

## education

### Engaging Undergraduates through Neuroanthropological Research

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**A**nthropology's holistic way of viewing and interpreting the world is an asset to any college graduate. It helps put global and local events in context and grounds this context in particularistic and scientifically meaningful frames. Nevertheless, the discipline is frequently beset by skepticism of its value. Most recently, critics have pointed to National Science Foundation funding of projects outside the United States (Cantor and Smith 2013). These challenges focus on immediate placement of majors in occupations with "anthropology" in the job description (Lende 2011) and the lack of financial largesse bestowed on professional anthropologists (Goudreau 2012), while others hold anthropology to be "the best major to change your life" (Antrosio 2012). Despite the myopic viewpoints, it is vital that anthropologists address criticisms of the discipline's methods and relevance.

Public anthropology advocate John Hawks (2011) says anthropology's relevance can be demonstrated by embracing new forms, defending good science and empowering students. We propose to meet this challenge by training undergraduates

in the "neuroanthropology" of religion through a project that develops new applications for the study of religious commitment and the psychology of dissociation, affirms scientific inquiry and empowers students to become active researchers. We present this project from the varied perspectives of a professor and undergraduate mentor (Lynn), a graduate student and assistant in undergraduate training (Stein) and a graduate student trained through this program (Bishop).

#### The Neuroanthropology "Brand"

Neuroanthropology is an increasingly popular specialty that combines ethnography with neuroscience to understand the brain in culture. As a synthesis of principles, theories and methods, it addresses questions about what Lende and Downey (2012) refer to as the "encultured brain." Neuroanthropological theory is situated in the biocultural paradigm, which investigates how humans are shaped by an irreducible relationship among biology, culture and environment. Biocultural principles position neuroanthropology to recognize how human potential is shaped relative to individual life stations.

The value of the neuroanthropology brand is that it embraces novel integration of disciplines, or "informed disciplinarity" (Lattuca 2001), and does not simply borrow constructs from other fields (Holley 2009). Neuroanthropology is also a dynamic new frontier (Dias 2010), rather than a gimmick to attract students. A Google Scholar search of "neuroanthropology" indicates more than

25 peer-reviewed journal articles on the topic in the past five years. At least three US universities (University of Alabama, University of South Florida and University of Wisconsin–Madison) offer full courses in neuroanthropology. In addition to their edited volume on the subject, Daniel Lende and Greg Downey run the Neuroanthropology PLOS blog, which, according to Lende’s 2012 review, enjoyed 350,000 page-views by 220,000 visitors from 197 different countries and territories for that year alone. There have been multiple sessions at regional and national conferences, and a special interest group of the American Anthropological Association is being established based on a Neuroanthropology Facebook group (<http://www.facebook.com/#!/groups/neuroanthro/>) that has attracted more than 1,400 members in just two years.

### **Simplifying Anthropology and Neuroscience**

Teaching neuroanthropology at the undergraduate level involves reducing complexity in ways that can undermine the messages. Similar problems are inherent to museum representations, which struggle to present complex ideas visitors can quickly understand without simplifications that result in public misunderstandings. One example is the persistent display of horse evolution as orthogenic (proceeding in a linear species-to-species trajectory) rather than anagenic (branching, without a trajectory), despite the fact that anagenesis is the accurate model of equine evolution accepted by scholars (MacFadden et al. 2012).

**While compromising some precision, neuroanthropological approaches can employ smaller, more affordable and minimally invasive neuroscientific methods in the field.**

In neuroanthropological research, patterns physiologically detectable in clinical and experimental research may not accurately reflect “dually embodied” experience—i.e., those processes by which universal biology is modified through individual-environment interactions and individual bodies exert force on the cultures they embody (Worthman 1999). Further, training students in anthropology usually means suggesting they go outside the university to some field site, which makes it difficult to teach neuroscientific techniques. There are related methodological and expertise limitations for anthropology instructors untrained in neuroscience. Ethnographic fieldwork often limits the utility of neuroscientific methods that require large, expensive or invasive equipment. While compromising some precision, neuroanthropological approaches can employ smaller, more affordable and minimally invasive neuroscientific methods in the field or use rapid assessment ethnography when taking advantage of lab-based facilities.

Fortunately, this is not a unique problem. Holley (2009) outlines a best-practices approach to interdisciplinarity, which includes:

- Dedicated organizational and physical space
- Student-centered pedagogy
- Focus on problem- or theme-based learning
- Curriculum shaped through a variety of interdisciplinary learning experiences
- Culmination in a capstone project or senior portfolio
- Collaborative learning rather than mastery of particular content
- Independent study, internships and experiential learning
- Goal of preparing students for a complex, modern, interdisciplinary future

We will briefly address all of these practices in teaching neuroanthropology to undergraduates, but we will focus on several successful strategies, including a lab-based format, multiple projects for students and systematized student “workbooks.”

### Our Organization

The Human Behavioral Ecology Research Group (HBERG) at the University of Alabama is a well-known destination for undergraduates who seek to get involved in research within the Anthropology Department. We maintain a physical space for student activities and for running experiments. As Karri Holley observes, such a facility “offers institutional legitimacy and facilitates contact among individuals who might otherwise be spread across campus” (2009:91). Students who consistently use the space become more invested in the research, build

stronger ties to their colleagues and profit more from their HBERG experiences.

Ideally, 5 to 10 undergraduates participate every week for a full academic year. The cycle begins with brainstorming research design for multiple projects and learning and developing methods to address our questions, then progresses to drafting research proposals and collecting and analyzing data. The effort culminates in the presentation of project outcomes at intramural or regional conferences. Being affiliated with an active organization helps students to take the work seriously and motivates them to complete tasks and move projects forward.

### Multiple Projects

The most significant challenge has been providing students with exposure to the full arc, from project design to presentation in one year. To address this, we utilize a multiple-project approach that allows students to experience the various stages of long-term research simultaneously, albeit via different projects. Additionally, students use HBERG as a forum to develop their own research ideas and methods, collect pilot data and practice their presentations. This encourages their independence and critical-thinking skills and allows their interests to shape their research (Holley 2009).

Multiple ongoing studies relate to our group’s cognitive science approach to religion and, in particular, the roles of dissociation and cooperation. Dissociation is a psychological partitioning of awareness experienced in myriad individual, social and

clinical contexts, from absorptive concentration to religious trance or dissociation disorders (Lynn 2005). The neuroanthropological approach takes into account the psychological dissociation model, the cultural construction and biological implications of dissociative forms and the neural correlates of awareness. For instance, previous research indicates that speaking in tongues—which occurs in a form of possession trance that is viewed by Pentecostals as the displacement of self by the Holy Spirit—can lower basal stress reactivity (Lynn et al. 2010, 2011) but is dependent on particular psychosocial matrices (Lynn 2013).

From an anthropological perspective, it is necessary to interpret dissociative manifestations on their own terms, which we accomplish through a combined signaling and cultural consensus approach. The signaling method involves identifying communicative behaviors and gestures that convey commitment to a group and determining the value assigned those signals (Sosis 2006). Recent analyses indicate that signaling is an important type of impression management that influences stress biology. Our present study uses cultural consensus modeling to determine the parameters of the commitment domain (Romney et al. 1986; Weller 2007). This involves interviewing key informants to determine the elements they associate with religious commitment and assessing the consensus value of those variables among a representative sample of that group.

The cognitive mechanisms underlying such religious behaviors as speaking in tongues are likely by-products of the evolution of basic cognition (Whitehouse 2008). One hypothesis is that dissociation became

important in enhancing social tolerance (Wrangham 2009) as cooperation to maintain fires increased after they came into widespread use but before kindling was developed (Gowlett 2006). Fire is reputed to have a hypnotic influence that could have enhanced the transcendent power of fireside religio-ritual behaviors (McClenon 1997, 2002, 2006) and, over time, affected human cognition (Rossano 2007, 2010).

Thus, our project involves assessing susceptibility to dissociative relaxation and the cooperative contexts in which contemporary dissociative practices are invoked. This necessitates lab-based investigation of relaxation response and field-based ethnographic investigations of religious commitment. Students participate in this overarching research agenda by working as investigators in the “Religious Ecology Study,” which provides them ethnographic research experience, and the “Fireside Relaxation Study,” which exposes them to neuroscientific methods.

### Religious Ecology Study

The Religious Ecology Study explores religious pluralism while developing particularistic cultural models for analyzing the influences of dissociation on a church-by-church basis. Social scientists have long been interested in the relationships between religious collectivity and other social forces. Factors largely overlooked until recently are the impacts of disease load (Fincher and Thornhill 2008, 2012) and perceptions of disease susceptibility (Miller and Maner 2012). The behavioral immune system hypothesis

**We explore how cooperative groups demonstrate commitment (e.g., through dissociative practices) and the feedback between these demonstrations and group vitality.**

(Schaller 2011) suggests that when actual or perceived disease susceptibility is higher, people preferentially associate with familiar others, but when disease rates or perceptions are relatively lower, people are more willing to associate with strangers.

Previous research has used meta-analytic and experimental approaches (Fincher and Thornhill 2008; Watkins et al. 2012). Our study tests this model in the field by asking why people in Tuscaloosa, Alabama, and Limón province, Costa Rica, join respective churches. We explore how cooperative groups demonstrate commitment (e.g., through dissociative practices) and the feedback between these demonstrations and group vitality. We also investigate how indices of this system can be used to understand varying success rates where several religions compete for congregation membership. The Tuscaloosa site enables us to train researchers and measure a relatively low-disease environment, whereas Limón provides a multi-ethnic and higher-disease comparison.

HBERG students select a Tuscaloosan religio-spiritual group and, using the workbook we discuss below, begin the process of recruitment. This is done in pairs or groups

for moral support and to provide supervisory feedback. The main criterion for study inclusion is spiritual “belongingness” (King 2007), independent of beliefs. Students attend services and obtain permission from church leaders to conduct research in their congregation. They make field notes and collect data about the structure and theme of services, including demographics and behavior, and sample willing informants from various levels of the church hierarchy to conduct structured interviews. Advanced students who continue past the first year of the project can integrate neuroscientific methods, which they have learned through the Fireside Relaxation Study, to investigate the influence of these behaviors and cognitive models on biological outcomes.

### **Fireside Relaxation Study**

The Fireside Relaxation Study tests the relaxing influences of fire by separating its effective elements. We expose participants to a digital recording of fire without sound, a digital recording of fire with sound and a control condition (an upside-down picture of fire that retains the form features of a fire without the naturalistic orientation, movement, or sounds), randomizing the order to prevent temporal bias. Student researchers learn the use of a blood pressure monitor and a NeXus 3 portable neurofeedback system with Biotrace software (Mind Media BV, The Netherlands) to measure heart rate, skin conductance and prefrontal cortical brain activity associated with wakefulness and relaxed states. This is an affordable neurofeedback system designed for clinical use, but

useful also for training students in lab and field settings.

Students are exposed to the Fireside Relaxation Study protocols first as subjects and then assist other experimenters in data collection. Subjects are recruited by HBERG students in courses and around the community. We then enter data into the appropriate analytical programs either as a group or in teams. Specific HBERGers are assigned to conduct analyses of some aspect of the study for use in the bigger picture of submitting our findings for peer-reviewed publication and for presentations at conferences.

While the Religious Ecology Study gives students experience in developing an ethnographic field site, the controlled experimental conditions of the Fireside Relaxation Study expose them to lab methods not available in traditional anthropology programs. To facilitate such disparate pedagogy with minimal staffing, we have developed a workbook that can guide the training of neuroanthropology students in other programs.

## Workbooks

A workbook makes it possible to learn ethnographic methods in the field. Systematic survey methods are seemingly anathema to classic ethnography, as the static nature of a workbook makes a priori assumptions about the nature of the field site. However, given the group structure and complexity of our combined pedagogical and research project, a workbook is the right choice for investigating individual- and group-level interactions. It also provides important background information on the re-

search questions, objectives and relevant literature and a step-by-step set of instructions for what to do and when to do it, as outlined in Figure 1 (p. 98).

The instructions in the workbook format fill four roles. First, the workbook acts like a course syllabus, explaining research objectives and giving appropriate goals and time frames to accomplish each aspect of the data collection. Second, the workbook is a manual, providing specific instructions and references to external resources. Third, the workbook is flexible and helps students orient themselves without routinizing each day of data collection. Finally, the workbook is an active document that makes clear what has been accomplished at each location. If data collection is not completed by a respective student or group of students, another researcher can be slotted in to complete it with minimal difficulty.

Among the most important sections of the workbook is the checklist (Figure 2, p. 99), which itemizes the specific tasks researchers are expected to complete at a given location. The checklist enables faculty supervisors and graduate assistants to monitor the progress of students, keep track of the data collection at each site and make sure that no aspects are forgotten.

Workbooks for training students work best when field sites share similarities in structure and operate to some extent as circumscribed communities. They can be a valuable tool when the objective is to conduct in-depth study at multiple sites and the project is conducted over an extended time period by a series of researchers. Workbooks should contain explicit instructions and examples to show how sections should



## Contents

Checklist . . . . .	3
Background . . . . .	4
Abstract . . . . .	4
Literature Review . . . . .	4
Training . . . . .	8
Human Subject Research . . . . .	8
Procedure . . . . .	9
Pick Unstudied Church . . . . .	9
Obtain Permission from Elders . . . . .	9
Create Folders on Shared Drive . . . . .	11
Submit to IRB . . . . .	11
Field Notes . . . . .	12
Conduct observations/take field notes . . . . .	12
Map the church . . . . .	12
Number of attendees . . . . .	12
Pattern of services . . . . .	12
Themes of service . . . . .	13
Behaviors that indicate commitment . . . . .	13
Who you talked to and what was the topic . . . . .	13
Interviewing . . . . .	20
Behavioral Sampling . . . . .	42
Collect Behavioral Focal Sample . . . . .	42
Instructions: Behavioral Scan Sampling . . . . .	45
Collect Behavioral Scan Samples . . . . .	46
Videotape if Possible . . . . .	47
Church Membership Questionnaire . . . . .	51

**FIGURE 1. Table of Contents for the Religious Ecology Study data collection workbook**

<input type="checkbox"/> CITI certification	
<input type="checkbox"/> Select Church	<input type="checkbox"/> Church Contact Info
<input type="checkbox"/> Support for RES Form	<input type="checkbox"/> * Backup & IRB
<input type="checkbox"/> Create Shared Drive Folders	
<input type="checkbox"/> Map of Church	
<input type="checkbox"/> Administered Church Membership Questionnaire	

**Field Notes:**

Main Service:	Other Service:	Other Service:	Other Service:
<input type="checkbox"/> Service 1	<input type="checkbox"/> Service 1	<input type="checkbox"/> Service 1	<input type="checkbox"/> Service 1
<input type="checkbox"/> Service 2	<input type="checkbox"/> Service 2	<input type="checkbox"/> Service 2	<input type="checkbox"/> Service 2
<input type="checkbox"/> Service 3	<input type="checkbox"/> Service 3	<input type="checkbox"/> Service 3	<input type="checkbox"/> Service 3
<input type="checkbox"/> Service 4	<input type="checkbox"/> Service 4	<input type="checkbox"/> Service 4	<input type="checkbox"/> Service 4
<input type="checkbox"/> Service 5	<input type="checkbox"/> Service 5	<input type="checkbox"/> Service 5	<input type="checkbox"/> Service 5

**Interviews:**

Interview Conducted:	Informed Consent:	* Backup & IRB:	Transcribed:
<input type="checkbox"/> Elder #1	<input type="checkbox"/> Elder #1	<input type="checkbox"/> Elder #1	<input type="checkbox"/> Elder #1
<input type="checkbox"/> Elder #2	<input type="checkbox"/> Elder #2	<input type="checkbox"/> Elder #2	<input type="checkbox"/> Elder #2
<input type="checkbox"/> Core #1	<input type="checkbox"/> Core #1	<input type="checkbox"/> Core #1	<input type="checkbox"/> Core #1
<input type="checkbox"/> Core #2	<input type="checkbox"/> Core #2	<input type="checkbox"/> Core #2	<input type="checkbox"/> Core #2
<input type="checkbox"/> Elite #1	<input type="checkbox"/> Elite #1	<input type="checkbox"/> Elite #1	<input type="checkbox"/> Elite #1
<input type="checkbox"/> Elite #2	<input type="checkbox"/> Elite #2	<input type="checkbox"/> Elite #2	<input type="checkbox"/> Elite #2
<input type="checkbox"/> New Member #1	<input type="checkbox"/> New Member #1	<input type="checkbox"/> New Member #1	<input type="checkbox"/> New Member #1
<input type="checkbox"/> New Member #2	<input type="checkbox"/> New Member #2	<input type="checkbox"/> New Member #2	<input type="checkbox"/> New Member #2
<input type="checkbox"/> Supportive #1	<input type="checkbox"/> Supportive #1	<input type="checkbox"/> Supportive #1	<input type="checkbox"/> Supportive #1
<input type="checkbox"/> Supportive #2	<input type="checkbox"/> Supportive #2	<input type="checkbox"/> Supportive #2	<input type="checkbox"/> Supportive #2
<input type="checkbox"/> Marginal #2	<input type="checkbox"/> Marginal #2	<input type="checkbox"/> Marginal #2	<input type="checkbox"/> Marginal #2
<input type="checkbox"/> Marginal #3	<input type="checkbox"/> Marginal #3	<input type="checkbox"/> Marginal #3	<input type="checkbox"/> Marginal #3

**Behavioral Scan Sample**

<input type="checkbox"/> Main Service	<input type="checkbox"/> Service 2	<input type="checkbox"/> Service 3	<input type="checkbox"/> Service 4
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**Behavioral Focal Sample**

<input type="checkbox"/> Main Service	<input type="checkbox"/> Service 2	<input type="checkbox"/> Service 3	<input type="checkbox"/> Service 4
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**\*Backup & IRB: Save a backup on the shared drive, and send a copy to Dr. Lynn**

FIGURE 2. Checklist for the Religious Ecology Study Data Collection workbook



be completed and appendices of options for further and more advanced inquiry.

### **Assessing the Benefits of Undergraduate Training in Neuroanthropology**

Through this systematic approach, students learn how to design mixed-methods research that is theoretically oriented rather than discipline or methods driven. The neuroanthropology approach enables students to appreciate the advantages and limitations of neuroscience's unique "under the hood" vantage on human brains and nervous systems while exploring the local nature of human plasticity through ethnographic depth. The trouble with disciplinarity is that students get pulled in one direction or another, whereas applied interdisciplinarity allows students to realistically meld approaches and better simulates post-graduate life and research.

We believe this is a regimen worth replicating, and the accomplishments of students who have been involved in this program attest to our success. One of us (Bishop) participated in HBERG before entering the graduate program at Arizona State University. Bishop's first experiences conducting scientific research were through the Religious Ecology and Fireside Relaxation studies, which were instrumental to his graduate successes and receipt of a National Science Foundation Graduate Research Fellowship. During his HBERG year, Bishop gave two presentations at a regional conference (Bishop et al. 2012a; Bishop and Lynn 2012) and published a co-authored

paper (Bishop et al. 2012b), giving him first-hand experience as an active contributor to anthropology and making him more attractive to graduate schools.

More than 50 students have passed through HBERG in just four years. More than 25 have presented HBERG-affiliated research at our university's undergraduate research conference, and another 15 have presented at national and regional conferences. One publication based on methods refined through our program has appeared in a top-tier peer-reviewed journal (Buzney and DeCaro 2012). As the ultimate testament to the success of this relatively young program, five HBERG students are now enrolled in graduate programs in anthropology.

### **Conclusion**

Neuroanthropology is a dynamic, hands-on biocultural specialty that can inspire students to participate in the rigors of "real anthropology" while developing new avenues for 21st century scholarship. Using best-practices approaches of interdisciplinarity, neuroanthropology training for undergraduates can be developed at colleges and universities nationwide with relatively low cost and potentially high returns. As our project suggests, because of limitations inherent to training students in anthropological and neuroscientific methodologies, it can be helpful in neuroanthropological pedagogy to incorporate a dedicated space and organization, multiple experiential projects, a workbook system, presentation and publication goals, and a focus on comprehensive exposure over subject mastery. Anthropolo-

gists face pressure to demonstrate relevance in the modern world where faceless political and economic factors seemingly have more value than the intricacies of culture. Our project draws on a century of anthropological scholarship and blends it with neuroscience to build community-based research that not only makes significant scholarly contributions, but helps train and inspire a new crop of undergraduate students. We hope that our project serves as a good example of the versatility of the discipline and its potential value for the future.

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