As I boarded the plane to Guinea (West Africa) at the start of my Peace Corps service, I naively thought the answer to global poverty was simple economic and agricultural development. However, while spending two years working in a community struggling with disease, I quickly discovered the problem is much more complex. Poverty and disease are intimately intertwined, creating a positive feedback trap few countries can escape. As land use shifts with economic development, we must study how disease dynamics are changing as well, and how human disease in turn influences development. The complexity of this system requires an interdisciplinary approach as its questions encompass multiple disciplines. In fact, most pressing environmental issues are similarly complex and future scientists, myself included, must be able to conduct research across disciplines if we are to address them.

RESEARCH EXPERIENCE ACROSS DISCIPLINES

***Social approach to environmental issues*.** I have research experiences in both social and natural science. While studying abroad in Tanzania, I noticed it was a common belief among conservationists that coral reef degradation was due to poor local management stemming from an ignorance of the damage caused by dynamite fishing. Using my Swahili language skills, I discussed environmental conservation in depth with local people and discovered that Tanzanians are very knowledgeable about their local environment and its current threats. Intrigued by this disconnect between popular opinion and my own personal observation, I **designed an independent project to assess the dynamite fishing education program in Ushongo**. During my six weeks living in this small fishing village, I led multiple focus groups and conducted over 100 individual interviews, through which I found a rich indigenous knowledge of the reef and the destruction caused by dynamite fishing. The lack of local conservation action was due to a lack of resources, not a lack of knowledge.

My successful experience in Tanzania prepared me to conduct Participatory Analyses of Community Activities as a Peace Corps Agroforestry Advisor in Guinea. Using **community-based social science methods** such as community mapping and needs assessments, I was able to identify areas of improvement from the local community's perspective. This led to several community projects, including the implementation of a water management regime in a women's garden, thus lengthening the vegetable growing season and reducing the labor requirements of irrigation.

Ecological approach to human-driven problems. From an early age, I considered myself a naturalist, spending summers catching and observing frogs and turtles in the neighborhood stream. Located in a residential area, the stream was directly affected by the surrounding human landscape, and, even as a child, I was curious how run-off and pollution impacted the ecosystem. My first formal training, however, was through Dr. Jon Chase's Experimental Ecology course, during which I designed and implemented weekly projects in novel systems that introduced me to different theories, experimental methods, and ecological statistics. I was amazed by the vast diversity of systems and curious about how human activity was causing biodiversity loss. Due to my interest in biodiversity, I chose to explore how habitat change, specifically homogenization, could affect diversity for an independent project. I used a **protozoan community as a microcosm to examine the relationship between species richness and evenness in heterogeneous metacommunities**, aiming to discover a general trend that could inform habitat conservation. After devoting countless hours in the lab to my experiment, I experienced the exhilaration of discovering an answer to a question. I found species evenness to be higher in heterogeneous habitats and species richness unchanged, driven by the abundance of rare species

in these habitats, suggesting that conservation efforts should focus on maintaining heterogeneous habitats habitats over homogeneous ones to maximize biodiversity.

In order to pursue these community interactions further, I applied for the Howard Hughes Medical Institute Summer Undergraduate Research Fellowship to conduct research with Dr. Chase and his doctoral student Dr. Lauren Woods. My research that summer, conducted at Tyson Research Center, employed aquatic mesocosms to investigate **the effect of habitat isolation on the relative strengths of top-down vs. bottom-up trophic dynamics, as well as patterns of local and regional diversity**. I found that predator community composition was strongly affected by isolation, weakening top-down processes relative to bottom-up processes. This research informs predictions of community composition shifts in the context of increasing habitat isolation due to anthropogenic habitat fragmentation.

While serving in the Peace Corps, my research interests expanded to encompass infectious disease. Guinea is host to a number of tropical diseases, and I witnessed many of my friends and host family members fall ill, often to malaria. As an ecologist who had worked in aquatic systems, I immediately recognized the potential contribution of semi-permanent ponds and rice fields to aquatic habitat for mosquito larvae, and how the community composition of this habitat could in turn influence disease prevalence. After delving into the scientific literature, I realized this field was the ideal way to combine my interest in ecological research and passion for development work/poverty alleviation.

Upon completion of my Peace Corps service, I arrived in the United States eager to further explore this new interest. I was especially fascinated by how anthropogenic activities were changing the landscape and, indirectly, disease dynamics. I worked as a research technician with Dr. Marm Kilpatrick's graduate student, Tony Kovach, at the University of California – Santa Cruz, on an NSF CNH project **exploring the relationship between wetland conversion, climate variation and West Nile Virus disease risk in the Sierra Foothills of California**. Sampling mosquitoes from natural and anthropogenic wetlands, we found that mosquito community composition and seasonal abundance differs across wetland types, and the conversion of natural wetlands to agricultural wetlands could drastically influence disease dynamics. Although my work focused specifically on mosquito dynamics in wetlands, it contributed to a larger interdisciplinary project incorporating landowner decisions, regional climate models, and bird community dynamics. My time on this project introduced me to the possibility of conducting integrative research across disciplines and scales, and is something I hope to replicate throughout my career.

This past fall, I began my doctoral studies at the University of Georgia in the Integrative Conservation and Ecology (ICON) program. I chose the ICON program because it strives to train interdisciplinary graduate students to address real world problems. My current research focus is on land use change and infectious disease, and I am working with Dr. Courtney Murdock to study how key life history traits of *Aedes albopictus*, a vector of several arboviruses, including Chikungunya and dengue, vary across an urban gradient. These mosquito traits quantified from mosquitoes in the field will be integrated with sociological and demographic data that are predictors of human exposure to inform disease transmission models across an urban gradient. This research will address a diversity of challenges associated with modeling socio-ecological systems such as limited empirical data and integrating data collected across scales.

LEADERSHIP AND TEACHING. Mentoring is a responsibility of all scientists, and I have been able to do so in a variety of formal and informal settings. I mentored high school students through Tyson Research Center's NSF-funded "Making Natural Connections" program. This

program provides high school juniors and seniors the opportunity to obtain hands-on field research experiences in a variety of ecological systems. I worked with two students, Jessica Plackenburg and Chloe Pinkner, who helped me implement my research. Both were interested in pursuing science and ecology after their work that summer and I was able to offer first-hand advice about both academics and undergraduate research. Serving as their mentor allowed me to see the influential role one can play in helping develop a younger scientist's academic interests and goals.

I organized and hosted an annual girls development conference in Kankan, Guinea for two years. High school-aged girls throughout the region participated in the conference, which focused on reproductive health, gender rights, and environmental issues. Participants returned to their villages with a newfound confidence and began small-scale development projects such as tree planting and girls' soccer teams. Through this role, I served as a mentor not just across ages, but also across cultures. I plan to incorporate undergraduate students into my research through the Population Biology of Infectious Disease NSF REU at UGA, and serve as a mentor through a university organization that promotes women in science, WiSci.

INTEGRATED RESEARCH AND PRACTICE. Scientific research is undergoing a dramatic shift. No longer can we simply ask questions to satisfy our own intellectual curiosity; environmental problems are arising that we, as natural scientists, are being called upon to understand and solve. This requires multiple perspectives, incorporating social, economic, and environmental contexts. Collaborating and working across academic boundaries relies on a working knowledge of the methods and vernacular of other disciplines. My interdisciplinary background has not only introduced me to methods in other fields, but also provided me opportunities to partner with a diversity of social and natural scientists, training me in communication skills essential in successful collaborations. In a time of global connectedness, my experience collaborating internationally and solving problems across cultural borders with the Peace Corps will allow me to work with researchers of different backgrounds and viewpoints than my own.

Conducting science to solve problems, as well as expand basic knowledge, requires scientists to communicate our science outside of academia, to practitioners, policy makers, and the general public. In Guinea, I collaborated with a local university to organize a scientific conference on the biodiversity of the local lake. Attendees included university professors, government ministers, leaders of environmental organizations, and indigenous "guardians" of the lake. Working with a wide variety of stakeholders, we created a joint plan with farmers, government agents, and the guardians to help protect the lake. In my eyes, it was the epitome of placing scientific research in its proper context and communicating it directly to those who could most benefit from, and act on, the results.

I plan to work at the interface of research and practice, conducting innovative research that is relevant to current societal and environmental issues. This fellowship will offer me the creative freedom to pursue an interdisciplinary study of infectious disease. I am fortunate enough to take part in an interdisciplinary program, but the notion of integrated research is still relatively new. A source of external, independent funding will allow me to follow my research across fields, from ecology to anthropology to public health, so that my results are based in a realistic context and contribute to the understanding of complex scientific questions we face today.