaningful to him in relation to the turtles, from the standpoint of education, leadership, or volunteerism. Perhaps all of these connections were meaningful for Cal. Likewise, Will's identity as a conservationist could be connected with his work as an Emerald Isle volunteer or other meaningful activities or identities, or connected with all of these factors. In his survey, Will also described himself as an avid hunter, fisherman, outdoorsmen, and a member of the group *Ducks Unlimited*. Within each of these groups one might find individuals who identify themselves as conservationists.[100]

Within the category of identity that I designated as a "community" identity, a few individuals identified themselves as an "environmentalist". Two of the five scientists (a NOAA scientist and a state sea turtle biologist) that completed the survey identified themselves as an "environmentalist". Also, one state employee (park ranger, Dewey) identified himself as an "environmentalist". Within this particular category of identity (i.e,

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[100] For example, *Ducks Unlimited* claims to be the "World Leader in Wetlands Conservation" (www.ducks.org). Hunters and fishermen share allied interests with state wildlife agencies in the use and conservation of wildlife.

community)--regardless of one's group affiliation (science, volunteer, state park)--3 of the total of 35 stated identities were identities specifying "environmentalist". In other words, 9% of the identities listed in this category were "environmentalist". The relatively low social capital granted an identity of "environmentalist" among members of these three communities of practice appears to match the absence of the idea of "environmentalist" in participants' discourses. During interviews and casual conversations with the study participants if the topic of "environmentalist" came up it was most likely due to my introduction of the term. Similarly, in my regular encounters and conversations with some of the locals--outside of these communities of practice--talk of "environmentalists" was not common.

By contrast, the sort of knowledge valued--coupled as it might be to one's identity--often related to one's occupation. People typically referred to one another by their occupations: water taxi; owner of a fish house; local operator of marina; various types of fisherman (gill net, trawler, charter, pound net); scuba diver; kayaker; officer with US Fish & Wildlife Service; boat captain; military officer; biologist.

The nature of the learner can also influence the nature of knowledge valued. The learners in the sea turtle communities of practice were adult learners. Lifestage events and transitions, and the developmental adjustments that may accompany these transitions, can result in meaningful learning in adult learners. Often, these events and transitions motivate adults to seek out learning activities (Merriam & Caffarella 1999, p. 391).[101] Situated within

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[101] Except for one individual, the Emerald Isle volunteers were retirees. Their motivations to join the *North Carolina Sea Turtle Project* were "for something to do" and "to be part of the [Emerald Isle] community". Also evident in the volunteers' interviews was the joy and the meaning that many of the volunteers experienced as a result of their participation in the ongoing learning that was part of their community of practice and because of the opportunities afforded them to share their newfound turtle knowledge with visitors and passersby on the beach. See next chapter 6 for more discussion of participants "turtle" connections

a lifetime of experiences, adult learning is ofttimes transformational in character (Merriam & Caffarella 1999, p.398). The nature of the learner as understood from the perspective of human development is not addressed by community of practice theory. The generational character of learning (newcomer versus old-timer) is discussed but the focus is upon the development of the learner as located in relation to a particular community of practice.

Does one need an identity of "environmentalist" to think like an environmentalist? Based upon survey and interview data in the study the answer to my question was "No". Returning to my earlier discussion of coupling, perhaps learning ecological knowledge in local communities of practice was coupled with an identity or identities constructed in some distant location. Too, the oft out-of-awareness character of identities and knowledge makes it difficult to evince a relationship specifying a type of identity as coupled with a type of knowledge. And finally, I may have missed possible identity-knowledge connections because my understanding of "environmentalist" was different than participants' interpretations of "environmentalist".

On the other hand, as I noted earlier, the survey data and supporting comments from the interviews did suggest that greater recognition of the nature of the learner in terms of human development may prove more significant to learning and to formation of identities in practice than previously considered by community of practice theory. This appeared to be the case especially with the volunteer sea turtle community of practice. All of the volunteers were older, adult learners for whom lifestage transitions from career to retirement influenced the nature of the identities most meaningful to this group of individuals. Being part of a community and individuals' self identities as a hobbyist of sorts (e.g., "a writer", "a history

buff", "a hunter and a fisherman") revealed the significance of life stage in the volunteers' reflections upon their self identities. This was not to say the volunteers were not learners. In fact, over the course of the study as I became better acquainted with the volunteers, it became evident to me that (for each of them) lifelong learning was a way of life and that many of the turtle volunteers had also been volunteers at various places throughout their lives. Rather, evidence from the data gathered about the volunteer community revealed to me that additional considerations of identity and learning from the perspective of human development were integral to analyses about identity and learning within a framework of community of practice theory.

In the next few sections, I include excerpts from interviews with a couple of members of the different sea turtle conservation communities of practice. I take as my starting point Wenger's characterization of identity as a nexus of multi-membership and I present some examples of contested identities--identities that are part of a nexus of multi-membership but contested within the individual. The shifting or switching between identities that is revealed in participants' interviews renders visible some of these identities in practice. I will also include the reflections of one volunteer (Elaine) who recognized that she had become "a nature-girl".

Identities in Practice and in Moments of Observation

In the Chapter 4 section titled, "The Agencies", collaborations but also conflicts in the practices of protecting sea turtles was evident. Internal conflicts also surfaced for community participants--that is, conflicts of selves or contested identities. Sometimes individuals' experiences of contested identities were connected with experiences in their place of work or

with the missions of their affiliated agency. The mission of the North Carolina Division of State Parks pledged *conservation,* for example, but during my fieldwork I sensed that for some of the Park staff a tension existed between the ideals of *conservation* and *preservation*.

One day, following up on this observation, I asked one of the park rangers (Sandra) at Hammocks Beach State Park what the difference was between "conservation" and "preservation". Sandra illustrated some differences between the two terms in this excerpt from her interview:

> Sometimes I think like a conservationist they're trying to conserve things while realizing that, you know, there's things we have to do like we all like toilet paper. (That's my famous example.) I like to use toilet paper—you like to use toilet paper. We need trees to make it. But a preservationist would be like, "No toilet paper! You can't cut down a tree, you can't touch anything, you gotta' leave everything the way it is." But I realize people can't live like that especially with our, like, styles and stuff like that. I don't know, sometimes with coastal development I feel like I'm more of a preservationist like, "just leave it alone, it's doing its job." Most people I know—use toilet paper. So, people can kinda' relate to that. Some things we've kinda' become accustomed to. It's, it's a lifestyle thing you know. Too, people have become accustomed to living these giant lifestyles with these big houses and big cars. Luckily I haven't gotten to that—mainly because I can't, I work for the State [laughs]! But, I try to recycle and do the good stuff; I do what I can.

This sort of shifting between the ideals of "conservationist" and "preservationist" was expressed by another member of the Park staff as well.[102] In his interview, park ranger (Kurtis) expressed his frustrations with the Park's mission "to conserve". Kurtis aspired to "preserve".

> I think our main goal is to keep Bear Island and the Park itself "pristine" as best we can for future generations. With the development we've inflicted on the Park…I think it's atrocious. We built the Taj Mahal out there on the Island. And I think we could have done better by making a lesser…less of an impact

[102] Sandra's distinctions about how a conservationist and how a preservationist might value toilet paper also potentially reflected Sandra's awareness of the contested nature of her self-identities.

> out there, making it more environmentally friendly, make it ah…more memorable of a place, make it pristine.[103]

For some individuals, a clash between their ideals and the ideals of their community of practice simmered.[104] While for other individuals, their self identities were contested within themselves and by others with whom they worked. As with the conflict over nest relocation (Chapter 4), the examples cited here of contentious practices within the group and of individuals' struggles were also markedly historical while at the same time ongoing in the present.

In their edited volume, *History in Person: Enduring Struggles, Contentious Practices, Intimate Identities*, Holland and Lave propose that

> History is constituted in the space that encompasses both social participation and self-authoring. Dialogically constituted identities are always re-forming somewhere between positions institutionalized on social terrain and their habitation as it is made meaningful in intimate terms (2001, p28).

Holland & Lave (2001) adopt and integrate into their theories about the formations of self and identity Bakhtin's concept of *dialogism* (as discerned by Holquist 1990). Dialogue mediates how one knows and how one works across different realities. Dialogue also mediates the formation of intimate and social selves. Dialogism describes the state of flux in which sentient beings are always being addressed and are always responsible for answering (Holland et al 1998 and Holland & Lave 2001). When I spoke with park ranger, Carl, about the mission of Hammocks Beach State Park some of his comments revealed this in-process

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[103] The "Taj Mahal" was the bathouse complex that the State built on Bear Island after Huricane Fran (1996), In addition to a bathhouse, the post-Fran complex included an elevated boardwalk with picnic shelters and a concessions bar. Visions of Bear Island (and its degree of "development") varied amongst Park staff and amongst town residents as well. To my knowledge, Kurtis was the only individual that called the bathhouse the "Taj Mahal".

[104] Comments to this effect by park rangers, Sandra and Kurtis, were highlighted. Their comments concerned the ideals of preservation versus conservation.

formation of what Holland and Lave (2001) term *dialogically constituted identities*. Below are some excerpts of our conversation.

> **[KC]:** I'd like to ask you about "the balancing act" or "the line you have to toe" between say--part of the Park's mission, to educate and to expose people to North Carolina's natural resources. Perhaps, the balancing act between protection and conservation…it's come up in previous conversations we've had and also in questions about attending to the public and to the [turtle] nests.
>
> **[Carl]** My feeling is—my personal feeling may not be in line with our division—my personal feeling is you should always make your decisions in favor of the resource in favor of the Park. That's not always the case, but I feel "that's our job, that's what we're entrusted to do." That's what I personally believe.
>
> And I know--I came along at a time-- when I first started at the Park there were a number of people, in parks then that aren't in it now, that truly felt this way too. And, I learned a lot of what I feel—I've kind of been taught by people that felt that way too.
>
> And, that was one of the first things a friend of mine told me (who's still in parks) when I became a superintendent. He told me "always, always do the right thing for the Park. And I interpret the park as "the resource" not for visitors, not for employees—that is, what's best for the resource.

The excerpt above from Carl's interview is an example of what Holland et al describe as "an orchestration of inner voices" inevitably present in self-authoring (1998, p. 178). Within this dialogic moment that Carl related, the orchestration of voices participant in Carl's act of self-authoring included: the NC Division of State Parks, individuals that Carl first worked with when he joined the State Parks, and one of Carl's friends. Carl vacillated between points of view and his self-identities. On the one hand Carl, observed himself in harmony with his preservationist friend and his former colleagues, voices that stressed "always, always do the right thing for the park." At the same time, as a NC State Park ranger Carl recognized his responsibility to answering the mission of the state park system that

employed him, i.e., “to conserve” and “to provide outdoor recreational opportunities”. Finally, to clarify how self-authoring is connected to the idea of history in person, Holland et al explain that

> “In Bakhtin’s account of ‘self-authoring,’ the ‘I-for-myself’ realizes itself explicitly in words and categories, naming the ‘I-for-others’ and the ‘other-in-myself’ (1998, p. 178).”[105] “These categories of the other...”, continue Holland et al, “guide the future self in its activity. They direct the trajectory of the self-process, becoming part of what we call *history in person* (1998, p. 178).”[106]

In Carl’s interview it appeared that he was contending with polarized views of an institutionally-informed identity (i.e., state park ranger) and a more personal identity formed within and among a set of friends or colleagues who saw things as he did (i.e, as a preservationist). Whereas, in the next interview excerpt--also with another park ranger (Jackson)--the contested identities that emerged during Jackson’s comments appeared to *both* be institutionally-informed identities. They were identities that voiced different aspects of the NC Division of State Park’s mission.

During Summer 2006, the channel (Cow Channel) used by the State ferry to access Bear Island had become nearly impassable during low tides. The ferries were heavy pontoon boats--and when weighted down with 30 passengers, passengers’ gear for camping or a day’s visit, the captain, and the first mate--they sat low in the water and and at low tide scraped the brackish channel’s bottom. At other times the ferries would strand on the sand bars and mud

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[105] See also Holquuist (1990)

[106] Like Wenger (1998), Holland et al (1998) employ a trajectory metaphor to describe identity formation. But Holland et al (1998) and Holland & Lave (2001) succeed to a greater degree in detailing these processes of self-identity and in detailing the local global interplay extant between these processes and the coterminous symbolic and socioeconomic order.

flats that lay below the water's surface. Once stuck, the ferry required a tow to return to the channel's deeper depths.

The Park and the Army Corps of Engineers were not sure why Cow channel had been gradually filling with sand. Some people speculated it was a natural outcome of weather patterns and changes in Bear Island's topography due to the inlets that embraced Bear Island. Bogue Inlet was on the eastern end of Bear Island, near Emerald Isle. And Bear Inlet cusped the western boundary of Bear Island.

That summer (2006), Bogue Inlet was also being re-dredged and the Emerald Isle beach nourishment project was ongoing. A contingent of angry, over-taxed, and under-represented locals seized the opportunity of Cow Channel's accelerated disappearance in order to halt the re-dredging of Bogue Inlet and the continuation of Emerald Isle's beach nourishment project. They blamed the sedimentation of the ferry channel upon Emerald Isle's shoreline re-structuring projects.

The Park initially sought to resolve the problem by limiting the amount and types of gear visitors towed to Bear Island. But, the ferries continued to have difficulty passing through Cow channel at low tide. Next, the Park began to restrict the number of passengers allowed on board the ferry and it reduced the number of ferry crossings scheduled during low tide. Of course this did not set well with the visitors and the tourists for whom their only access to Bear Island was via the Hammocks Beach State Park ferry.

Among the Park staff, there were debates about whether Cow Channel should be restored and if it was restored what would prove the best approach. During these debates the NC Division of State Park's mission was tested and the staff intermittently engaged in

conceptual jousts with one another debating about “preservation”, “conservation”, and the idea of “natural”. Kurtis, who named the Island’s bathhouse “The Taj Mahal” and who favored the idea of a “pristine nature”, thought Cow Channel’s disappearance presented a perfect opportunity to ban visitors from Bear Island. In time, Kurtis offered a second mildly less misanthropic solution. He suggested that only kayakers be granted access to Bear Island for the ferries unavoidably introduced residues of gasoline and oil as they crossed the salt marshes to the Island.

Ultimately it was decided that Cow Channel would be dredged in order to resume state ferry service to Bear Island. After all, the NC State Parks system existed for the enjoyment, education, health and inspiration of all citizens and visitors (http://www.ncparks.gov/About/agency_mission.php). The sand dredged from Cow Channel would be pumped on to the Atlantic Ocean side of Bear Island, in front of the bathhouse, and directly on to the beach. To date, Bear Island had not undergone any beach nourishment. Because Bear Island was bejeweled with soft, smooth, bright crystalline sand, palpable were all of the staff members’ concerns as to whether the Island’s natural beauty would be defaced once a shellac of dredge material was applied to its beaches.

The Hammocks Beach State Park superintendent, Jackson, held final responsibility for the decision to dredge Cow Channel. The fugue of local voices contributed to the development of another furrow across Jackson’s brow that summer. In addition to concerns for the Island’s aesthetic, Jackson told me he was worried about the immediate consequences of the dredge for the inhabitants of the salt marsh. Shorebirds nested and fished in the salt grass while its waters were a nursery for fish and and its mudflats provided a respite for migratory

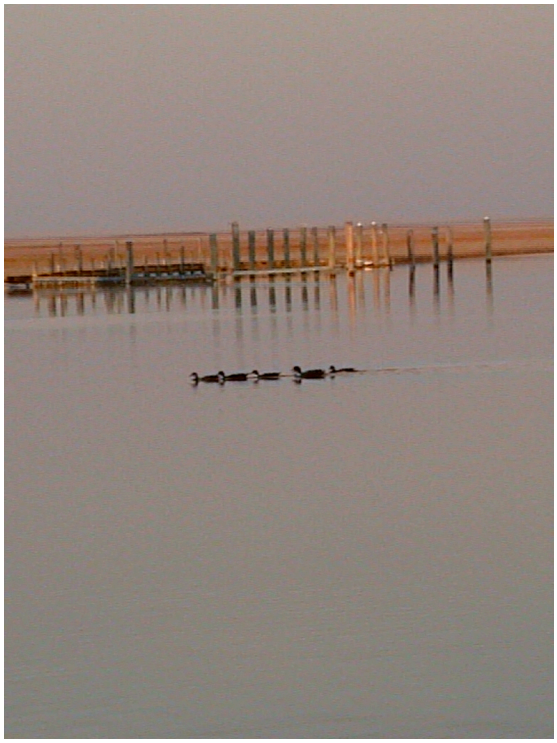
waterfowl (Figure 5.1 & Figure 5.2). The salt marsh was also home to a variety of flora and fauna: molluscs, crustaceans, microscopic organisms, and juvenile sea turtles having returned from years spent in the Sargasso Sea.

Figure 5.1 Great White Egret Fishing © KCMartin 2006

Jackson had a number of critics that opposed his final decision to dredge the channel. And as critics will do, they attacked Jackson's knowledge, his values and his person. Based upon my discussions with Jackson, I found him to be a knowledgeable and thoughtful individual and someone who cared about others' viewpoints and valued a job well-done. Interestingly, here are a few of the statements Jackson made about himself in his self-identity survey:

> *A person who cares about people. A person who likes to see other people happy. A manager. A person who cares about the environment. A park ranger. A person who likes to hear others' ideas and view points. Someone who cares about the future. A law enforcement officer. A person who likes to learn.*

In conversation, Jackson had mentioned to me that he understood as part of the NC Park's Service that they [he and the other rangers] were to be "stewards of the environment".



Indeed it seemed that for Jackson the NC State Parks' mission statement was never far from recall. Perhaps, for Jackson it became the soliloquy contributing to his ultimate decision to dredge the ferry channel. In the excerpt below, Jackson addressed and responded to the NC Division of State Parks' mission concerning North Carolina's natural resources.

Figure 5.2 Autumn Salt Marsh © KCMartin 2006

[KC]: What is your idea of "natural"?

[Jackson]: I guess when you're providing recreation opportunities for people there's some give and take there. For Bear Island, the way I look at it we have a centrally located area or a small portion of the Island which has been developed. It's basically been developed to provide people the amenities they feel like they need in order to come out and recreate. And the rest of the Island--and that's just a small part of it (its the roadway, the barracks area, the maintenance area, the bathhouse area and the ferry waiting station), that's what we've pretty much developed--the rest of the Island I look at, I guess, is just sorta' letting nature take its course (for the most part).

Um, the difficult thing for me right now, I guess, is access to Bear Island. I think you're well aware of the problems we're having with Cow channel.

But, to me if we're not providing access to that Island, how can people experience that Island and enjoy that Island if they can't get there--if the majority of people can't get there.

Identity Transformation

The interview excerpts in the previous section provided examples of the the shifting between social speech and inner speech ongoing in the processes of dialogically constituted identities. Identities are formed and reformed and occasionally in the fleeting moments in which our realities crystallize and we recognize ourselves through the comments of others Observation of an identity transformed can also be recognition of an identity that, according to Holland et al (1998), has become relatively stable, perhaps habituated.[107]

The use of transformation here is not meant to imply an arrival at some final destination of the self nor a metamorphosis from a chrysalis of an asocial self or self type. Rather transformation describes developments that can include growth, learning, changes that can result in a reorientation of one's activities within practice, and possible changes in one's social position within social practice as well. The reorientation of one's activities includes: changes in consciousness and subjectivities, construction of new identities, and agency.[108] Emerald Isle volunteer Elaine's recognition that she had become "a nature girl" was accompanied by a sense of being able to do things she would never before thought she could have accomplished. And Elaine had also developed a newfound sense of awareness about humans' relationships with nature.[109]

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[107] See Holland et al (1998, p. 189). Note too their accompanying comments summarizing the relevance of Vygotsky's ideas about development, consciousness and control (1998, p. 190).

[108] [Social] consciousness is a state of overall awareness that exists at both individual and collective levels. According to Marx this sort of consciousness can only emerge via *praxis*.

[109] Elaine was the only individual among the three communities of practice I studied who experienced such a profound transformation. Leastwise, she was the only individual who shared a narrative like this. In her self-identity survey, Elaine described herself as "a baby boomer", " a wife", "a dog-lover", "a grandmother" and "a nature girl".

[KC]: So, you consider yourself a "nature girl" now?

[Elaine]: (chuckles softly) Yeah.

[KC]: "Yeah?" Could you tell me a little bit more about this?

[Elaine:] (LAUGHTER) It's just changed my life. It's changed the way I look at things.

[KC]: In what way?

[Elaine]: I just feel more protective and sometimes feel there's no hope for nature. You know, when you hear or when you just worry about what land's being filled and what the Supreme Court's going to do with questions before them. And what President George W. [Bush] and the current administration thinks about "nature" and "wetlands". So, I worry now; something else for me to worry about besides "war" and "poverty".

I guess I could just tell you that I feel so much more confident in talking with people about sea turtles. Certainly as the years went on and I learned more and could do more with the program…I just feel like ah…. If people ask me things--or I've gone to schools--I just feel very confident about it. And I never would have felt that way before had I not gotten involved in this. I feel confident that I am giving correct information out and that I am informing people which in turn may help future generations of sea turtles and help future generations of people regard nature in a different way.

[KC]: How do you see people "regarding nature in a different way?"

[Elaine]: I think people will do it for the moment. But, I think that you'll need a much deeper commitment to carry it on into their lives. But, you know, when you tell kids just about picking up plastic bags…you just hope that that's going to stick. And I have a little girl, "Chloe" who lives in my neighborhood and she sees me and (laugh) says "Miss Elaine, I picked up 3 plastic bags off the beach today." (Laughter). So you think, "Oh, boy!", you know you have had an impact.

My conversation with Elaine ended shortly after this. It was July 4th. She was on her way to post some handmade signs at local shops and gas stations--signs that cautioned people that

shooting fireworks on the beaches could disturb or harm nesting sea turtles. Smiling, I thought to myself that this was probably something Elaine hadn't ever done before either.

There's a Sea Turtle in my Habitat 6

When you work with sea turtles, people buy all kinds of turtles for you and for your house. They assume you like turtles if you work with them.
–Megan, a sea turtle biologist with *The North Carolina Sea Turtle Project*

This chapter relates details from the study about *how individuals developed concepts and practices of connection in their daily lives*. What sorts of experiences contributed to individuals' learning and understanding and contributed to individuals' senses of connection with the sea turtle? The chapter highlights participants' situated practices and embodied experiences in the world of barrier islands.

First I highlight the kinds of circumstances that initially encouraged individuals to become involved with sea turtle conservation. The study findings were remarkable because the sea turtle was *not* the subject that initially persuaded individuals to work or to participate in conservation efforts on its behalf. As such, the data challenged popular and scholarly preconceptions about the nature of human and non-human animal relationships in post-industrialized societies--i.e., that the charisma or the cuteness of the non-human animal underscores the development and maintenance of human and non-human animal relationships in post-industrial society.[110] Also featured in this section are participants'

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[110] See Campbell (1997) for example. Also, Kellert (1982, 1985, 1996) has written extensively about US society's values and attitudes toward animals. The US Dept of Interior Fish & Wildlife Services has appropriated some of Kellert's research on this topic. Kellert (1996) developed a typology of 10 core human values of nature: utilitarian, aesthetic, naturalistic, scientific, humanistic, dominionistic, moralistic, symbolic, negativistic, ecologistic,

discussions about the meanings and/or significances of the sea turtle for these local communities of practice.

Following this initial discussion I highlight, in the next section of the chapter, participants' impressions upon encountering sea turtles in the world of barrier islands. Here too, the topic of boundaries appears in this chapter--boundaries in terms of boundary trajectories and boundary practices.

The embodied character of learning and knowledge in practice is the topic that I turn to in the section titled "The World of Barrier Islands". Here, two examples from the study are highlighted. The first example focuses upon the interviews of three study participants. Each participant is from a different community of practice, however these three individuals shared alike a cognitive model concerning the ecological significance of sea turtles for North Carolina's coastal communities. A second example concerning the embodied character of learning and knowledge in practice considers how participants learned and produced a model of "habitat". In this latter example, so as to accommodate for the fact that sea turtles were also active participants in this habitat, my analyses necessarily relied upon Sebeok's theories in semiotics.

Questions about Turtles

Initially, how did individuals become connected with local sea turtle conservation practices? Data from this study were remarkable because the sea turtle was *not* the subject that initially persuaded individuals (including the author of this manuscript) to work or to participate in conservation efforts on its behalf. As a result, the data challenged some popular and scholarly preconceptions about the nature of human and non-human animal relationships

in post-industrialized societies. However, individuals' extended experiences with the sea turtles--coupled with their engagements in local sea turtle conservation practices--did ultimately contribute to the conceptual and practical connections that individuals experienced in their daily lives.

One prevailing conjecture in popular and academic discourses is the assumption that in post-industrial societies humans' interactions with non-human animals are determined by humans' perceptions of the non-human other as "cute" or "charismatic" in bearing. Contributing to the development of these preconceptions is the employ of two widely circulated and popularized forms of two, separate theories--"neoteny" (originating in the field of biology) and "charismatic megafauna".[111] The two theories suggest (respectively) that for humans "round figures with round eyes" and "large, flagship species" predict individuals' affinity for other beings (human and/or non-human) bearing these traits. However, both theories have become routinely misused and misapplied across a variety of popular and academic discourses. When I asked participants, "Why the sea turtle? Why not a piping plover or a deer?", a few scientists and state park employees jocularly suggested that the sea turtle was popular in this part of North Carolina because it was "cute and cuddly". The playful nature of their responses indicated some familiarity with these theories and perhaps some familiarity with mis-applications of these theories.

The following vignette, taken from this study, raised the question of whether a sea turtle's round (and therefore "cuddly") morphology contributed to local flag raising and other related forms of positive attention bestowed upon the sea turtle along North Carolina's

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[111] The related terms, "charismatic megafauna" and "flagship species" were introduced by conservationists during the 1980s (Leader-Williams & Dublin in Entwistle & Dunstone 2000, p. 54)

central coast.[112] In this example, I was talking with Humerto (one of the state sea turtle biologists) about local affinities for the sea turtle. "Why", I asked, "the popularity of the sea turtle in this part of North Carolina? Somehow, I don't think ghost crabs or bats would have the same appeal." Humberto's face was immediately alight with a wide grin and twinkling eyes,

> Yeah, you know, I've been wondering that for years. A friend of mine in graduate school who worked with alligators—so, another reptile with many of the same characteristics—yet, they [alligators] haven't generated the same public adoration. And I would always ask her, "why, why is that the case?" And one time she said, "haven't you figured it out? They always lump sea turtles with marine mammals—they always say 'whales and turtles' as opposed to 'sharks and alligators'."
>
> So she was convinced it's just that they've got big eyes, and they seem…you know, they're round (they don't really have any sharp edges on them, they're kinda' round). And people just really feel something for them. They generate some kind of deep down emotional response that other, that other species don't.

Simultaneously, we saw the connections his colleague's observations had with a theory in the field of developmental biology. Together we laughed and each rushed to proclaim the foregone conclusion--"neoteny".

A theory of neoteny in this case would suggest that the sea turtle's retention of juvenile features--large eyes and a round shape—had contributed to its survival. Large eyes and roundness are traits common to neonates and juveniles across multitudes of species. These traits function to indicate relative maturity levels between conspecifics and to elicit adults' caring dispositions and responsiveness to neonates and to juveniles of the species

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[112] During sea turtle nesting season, Hammocks Beach State Park flies a sea turtle flag on days that a freshly laid sea turtle nest has been discovered and confirmed. Remarkably, no other park inhabitant is similarly recognized and heralded for its nest-building triumphs: no flag is hoisted upon discovering the nest of a Piping Plover (an "endangered species") or that of an Eastern Painted Bunting (a "federal species of concern").

(Lorenz, 1971). In his analysis of the morphologic evolution of Walt Disney's Mickey Mouse, Gould (1980) proposed that human beings *also* respond to and care for *non-human others* with large eyes and round shapes. Might this proclivity of *Homo sapiens* then, *also* include some sort of primal urge to care for roundish sea turtles? No…leastwise, the data in this study did not appear to support this conjecture.

Nor did a theory of "charismatic megafauna" supply a tenable rationale here for explaining how study participants enrolled in the *NC Sea Turtle Project*. An explanation of "charismatic megafauna" highlights the strategic use of certain species, i.e., species deployed to attract public support for broader conservation or preservation agendas. When captivating species (or charismatic megafauna) are used to gain attention for broader conservation or preservation agendas these charismatics are used to recruit new members to the cause. Thus, it is a species' relative attractiveness (e.g. large, strong, sovereign, etc...) that purportedly persuades individuals to join a group or a cause.

Some of the park rangers from Hammocks Beach State Park were familiar with these theories. One afternoon I spoke with Dewey in the Park office. Dewey was a recent college graduate and the newest park ranger at Hammocks Beach. Dewey was one of the rangers who primarily worked in the Park office. Most days, Dewey managed to keep the office staff hopping and in good spirits. Dewey was bright, articulate, and charismatic. Consequently, some of his work responsibilities also included presenting talks and education programs to school groups and to local civic groups. During one of our conversations I commented to Dewey, "I've noticed there's turtles everywhere—all over this park—was it the same at Ft.

Macon?" Before graduating college, Dewey had worked one summer at North Carolina's Ft. Macon State Park.

Smiling mischievously Dewey challenged, "You mean box turtles?",

I returned his volley, "No…you know, everyone's got a turtle on their desk and then there's the turtle flag…" Amused and laughing, Dewey cut in,

> I think that's just the culture of this park. At Ft. Macon their actual…their actual motto is "land of 1,000 nests," which is all birds. And I think Carolina Beach is notorious for its Venus Fly Traps and Jockey's Ridge of course is notorious for its big dune. I think each park has its ah…has its little…I don't know what you say [laughs], it's little group I reckon or self image.
> So, this park is definitely a turtle park. I think it kind of got like that over the years, with it being with one of the last beaches undeveloped and with the park staff being so gun-ho for turtles.
>
> And with as much education we do to the public, every program we do is pretty much sea turtles. I think that that has a lot of effect and ah…I think a lot of people understand NOT developing one of our last islands.

On another day, in another conversation about the Park's interpretive programs, Dewey and I mused some more about the local significance of the sea turtle.

"You do a lot of education programs at the schools," I noted, "and, it's mostly on sea turtles?" Dewey nodded and continued,

> Most all the teachers that call in and request programs—they call in a request for sea turtles. We tell them we have TONS of—we have tons, tons of ecological things we talk about, whether it's as boring as an oyster, a tree, or raccoons, or squirrels (or whatever), we may have at the park. We…we pretty much tell 'em we'll educate 'em on everything we have here at the park--and let them know what programs we have--and most of the time they're like, "sea turtles"!

The Park offered a wide variety of interpretive programs: ecological and historical and cultural. Additionally, the Park had several well-designed and informative displays and dioramas that beautifully portrayed the various habitats and introduced the various

inhabitants one might encounter in these habitats. On Bear Island discrete but visible signage helped to highlight for visitors the different types of habitats they were walking through as they traversed the path connecting the salt marsh side of the Island (where the state ferry docked) with the Atlantic Ocean side of Bear Island.

"You don't hear anybody saying Save the Snakes!", Dewey guffawed.

I smiled and I agreed, "No. But, what about a deer?"

"I don't know…. The thing is, in North Carolina, the deer are overpopulated and everybody knows it," laughed Dewey

"Okay...how about a pelican?" I persisted. I was doing my best at this point to think of cuddly and attractive animals. And, Dewey was ready with some observations about these handsome birds.

> I think pelicans got their time when Rachel Carson was around [laughs]. I think it's something else now. I don't know, I just think the sea turtle thing is…I think a lot of the local towns—like Carteret [county] especially—all of Emerald Isle, everybody pushes sea turtles and all the stores have sea turtle pictures and things in them. I think it's kinda' local culture of the coast--especially, the barrier island parts of the coast.

In the end, the collected observations and interviews in this study did not lend support to an explanation of neoteny nor to an explanation of charismatic megafauna for ascribing to the sea turtle its capacity to captivate. Rather, in the [study's] *involvement interviews* individuals most often cited "friendship", "job opening", "something to do" and "the possibility of making a connection with some other sought after goal, e.g., fun, travel, etc…." as explanations for *how* they initially became involved in the *NC Sea Turtle Protection* program (or, with sea turtles more generally). Clearly--in this two-county, portion of the

NC Sea Turtle Protection Project--opportunity, convenience and coincidence were primary factors in precipitating individuals' affiliations with *Caretta caretta*.[113]

Some individuals' regular encounters and experiences with *Caretta caretta,* though, did provide some indications as to why the sea turtle becomes important. These shared encounters and experiences were situated in the world of barrier islands. As we'll see in later sections of this chapter, the environmental and cultural interfaces that Dewey speculated about (on more than one occasion) contributed to the significance of the sea turtle in local culture. I visit this barrier island site of connection-making later in the chapter. Next, though, I relate some of the study participants' initial impressions...first impressions upon encountering a sea turtle (adult or hatchling). I include here as well some snapshots of the public's encounters with nesting sea turtles and with the sea turtle volunteers.

Bear in mind that encounters with sea turtles in North Carolina are relatively rare. Therefore study participants' first encounters with a sea turtle most often occurred *after* they had participated for some time in their respective communities of practice. In other words, it was not the roundness of the sea turtle that compelled individuals to join the group. Rather, joining the Emerald Isle volunteer community offered "something to do" or a "way to make friends". One's participation in the *NC Sea Turtle Project*, for some state employees, coincidentally happened to be one's first assignment as a career park ranger. And, for some scientists an available research post was the factor prompting their participation in sea turtle conservation practices. In other cases, a scientists' participation in these conservation

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[113] As I related in the opening pages of Chapter 3, "coincidence" and "opportunity" both factored into my involvement with these local sea turtle communities of practice.

communities of practice presented an opportunity for travel, research, and attending international conferences in the potentially exotic habitats occupied by sea turtles.

Impressions and Encounters and Boundaries

When I asked participants about their first encounters with a sea turtle their descriptions would be laden with superlatives. "Amazing" was the adjective most frequently employed by scientists, state employees, and volunteers alike. Individuals were also captivated with the sea turtle's life cycle: the sheer size of a Loggerhead sea turtle was amazing but equally impressive was the turtle's growth from a palm-sized hatchling into a 200-300 pound adult reptile.

Volunteers' and state employees' first time encounters with sea turtles also inspired awe and reverential respect for the turtle. A few members in each of these two communities of practice were awestruck by the "effort" an adult turtle had to exert in order to lumber up a stretch of beach, dig a nest with her swim-design flippers, lay 100-200 eggs, bury the eggs, and then crawl back into the ocean. At times the antiquated history of this reptilian summer ritual also produced feelings of reverence in participants. "Because they [sea turtles] were here before us", a number of participants felt a profound respect on first meeting this pre-historic species.

Like the volunteers and the state employees, I had similar felt impressions and feelings upon encountering a sea turtle for the first time. I felt this way on subsequent encounters too. (I imagine on more than one occasion of meeting a sea turtle these feelings and impressions re-surfaced for some of the state employees and the volunteers as well.) Indeed, for a few participants in each community (volunteers and state employees) the

impressions they experienced on first encountering a sea turtle would develop into personal meanings for saving the sea turtle.

Reverential comments and descriptions of being awestruck were not common themes in the scientists' interviews. Perhaps a factor related to this was the practice of distancing one's self from the object of study that is required in science. Also the scientists--more than the volunteers and the state employees--clocked more hours in recovery of sick and mangled turtles and in performing necropsies [on dead turtles]. These daily, grim encounters could with time begin to overshadow any individual's senses of awe and wonder.

As a sea turtle intern, I participated in both the scientists' community of practice and in the state employees' community of practice as a "newcomer" and a "natural scientist". While, throughout the entire period of my field research, I was also a "social science researcher" and a "newcomer" in each of the three communities of practice.

As a newcomer my valence of practice was located at the periphery of each community. Thus I was initially spared the everyday knowledge of the harsh realities that battered sea turtles--a knowledge that could also modulate one's perspective. Additionally, because I was associated with each of the three communities of practice my accountability to a particular enterprise was more nebulous and greater were the opportunities for me to improvise in the negotiations of each community's repertoires.[114] Located in this boundary trajectory, I could avail myself of a broader range of perspectives and valued experiences

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[114] Wenger states that "practice defines a community through three dimensions: mutual engagement, a joint enterprise, and a shared repertoire (1998, p. 152)."

(and ways of talking about experiences with the sea turtle).[115] Wenger (1998) describes practice at the boundary between communities (or a community and the outside) as brokering. “Brokers are able to make new connections across communities of practice, enable coordination,--and if they are good brokers--open new possibilities for meaning (Wenger 1998, p. 109).”

Each Emerald Isle volunteer was a broker negotiating the physical and cultural boundaries between the volunteer community and the public. Due to the sheer numbers of human beings occupying Emerald Isle a substantial portion of the Emerald Isle volunteers passed time demarcating, policing, and negotiating a physical space between the turtles and the public. The nature of this physical space would depend upon the turtles‘ activities (seeking out nest sites, nesting, or hatching). When a nest hatched for instance, the volunteers necessarily had to cordon off a sandy passage for the hatchlings. This passage would help facilitate the hatchlings frenzied crawl to the ocean surf keeping them safe from interloping humans and the disorienting effects of bright, artificial light reflected onto the beach.

Often, the boundary work that took place during a nest hatch could produce positive outcomes. Through their engagements with the public the volunteers were frequently able to transform this boundary space into a learning experience and/or for recruiting support (e.g., monetary, new volunteers). During these boundary encounters the volunteers enthusiastically taught the public about the sea turtles’ activities and the turtle’s life cycle. If a sea turtle was present the volunteers had the opportunity to relate what the turtle was doing at the moment.

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[115] As a social scientist studying these 3 communities of practice my social location in this way was outside these 3 communities. Here again, my interpretation of events or turtle encounters was less conditioned by the dominant discourse in any one community of practice. Additionally, although I was also positioned within a peripheral trajectory and headed inbound during the course of my field work because I was always also a social scientist (and therefore an outsider) I never achieved full membership in any one community.

Because boundary locations are essentially nexi of multi-membership perspectives, individuals outside of the immediate community of practice can (potentially) introduce new concepts and novel reifications. Consequently, participants situated and practicing along these boundary sites--that is, engaging and separating, and re-engaging with one another--likely negotiated meanings new and old. Possibly identities and cultural models were formed and re-formed. And maybe some learning and production of ecological knowledge transpired.

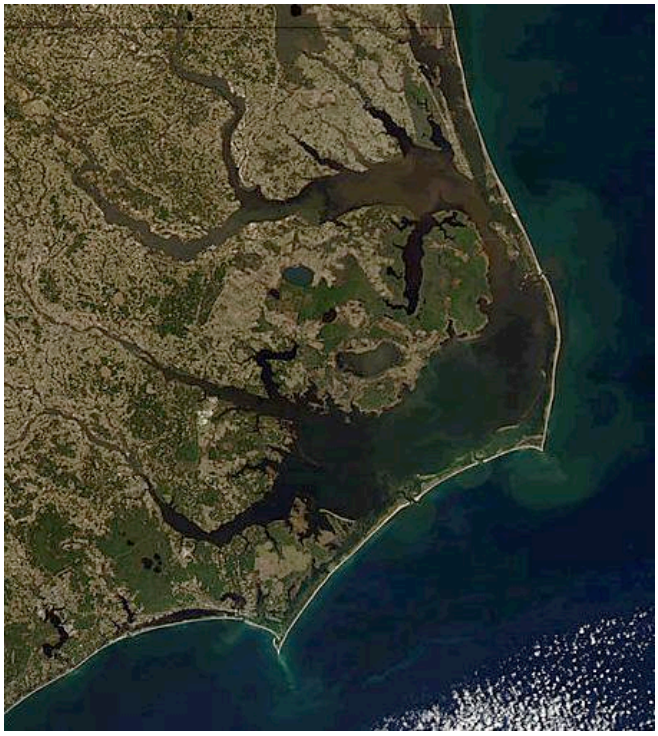
Finally, visitors and tourists were also amazed and awestruck with the sea turtles they encountered on Emerald Isle's beaches. But it was not always clear if their amazement and awe were also connected to a reverential respect for the turtles or if the effect was connected to perceptions of the turtles as curiosities and entertainment. After witnessing a nest hatch one evening a tourist told one of the Emerald Isle volunteers, "We went to Disney World this year with the kids. This was better". Another time on Emerald Isle, the volunteers had to wrangle with a visitor who wanted his children to be able to see some turtle eggs that were buried in a nest. He wanted to unbury the eggs. First he tried to pay off the volunteers. And when his bribe did not work he set about yelling at them all-the-while trying to convince them of his "rights" to see the eggs.[116] John Dewey once noted that, "The belief that all genuine education comes about through experience does not mean that all experiences are genuinely or equally educative (1997, p. 13)."

[116] Somehow he did not take notice of the sign posted at the nest that warned individuals that disturbing turtle nests was unlawful and subject to fines by the US Federal Government.

The World of Barrier Islands

Barrier islands are a loci of sea turtle activities in North Carolina. Both Bear Island and Emerald Isle are barrier islands along North Carolina's Atlantic seashore. Like a dotted line, barrier islands run up and down the length of North Carolina's seashore (Figure 6.1). And just as a dotted line indicates a separation of space so too do barrier islands seem to suggest a separation of points in space, i.e., barrier islands delineate the mainland from the ocean. Separate in space from the mainland, barrier islands appear to offer escape and refuge from the daily concerns of continental living. Thus, humans eagerly seek to colonize these dotted lines of islands despite their friable shorelines and predictable retreats toward the mainland continent. Barrier islands protect the mainland space from the ocean's expanse, but the dotted line of barrier islands is never a stationary line. For while the barrier islands *do* offer some protection to the mainland, the islands themselves are also inclined to move toward the mainland's harbour in their retreat from the ocean's daily waves, periodic storms, and rising levels.

Barrier islands are separated from one another by tidal inlets and are backed by salt marshes and often have inland maritime forests (Neal, Pilkey & Kelley 2007). Emerald Isle's once lush maritime forest has been bulldozed and replaced by souvenir shops, motels, and giant beach cottages. Bear Island was relatively *undeveloped*. It was undeveloped excepting facilities built by the state of North Carolina: a boat dock and an open shelter for state ferry passengers; a driveable footpath that connects the marsh side of the island with the ocean side of the island; a garage and storage facility; a small, heated and air-conditioned barracks for seasonal employees that reside on the island; a bath house with washrooms, water



fountains, outdoor showers, picnic tables, trash cans, and a snack bar. The state park had also designated along the island's shores 14 primitive campsites.

Figure 6.1 North Carolina mainland & Dotted Line of Barrier Islands. (Photo credit: NASA)

The world of the barrier island is one of the worlds of the sea turtle. How did sea turtles participate in the ecological dynamics endemic to this barrier island environment? Moreover, did individuals in the communities of practice perceive as meaningful the sea turtles' ecological locations in the barrier island environment they all shared? Hoping to gain some insight about these questions, at the end of each interview I asked each study participant alike: "In your experience...if North Carolina sea turtles completely disappeared, how might this impact the Coast?"

Seeking clarification from me Carl asked, "*Impact*...in what respect?"

"Whatever *your* opinion is," I replied. And Carl set in motion his opinion.

> Well, my personal opinion is that it would be a terrible loss to lose any species in this world, from many viewpoints. Number one is—it's an old saying that people always say and don't really think about, but—yea, "they are in that chain, that web of life, that things are connected. Each thing out there does have a purpose, does have a reason."

> That's a big thing…the health of the ecosystem, making sure that we have a healthy ecosystem that is representative of the things that are supposed to be there. I think that's important.
>
> Ah, you know, another example of that is (something that's not near as glamorous) is oyster shell communities—having an oyster reef. We don't have these oyster reefs and they're a very, very big indicator of the health of our marsh. And when you have those you have a lot of other things. That's why a lot of our marsh areas are getting more and more sterile. Because, these large oyster reefs are gone and not supporting all [of] the other small invertebrates and things that make the whole ecosystem healthy. So, I think from that aspect (from an ecological aspect) it would be terrible to lose one of the species.
>
> From a personal aspect just knowing we still have these neat creatures out there. And, "aren't there anymore?" To me that's very sad to know they're not going to be around anymore. Particularly, something like a sea turtle that's so ancient in its looks and they're almost dinosaur-like…to know that they're still here and hanging around... Even something as simple as seeing a fox; it's a wild animal and even wild animals have a place in our community…I mean it thrills me. To think that there's one gone forever…ah, that'd be a tragic loss.

I introduced Carl in previous chapters. Carl was a native; he had lived his entire life in this area of coastal North Carolina. He spent much of his youth outdoors, surrounded by wildlife. And in his career with the state of North Carolina park service Carl had spent many of his adult years in the outdoors surrounded by wildlife. Carl was recognized as, the "natural resources person", by his colleagues at Hammocks Beach State Park. Reserved, Carl declined the recognition and the potential celebrity that such an official title might confer.

"But," he added when I reminded him about his colleagues' views of him, "it's my personal interest and what I want to do and what I believe in."

Carl put into practice his beliefs and his interests at work and in the larger, surrounding community as well. He was regularly involved in local environmental meetings, initiatives, and contests.

Carl recognized the sea turtle as part of a healthy ecosystem. While he did not offer details relating the sea turtle's specific roles in barrier island ecology he understood its presence as an indicator of a healthy ecosystem. Carl compared the signifying role of the sea turtle to that of an oyster (and oyster reefs) in a marsh ecosystem: "We don't have these oyster reefs and they're a very, very big indicator of the health of our marsh. And when you have those you have a lot of other things. That's why a lot of or marsh areas are getting more and more sterile.*"*

Megan, a sea turtle biologist with the state of North Carolina Wildlife and Resources Commission (NCWRC) provided some specific details about the sea turtle's roles in barrier island ecology. Additionally, Megan acknowledged the limits to the possibility of knowing what the major biological consequences might be if the sea turtle completely disappeared from the North Carolina Coast. Nonetheless, like Carl, Megan sensed that a chain-of-being would be disrupted.

> I think it would be really hard to even fathom what…. You know, you could have everything from just the general effects of having turtles around and the nutrients they add to the system (the eggs and the eggshells, and the bacteria, and the turtle poop—everything that kind of gets added on to). Whether or not that would have any really noticeable effect down the chain--that it could be easily linked that fish stocks are declining because there's no more turtle poop [laughs]—whether we'd be able to link that I don't know [laughs]. You know, or if it would even be noticeable…it's stuff like that I start to think about if turtles were to really start to decline.
>
> And, I think um, if they weren't here at all I think there would be—you know, we do rely a lot on turtles being here and turtles coming up on the beach to nest as a tourist attraction…. And maybe not so much in North Carolina, because nesting's so spotty. (Here it's hard to take the public out on a turtle walk and actually have them see a turtle. That's pretty rare.)

> But, especially in Florida where they have so many nests and it's a piece of cake to go out on any given night to see a turtle nesting. If that became harder to do then I think a lot of aspects of tourism would suffer.
>
> I know—especially with the Sea Turtle Hospital—the towns on Topsail Island very much back the Turtle Hospital and Jean Beasley and give her a lot of support. Because, they know people come year after year. (I mean, of course, they love Topsail Island and a lot of people come back year after year.) But, a lot of people come back because they want to go to the Turtle Hospital. She brings in a lot of people and a lot of people come there to visit specifically her Hospital. And they know that she brings in people and that she's a major tourist attraction for that very sleepy little beach town.
>
> So, I think it's really hard to say what would be affected. But, that would probably be the most obvious, the "tourist effect". From a biological standpoint it would be hard really to link any sort of major effect. But, it would be there; it would definitely be there.

Megan also mentioned the effects on tourism that would likely be experienced in the wake of the sea turtle's disappearance. From the perspective of tourism, Megan recognized that the sea turtle played an important role as a flagship species. Similarly, when citing in his interview the "not near as glamorous" example of oyster shell communities...Carl, by counter-example, also acknowledged the relatively glamourous appeal of the sea turtle. Carl and Megan were both very aware of the sea turtle's potential cultural function as charismatic megafauna and as a tourist attraction.

In the following interview transcript, the sea turtle's cultural significance for a coastal "tourist mecca" and the turtle's ecological significance in a coastal "habitat" was also recognized by Elaine (one of the volunteers on Emerald Island).

> It depends on...it depends on how you look at the Coast. If you look at the Coast as a tourist mecca and a money-making mecca it's not going to hurt it at all. But, if you look at it as an environment for wildlife and that wildlife kind of goes hand-in-hand with the preservation of the habitat and everything then I think it will impact it greatly.

> But, I don't think anyone believes that. I think, I think people can ah…. You know, if they didn't have them [sea turtles]—just like I said to you in the beginning—there are people like "Oh, I didn't know there were sea turtles here."
>
> And truthfully, when we used to come here on vacation I never saw a nest or never noticed a nest. I'm sure they were there because we used to have…. I mean in years back, if you go through the stats there were twenty, twenty-five nests in one season. And my family would come down every year and I never saw it. And there was never a nest close by and I never asked about it because I was just self-focused. And, NOW, I'm amazed that people don't know.

Elaine's interview transcript was also remarkable because it revealed how Elaine's cognitive model of "the beach" changed as a result of her experience with the *NC Sea Turtle Protection Project*. Elaine's previous cognitive model of the beach was that of a *vacation beach*--"a tourist mecca". Whereas, Elaine's current cognitive model of the beach is one in which the beach is a place for family vacations but it is also a place for sea turtles' to nest.[117]

In each of their discussions Elaine, Megan, and Carl, linked the (hypothetical) disappearance of local sea turtles with potential ecosystem deficit or decline. This contrasted with Campbell and Smith's (2006) study of the values of volunteer tourists working in a Costa Rican sea turtle conservation program. Campbell and Smith noted "Second, we found no evidence of what Kellert (1986) classifies as ecological value, i.e., value attached to the role that sea turtles play as part of a wider ecological system...(2006, p. 94)."

Perhaps the participants in the *NC Sea Turtle Protection Project* learned about sea turtles from sources that placed greater emphases upon the significance of the sea turtle in barrier island ecology. On the other hand, in addition to the formal discourses with which

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[117] Elaine was also the volunteer who recognized that she had become a "nature girl" (see Chapter 5). Accompanying this change in her sense of self was a change in her cognitive model of the beach--a change in the way she looked at the world.

each program articulated, the potential for learning resources was multiple and varied for individual participants in both the Costa Rican and the North Carolina programs. Public libraries, college course and seminar offerings, museum, aquarium, and national and state parks education programs, and the Internet, are some of the many informal sources of education available to individuals keen on learning about sea turtles and their ecological niches.

All the same, discernible in Carl's, Megan's and Elaine's interviews was the embodied character of the knowledge these three individuals shared concerning the ecological significance of sea turtles. Their shared conception--that the turtle is part of a chain of being--demonstrated, in this example, perceptual experience's coupling with conception. A *chain* metaphor is a type of basic, experiential cognitive structure. Johnson (1987) defines these basic experiential cognitive structures as "kinesthetic image-schemas" (cited in Lakoff 1987, p.271). Additionally, Lakoff notes that kinesthetic image-schemas are gestalt structures derived from experience prior to *and* independent of any concepts (1987, p.271).

According to Lakoff, individuals employ a *chain* image-schema when describing perceived interrelationships (1987, p.274). For example, in her interview, Elaine described wildlife preservation as going "hand-in-hand with the preservation of habitat." Megan, the sea turtle biologist, opened her discussion with some scientific knowledge about sea turtles, e.g, nutrients (in the forms of eggs, eggshells, bacteria, and "poop") that the sea turtle adds to the [ecologic] system. But, Megan went on and proceeded to link the hypothetical extinction of the sea turtle--and the system-wide nutrients it distributes--"down the chain", to a

hypothetical possibility of related declines in fish stock. Carl noted that if sea turtles (and for that matter, "any species") were to disappear it would be "a terrible loss" because "they are in that chain, that web of life, that things are connected."

Carl also switched metaphors mid-sentence. He began with the image of a *chain* but then exchanged it with the image of a *web*. In either schema, a chain or a web, "things are connected" all the same. But, Carl's mid-sentence exchange of metaphors reminds us that in practice and in experience we remain connected to--perhaps, enmeshed in--discourse.

That is, current ecological discourse describes the biotic and abiotic elements of an ecosystem as an interconnected web. Carl knew this. A native of the North Carolina coast and regularly engaged in the discourse of ecology, in a mid-sentence moment Carl described for his conversants the connection between ecological knowledge as embodied experiential practice and ecological knowledge as theoretical discourse. Specifically, in terms of research on cognition and the mind, Carl's self-conscious mid-sentence switch of metaphors provided a brief glimpse of the organic connection between ecological knowledge as embodied experiential practice and ecological knowledge as theoretical discourse. This was a glimpse, perhaps, in terms of neural activity. A switch of conceptual metaphors may indicate a switch of (neural) cognitive structures. For, according to Lakoff & Johnson, "What we call concepts are neural structures that allow us to mentally characterize our categories and reason about them (1999, p. 19)."

Habitat: Dunes and Flats

In a barrier island ecosystem, Loggerhead sea turtles tend to nest atop or near an island's primary foredunes whereas Piping Plovers and colonial shorebirds tend to nest on

sand flats. Both features--sand dunes and sand flats--are topographic elements in healthy barrier island systems. Of the two, a sand dune is the topographical feature that offers the greatest amount of immediate protection from rising tides and from flood waters associated with severe thunderstorms and hurricanes. The stability and shelter that foredunes provide is also conducive to seed germination and the growth and development of plants. Established vegetation further contributes to island stability and the vegetation provides shelter and nutrients for various non-human island inhabitants.

Ironically, as a matter of practice, coastal land-development projects bulldoze, de-nude of vegetation, and flatten many of a barrier island's dunes so that the availability of beach-front properties is maximized (Neal et al 2007). Eventually, the beach that fronts these properties begins to disappear because the flattening and the removal of dunes to accommodate beach front properties results in the removal of the sources of sand that replenishes the beach [sand] lost to naturally-occurring beach migration or conditions that precipitate erosion (e.g., weather, winds, currents). Historically, up and down the US Atlantic coast various methods have been employed to mitigate erosion and to reduce beach migration. Methods of "hard stabilization" include the construction of sea walls, groins, breakwaters, and jetties (Neal et al 2007). Alternatives to the construction of these concrete impediments include: artificial beaches and artificial dunes (Neal et al 2007). To date, North Carolina has not permitted hard stabilization of its beaches but instead has relied upon the construction of artificial beaches and artificial dunes to slow the Atlantic's beachfront advance (see related discussion on beach nourishment in Chapter 4).

Because flooding and rising sea levels can destroy humans' homes and businesses, sand dunes were an island feature highly valued by island residents and business owners. Moreover, nesting loggerhead sea turtles made visible the foredune topography as habitat. Evident Loggerhead nesting habitat was in turn associated with overall island health.

Simply stated, *habitat* is the place that a living organism resides. It was the sea turtle's activities and participation in a particular island locale, though, that confirmed for some of the human observers (in this study) his or her perception of a viable habitat. A Loggerhead sea turtle nest (Figure 6.2) is a sign, for instance, produced by the sea turtle. It is an *indexical sign*, because "its representational focus is the location of a referent in space, time, or in relation to some other referent (Seebeok & Danesi 2000, p. 25).[118] Spatially, the sea turtle's nest pointed out the dune to the human observer and relationally defined the nest/ dune relationship as habitat. Temporally, this viable dune habitat was related then to perceptions of island health.

Figure 6.2 Loggerhead sea turtle nest atop Bear Island sand dune
© KCMartin 2004

[118] Seebeok & Danesi illustrate this description of "indexical signs" using Pierce's comment about the footprint that Defoe's (1719) literary character, Robinson Crusoe, found in the sand. Crusoe interpreted the footprint as an index of some creature (2000, p.25).

My conversation with the sea turtle biologist, Humberto, provided an illustration of this. I asked Humberto "what would be the impact (if any) of sea turtles disappearing along the coast?"

He replied, "Sociologically...right now we use sea turtles as a 'hook' to enact a lot of different legislation in the State for things like lighting, nourishment, beach bulldozing, development, types of sand (that people can put on the beach), fencing, plantings."[119]

"And, how about shorebirds?", I inquired.

"Yeah, the birds are getting a little bit better these days. But, yeah, they still don't have as much pull as turtles do. So I think if we lost the turtles there would be less management of how the coastal zone is developed."

Seeking some clarification, I asked, "So, these sociological impacts are also ecological impacts..."

Humberto quickly jumped in, "Oh-h-h yeah! Yeah, definitely. We probably wouldn't have as wide a beach right now or the houses set that far back right now. And we'd probably have huge lights on the beach (all sorts of stuff). Maybe we'd have big sand fences running parallel to the shore."

Colonial shorebirds like the Least tern (*Sterna antillarum*), the Common tern (*Sterna hirundo*) and the Black skimmer (*Rynchops niger*) nest on tidal flats. Piping plovers (*Charadrius melodus*) also nest on tidal flats and may also nest on low-pitched beaches along the line of the foredunes. On the tide flats one might spot an occasional embryonic dune but

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[119] The "hook" was the sea turtle's status as a protected species under the *US Endangered Species Act* (1973).

it was the overwash fan of sand and seashells that provided the nest sites and nest camouflage for these shore birds (see Figure 6.3). By virtue of their relatively diminutive size shore-

Figure 6.3 Least tern nest and egg **© KCMartin 2005**

birds' nests are likely ineffective indexical signs specifying viable habitat. On the other hand, the North Carolina State Parks provided additional signs pointing to the ecological significance of the tidal flat habitats.

Additionally, on Bear Island, the Park roped off the shorebird colony from May through August each year in an attempt to protect the colonial shore birds, their nests, and their nestlings. But, the Park's efforts were frequently ignored by individuals choosing to walk through the colony--rather than around it--to get from one side to the other on the narrowed end of the Island at Bogue Inlet. Neither ropes and threats of fines, nor signs *naming* a species' and defining its status as "federally protected", seemed able to convince trespassing human beings that they were disrupting viable habitat and maiming its young and fragile inhabitants.

Figure 6.4 A shorebird nesting colony established by the birds but protected by the US and North Carolina. © KCMartin 2005

An index is efficacious because it is dynamically connected with that which it points to or specifies and it is connected with the senses or memory of the person for whom it serves as a sign (Seebeok & Danesi 2000, p. 95). In other words, the sea turtle nest was an index of viable habitat *not* because there was a similarity between the built location (i.e, atop a sand dune) of the sea turtle's nest and the built location of the observing human's dwelling. Afterall, coastal development projects bulldoze most of an island's existing foredunes to make way for beach dwellings and businesses. Rather, the sea turtle's nest was an index of healthy island habitat because in the practical experiences of some of the study participants it connected with their perceptual senses and memories of what constituted a *viable* habitat. The study participants engaged in practices of sea turtle conservation on the beach. Correspondingly, in conversation, some participants' references to "habitat" defined a beach habitat. Evident throughout study participants' interview transcripts the discussions of

habitat--as habitat destruction ("beach and/or dune erosion"), habitat pollution ("plastics and balloons that wash up on the beach") and habitat renewal ("beach nourishment")--reflected participants' general, perceptual experiences of habitat as the beach.

Habitat Trajectory

Entry into this chapter entailed exiting from community of practice theory. Or maybe "one foot in, one foot out" better situates this chapter in terms of community of practice theory. Straddling the boundary like this was a necessary step so that I might consider how individuals developed concepts and practices of connection in their daily lives in practice with the sea turtle. Because human language is not a sign system in which sea turtles are able to partake, considering any meaningful engagements between humans and sea turtles would necessarily require some time spent outside the analytic lens of community of practice theory.[120]

I introduced the chapter with some discussion of how people became involved in local sea turtle communities of practice. The sea turtle's "large roundness" was not a precipitating factor in this connection. Continuing along an inbound trajectory, I highlighted a sample of community members' (and non-community members') impressions, encounters, and boundary experiences. After arriving in the world of barrier islands, individuals' senses of interactions with the sea turtles were narrated. Finally, the latter portion of the chapter presented an exploration of the implications of habitat for humans and sea turtles. In the end, what if sea turtles disappeared along North Carolina's coast? It would mean the loss of a healthy barrier island habitat and the loss of a barrier island way of practicing.

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[120] Engagements and negotiations of meaning in a community of practice setting requires one's capacity for participation and reification in the human language sign system.

Conclusion: The Nature of Experience 7

What better place to live and study than an island? Afterall, cultural images of Edenic island escapes proliferate our media. And some of the most famous scientific studies took place on islands: Darwin in the Galapagos Islands; Mead in Samoa; Geertz in Bali. An island's distance from the mainstream of the mainland and an island's ofttimes unique ways of life and unusual topologies inspire imaginings not unlike those of Holland et al.'s (1998) figured worlds. Then again, islands can be harsh and isolating locations: Easter Island; Crusoe's "Island of Despair"; Alcatraz; Guantanamo Bay, Cuba.

The island experience differed for each of the sea turtle interns that lived and worked on Bear Island during the summers that I was there doing my fieldwork. In summer 2004 Tina and I (as sea turtle interns) caught the attention of the park staff because we were each content to stay on the Island and because we each packed lightly. In subsequent summers, the interns departed the Island daily and each of these interns conveyed numerous possessions to the Island for his or her summer stay in the barracks. I wondered if, by contrast, the summer 2005 and summer 2006 interns experienced the Island environment as too isolating or too spartan. Whereas Tina and I found the Island offered endless opportunities for exploration, cataloguing its plants and its seashells, and for observing its wild inhabitants, these same aspects of the Island experience retained less attraction for the summer 2005 and summer 2006 interns. The summer 2005 and 2006 interns preferred the mainland's attractions: shopping, surfing the Internet, and hanging out in the Park visitor center.

Too, situating one's self in an experience like the North Carolina sea turtle conservation communities of practice was coupled with formations of self-identities as identities of participation and identities of non-participation. Wenger reminds us that identification includes experiences of what we enjoy being and what we dread (1998, p. 191). Wenger also wisely observes that, "We can be included in a community or excluded, and still identify with the situation in both cases (1998, p. 191)."

The nature of an experience is manifold--a superposition of states, if you will. And learning and knowledge production within any experience is uncertain. When experience is defined in terms of activity or practice then the object of that activity or practice is conditioned upon operationalized action(s) or the coupling of action(s) and activity (Dewey 1997, Leont'ev 1978, Maturana & Varela 1992, Nardi 1996). Translating this in terms of community of practice theory, learning and knowledge production may be observed at these sites of action: mutual engagement, negotiation of an enterprise, and sharing a repertoire (e.g. stories, artifacts, events, discourses).[121]

Take for example, a situated experience of being at the beach. Ubiquitous on the beaches of North Carolina's Crystal Coast, plastics littered the perceptual fields of all participants in this study. Twice daily, the Atlantic's high tides strewn along the upper beaches of the Crystal Coast a deposit of plastic debris. Revolting, the cache of plastic endlessly cast ashore, one couldn't help but imagine sometimes that the ocean was actually regurgitating the debris. Plastic's ubiquitous material presence contributed to its adoption as a mediating artifact. For the study participants, it was also a cultural artifact in that individuals' first

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[121] Recall Wenger's specification of the three dimensions characterizing a community of practice: mutual engagement, a negotiated enterprise, and a repertoire of negotiable resources accumulated over time (Wenger 1998, p. 126).

introduction to the problems of plastic trash was during a local meeting about sea turtle protection.[122] Assuming one's ongoing participation and succession along an inbound trajectory of learning and identity formation in one of the communities of practice, the problem of plastic quickly became a repertoire one shared with every member (in all three) of the North Carolina sea turtle conservation communities of practice that I studied.

The short answer questions (Appendix II, Table 2.4) that the study participants completed, the interviews, and [my] participant observations clearly demonstrated that--motivated by their knowledge of plastic trash's harsh and deadly threats to the island habitats and island inhabitants--the scientists, the volunteers and the Park employees had all been transformed into lifelong vociferous recyclers of plastic. This is impressive. Especially, if you think about the fact that when visitors to the beach encounter plastic strewn on the sand of North Carolina's Crystal Coast they just toss the plastic aside so they can set down their beach towels.

Leont'ev reminds us that a particular action may accomplish various activities, and [within a history of practice] may transfer from one activity to another (Leont'ev 1978, p. 64). Picking up plastic trash on the beach in order to prevent harm to sea turtles can engender one's sense of self as a community participant. New identities are coupled with new ways of looking at the world and ongoing negotiations of the meaning of "community participant". According to Wenger (1998) the outcome of this connection between practices of participation and practices of reification can enhance boundary crossings. Boundary

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[122] Plastic bags and balloons bobbing up and down in the ocean look like floating jelly fish. Loggerhead sea turtles eat jelly fish. They also eat plastic bags and balloons...and die. Plastics are harmful to a wide assortment of marine and coastal wildlife. Disintegrating plastic is toxic while intact plastic is lethal primarily via entanglement and ingestion. By no means is marine debris limited to plastics. But, plastics clearly represent a gigantic proportion of the debris that clutters the world's oceans and coastlines.

crossings between a community of practice and the larger world in which one participates open up the possibility of shared repertoires and enterprises and new alignments of the self as a community participant. At this point, one's expanded awareness and knowledge of plastic debris' assault on the planet can contribute to one's lifelong everyday practice of recycling plastic.

In Chapter 4, I suggested that learning and knowledge were in evidence when the enterprise of nest relocation was being negotiated across the boundary between the scientist's community of practice and the volunteer's community of practice. But learning and knowledge's presence cannot predict practitioners realignment or amenability to shared enterprises and shared repertoires. A community's privileged social position (the biologists) and access to power can disband activities or practices (moving nests) by another community (the volunteers) if these activities challenge stable practices (no nest relocation) with a relatively solid history of acceptance and/or history of institutional support (science and stats).

The distributed nature of ecological knowledge production was evident at the intersection between the geography of the sea turtle's life cycle and the activities of the federal and state agencies responsible for sea turtle protections (see Chapter 4 and Appendix IV, Figure 4.1 & Table 4.2). Here, knowledge was distributed across time and space. At this intersection the sea turtle's spatial locations (terrestrial, oceanic and neritic) and age- and season-related activities, and the agencies' historic and geographic activities paired with their respective responsibilities for protecting sea turtles, all figured into the production of ecological knowledge. Notwithstanding this intersection of activities, each agency's

conceptual ecological locus of practice differed. The US NOAA Fisheries, for example, conceptualized its practices in terms of "ecosystem". "Species" was the NC Wildlife Resources Commission's (NCWRC) conceptual ecological locus. And, "habitat" was the NC Division of Marine Fisheries' (DMF) conceptual ecological locus.

The state sea turtle biologists with the NCWRC and the NC Division of State Parks taught new sea turtle volunteers and sea turtle interns about local sea turtle conservation practices from the conceptual ecological locus of "species". This was the case during the period when Rianna was the state biologist as well as during the period when I was a sea turtle intern conducting my dissertation field research (and Humberto and Megan were the current state sea turtle biologists). Much of the anchoring of the *NC Sea Turtle Protection Project* and the development of its communities of practice occurred during Rianna's tenure. Using what materials and state support she could avail herself, Rianna set about the task of teaching the Emerald Isle volunteers and the Hammocks Beach State Park staff how to collect data, how to aid injured and/or ill sea turtles, how to perform a necropsy and how to obtain Federal permits for engaging in local practices to protect sea turtles. Rianna was a co-author of the first *Handbook for Sea Turtle Volunteers in North Carolina*. She established an annual, statewide Spring meeting for everyone (scientists, volunteers, and park staff) participating in *North Carolina's Sea Turtle Protection Project*. And, Rianna insured that the office of North Carolina's state sea turtle biologist would become a permanently staffed position recognized and supported by the NCWRC. The formations of community identities, the creation of connections between communities, the development of protocols, and the

organization of practices all contributed to anchoring the *North Carolina Sea Turtle Protection Project*.[123]

The annual springtime sea turtle meeting offered a review of, or an introduction to, the practices of North Carolina's sea turtle conservation communities of practice (depending, that is, on whether one was an old-timer or a newcomer). The annual meeting also provided members of the different sea turtle conservation communities the opportunity to re-connect, to share stories, to introduce new ideas and to make inquiries. Additionally, each spring, a number of speakers were invited to give presentations on topics of sea turtle research and/or ecological and sociocultural issues related to the protection of sea turtles. This spring ritual was a site for continuing education and it reaffirmed the centrality of scientific discourse's location in North Carolina's sea turtle conservation communities of practice.[124]

Instructional and informational in content, the *Handbook for Sea Turtle Volunteers in North Carolina* was a primary pedagogical resource detailing: how to identify the five species of sea turtles that annually visited the North Carolina coast--the Loggerhead (*Caretta caretta*), the Kemp's Ridley (*Lepidochelys kempii*), the Green Turtle (*Chelonia mydas*), the Leatherback (*Dermochelys coriacea*) and the Hawksbill (*Eretmochelys imbricata*); how to identify a nest; how to protect a nest; how to excavate a nest; how to aid a debilitated turtle or to recover a dead turtle.[125] The *Handbook* contained contact information and maps and it

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[123] Interestingly, during this same period the Emerald Isle volunteer community elected to change its name from *The Emerald Isle Turtle Trotters* to (in the words of one volunteer, the "more official-sounding") *Emerald Isle Sea Turtle Protection Program.*

[124] It was during the Spring 2006 annual sea turtle meeting that the Emerald Isle volunteers' peripheral practice of nest relocation was noted and extinguished.

[125] Conversation, storytelling, demonstration, and participation in practice were the other primary sources for teaching, learning and sharing knowledge about how to protect sea turtles. For example, recall from Chapter 3 my notes about my arrival at Hammocks Beach State Park and introduction to my summertime employment as a sea turtle intern.

provided written outlines of procedures and protocols.[126] It was not, however, a resource for learning ecological knowledge as it related to sea turtles; nor did it introduce any ecological concepts like "ecosystem" or "habitat". This fact coincides with the NCWRC' conceptual ecological locus of practice at the level of "species".

Chapter 6 explored the significance of discovering that there's a sea turtle in one's habitat. In this chapter, I considered how individuals developed concepts and practices of connection in their daily lives. I began the chapter with the question, "what sorts of experiences contributed to individuals' learning and understanding and ultimately contributed to individuals' senses of connection with the sea turtle?" The sorts of concepts and practices of connection that emerged had little to do with any perceivable "cute" or "charismatic" features that the sea turtle might have possessed. Individuals' initial impressions and encounters with sea turtles left them awestruck and ofttimes revering the sea turtle's pre-historic ancestry. Individuals also identified with the sea turtle's efforts and struggles to come ashore to nest and to reproduce its species and (more generally) to survive.

Individuals' extended experiences with the sea turtles--coupled with their engagements in local sea turtle conservation practices--potentially contributed to the conceptual and practical connections that individuals experienced and related in their interviews. In part the significance of the sea turtle in participants' lives was cultural or, from park ranger Dewey's perspective, "kinda' local culture of the coast--especially, the barrier island parts of the coast." Additionally, Dewey proposed that the sea turtle's ubiquity in local culture together with the geographic presence of undeveloped Bear Island meant that "a lot of

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[126] The 2006 edition of the *Handbook for Sea Turtle Volunteers* provided a page of references and resources for additional inquiry and [one's] informal education about sea turtles. Informally, I learned about sea turtles by consulting a few classic texts Lutz, Musick, & Wyneken, (1997) and Bjorndal (1982).

people understand NOT developing one of our last islands." Indeed, were the sea turtle to possibly disappear from North Carolina's coast, cultural and ecological consequences were also envisioned by other members of the local sea turtle conservation communities of practice. Carl (a park ranger), Megan (a biologist) and Elaine (a volunteer) each used a chain metaphor to describe their understanding of the ecosystem dynamics that might coincide with the sea turtle's disappearance along North Carolina's coast. Each individual's cognitive model was discernibly embodied for meanings in each model were constructed using real examples of personal experiences in the world. According to Lakoff, "Cognitive models that are embodied are not made up merely of items in an artificial language (1987, p. 206)."

The sea turtle's visible presence and activities on the beach also contributed to individuals' embodied conceptions of "habitat". The sea turtle's presence on the beach and its tendency to nest on or near the foredunes confirmed for some of the human observers (in this study) their perceptions of a viable habitat. An indexical sign, the sea turtle's nest pointed out the dune to the human observer and relationally defined the nest/dune relationship as habitat. Moreover, the sea turtle's nest was an index of healthy island habitat because in the practical experiences of some of the study participants it connected with their perceptual senses and memories of what constituted a viable habitat. As I previously noted in Chapter 6, evident throughout study participants' interview transcripts the discussions of habitat--as habitat destruction ("beach and/or dune erosion"), habitat pollution ("plastics and balloons that wash up on the beach") and habitat renewal ("beach nourishment")--reflected participants' general, perceptual experiences of habitat as the beach.

Looking back at the definition of ecological knowledge that I proposed in Chapter 1, the emergence of this concept of habitat was also (in terms of social practice) an example of the production of ecological knowledge. For, the state sea turtle biologists used this conception of habitat (along with the added "hook" afforded by the sea turtle's protected status) in matters of North Carolina's coastal management to enact legislation that protected and contributed to the viability of the local barrier island ecosystem.

The coupling of identities and identity formations with learning and knowledge production was not a connection easily discerned. The experience of Emerald Isle volunteer Elaine was the exception. Elaine recognized in herself a transformation of identity--she had become a "nature girl" (see Chapter 5). As Elaine understood it, becoming a "nature girl" accompanied a sense of being able to do things she would never before thought she could have accomplished. Elaine had also developed a newfound sense of awareness about humans' relationships with nature. Her understanding of the beach as "habitat" was one aspect of this new awareness about human and non-humans interrelationships (see Chapter 6). In Chapter 5, I also highlighted instances in which individuals' experienced the sometimes contested character of [their] self identities. At times, participants experiences of contested identities occurred along with contested ideas about the meaning of nature. Because the experiences of contested identities were also experienced as contests between ideals or one's sense of belonging to more than one community, it was plausible that the dialogue and inner speech that accompanied these contested experiences was also revealing of the learning and knowledge produced in these experiences.

Finally, despite our sciences and our stats, on many levels our knowledge of how we learn and how we know remains incomplete. At times, on reading Wenger's (1998) interpretation of community of practice theory I found his explanations vague and not quite "to the point" about the how of the activities and processes that structured a community of practice. But, perhaps his model of a community of practice realistically depicts some aspect or facet of the nature of human cognition and in this manner is best left leaving his reader with a sense of the incompleteness about how we learn and how we know.

Wenger (1998) draws a picture within a picture; community of practice is recursively defined. The following statement is an example of recursion concerning the activity of identity formation: formation of an identity as a community member may be recognizable because of participation as a member in a community. Also Wenger's observation that "identity in practice is defined socially because it is produced as lived experience of participation in specific communities" (1998, p. 151) provides another example of a recursive activity. Recursion is a feature in some models of cognition (Hofstader 1979, Maturana & Varela 1992, Minsky) 1986). According to Minsky (1986) forms of memory and language may function recursively. In our brains, below many levels of tangled (but modifiable) recursive sets Hofstader suggests that there is an inviolate level or schema that does not change. (1979, p. 685). In the levels that do change there are neural nodes or activity centers that can connect with one another in a variety of ways depending upon the nature of one's experiences (and the developmental state of the brain at that point in time). This is the area of incomplete knowledge contingent as it is upon our perceptual experiences, activities, practices, and engagements with one another.

It may be, that it's turtles all the way down.

Nonetheless, there were glimpses of evidence in this study's outcomes that supported Schrodinger's assurances that upon our observing *Felis catus* the cat's reality crystallizes. And, increased is the likelihood of our knowledge through our engagements with one another.

Appendix I

Demographics & Social Locations
of
Study Participants

	State park staff	Biologists	Island volunteers[b]
Sample size (n)	n = 11	n = 9	n = 7
Ethnicity	Euro-American(10) Native American (1) Unknown (3)	Euro-American (5) Native American (1) Jewish (1) Black (1) Unknown (1)	Euro-American (6) French Canadian (1)
Gender	Female (4) Male (7)	Female (4) Male (5)	Female (4) Male (3)
Education--highest level obtained	4 yr college degree or some college (11)	PhD (4) MS (4) BS (1)	PhD (1) MA or MS(≥ 1) 4 yr college degree or some college (≤5)
Occupation	park ranger (5) educator (2)[a] boat captain (2)[a] student intern (1) administrative (1)[a]	Federal biologist (2) State biologist (6) NGO biologist (1)	professor (1) engineer (1) teacher (1) therapist (1) military (1) artist (1) judicial admin (1)
Age range--yrs	20-40 (4) 41-60 (5) 61& up (2)	20-40 (3) 41-60 (5) 61 & up (1)	20-40 (0) 41-60 (1) 61 & up (6)

Table 1.1: Participant Demographics

(a) these individuals had previous careers in education, fishing and technology, & military

(b) volunteers (except artist) all current retirees

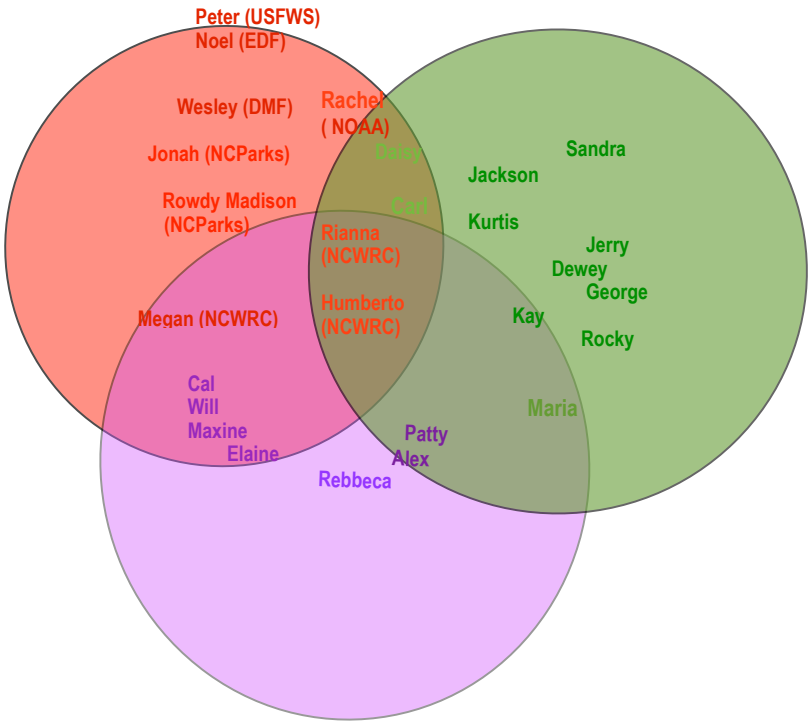

Table 1.2: Participants' Social Locations in Each Community of Practice

Notes:

Scientist community of practice =

Volunteer community of practice =

State Park community of practice =

***The text of each individual's name is color-coded to match each individual with his/her community of practice.**

Appendix II

Interviews and Instruments

Table 2.1: Interviews and Interview Questions

Involvement Interviews

1. When did you first become aware of conservation issues related to sea turtles?

2.. How did you become involved in the local North Carolina Sea Turtle Project?

3. In your experience…if North Carolina sea turtles completely disappeared how might this impact the Coast?

Organization Interviews

1. How is (name of community group) involved in the North Carolina Sea Turtle Project?

2. How does your organization's work in protecting the sea turtles interface with the work of (name of community or agency).

3. What sorts of responsibilities do individuals in your group typically have?

4. Why does your group believe it is important to protect sea turtles?

5. What is your organization's mission?

Ecological Issues Interviews

1. What kinds of ecological issues are important to you?

2. If you were in charge of the Emerald Isle beach nourishment project how would you handle the issue of moving low-lying nests?

Table 2.2: Participants and Interview Types

Participant	Focused Participation Interview	Organization Interview	Ecological Issues Interview	Survey & Question
Dewey	x		x	x
Carl	x	x	x	x
Daisy	x		x	x
Kurtis	x	x	x	x
Sandra	x	x	x	x
Jackson	x	x	x	x
Rocky	x		x	x
George	x		x	
Kay	x		x	x
Jonathan	x		x	x
Maria	x		x	x
Rianna	x		x	
Megan	x		x	x
Noel	x	x	x	
Humberto	x	x	x	x
R. Madison	x		x	
Rachel	x		x	x
Peter	x	x	x	x
Johah	x		x	x
Wesley	x	x	x	
Cal	x	x	x	x
Rebecca	x		x	x

Participant	Focused Participation Interview	Organization Interview	Ecological Issues Interview	Survey & Question
Alex	x		x	
Maxine	x	x	x	x
Will	x	x	x	x
Patty	x		x	x
Elaine	x	x	x	x
Data Collection Totals by Type	27	12	27	21

Notes:

1. In order to protect participant anonymity, listed names of participants are pseudonyms. Each participant chose his or her pseudonym. In a few cases, participants asked me to assign a pseudonym or I necessarily modified an individual's chosen pseudonym because the name choice would prove confusing to the reader.

2. To aid in identifying each community of practice represented in this (and other, accompanying graphics) each community of practice was assigned a color code. Green text and color-fill was assigned to the state park community of practice, red text and color-fill was assigned to the scientist community of practice, and purple text and color-fill was assigned to the volunteer community of practice.

Table 2.3: Adaptation of Kuhn & McPartland (1953) Survey Instrument

Questionnaire

There are twenty numbered blanks on the page below. **In these blanks, please write twenty answers to the simple question, "Who am I?"** Just give twenty different answers to this question. Answer as if you were giving the answers to yourself, not to somebody else. Write the answers in the order that they occur to you. Don't worry about *logic* or *importance*. Working quickly, allow yourself 12 minutes to complete as many
blanks as possible.

1.
2.
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19.
20.

Your Name (please print)_____

Table 2.4: Short Answer Questions

Short Answer Questions

Each of the following questions relates to a topic raised by a significant number of study participants, each, during his or her interview. Please provide in the space below a brief reply to each of the questions listed below.

1. Are there other activities or groups that you participate in that are like the turtle project?

2. Plastic trash on the beach is widely recognized as harmful to sea turtles. What are some good ways that you have come up with to cut down on plastic trash?

3. Some people distinguish “local development” from “local change”. Do you see a difference in those two things? What’s the difference?

Appendix III

Identity Data

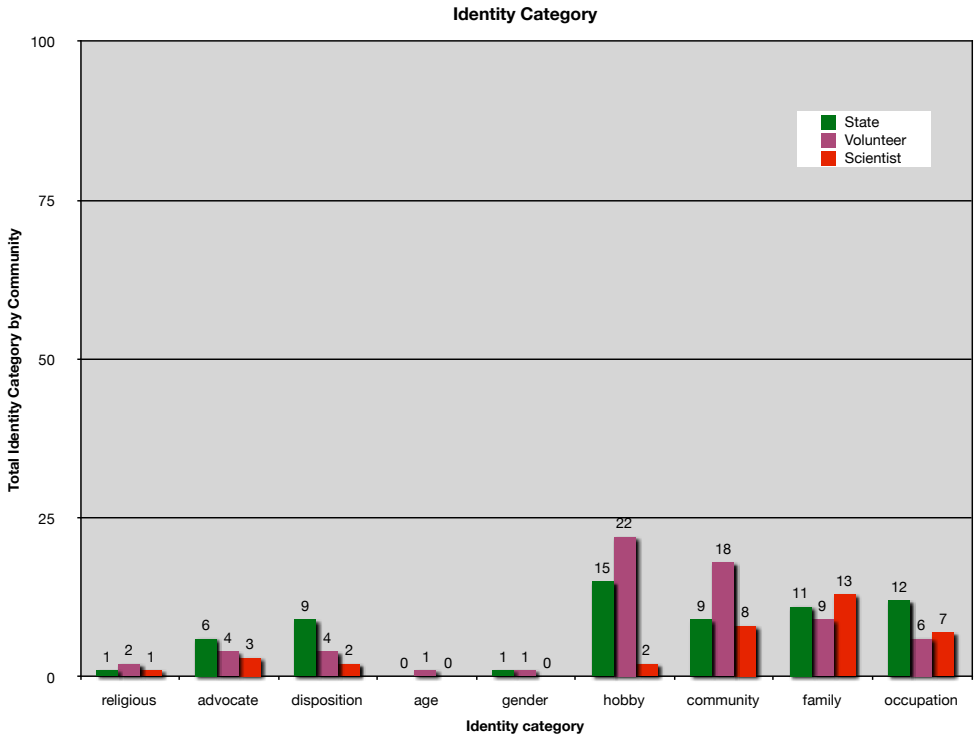
Table 3.1: Specific Identities in Each Category of Identity

Group ID	Occupation	Family	Community	Hobby	Gender	Age	Disposition	Advocate	Religious
	biologist	aunt	leader	gardener	woman	baby boomer	learner	animal lover	religious
	biologist	daughter	environmentlst	cook	woman		optimist	nature lover	christian
	biologist	partner	environmentlst	gardener			conservative	coastl advocte	methodist
	biologist	mother	volunteer	bibliophile			cynic	dog lover	christian
	editor	wife	leader	auriophile			loner	animal lover	
	biologist	daughter	friend	nature lover			optimist	ocean lover	
	teacher	sister	volunteer	hunter/fisher			optimist	environ. advoc	
	retiree	son	teacher	choir membr			social butterfly	animal lover	
	artist	dad	red sox nation	walker			rolling stone	sea trtle advoc	
	retired prof	friend	political actvst	history buff			conservative	animal lover	
	geologist	brother	american	math hobbyist			family man	eviron advoc	
	acad. chair	son	ret. soldier	epicurean			listener	environ. advoc	
	award academ	husband	AA member	instructor			listener	environ. advoc	
	speech pathlg	daughter	leader	birder			extrovert		
	scientist	wife	conservationst	naturalist			comm. minded		
	park ranger	husband	hippy	scuba diver					
	teacher	father	turtle vol cord	writer					
	law enforce	granddad	museum vol	cook					
	manager	granddad	bble studylead	reader					
	park ranger	father	swede-americ	epicurean					
	mer mar cpt	husband	college alum	traveller					
	supervisor	mother	volunteer	sci-fi reader					
	consultant	friend	facilitator	outdoorsman					
	teacher	pet cmpanion	friend	swimmer					
	educ/instruct	mother	political vol	outdoorsman					
	scientist	wife	republican	surfer					
	homemaker	father	beach bum	fisherman					
		husband	environmentlst	scuba diver					
		pet cmpanion	volunteer	kayaker					
		pet cmpanion	friend	sushi chef					
		girlfriend	scotsman	artist					
		sister	democrat	cook					
		daughter	homeowner	auriophile					
			organizer	outdoorsman					
			Eagle Scout	fisherman					
				fisherman					
				runner					
				naturalist					
				musician					

Identity	Scientist	% Total ID	Volunteer	% Total ID	State	%Total ID
occupation	7	19	6	9	12	19
family	13	**35**	9	13	11	17
community	8	22	18	**27**	9	14
hobby	2	6	22	33	15	**23**
gender	0	0	1	1.5	1	2
age	0	0	1	1.5	0	0
disposition	2	6	4	6	9	14
advocate	3	8	4	6	6	9
religious	1	3	2	3	1	2
Raw Ttl ID	**37**		**67**		**64**	

Table 3.2: Identity Category Totals by Community

Table 3.3: Total Identity Category by Community



Appendix IV

Ocean Biozones
&
Geography of Sea Turtle Life Cycle and
Federal & State Agencies' Protections of Sea Turtles

Table 4.1 Terrestrial, Neritic, and Ocean Biozones (from http://www.noaa.gov)

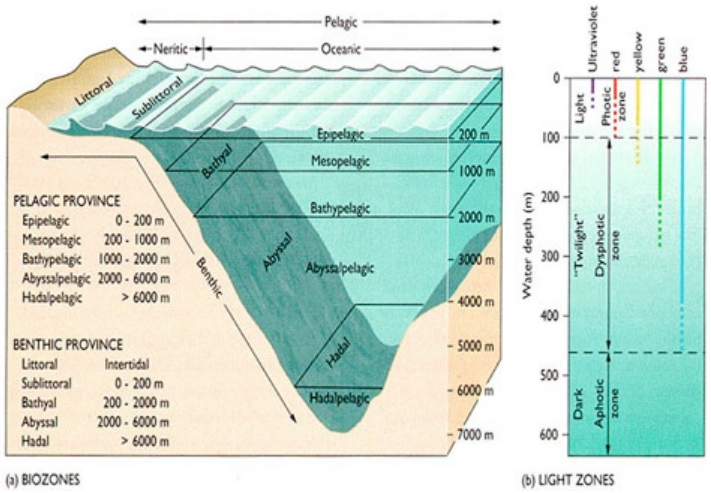


Table 4.2 Geography of Sea Turtle Life Cycle and Federal & State Agencies' Protection of the Sea Turtle

Agency / **Turtle Life Cycle**	**US Fish & Wildlife Services** enforce US Endangered Species Act	**US NOAA Fisheries** recovery & maintenance of protected species	**NC Department Environment & Natural Resources**		
			WRC conserve & use	**DMF** steward & use	**Parks** conserve rec & educ
Terrestrial	x	x	x		x
Oceanic	x	x		x	
Neritic	x	x	x	x	x

Notes:
1. WRC = North Carolina Wildlife Resources Commission
   DMF = North Carolina Division of Marine Fisheries
   State Park = North Carolina Division of State Parks
2. WRC also "strives to prevent species from becoming endangered"

Bibliography

Allen, C. & Bekoff, M. (1997). *Species of mind, the philosophy and biology of cognitive ethology*. Cambridge: MIT Press.

Anderson, J.R., Reder, L.M., Simon, H.A. (1996). Situated learning and education. *Educational Researcher*, 25(4), 5-11.

Archer, M.S. (2000). *Being human: The problem of agency*. Cambridge: Cambridge University Press.

Argyris, C. & Schön, D.A. (1978). *Organizational learning: A theory of action perspective*. San Francisco: Jossey-Bass.

Argyris, C. & Schön, D.A. (1974). *Theory in practice: Increasing professional effectiveness*. San Francisco: Jossey-Bass.

Barab, S.A. & Plucker, J.A. (2002). Smart people of smart contexts? Cognition, ability and talent development in an age of situated approaches to knowing and learning. *Educational Psychologist*, 37(3), 165-182.

Bateson, G. (1972). *Steps to an ecology of mind.* New York: Ballantine Books.

Bakhtin, M.M. (1990). *Art and answerability* (M. Holquist, Ed. & Vadim Liapunov, Trans.). Austin: University of Texas Press.

Bakhtin, M.M. (1981). *The dialogic imagination*: Four essays by M.M. Bakhtin (M. Holquist, Ed., C. Emerson & M. Holquist, Trans.). Austin: University of Texas Press.

Bakhtin, M.M. (1986). *Speech genres and other late essays* (C. Emerson & M.Holquist, Eds. & V. W. McGee, Trans.). Austin: University of Texas Press.

Bereiter, C. (1985). Toward a solution of the learning paradox. *Review of Educational Research*, 55(2), 201-226.

Bertalanffy, L. von (1968). *General system theory: Foundations, development, applications.* New York: George Braziller.

Bertalanffy, L. von (1975). *Perspectives on general system theory: Scientific philosophical studies* (E. Taschdjian Ed.). New York: G. Braziller.

Björndal, K. A. (Ed.) (1982). *Biology and conservation of sea turtles.* Washington DC: Smithsonian Institution Press.

Boettcher, R. & Henson, T & Godfrey, M. & Cluse, W. (Eds.) (2006) *Handbook for sea turtle volunteers in North Carolina* (Rev. ed.). Raleigh, NC: NC Wildlife Resources Commission.

Bourdieu, P. (1990). *The logic of practice,* (R. Nice, trans.). Stanford: Stanford University Press. (Original work published 1980).

Bourdieu, P. (1977). *Outline of a theory of practice,* (R. Nice, trans.). Cambridge: Cambridge University Press. (Original work published 1972).

Bowers, C.A. (1993). *Education, cultural myths, and the ecological crisis: Toward deep changes.* Albany: State University of New York Press.

Broglie, L. de (1960). *Physics and microphysics: Expositions on physics and the history and philosophy of science*, (M. Davidson, Trans.). New York: Harper Torchbooks, The Science Library. (Original work published n.d.).

Bronfrenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Cambridge, MA: Harvard University Press.

Brooks, R.A. (1998). Intelligence without representation. In (A. Clark & J. Toribio, Eds.) *Cognitive architectures in artificial intelligence: The evolution of research programs*. New York: Garland Publishing, Inc.

Brown, J.S. & Collins, A. & Duguid, J. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 8(1), 32-42.

Camazine, S., Deneubourg, J.L., Sneyd, J., Theraulaz, G., & Bonabeau, E. (2001). *Self-organization in biological systems (pp. 5-27)*. Princeton: Princeton University Press.

Campbell, L.M. (2002). Science and sustainable use: Views of marine turtle conservation experts. *Ecological Applications,* 12(4), 1229-1246.

Campbell, L.M. (1997). Contemporary culture, use and conservation of sea turtles, In P.L. Lutz (Series Ed.) & P. L. Lutz, J.A. Musick, & J. Wyneken (Vol. Eds.). *The biology of sea turtles: Vol. 2. CRC marine biology series.* (pp. 307-338). New York: CRC Press.

Campbell, L.M. & Smith, C. (1986). What makes them pay? Values of volunteer tourists working for sea turtle conservation. *Environmental Management*, 38(1), 84-98.

Capra, F. (1996). *The web of life: A new scientific understanding of living systems*. New York: Bantam Doubleday Publishers.

Capra, F. (2002). *The hidden connections: Integrating the biological, cognitive, and social dimensions of life into a science of sustainability*. New York: Doubleday.

Carroll, J. (1963). A model of school learning. *Teachers College Record*, 64, 723-733.

Carleton, R. & Gregg Jr., W.P. (1991) Establishing biosphere reserves for coastal barrier ecosystems. *Bioscience*, 41(5), *Coastal Barriers* 301-309.

Carson, R. (1955). *The edge of the sea*. New York: The New American Library.

Clark, A. (2008). *Supersizing the mind: Embodiment, action, and cognitive extension*. Oxford: Oxford University Press

Certeau, M. de (1988). *The practice of everyday life* (S. Rendell, Trans.). Berkeley: University of California Press.

Clayton, L. & Optow, S. (Eds.) (2003). *Identity and the natural environment: The psychological significance of nature*. Cambridge, MA: MIT Press

Clifford, J. & Marcus, G.E. (Eds.). (1986). *Writing culture: The poetics and politics of ethnography*. Berkeley: University of California Press.

Cole, M., Engeström, Y. & Vasquez, O. (Eds.). (1997). *Mind, culture and activity: Seminal papers from the Laboratory of Comparative Human Cognition*. Cambridge: Cambridge University Press.

Coombs, P.H., Prosser, R.C. & Ahmed, M. (1973). *New paths to learning: For rural children and youth.* New York: International Council for Educational Development

Crouse, D.T. (1985). The biology and conservation of sea turtles in North Carolina (marine, population, *Caretta caretta*, demography, Georgia). Ph.D. dissertation, The University of Wisconsin - Madison, United States -- Wisconsin. Retrieved November 1, 2009, from *Dissertations & Theses: Full Text*. (Publication No. AAT 8519758).

Darwin, C. (1965). T*he expression of the emotions in man and animal*s. Chicago: University of Chicago Press. (Original work published 1872).

Darwin, C. (2009). *On the origin of the species*. Cambridge: Cambridge University Press. (Original work published 1859).

Davies, C.A. (1999). *Reflexive ethnography, a guide to researching selves and others.* London: Routledge.

Dewey, J. (1997). *Experience and education*. New York: Simon & Schuster. (Original work published 1938)

Dourish, P. (2001). *Where the activity is: The foundations of embodied interaction.* Cambridge, MA: MIT Press.

Dreyfus, H.L. (1979). *What computers can't do: The limits of artificial intelligence*. New York: Harper & Row.

Dupuy, J. & Varela, F.J. (1992). Understanding origins: An Introduction. In R.S. Cohen (Series Ed.) & F.J. Varela & J. Dupuy (Vol Ed.) *Boston studies in the philosophy of science Vol. 130. Contemporary Views on the Origin of Life, Mind and Society* (pp. 1-26). Boston: Kluwer Academic Publishers.

Eisenhart, M., Finkel, E. & Marion, S.F. (1996). Creating the conditions for scientific literacy: A re-examination. *American Educational Research Journal*, 33(2), 261-295.

Engeström, Y., Miettinen, R. & R. Punamäki (Eds.). (1999). *Perspectives on activity theory* (pp. 1-38 & 377-404). Cambridge: Cambridge University Press.

Entwistle, A. & Dunstone, N. (1999). *Priorities for the conservation of mammalian diversity: Has the panda had its day?* Cambridge: Cambridge University Press

Evens, T.M.S. (2008). *Anthropology as ethics: Nondualism and the conduct of sacrifice.* New York: Bergahm Books.

Forrester, J.W. (1969). *Urban dynamics* (pp. 1-14). Cambridge, MA: MIT Press.

Foucault, M. (1972). *The archaeology of knowledge*, (A.M. Sheridan Smith, Trans.). New York: Pantheon Books. (Original work published 1969).

Foucault, M. (1995). *Discipline & punish: The birth of the prison*, 2nd ed. (A. Sheridan, Trans.) New York: Vintage. (Original work published 1975).

Freire, P. (2000). *Pedagogy of the Oppressed*. (M.B. Ramos, Trans.) New York: Continuum. (Original work published 1972)

Gagnè, R.M. (1965). *The conditions of learning*. New York: Holt, Rinehart & Winston.

Giddens, A. (1991). *Modernity and self-identity: Self and society in the late modern age* (pp. 1-34). Stanford: Stanford University Press.

Ginsburg, M. (Ed.) (1995). *The politics of educators' work and lives*. New York: Garland Publ. Inc.

Godfrey, M. & Holloman, K. (2005). *2004 Sea turtle monitoring project report Bogue Banks, North Carolina*. Raleigh, NC: North Carolina Resource Commission.

Gore, A. (1993). *Earth in the balance: Ecology and the human spirit*. New York: Plume

Gould, S.J. (1980). *The panda's thumb: More reflections in natural history* (pp. 95-107). New York: W. W. Norton & Company.

Gramsci, A. (1971). The intellectuals: The formation of intellectuals. In (Q. Hoare & G.N. Smith, Eds. & Trans.) *Selections from the Prison Notebooks*. New York: International Press.

Gray, D.B., Borden, R.J. & Weigel, R.H. (1985). *Ecological beliefs and behaviors: Assessment and change.* Westport: Greenwood Press.

Greene, M. (1994). Epistemology and educational research: The influence of recent approaches to knowledge. *Review of Research in Education*, 20, 423-464.

Greene, M. (1997). Metaphors and multiples: Representation, the arts and history. *The Phi Delta Kaplan*, 78(5), 387-394.

Grumet, M. (2009). The politics of personal knowledge. *Curriculum Inquiry,* 17(3), 319-329.

Gredler, M.E. (1997). *Learning and instruction: Theory into practice*. New Jersey: Prentice-Hall.

Gribbins, J. (1984). *In search of Schrödinger's Cat: Quantum physics and reality.* New York: Bantam Books.

Griffith, D. R. (1992). *Animal minds*. Chicago: University of Chicago Press.

Gross, M. (2003). *Inventing nature: Ecological restoration by public experiments.* New York: Lexington Books.

Haas, P. M. (1997). Scientific communities and multiple paths in environmental management. In (L.A. Brooks & VanDeveer, S.D. Eds.) *Saving the seas: Values, science and international governance*. College Park, MD: Maryland Sea Grant College.

Heisenberg, W. (1958). *Physics and philosophy, the revolution in modern science*. New York: Harper and Row Publishers.

Hofstadter, D.R. (1980) *Godel, Escher, Bach: An eternal braid*. New York: Vintage Books

Holland, D. & Lachicotte, W. Jr. & Skinner, D. & Cain, C. (1998). *Identity and agency in cultural worlds.* Cambridge: Harvard University Press.

Holland, D. & Lachicotte, W. Jr. (2007). Vygotsky, Mead and the new sociocultural studies of identity. In (H. Daniels & M. Cole. & J. Wertsch, Eds.) *The Cambridge companion to Vygotsky*. New York: Cambridge University Press.

Holland, D. & Lave, J. (Vol. Eds.) (2001). History in person: enduring struggles, contentious practices, intimate identities. In D.W. Schwarz (Series Ed.) *School of American Research Advanced Seminar Series.* Santa Fe: School of American Research Press.

Hutchins, E. (1995). *Cognition in the wild*. Cambridge, MA: MIT Press.

Illich, I. (1972). *Deschooling society*. New York: Harper & Row.

Jasanoff, S. (1997). Compelling knowledge in public decisions. In (L.A. Brooks & VanDeveer, S.D. Eds.) *Saving the seas: values, science and international governance*. College Park, MD: Maryland Sea Grant College.

Johnson, M. (1987). *The body in the mind: the bodily basis of imagination, reason, and meaning*. Chicago: University of Chicago Press.

Johnson, M. & Lakoff, G. (2002). Why cognitive linguistics requires embodied realism. *Cognitive Linguistics*, 13 (3), 245–263, ISSN (Online) 1613-3641, ISSN (Print) 0936-5907, DOI: 10.1515/cogl.2002.016, 23/09/2002 Published Online: 23/01/2006

Jorgensen, S.E. (2002). I*ntegration of ecosystem theories: a pattern* (3rd ed.). London: Kluwer Academic Publishers.

Kahn, P.J. (1999). *The human relationship with nature: Development and culture*. Cambridge, MA: MIT Press.

Kellert, S. R. (1985). *A bibliography of human/animal relations* (J.K. Berry, Ed.). Lanham, MD: University Press of America, c1985.

Kellert, S. R. (1982) Public attitudes toward critical wildlife and natural habitat issues (In J.K. Berry,Ed.) *U.S. Fish and Wildlife Service and Yale University School of Forestry and Environmental Studies*. Washington, D.C. : U.S. Dept. of the Interior, Fish and Wildlife Service.

Kellert, S. 1986. Social and perceptual factors in the preservation of animal species. In B. G. Norton (Ed.), *The preservation of species*. Princeton: Princeton University Press.

Kellert, S. R. (1996). *The value of life: Biological diversity and human society.* Washington DC: Island Press.

Kirshner, D. & J.A. Whitson (Eds.) (1997). *Social cognition: Social, semiotic, and psychological perspectives*. New Jersey: Lawrence Erlbaum Associates, Inc.

Kitchell, A. & Kempton, W. & Holland, D. & Tesch, D. (2000). Identities and actions within environmental groups. In *Human Ecology Review*. 7(2). 1-20.

Kolb, D.A. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, NJ: Prentice Hall 1984.

Kormondy, E.J. (1965). *Readings in ecology*. New Jersey: Prentice-Hall, Inc.

Kuhn, T. (1970). The structure of scientific revolutions (2nd ed.). In O. Neurath, R. Carnap, & C. Morris (Series Eds.) *Foundations of the unity of science,* Vol. 1 & 2. Chicago: University of Chicago Press.

Kuhn, M.H. & McPartland, T.S. (1954). An Empirical investigation of self-attitudes. *American Sociological Review*, 19 (1), pp. 68-76

Lakoff, G. (1987). *Women, fire and dangerous things: What categories reveal about the mind.* Chicago: University of Chicago Press.

Lakoff, G. & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to western thought.* New York: Basic Books.

Latour, B. (2005). *Reassembling the social: An introduction to actor-network theory.* Oxford: Oxford University Press.

Lave, J. (1988). *Cognition in practice: Mind mathematics and culture in everyday life*. Cambridge: Cambridge University Press.

Lave, J. (1991). *Situating learning in communities of practice*. Retrieved October 6, 2009 from http://www.udel.edu/educ/whitson/files/Lave,%20Situating%20learning%20in%20communities%20of%20practice.pdf.

Lave, J. (1996). Teaching, as learning, in instruction. In *Mind, Culture and Activity,* 3(3). 149- 164.

Lave, J. & Wenger, E. (1991). *Situated learning: legitimate peripheral participation.* Cambridge: Cambridge University Press.

Lefebvre, H. (1984). *The production of space*. (D. Nicholson-Smith, Trans.). Oxford: Blackwell Publishing

Leff, H. L. (1978). *Experience, environment, and human potentials.* New York: Oxford University Press.

Leont'ev, A.N. (1978). *Activity, consciousness, and personality* (M.J. Hall, Trans.). Englewood Cliffs, N.J.: Prentice-Hall, Inc. (Original work published n.d.).

Levinson, B. A. & Holland, D. C. (1996). The cultural production of the educated person: An introduction. In *The cultural production of the educated person: Critical ethnographies of schooling and local practice*, (B.A. Levinson, D.E. Foley, & D.C. Holland, eds.). Albany: State University of New York Press.

Levins, R. & Lewontin, R. (1985). T*he dialectical biologist.* Cambridge: Harvard University Press.

Linde, C. (1993). *Life stories, the creation of coherence.* New York: Oxford University Press.

Lorenz, K. (1971). *Studies in animal and human behavior,* vol. 2. New York: Methuen & Co. Ltd.

Lutz, P.L., Musick, J.A., & Wyneken, J. (Vol Eds.). (1997). The biology of sea turtles *Vol. 2*. In P.L. Lutz (Series Ed.) *CRC marine biology series*. New York: CRC Press.

Marcus, G.E. (1995). Ethnography in and of the world system: The emergence of multi-sited ethnography. In G.E. Marcus (Ed.) *Ethnography through thick and thin*. Princeton: Princeton University Press.

Mareschal, D. & Johnson, M.H. & Sirois, S.& Spratling, M.W. & Thomas, M.S.C., & Westermann, G. (2007). Neuroconstructivism: How the brain constructs cognition. In (M.H. Johnson Series Ed.) *Oxford series in developmental cognitive neuroscience.* Oxford: Oxford University Press.

Margalef, R. (1963). On certain unifying principles in ecology. In E.J. Kormondy (Ed.) *Readings in ecology* (pp. 215-219). Englewood Cliffs, NJ: Prentice Hall.

Marta, E.E. (2008). Young people and volunteerism: A model of sustained volunteerism during the transition to adulthood. *Journal of Adult Development,* 15(1), 35-46.

Matthies, M., H. Malchow, & J. Kriz (2001). *Integrative systems approaches to natural and social dynamics.* Berlin: Springer.

Maturana H.R. & Varela, F.J. (1992). *The tree of knowledge: The biological roots of human understanding* (R. Paolucci, Trans.). Boston: Shambhala. (Original work published 1987).

Mehan, H. (1980). The competent student. *Anthropology & Education Quarterly,* 11(3), 131-152.

Merleau-Ponty, M. (2003). Phenomenology of perception. (C. Smith, Trans.). New York: Routledge. (Original work published 1945).

Merriam, S.B. & Caffarella, R.S. (1999). *Learning in Adulthood: A comprehensive guide*. (2nd ed.). San Francisco: Josey-Bass.

Miller, P.H. (1993). *Theories of developmental psychology,* (3rd ed.). New York: W.H. Freeman and Company.

Minsky, M. (1986). *The society of mind*. New York: Simon & Schuster, Inc.

Myers, G. (1998). *Children & animals: Social development and our connections to other species*. Boulder, Co: Westview Press.

Nader, L. (1996). *Naked science: Inquiries into boundaries, power, and knowledge*. New York: Routledge Press.

Nardi, B. (Ed.) (1996). *Context and consciousness: Activity theory and human-computer interaction*. Cambridge, MA: MIT Press.

National Research Council (1986). *Ecological knowledge and environmental problem-solving: Concepts and case studies*. Washington DC: National Academy of Sciences.

National Research Council (1999). *How people learn: Brain, mind, experience, and school.* J. Bransord, A. Brown, R, Cocking (Eds.). Washington DC: National Academy of Sciences.

Neal, W. & Pilkey, O.H. & Kelley, J.T (2007). *Atlantic coast beaches: A guide to ripples, dunes, and other natural features of the seashore*. Missoula: Mountain Press Publishing.

Newman, J.R. (1956). The supreme art of abstraction: group theory, certain important abstractions. In J.R. Newman (Series Ed.) *The world of mathematics* Vol. 3 (pp. 1534-1538). New York: Simon and Schuster.

Norman, D. (1994). *Things that make us smart: Defending human attributes in the age of the machine*. Boston, MA: Addison-Wesley

North Carolina Coastal Federation. (2002). T*he state of our coas*t. Wilmington, NC: Coastal Carolina Press and North Carolina Coastal Federation.

Oelschlaeger, M. (1991). *The idea of wilderness from prehistory to the age of ecology.* New Haven: Yale University Press.

Ollman, B. (2003). *Dance of the dialectic, steps in Marx's method.* Chicago: University of Illinois Press.

Palmer, J. A. (1998). *Environmental education in the 21st century: theory, practice, progress and promise*. New York: Routledge.

Piaget, J. (1970). *Structuralism*. (C. Maschler, Trans.). New York: Basic Books. (Original work published 1968).

Pickett, S.T.A. & Kolasa, J. & Jones, C.J. (1994). *Ecological understanding: The nature of theory and the theory of nature*. San Diego: Academic Press.

Pinar, W.F., Reynolds, W.M., Slattery, P. & Taubman, P.M. (2000). Understanding curriculum: An introduction to the study of historical and contemporary curriculum discourses. In J.L. Kincheloe & S.R. Steinberg (Series Eds.) *Studies in the postmodern theory of education* vol 17. New York: Peter Lang.

Prigogine (1997). *The end of certainty: Time, chaos and the new laws of nature.* New York: Free Press.

Prigogine, I. & Stengers, I. (1984). *Order our of chaos: Man's new dialogue with nature*. New York: Bantam Books.

Resnick, L.B. (1990). Literacy in school and out. *Daedalus, 119(2), Literacy in America*, 169-185.

Resnick, L.B. & Hall, M.W. (1998). Learning organizations for sustainable education reform. *Daedalus, 127(4), Education Yesterday, EducationTomorrow*, 89-118.

Rosen, R. (1991). Life itself: A comprehensive inquiry into the nature, origin, and fabrication of life. In T.H. Allen & D.W. Roberts (Series, Eds.) *Complexity in ecolgoical systems series*. New York: Columbia University Press.

Rumelhart, D.E. & McClelland, J.L. (1986). *Parallel distributed processing: Explorations in the micro-structure of cognitions.* (University of California San Diego PDP Research Group, Eds.) Cambridge, MA: MIT Press.

Salomon, G. & Perkins, D.N. (1997). Individual and social aspects of learning. In *Review of Research in Education*, (23), 1-24.

Schoenfeld, A.H. (1999). Looking toward the 21st century: Challenges of educational theory and practice. In *Educational Researcher*, 28, (7). 4-14.

Sea Turtle Advisory Committee (2006). *Sea turtle interactions with North Carolina fisheries: Review and recommendations to the North Carolina marine fisheries commission*. Raleigh, NC: The North Carolina Marine Fisheries Commission.

Sebeok, T.A. (1998). The Estonian connection [Electronic version]. *Sign Systems Studies*, 26, 20-41.

Sebeok, T.A. (1972). *Perspectives in zoosemiotic*s. The Hague: Mouton.

Sebeok, T.A. (2001). *Signs: An introduction to semiotics*. Buffalo: University of Toronto Press.

Sebeok, T.A. & Danesi, M. (2000). *The forms of meaning: Modeling systems theory and semiotic analysis*. Berlin: Mouton de Gruyter.

Shannon, C. E. & W. Weaver (1963). *The mathematical theory of communication*. Chicago: University of Illinois Press.

Shuell, T.J. (1986). Cognitive conceptions of learning. *Review of Educational Research*, 55(4), 411-436.

Skinner, D. & Valsiner, J. & Holland, D. (2001). Discerning the dialogical self: A theoretical and methodological examination of a nepali adolescent's narrative. *Forum: Qualitative Social Science Resarch*, 2(3). 18.

Smith, R.L. & Smith, T.M. (1998). *Elements of ecology* (4th ed.). New York: Addison Wesley Longman, Inc.

Spotila, J.R. (2004). *Sea turtles: a complete guide to their biology, behavior and conservation*. London: The Johns Hopkins University Press.

Star, S. & Griesmer, J.R. (1998) Institutional ecology, “translation” and boundary objects: Amateurs and professionals in Berkeley’s Museum of Vertebrate Zoology. In (M. Biagioli, ed.) *The science studies reade*r. New York: Routledge Press.

Strauss, C. & Quinn, N. (1997). *A cognitive theory of cultural meaning*. Cambridge: Cambridge University Press.

Tucker, R. C. (Ed). (1978). *The Marx-Engels Reader*, 2nd ed. New York: Norton

Uexküll, J. von (1957). A stroll through the worlds of animals and men. In C.H. Schiller (Ed. & trans.) *Instinctive behavior, the development of a modern concept.* (Original essay published, 1934). New York: International Universities Press, Inc.

Uexküll, J. von (1926). *Theoretical biology*. (D.L. Mackinnon, Ed. & Trans.) London: K. Paul, Trench, Trubner & Co. Ltd.; New York: Harcourt, Brace & Co.

Ulanowicz, R.E. (1997). Ecology, the ascendent perspective (pp. 1-55). In T.H. Allen & D.W. Roberts (Series Eds.) *Complexity in Ecological Systems Series*. New York: Columbia University Press.

Van Dyke, F. (2003). *Conservation biology: Foundations, concepts, applications.* New York: McGraw Hill.

Varela, F.J. (1999). *Ethical know-how: Action, wisdom and cognition.* (Board of Trustees, Leland Standford Junior University, Trans.). Stanford: Stanford University Press. (Original work published 1992).

Varela, F. J. & Thompson, E. & Rosch, E. (1991). *The embodied mind: Cognitive science and human experience*. Cambridge: MIT Press.

Varela, F.J. (1991). Organism: A meshwork of selfless selves. In R.S. Cohen (Series Ed.) & A.I. Tauber (Vol Ed.), *Boston studies in the philosophy of science Vol. 129. Organism and the origin of self* (pp. 79-107). Boston: Kluwer Academic Publishers.

Varela, F. J. (1979) Principles of biological autonomy. In G. Klir (Series Ed.) *The North Holland series in general systems research.* Oxford: North Holland

Varela, F.J. (1992). Whence perceptual meaning? A cartography of current ideas. In R.S. Cohen (Series Ed.) & F.J. Varela & J. Dupuy (Vol Eds.) *Boston studies in the philosophy of science Vol. 130. Contemporary Views on the Origin of Life, Mind and Society* (pp. 235-264). Boston: Kluwer Academic Publishers.

Vygotsky, L.S. (1978). *Mind in society*. (M. Cole, Ed.) Cambridge, MA: Harvard University Press.

Vygotsky, L.S. (1960). *Razvitie vyshhih psihicheskih funktsii* [Development of higher psychical functions]. Moscow: Izd. APN

Vygotsky, L.S. (1986). Thought and language. (A. Kozulin, Ed.) Cambridge, MA: MIT Press.

Wacquant, L.J.D. (1989). Towards a reflexive sociology: A workshop with Pierre Bourdieu. *Sociological Theory*, 7(1), 26-63.

Weaver, W. & Shannon, C.E. (1963). *The Mathematical Theory of Communication* (2nd ed.). Urbana, Illinois: University of Illinois Press.

Wenger, E. (1998). *Communities of practice: Learning, meaning and identity*. Cambridge: Cambridge University Press.

Wertsch, J.V. (1998). *Mind as action*. Oxford: Oxford University Press.

Widdows, D. (2004) *Geometry and meaning*. Stanford:Center for the Study of Language & Information Press.

Wilson, E.O. (1984). *Biophilia.* Cambridge, MA: Harvard University Press.

Wolff-Michael, R. & Stuart, L. (2004). Science education as/for participation in the community. *Science Education*, 88 (2), 263-291. Retrieved November 2009 from, http://dx.doi.org/10.1002/sec.10113

Worster, D. (1985). *Nature's economy: The roots of ecology.* Cambridge: Cambridge University Press.

Wortham, S. (2006). *Learning Identity: The joint emergence of social identification and academic learning*. Cambridge: Cambridge University Press.

Worthington, E.B. (1983). *The ecological century: A personal appraisal*. Oxford: Clarendon Press.