
Commentary

SEEDS of a New Millennium

Though I do not believe that a plant will spring up where no seed has been, I have great faith in a seed. Convince me that you have a seed there, and I am prepared to expect wonders.

—Henry David Thoreau

Ideas that each of us nurtured in private seemed to blossom when we shared them at a recent leadership workshop held in Phoenix, Arizona by the Strategies for Ecology, Education, Development and Sustainability (SEEDS) Program. We are 12 young scientists, representing three cohorts of the Ecological Society of America's SEEDS Program, who have been awarded Undergraduate Research Fellowships in 2004–2007. We were chosen from America's minority and immigrant populations. Some of us represent Native Americans, including Hawai'ians and the Lakota, Mandan, Hidatsa, and Arikara Nations. Some of our parents or we ourselves come from other countries, including Mexico, Puerto Rico, Honduras, Peru, Africa, and China. More than a nod to political correctness and affirmative action, we embody the diversity that ESA seeks, a diversity that is necessary for the advancement of science and society. Today, we share our thoughts with those who set the agenda for the field we are now part of. We believe it is imperative to expand the focus of ecology and understand the importance of hard science. We are global citizens who feel a deep obligation toward serving our communities. As emerging ecologists, the inheritors of ESA, we wish to express our views and concerns regarding the future of this field.

Currently African Americans, Hispanics, and Native Americans make up nearly 25% of the national population, yet they receive only 13% of all United States science and engineering bachelor's degrees, and 7% of all science doctoral degrees (Mojica Rey

2001). Similarly, African Americans, Hispanics, and Native Americans compose <5% of ESA's total membership (ESA 2005). ESA realized the need to increase the presence of underrepresented ethnicities in the field of ecological research by creating the SEEDS Program. The mission of SEEDS is to *promote opportunities, to spark and nurture the interest of underrepresented students in the science of ecology*. SEEDS values cultural diversity in ecology by viewing it as a crucial tool to expand global environmental awareness, advance science, and increase community development.

The SEEDS Program has given minority students the chance to learn and apply rigorous Western Science through practical hands-on use of the scientific method, without being forced to deny or forsake the wisdom that is inherent and embedded in their cultures. We must remain true to both science and our cultures while being careful to distinguish the similarities and differences in these two realms. Cultural wisdom goes beyond the traditional science methodology by including not only the how or why, but also purpose of understanding the natural world. The SEEDS program recognizes our unique perspectives and constantly encourages us with support and opportunities.

SEEDS has given us the chance to conduct independent ecological research projects through the SEEDS Undergraduate Research Fellowship. Through experiencing what graduate students and career ecologists do, we are beginning to understand and visualize what it takes to pursue an ecological profession. The teachings that we receive from this program and our mentors are priceless. The support of ESA and SEEDS has maximized our learning potential by also enabling us to participate in other SEEDS activities: taking ecological field trips, attending and presenting at the ESA Annual Meetings, networking with other ecologists, and often participating in our local campus SEEDS Chapters.

All of us were introduced to SEEDS differently, either through faculty members, mentors, and/or SEEDS

Chapters. Prior to SEEDS many of us did not know what the field of ecology entailed. We all possessed a sincere interest in environmental science and nature, but we did not know where our passions lay or how to pursue them. SEEDS has shown us the many different realms of ecology, allowing us to find an ecological discipline that is close to our personal interests. Our interests encompass a variety of areas: biogeochemistry, urban ecology, rangeland ecology, tropical ecology, Northern Plains ecology, agro-forestry, marine ecology, and population ecology. SEEDS students, with our diverse cultural, geographic, and disciplinary backgrounds, are a vivid message to the ecological community that diversity can greatly strengthen the profession.

SEEDS has enhanced multilingual and multicultural relations by uniting diverse students who are deeply committed to ecology, equity, and culture. We have made lifelong friendships, and support each other, regardless of how many miles lie between us. SEEDS is a family that makes us not only want to become ESA members, but also active participants in shaping the future of the organization. The chance to meet and collaborate with students and scholars from different ethnic backgrounds has given us a positive and optimistic outlook on science. We believe that the future of ecological research lies in collaboration across boundary lines: geographical and intellectual. Borrowing tools from other disciplines and incorporating different methodological and theoretical perspectives will make ecology prepared for future challenges. SEEDS has opened our eyes and minds to a whole new world of possibilities—possibilities we would never imagined had we not found SEEDS, or maybe if SEEDS hadn't found us.

Studying ecology has helped us understand the world's complexity. However, the lack of pristine ecosystems has affected our paradigm in research, leading us to focus on restoration, preservation, and urban ecosystems. To address the environmental problems we see in the world and in our communities, we have a broad view on research questions, perspectives on research, and approaches to solutions, such

as the combination of science and traditional ecological knowledge. We wish to conduct scientific research that is credible in the scientific community, but that can also be applied in real-world settings. As scientists we have the knowledge of how systems may function, and we believe that with knowledge comes the responsibility to act. Within the scientific community, professionals have collaborated and are sharing information with each other, but now we must take the next step forward by ensuring it is passed on to society and applied for the benefit of everyone.

As emerging young scientists of the new millennium we understand and admire the goals of ESA. Those related to diversifying and communicating science include:

- *Improve ecological science and its application by increasing the diversity of ecologists, including the representation of cultural, ethnic, gender, intellectual, and disciplinary perspectives, and persons with disabilities.*
- *Improve communication and enhance education and public awareness.*
- *Increase resources and inform policy.*

In order to fulfill these goals, ESA members and all ecologists should become more involved in increasing diversity in ecology, educating communities, and informing policy makers.

During our undergraduate careers, we already are fulfilling ESA's goals and strengthening the science of ecology by asking broad ecological questions, doing ecological research in different international locations, and actively using our ecological knowledge to influence society and the public. For example, a fellow at the University of Texas El Paso (UTEP) directs, designs, and participates in restoration and outreach projects that expose grade school students to the field of ecology, and strengthens their abilities in science for

the annual Texas mandated test. At Occidental College in Los Angeles, a SEEDS fellow founded and directs the Scientific Scholars Achievement Program (SSAP). SSAP helps students from underrepresented groups in under-funded public high schools successfully pursue their scientific passions by offering mentoring/tutoring sessions and a strong supportive community. Another SEEDS fellow at UTEP is president of the University's Society for the Advancement of Chicanos and Native Americans in Science (SACNAS) chapter, and is actively involved in building a science community by creating student-mentor relationships, journal reading clubs, and tutoring opportunities. At United Tribes Technical College in North Dakota, a SEEDS fellow tutors other students in math and science, and was also recently awarded the honor of representing the American Indians in Higher Education Consortium (AIHEC), as Ms. AIHEC. We also have members who are presidents of their local ESA SEEDS chapters and have recruited many students into ecology on their own campuses.

Due to the nature of campus life, one student's achievements instantly become motivation and curiosity builders for other students. Just being part of an innovative program like SEEDS makes each and every one of us a spokesperson for the ESA wherever we bring our science. The cultural diversity within our group helps us gain awareness of different perspectives on life, science, and community development.

As large as the field of ecology can appear to be, it can only go as far as the scientists that compose it. We believe ESA members and ecologists should become more involved in outreach programs for people of all ages. At this time, with much science in the news (e.g., global climate change, diseases, pollution, extinction of species, etc.) all the world's people, starting at an early age, should be able to understand science, and how science can help them. Some concrete suggestions we have for ecologists are the following:

- 1) Volunteer at local high/middle/elementary schools or at community centers and work with children and community members by giving simple presentations.

- 2) Create programs that incorporate community members, students, and scholars at your university.
- 3) Mentor minority undergraduate students and high school students in your laboratories.
- 4) Get more involved in the SEEDS program. Mentor students at ESA meetings and attend the diversity luncheon and diversity mixer at the Annual Meetings.
- 5) Make your research understandable to a broader audience and work with local, regional, state, and federal agencies and government officials.
- 6) Make an effort to publish your research in media that are available to the public, such as newspapers and magazines that can be purchased readily.
- 7) Become actively involved in government and community policy-making.
- 8) Increase cross-disciplinary collaborations of science with economics, sociology, anthropology, psychology, etc.
- 9) Maintain an open mind to different cultures and indigenous wisdom.
- 10) Respect and involve the communities that you study.

Through our exposure to ecology and to each other we have concluded that science does not reach its full potential until it has been applied to real-world issues. We feel ecology must include the transmission of scientific knowledge back to the people who can use it on a daily basis to improve their lives. Through this empowerment, individuals can apply scientific knowledge that can help them make informed decisions that will affect the rest of the world. It is our obligation as educated scientists and citizens to use what we have learned to make a difference in society. It is imperative that we work with educators in other disciplines

and with members of all segments of our communities. As ecological issues become increasingly pressing, it is time for us to build a foundation of knowledge and methods that will protect our global environment, making the earth a better place for us and the generations to come.

Literature cited

ESA. 2005. Ecological Society of America annual report. Ecological Society of America, Washington, D.C., USA.

Mojica Rey, C. 2001. Making room for diversity makes sense. *Science* **293**:1611–1612.

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