

# MINERVA



A JOURNAL OF RESEARCH AND CREATIVE ACTIVITY



THE UNIVERSITY OF NORTH CAROLINA  
**GREENSBORO**

**Inside This Issue**  
The Environment



Dr. Brad Bartel  
Associate Provost  
for Research,  
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Graduate School

The environment as a theme for this issue of *Minerva* cannot be timelier. North Carolina's environment, and surrounding mid-Atlantic region, has been in the news during the past year in a number of scientifically important and also disastrous ways. For example, the profusion of large-scale pig breeding farms in North Carolina has caused great concern for the welfare of ground water systems if polluted by waste run-off. Although this year's large El Niño effect apparently reduced the frequency of hurricanes in the Atlantic, the past toll of hurricane damage has reduced the sand shoreline content of the fragile Outer Banks area. When added to by human population growth, tourism, and housing development, the delicate balances for this ecological area are thrown into significant imbalance. Even the history of the region is being studied anew. Dendrochronological evidence from 500 year old trees indicate that the 16th and 17th century colonization problems at Roanoke and Jamestown colonies may have been due to stretches of severe drought.

Many universities are tackling environmental problems. UNCG is no different in this regard, and probably could fill a dozen issues of *Minerva* with environmental research. What we are doing with this issue is giving the reader a broad overview of some of the very diverse ways our faculty are dealing with these issues. One of the biggest problems potentially relates to

the fishkills that have hit the greater Chesapeake area, and the infestation of the river systems in eastern parts of North Carolina with *Pfiesteria piscicida* — a toxin under emergency study by scientists in the mid-Atlantic region. The once pristine river systems are now becoming unsafe for recreational and food sources. Parke Rublee's research on this environmental problem is highlighted in this issue of *Minerva*. Physical geographers Roy Stine and Jeff Patton are using cutting-edge techniques to understand current and past world environments. To complement these life and physical science articles we present three articles from the social sciences and humanities. Catherine Mathews is changing the way elementary-age children learn about the natural world around them, and Susan Buck is one of a few scholars studying comparative international law and policy about the environment. Finally, in an interesting and thought-provoking article, the relationship between religious belief and attitudes towards the environment is brought together in a new way through the research of Mathew Zeufle.

This issue ends our second year of producing *Minerva*. Due to the positive responses to our research magazine nationally, we will be expanding the size of the publication beginning with the next issue (winter 1999). We look forward to offering you more articles about our faculty research at UNCG.

## MINERVA

The University  
of North Carolina  
at Greensboro

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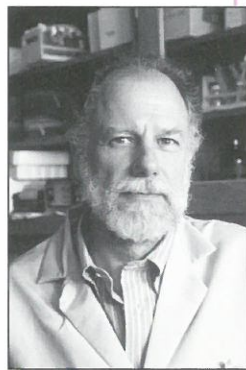
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On the cover: Ethel Schwabacher, *Blow Upon My Garden*, 1946, pastel on paper  
Gift of Christopher Schwabacher and Brenda Webster,  
Weatherspoon Art Gallery, UNCG, 1995



# HUNTING A KILLER: THE PFIESTERIA PROBLEM IN RIVER SYSTEMS OF THE MID-ATLANTIC

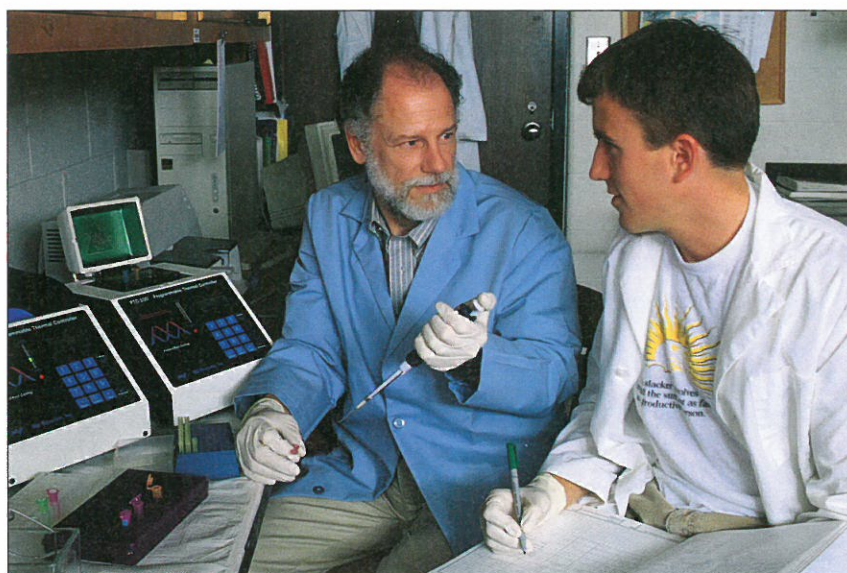


Dr. Parke Rublee  
Associate Professor,  
Biology

Down the seemingly benign halls on the third floor of the Eberhart Building at UNCG, Dr. Parke Rublee is stalking a killer. The perpetrator is as lethal a microorganism as any thought up by Hollywood. It is *Pfiesteria piscicida*, one of about fifty toxic microorganisms called dinoflagellates commonly linked to the infamous Red Tides. In its zoospore or flagellated stage, this venomous predator poisons, then stuns fish, causing lesions on their skin. Dubbed "the cell from hell," *Pfiesteria* then feeds on the bits of flesh as they fall from the fish. Rublee, an associate professor of biology, says, "*Pfiesteria* is a serious environmental concern and a human health hazard." Since its discovery in 1991, it has been responsible for massive fish kills in the lower Neuse, Tar-Pamlico, and New River estuaries of North Carolina, and in Maryland and Virginia, having a multi-million dollar impact on the fishing and seafood industries.

Its effect on humans is not clear, however. Watermen along the coast of North Carolina have complained for years about open sores that don't heal, dizziness, memory loss, headaches, and severe cognitive problems. In addition, researchers at North Carolina State University (NCSU) were affected by the

Dr. Parke Rublee (l),  
conferring with  
graduate assistant  
Jason Kempton (r)



microbe. "Individuals with high levels of exposure to *Pfiesteria* scored in the lower 2% in learning ability," says Rublee. "At this point we don't know if there are any long-term effects." Over seventy physicians have petitioned the North Carolina government to increase research to determine the human health risks.

Rublee says the microorganism is taken very seriously and in its toxic form is now cultured at a level-three biosafety facility at NCSU. The UNCG lab does not culture the toxic *Pfiesteria* but acquires it from other labs. Rublee says, although they take precautions handling the cultures, by the time they are used at UNCG, their short-lived toxins have dissipated. With his students and researchers at other universities Rublee is trying to develop a means for rapid identification of *Pfiesteria* in the environment which, combined with a toxin assay, will determine whether the microbe is present and toxic. "This is truly a major collaborative effort," says Rublee, who works with scientists at the Institute of Virology of the University of Maryland and the Maryland Department of Natural Resources, and JoAnn Burkholder an aquatic botanist at North Carolina State University, the leading expert on *Pfiesteria*.

One of the characteristics of this elusive and devious dinoflagellate is its complex life cycle. This phantom can assume 24 different stages but exists primarily in three forms. In its cyst-like form, it is dormant, usually colorless, and is a well-armored foe resistant even to sulfuric acid. It exists most of the time in its amoeboid form when it feeds on other algae. It is in its zoospore form, with its twin flagella and tongue-like peduncle, that it is most lethal to fish. "This is an unusual organism," says Rublee. "Every time you turn around it offers a new surprise." Ephemeral in nature, this ambush predator thrives under the right conditions of temperature, salinity, and nutrient rich areas. Some believe its toxic form is triggered by fish excretions.

Three graduate students, Kristen Toffer,

Eric Schaefer, and Jason Kempton, have been integral in his efforts to find a molecular gene probe that will determine if *Pfiesteria* is present in waters, says Rublee. Using cultures provided by Burkholder's lab, they have replicated parts of the gene using the polymerase chain reaction (PCR) and DNA sequencing. The complicated process is repeated many times to search out a DNA characteristic unique to the organism. Toffer and Schaefer have completed their masters. Kempton remains and, using modern biotechnology, continues to try to isolate the unique DNA tag for *Pfiesteria*. He is currently trying another method using fluorescent *in situ* hybridization instead of PCR. This process takes only a couple of hours and costs less than the time-consuming PCR process. The next step, says Rublee, is to take the technique out into the field.

Rublee's lab has received funding from the North Carolina Water Resources Research Institute, the National Sea Grant Biotechnology Program, and the EPA. "We are not a big lab; our funding level has reached about \$45,000 per year, which provides essential materials and supports one graduate student," he says. However, he is seeking additional funding from ECOHAB (Ecology of Harmful Algae Blooms), whose money comes from a variety of federal agencies, to be able to pay a full time technician in order to accomplish their goals much faster. The payoff in all of this is to be able to determine management tools to prevent *Pfiesteria* outbreaks. "I'm currently working with David Oldach, a medical researcher at the Institute of Virology of the University of Maryland School of Medicine, on some even

## STUDENT PROFILE

### Jason Kempton

"Working with Dr. Rublee has been a great experience," said Jason Kempton, graduate student at UNCG. "I've been able to get a scholarship from the Guilford Wildlife Club partly because of what I am doing here," he said. "Eventually, I want to get into environmental management at the state or federal level."

more rapid methods. Hopefully in a year or two we will have a method to assay for *Pfiesteria* within an hour that can be done on board ship," says Rublee.

A believer in planning for the future, Rublee has been a co-chair of the Water Quality and Toxic Substances task force established by the Guilford County Board of Health to address issues regarding the water supply in Guilford County and Greensboro. He is trying to promote a proactive, long-term task force to study water issues. He says, "With our population growing the way it is, in order to

maintain water quality, we must plan across geographic and political boundaries. Water doesn't obey political boundaries so why should our solutions?"

Rublee's research also has taken him to Alaska, where he is helping to determine the role of microorganisms in the functioning of aquatic ecosystems and the gene flow among fish populations in arctic lakes. At the Toolik Lake Long Term Ecological Research Site he is checking to see what happens to the ecosystem with eutrophication (addition of excessive nutrients), overfishing and global warming. The results of this research will help determine how to improve and manage the system.

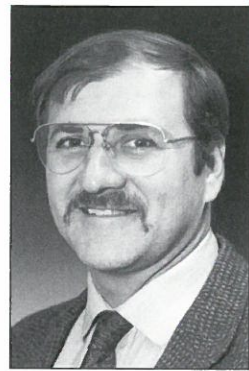
As he continues to pursue the *Pfiesteria* microorganism, Rublee says, "From a scientific aspect, this is an unusual challenge. Even if it didn't have a practical aspect, it would still fascinate me. Science is a very long-term investment. Although an individual project may not pay off on its own, combined with other research it will often prove beneficial in the end."

"INDIVIDUALS WITH HIGH LEVELS OF EXPOSURE TO PFIESTERIA SCORED IN THE LOWER 2% IN LEARNING ABILITY. AT THIS POINT WE DON'T KNOW IF THERE ARE ANY LONG-TERM EFFECTS."



# THE NEW GEOGRAPHY

## SOLVING ENVIRONMENTAL PROBLEMS IN MODERN WAYS



Dr. Jeffrey Patton  
Associate Professor,  
Geography

"Some of our students say they never realized they would learn space technology here at UNCG and that it would be so interesting," says Dr. Jeffrey Patton, an associate professor of geography. "This is an exciting time to be a geographer," adds Dr. Roy Stine, assistant professor of geography, enthusiastically. "Incredibly innovative work is emerging everywhere." In their program, students are introduced to Geographic Information Systems (GIS), remote sensing/digital image processing, and Global Positioning Systems (GPS). "GIS combines mapping with databases and the analytic capabilities from cartography to determine space, area, distance, pattern, and so on," says Stine. Students learn how data are gathered, stored, manipulated, and displayed through geographic information processing technology. Students find this hands-on use of space-age technology incredibly appealing.

"An exciting area of research in geography is what has become known as scientific visualization," says Stine. "You have to be able to visualize data in order to make it understandable, whether it's for business, industry, or the government." With the help of another faculty member, Rebecca Roush, that's what these enthusiastic teachers and their students make happen in their state-of-the-art cartography and remote sensing computer lab. The laboratory was created with support from UNCG, by a grant from the National Science Foundation, and from grants from leading GIS and remote sensing corporations, such as ERDAS and ESRI.

Patton and Stine explain how they compile and digitize information for planning and resource purposes by downloading satellite imagery acquired from various sources, like the Space Imaging EOSAT (Earth Orbiting Satellites) operated by NASA in conjunction with private industry or SPOT (Satellite Probatoire pour l'Observation de la

Terre), the French multispectral sensor. "An example of how we've been using the satellite imagery is in the delineation of small intermittent wetlands in the Piedmont," says Patton. "Identification by traditional aerial photography of the wetlands has been nearly impossible. However, by using the digital information supplied by the satellites we can accomplish it. For instance, if we concentrate on the near- and mid-infrared portions of the spectrum we can detect water content in soil and even identify specific plant species. Both of these items can be used as indicators of wetlands." Stine adds, "We are also developing databases or layers of information for a regional GIS." This information can be used for a variety of planning purposes. For instance, if you are interested in siting a new landfill, there are sets of criteria that are necessary to locate the facility. These criteria may include how quickly water percolates through the soil, distance from streams, access to highways, distance from neighborhoods, and the cost of land. Once the criteria have been established, the GIS will search all of the spatial data layers to find all the locations that meet the criteria. To develop the systems, Patton and Stine gather volumes of information. "We work with the city, county, state, and natural resource officials. The GIS that we are building is a combination of many layers of information and satellite imagery from various sources," says Patton.

GIS technology is becoming critical for everyone. Patton points out that the 911 system in place throughout the country was made possible by using GIS. Citing another example, Stine says, "We're told that the rain forests are being destroyed, and we can see that from the images taken from space. But if that's all you're doing, it's a bit simplistic. Using GIS technology allows us to understand more of the problem. For instance, if we overlay the amount of

Examination of a satellite image of Greensboro and surrounding area.



sediment being carried by the streams, we start to see not just what is happening, but why and what the effects are. City, state, and federal governments are all realizing how important the technology is."

Drs. Patton and Stine see GIS as a powerful tool. They teach their students how to use this tool, how to ask the right questions, and how to evaluate the results. "Lots of people can plug in the numbers, but you need to know more. If it's an environmental question, you need to know how the environment works. In our program, you take many courses in basic environmental science, including geology, hydrology, geomorphology, and climatology," says Patton.

Many of Stine and Patton's students work as interns with the city and in private companies in environmental design. "When they come back from their internships, they're better students," says Stine, "and it also enables us to keep our contacts with private industry, city, and state agencies open. The relationship is one of mutual benefit. The business and government agencies welcome the undergraduate and graduate students." Patton says that the students' advanced knowledge and techniques often benefit their business mentors. "It keeps both industry and us up-to-date on new advances in the field. Also, many of the interns wind up being hired by the companies for which they have worked."

Dr. Stine and his students are currently working on two projects with the City of Greensboro. One is to map impervious surface area and the other is to conduct a tree census. They are using panchromatic digital imagery purchased by the city in 1995, and donated to the lab. Stine and the students will see if they can develop the basic image processing

### STUDENT PROFILE

#### Heather Zerbe

*A graduate student in her first year, Heather Zerbe is working on one of the projects for the city of Greensboro. She is trying to develop algorithms to use in the tree census, which will correctly identify trees within an accepted error rate. "What we do has real-life applications," she says. "When I go job hunting, I can put this on my resume."*

techniques necessary to isolate and map impervious surfaces with the existing imagery. If it works, the city will have a better way to update their impervious surface maps and thus predict areas of potential flooding. The tree census study will provide the city with baseline data against which future development can be measured.

Patton points out that when he came to UNCG in 1980, the department had five geography majors. It now has 118 majors and 25 graduate students in its two-year-old applied geography masters program. Much of the growth can be attributed to interest in the new technologies, a strong internship program, and a growing realization of the importance of geography in understanding the complexity of the environment.



## HANDS-ON NATURAL SCIENCE FOR TEACHERS AND STUDENTS



Dr. Catherine Matthews  
Assistant Professor,  
Curriculum and Instruction

**“TRADITIONAL  
SCHOOLING  
EXPERIENCES  
DON’T OFFER  
OPPORTUNITIES  
LIKE THIS...  
TO GET OUT IN  
THE FIELD AND DO  
REAL SCIENCE AND  
COLLECT DATA  
AND EVEN TO  
BECOME PART OF  
GROUPS OF  
STUDENTS  
SHARING  
INFORMATION ON  
THE INTERNET.”**

For years, the United States has been struggling to attain prominence in the areas of math and science. To do this, Dr. Catherine Matthews believes you have to start with the teachers — to change their attitudes and fears about the sciences. She teaches teachers that science and outdoor education is fun and interesting by introducing them to hands-on science activity and field experiences.

Matthews, who received her doctorate in science education at the University of Kansas, has been on the faculty of the UNCG School of Education since 1992 and has written many articles on environmental and natural history education. However, more than likely, you’ll find her out-of-doors turning it into nature’s own classroom as she develops and searches out exciting programs to demonstrate environmental impact. Matthews has introduced numerous teachers and soon-to-be teachers to the wonders of wildlife resources.

Matthews received a Hands-On Hydrology in North Carolina grant from the US Geological Survey recently to fund a wetlands and water quality project for two Greensboro schools, General Nathaniel Greene Elementary School of Science and Technology and Alfred Rankin Elementary School. The project integrated a variety of activities for the pupils and their teachers, who are in-service and pre-service teachers studying at UNCG. Following in-class and on-site workshops, the teachers developed a curriculum to introduce to their students the concepts they had learned at the University. At a Piedmont Land Conservancy pond located behind the city’s major shopping area, the Four Seasons Mall in Greensboro, the five- to nine-



Dr. Catherine Matthews (c) discussing a pond environment

year-olds worked first-hand with a wetland. “The kids love it,” said Matthews. “They take water samples and photographs; they study the birds and natural vegetation, and they actually see the process of metamorphosis.

“They learn about cattails and how they were used by native Americans; they have a lesson on the beaver pond, and do some simple water chemistry.” Matthews points out that the hydrology grant provided classroom teaching materials as well as some long-term residuals in the form of equipment for both schools and some funding to install a mini-pond at Greene School for on-going, on-site hydrology experiences. In addition, installing the mini-pond inspired the cooperative efforts of others, including an undergraduate student and her friend who is a landscape designer, and the PTA. Rankin kindergarten teacher and hydrologist-in-residence for this grant, Louise Monroe, commenting on the effectiveness of the program, writes, “I will be eternally grateful for the opportunity to swamp around...with those excited children...Each student touched by the experience will be affected forever.”

These activities do more than serve to introduce teachers and their pupils to the dynamics of wildlife, says Matthews. “Teachers, who are encouraged to focus on teaching basic skills, find that involvement with the wetlands gives their pupils numerous opportunities to use their skills. They are motivated, even inspired to write about what they see and hear and feel. Traditional schooling experiences don’t offer opportunities like this...to get out in the field and do real science and collect data and even to become part of groups of students sharing information on the internet.”

As part of her push to popularize the outdoor sciences, Matthews leads undergraduate Professional Development School (PDS) Environmental Education teams, which are initiated in the students’ junior year. The students work with graduate students and kindergarten through fifth grade teachers and school principals to engage in what Matthews refers to as “basic natural history literacy.” The students get their training and materials through an integrated program of on-campus study, exposure to classroom projects at two local elementary schools and field trips. The PDS teams also complete both Project WILD and Project WILD: Aquatics programs sponsored by the North Carolina Wildlife Resources Commission of the Department of Environment, Health, and Natural Resources. The students also are encouraged to pursue environmental experiences through the NC State Parks Environmental Education Learning Experiences (EELEs), which has been funded to design curricula for specific grade levels based on the natural resources of their particular park. Teachers are introduced to these programs and then bring their pupils to the parks to stimulate their interest in the environment by giving them opportunities to make their own discoveries.

Matthews points to the declining amphibian population as a critical issue. “I’d like to get the schools to monitor vernal pools, look at the amphibians, measure chemical and physical parameters, and do tagging to see if this is an issue here in the Piedmont...We need to understand what is in our environment — what the patterns are that we see. If we don’t know what’s there, we can’t miss it when it’s gone.”

### STUDENT PROFILE

#### Doctoral Student Leads Numerous Field Trips

*Helen Cook is a Ph.D. student in the School of Education concentrating on science curriculum and instruction. She teaches at the magnet school, Greene Elementary School of Science and Technology, and takes her students on 54 field trips a year to various sites, including state parks, to take advantage of the educational opportunities. She and Dr. Matthews have co-authored articles for education periodicals.*

*Tracking the Vanishing Frogs*, by Kathryn Phillips, is the text Matthews uses in one of her classes. UNCG’s Dr. Frank Hensley, who directs the freshman biology labs, is mentioned in the section on the Costa Rica golden toad. The last person to see a golden toad alive, Hensley discussed his research with the class. He also brought a relevance and immediacy to the subject by bringing frogs, which he raises, to the classroom. He introduced the students to ways to raise frogs as an in-classroom project.

On Matthews’ annual spring Outdoor Science Education field trip, the graduate class went to the North Carolina coast. At the Rachael Carson Preserve they learned about Project Estuary, a curriculum project of the national Estuarine Research Reserve, and studied the fiddler crab colony activity, to learn how to sample the colony and take a population count. At Hammocks Beach State Park they were introduced to the sea turtle program. The staff at each park worked with the teachers in broadening their knowledge of the pertinent environmental issues and designing science activities to use with their pupils.

Matthews says, “The first step with environmental education is to know what’s outside... How many animals you can identify, how many bird calls you can recognize...I find most people totally uncomfortable with their surroundings outdoors.” I believe learning about nature and wildlife is fun and interesting...and it’s critical to preservation.”



# THE GLOBAL COMMONS

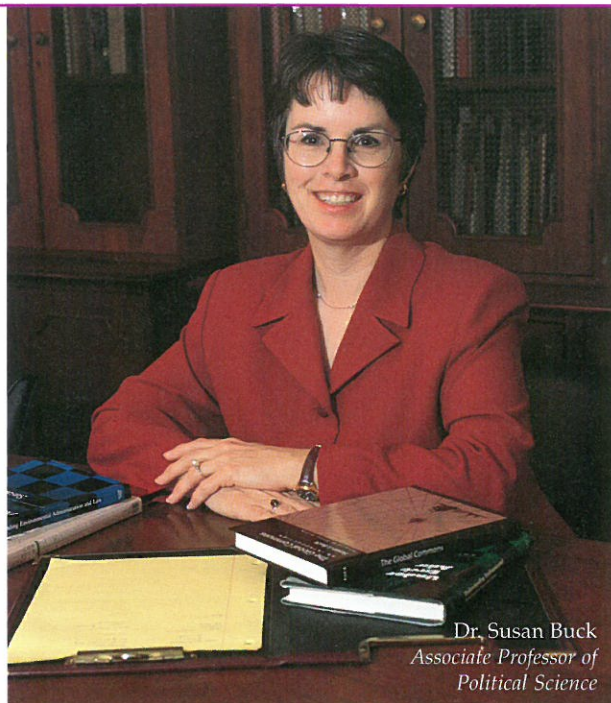
## INTERNATIONAL ENVIRONMENT ISSUES

Susan Buck likes to unravel the complex — particularly when it relates to conflicting legal and political environmental policy. “When the same resource is used by different types of people for different types of activities,” she says “regulation and management of common property resources become entangled and very complicated.” An

associate professor of political science at UNCG, Dr. Buck says, “It’s easy to describe, but difficult to analyze. It gets complicated, for instance, when a commons provides water for irrigation and for fishing, is a habitat for animals sought out by hunters, and is a site for hikers, as well.” She says the overlap of federal and state jurisdictions and mandates further complicate management. “For instance, the federal government controls endangered species, so they regulate migratory birds in cooperation with the states. They write a law that says here are the restrictions are on hunting ducks. Then the state agencies have to write the regulations and enforce them.”

Buck, who is currently working on a paper testing an analytic framework for multiple uses/multiple user resources, asks, “How do you regulate to allow for hunting and recreation together — to provide for a habitat for both hunting birds and song birds? Or the encroachment of urban areas on wildlife habitat?”

In her recently published book, *The Global*



Dr. Susan Buck  
Associate Professor of  
Political Science

*Commons: An Introduction*, Washington, D.C., Island Press, 1998, Buck challenges the legal and political complacency that surrounds the major global commons: Antarctica, the high seas and deep seabed minerals, the atmosphere, and outer space. “I hope this book will help people see where the parallels and differences are across the global commons areas, so

we can avoid the sloppy kind of thinking that says, ‘Well, we did this for the ocean regime, let’s do it for the space regime,’ because there are some very fundamental differences.”

Regarding the issues surrounding outer space, which started in the early 60s, Buck says, “The general tendency has been that as long as nobody wants or is able to extract something valuable from outer space the international community is willing to consider it a common resource that everyone can access and share — the common heritage of mankind idea. As soon as it becomes economically feasible to start extracting the resources, we start to change the management regime so that capitalism can function, and we get privatization of public resources.”

Buck cautions about falling into the trap of considering the atmosphere a global commons. “We don’t extract resources out of the atmosphere, we dump extra matter into it — it’s being used as a trash dump. I don’t think of air pollution as a commons problem. If you consider it a global commons problem, you look for the wrong solutions.” Buck’s conclusions challenge the conventional

wisdom in the academic international relations community, and she is eager for their response to her analyses.

Written to inform and intrigue the general public, as well as scholars who study environmental law and policy, Buck’s in-depth exploration of the resource regimes includes the history, exploitation, conflicts, and regulations which have evolved over the years.

Buck has authored two other books unique to her field: *Public Administration in Theory and Practice*, Englewood Cliffs, NJ, Prentice-Hall, 1994 (co-author); and *Understanding Environmental Administration and Law*, Washington, DC, Island Press, 1991, updated in 1996 and in its second edition. The latter book provides a primer for mid-level managers in state and federal wildlife agencies to help them understand how the federal regulatory and political processes operate — how to interpret rules and regulations and how to lobby. She receives letters of thanks and praise from former scientists, promoted to the ranks of administrators, for the clear, concise explanation of how the law operates as a tool for management. The approach presents a more practical focus than that taken by the more traditional environmental law books and histories of the environmental movement.

Buck earned her Ph.D. in Public Administration and Public Affairs, with a specialty in Natural Resource Management in 1983, from Virginia Polytechnic Institute and State University. She has received several prestigious research grants, including a recent Fulbright American Lecturer and Research Scholar Grant which enabled her to spend three months in the United Kingdom at the Robert Gordon University School of Public Administration and Law University in Aberdeen, in the summer of 1997, to research British and Scottish wildlife management. Buck says, “It was wonderful to immerse myself in a system enough like ours but

sufficiently different to make me look at things from another perspective — to see how it colors our approach to resource management. For instance, because of their legal system, Scotland has no national parks.”

Buck also received a National Science Foundation grant as co-principal investigator to examine “Transnational Implications of Legal and Institutional Change in Soviet Central Asia,” and a Ford Foundation Grant for “A Proposal to Enhance International Participation in the Second Annual Meeting of the International Association for the Study of Common Property (IASCP).”

Buck, who has been on the faculty at UNCG since 1988, teaches undergraduate environmental law and policy; natural resources law and policy, public administration, and American government. At the graduate level, she teaches public policy, administrative law, environmental policy, and administrative ethics.

“I have so much material to synthesize from so many sources, like law cases and law journals, and financial survey information gathered by the federal government, that unfortunately it’s not always possible to find a graduate assistant with the right background and skills,” says Buck, who would like to provide more opportunities for graduate students to work with her on research projects. For her undergraduate students, Buck considers community involvement critical to their studies, and they are offered the option of working three hours a week on various programs in environmental centers and city parks to satisfy part of their course requirements.

Ever immersed in the complexities of the legal and political ramifications of wildlife administration, Buck will continue her schedule of teaching, research, and prolific writing, and this summer will publish a paper on the differences between the Scottish feudal land tenure system and our laws of property and how they affect wildlife management.

**“THE GLOBAL COMMONS IS A BOOK OF HIGH QUALITY AND THOROUGH SCHOLARSHIP. THE IDEAS ARE PRESENTED CLEARLY, CHARACTERIZED BY SOPHISTICATED ANALOGIES OF HISTORICAL DEPTH. I REGARD IT AS THE DEFINITIVE TREATMENT OF THE GOVERNANCE OF THE GLOBAL COMMONS.”**

— Lynton Caldwell,  
Arthur F. Bentley  
Professor Emeritus of  
Political Science and  
Professor of Public and  
Environmental  
Affairs, Indiana  
University.



## RELIGIOUS BELIEFS AND ENVIRONMENTAL ATTITUDES: LIVING THE IDEAL?

Do people's religious beliefs influence their attitudes towards the environment? Dr. David Matthew Zuefle, assistant professor of recreation, parks, and tourism at UNCG, began to pursue this question and many others by examining the interface of religious beliefs and environmental attitudes. His research has led to even more questions about the messages and the messengers of environmental education and interpretation.

In his research, Zuefle set out to examine the two widely accepted hypotheses introduced by Lynn White, Jr., in the article, "Historical Roots of our Ecologic Crisis," which appeared in *Science Magazine* in 1967. White, an historian, said: 1) A relationship exists between religious beliefs and attitudes toward the environment. Since religious beliefs produce an over-arching value system, they are very likely to influence people's relationship with the environment. 2) Some religious beliefs may be friendlier to the environment than others. The Judeo/Christian traditions and other related religions like Islam, and even the secular traditions like the political/economic philosophy of Marxism, share certain ideas about people's relationship to the earth. According to White's interpretation, this relationship was a negative one. Citing the Bible as proof, White claimed historical precedence for his assertions. He said, in Genesis, man was given dominion over the earth. Going back to the earliest texts, man is the ultimate creation. With God, man even gets to name the other species, and man is told he has stewardship over them. White asserts, as a result, society has been culturally prepared to have this master/servant relationship with the environment.

The few early attempts to measure the hypotheses were through scales of religiosity. Zuefle says these kinds of instruments were designed to demonstrate people's outward commitment to their beliefs, like how often they attended church, and they failed to measure the individual's spiritual investment.

Zuefle's study population included natural resources professionals, including environmental educators and interpreters, and

tested the association of their self-professed religious identification and their attitudes toward the environment. "One of the most striking things the data shows within these populations is that only about two-thirds as many Christians turn up in the sample, and about two and a half times as many atheists and agnostics, and 23 times as many who profess some non-Abrahamic belief, as you would expect. This is fascinating," he says. "Each of these subgroups is disproportionately represented when compared to the general population." This brings to question whether fields like environmental education and interpretation attract people with different beliefs, or whether spiritual views change after exposure to the field.

In Zuefle's study, the first of White's hypotheses appears valid. "My findings suggest he is right, and there is an association between religious belief and environmental attitudes. The presumption is that religion is the independent variable and influences environmental attitudes." The second of White's hypotheses, however, is not well supported, Zuefle says. His studies demonstrate that none of the religious or secular traditions clearly embraces negative attitudes towards the environment. The differences were more subjective and were more the result of the way they were expressed. Considering that the spiritual attitudes of the environmental educators and interpreters differ so from the general population, how do these attitudes affect parks and recreation programming, where interpreters have considerable latitude in their presentations, and how do they affect the public performances of the presenters?

Some practical questions regarding the profession surface, as well: do some of those who work in environmental education and interpretation make people angry with the kind of themes that they embrace in their presentations? He says, "Sometimes there's an abrasive edge to their message. They may even come across as condescending. As a result, there is a chance the entire message will be rejected." Does their passion turn off the very



Matthew Zuefle  
Assistant Professor of  
Recreation, Parks, and Tourism

public they want to attract?

Zuefle is interested in why people become involved with environmental careers. Why do they care? Many of them willingly make personal and financial sacrifices to pursue careers in this field," he says. "There is an element of religious fervor in this field," says Zuefle. "In fact, many refer to it as 'a calling'. He points out that in their zeal to share information, to make a positive impact on the world, there is a danger they will inject their own values and interpretations and, in order to make a point, might inadvertently or purposely perpetuate common myths that circulate about various things in nature. In an article from 1996, "Are We Ministers Of Misinformation?: On The Need For Responsible Criticism In Interpretation," Zuefle and a colleague from San Diego State University, Dr. Larry Beck, identify a number of common fallacies that appear in park, recreation, and environmental education programming across the country. "As a result, do the programs become ineffective? The really elemental questions I'm asking might be the kind of information that will salvage these

enterprises from falling into a kind of demagoguery on one hand or exercises of mass congratulations on the other. It is important that people know about their environment."

Zuefle explains that there is a difference between environmental education and environmental interpretation: "Environmental education is pedagogic and sequential, delivered to a captive audience, structured, and with desired outcomes. Environmental interpretation is not like that. It is delivered to a non-captive audience, in a short period of time, usually at a campsite or a park area; it is an overt educational entertainment, and can be a last opportunity to reach someone who has never been exposed before. This is our chance to make a connection with those who don't normally have any sense of community with the environment. I think it gets short shrift because it is entertainment in a recreational setting." Tens of thousands of people frequent nature centers, park areas, and other environmental sites annually, he says. Only about ten percent of them attend the interpretive programs that are presented, and most of them come because they are already committed to the environment. How do we reach the other 90 percent, he asks. Zuefle, who has more than an academic interest in the environment and has worked for years in the field, says, "People in this field are willing to make personal sacrifices in order to live a different kind of life, where leisure and work are integrated, not segmented, seemingly more balanced. I've never been able to forget what one of my subjects said when asked to describe his work: Living an ideal and ideally living, all at the same time."

When Zuefle came to UNCG in 1994, he says, environmental education hadn't been taught in many years. He considered it so important that he offered to teach it for free. He did it on his own time and had a great response. This summer it will be offered for the first time as a regular class and is attracting teachers in the community, park rangers and park managers interested in enhancing their professional status and their understanding of their own field.

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## FACULTY RESEARCH VIGNETTES

**James Fleet**, Nutrition and Foodservice Systems, received a five year, \$574,000 award from the National Institute of Health for his research on calcium absorption of the body and its molecular mechanism. Much of Dr. Fleet's research is in the area of mineral nutrition and identifying those factors which facilitate calcium absorption and the effect aging has on this process. Dr. Fleet's research has appeared in *The Journal of Bone Mineral Research*, *Endocrinology*, *The Scientist*, and many others.

Examining current issues in sport psychology, **Dan Gould**, Exercise and Sport Science, is particularly interested in elite athletes and factors influencing their athletic performances. Dr. Gould recently received an award from the US Olympic Committee to examine the positive and negative factors influencing Olympic athletes and coaches. Dr. Gould attended this year's Winter Olympics in Nagano, Japan as the sport psychology consultant for the US Olympic Freestyle Ski Team.

**Nancy Vacc** and **George Bright**, Curriculum and Instruction, study teacher education and elementary mathematics education. Their current research is in the area of cognitively guided instruction in mathematics which focuses on student development of problem solving skills and planning instruction based on student's thinking. Dr. Vacc recently received funding from the UNC Math and Science Education Network for further research of the development of teaching methods addressing diverse student learning styles.

**Tom Martinek**, Exercise and Sport Science, expanded his program "Project Effort", a program to foster resilience in middle school students. This after-school program targets underserved youth in low socioeconomic areas, encouraging at-risk children to reinvest their energies in schooling and becoming healthy, competent young adults through specialized physical activity and mentor programming. Dr. Martinek's project is funded in part by the Community Foundation of Greater Greensboro.

In developing educational technologies, **Pierre Balthazard**, Information Systems and Operations Management, studies group support systems, strategic decision making, mathematic aggregation, classroom technologies, and other related subject areas. Recent research supported by the National Science Foundation has Dr. Balthazard exploring the Influence Allocation Process, which may provide new insights into personal and group behaviors.

**Vincent Henrich**, Biology, was recently awarded a grant by the US Department of Agriculture to identify the development of new insecticides. Because insect populations develop a resistance to insecticides over time, insect damage is a major cause of crop and economic loss throughout the world, thus emphasizing the importance of Dr. Henrich's work.

**George Loo**, Nutrition and Foodservice Systems, investigates issues of smoking behavior, aging, and nutrition. In recent research, Dr. Loo investigates the mechanisms of antioxidants. funded by the U.S. Department of Agriculture, his study entitled

"Impact of Flavonoids on Redox Regulation of Gene Expression" addresses the benefits of flavonoids in battling chronic disease, such as coronary heart disease and cancer.

**Charles Kim**, Textile Products Design and Marketing, studies the sensory and physical assessment of fabric hand. His research includes development of processes for removal of pesticide residue from contaminated protective clothing, performance evaluation of protective clothing, and other related subjects. Dr. Kim recently received funding from the CULP Corporation for fabric hand evaluation of upholstery fabrics.

Uncovering never-before-heard music of the past, **Nancy Walker**, School of Music, is particularly interested in the contributions of female artists. Dr. Walker recently received a Fulbright Scholarship Award to research the works of Josephine Lang, a 19th century German composer. Dr. Walker will spend three months in Munich, Germany studying and cataloguing Lang's work, revealing previously unpublished musical compositions.

Classroom instruction integrated with real world application is one of the very exciting events taking place at UNCG. **Andy Dunnill**, **Billy Lee**, and **Pat Wasserboehr**, Department of Art, have developed a partnership with Liberty Property Trust in which UNCG art students will create a sculpture to be erected at a business site. Graduate and upper-level undergraduate students will have the opportunity to participate in this "site-specific" sculpture course in Fall 1998, and one of the creations from the class will be chosen as the sculpture to be placed at a Greensboro business park.

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