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A Conservation Ethic in Practice

Preserving Cultural and Biodiversity by Bridging the Generational Knowledge Base

Innovations Case Discussion:
Amazon Conservation Team

> A conservation ethic is that which aims to pass on to future generations the best part of the nonhuman world. To know this world is to gain a proprietary attachment to it. To know it well is to love and take responsibility for it.
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> —Edward O. Wilson, *The Future of Life*

In "Changing the Landscape of Power," Mark Plotkin describes his personal journey and his efforts to preserve cultural and biodiversity in the northeast Amazon rainforest—what he terms "biocultural preservation." He discusses his novel approach, which seeks to protect the knowledge of the indigenous peoples integral to the ecosystem and brings together shamanic traditions, computer technology, and global positioning systems in the service of ecosystem preservation. Plotkin's path to the creation of the Amazon Conservation Team (ACT) and its landmark Shamans and Apprentices Program is the inspirational tale of how he developed a sense of purpose and a conservation ethic, and then executed his vision of an organization that would leave an enduring legacy.

Plotkin's tale began with his search for personal purpose. He recognized early in his pursuit of higher learning that the new and trendy approaches of molecular biology he experienced in his classes were not going to satisfy his interest in the biology of whole organisms. He dropped out of the University of Pennsylvania's program in molecular biology, which led him to a series of fortunate encounters with some of the greatest scholars in ethnobotany, evolution, and ecology, including Richard Evans Schultes, Stephen J. Gould, and Edward O. Wilson. Plotkin cred-

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its a class he took with Schultes for awakening his sense of personal purpose. Inspired by Schulte's personal story of life and discovery among the indigenous peoples of the Amazon, Plotkin looked for opportunities to emulate him.

Imbued with a newly found purpose, a well-developed sense of adventure, and a generous tolerance for risk-taking, Plotkin found his first opportunity to visit the South American rain forest as a research assistant to a field biologist studying the black caiman, an endangered crocodilian. He soon returned to South America on his own, first to visit the Maroons, a West African society in the rainforest of Suriname, and subsequently for the first of his many stays with the Tirio Indians in the area along Suriname's border with Brazil. Plotkin's fundamental ethnobotany apprenticeship took place among the Tirio, and it was there that the first seeds of his career as a social entrepreneur were planted, germinated, and grew into what is now the ACT.

The Shamans and Apprentices Program was the first key component of what became the ACT. The program began as a way to promote and provide opportunities for shamans to pass on their ethnobotanical and other knowledge to a younger generation. The program considers indigenous peoples and their knowledge of their environment an integral part of the ecosystem to be preserved and protected. Shamans and Apprentices shares important characteristics with other programs that recognize that if they are to be successful, they have to provide something of value to the indigenous people. Plotkin's research, an almost ten-year compilation of the Tirio's ethnobotanical knowledge that waspresented to the tribe's leadership, challenged their skepticism about the "old ways" and convinced them of the value of preserving their ancestral knowledge. Shamans and Apprentices grew from the Tirio's help in translating the research into their native language and, more importantly, their rekindled interest in passing knowledge from one generation to the next. As in other successful programs, the Shamans and Apprentices Program's mechanism for making this intergenerational transfer of knowledge is both replicable and sustainable, and is operated by the indigenous people themselves.

Ethnographic mapping, which enables tribes to map and monitor the integrity of their territories by using Google Earth and global positioning technology, is the second key component of ACT, which is also shared with other successful programs. Of particular note are transparency, and building relationships and alliances. In teaching the Tirio how to map their territories, ACT engaged Suriname's government as well as neighboring tribes. As the other tribes saw how the Tirios mapped their territories, they wanted to map their own, and so it spread. Tribes that had maps were able to use the government's legal system to challenge illegal encroachment on their lands. Transparency, relationships, and alliances all proved crucial to scaling-up the mapping projects; by 2009, a reported 20 million acres of indigenous lands had been mapped.

The innovative aspect of ACT lies in its bringing together ethnographic mapping and the Shamans and Apprentices Program. Putting the tools for ethnographic mapping directly into the hands of the shamans and their apprentices is a novel

idea, and it has been critical to the success of ACT. This single act has enabled a preindustrial indigenous people to leap into the twenty-first century on its own terms. Ethnographic mapping encourages the transfer of intergenerational knowledge well beyond ethnobotany alone. The shamans' knowledge of their territories is often deeper than what can be gleaned from purely technological approaches, and the apprentices have thus learned to consult their elders. Indigenous peoples have been empowered by knowledge and by having in their own hands the tools to map their territories, use satellite technology to monitor encroachments on their borders, and avail themselves of legal means to protect their lands.

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ACT's integrative approach to ecosystems, which preserves indigenous peoples and their knowledge, is particularly valuable in terms of discovering new drugs. A 2007 analysis (by Newman and Cragg) of the role that sources for new and approved drugs play in the treatment of human diseases found that natural products are significant.[1] Natural products or their synthetic derivatives comprise the majority of antibiotics, antifungals, and anticancer agents, and they were the source for the majority of the antibacterial and antidiabetic drugs developed between 1981 and 2006. During this period, totally synthetic compounds found either by random screening or by adapting the known molecular framework of an active natural product played an increasingly important role as the source for antiparasitic, anticancer, antiviral, and antifungal drugs. Of particular note is the fact that the known bioactive structural features of natural products informed the synthesis of a significant fraction of the totally synthetic compounds. The authors argue that the awesome power of combinatorial chemistry to generate untold numbers of potentially bioactive molecules is most effective when informed and focused by knowledge of the naturally produced bioactive compound. ACT's systems approach is ensuring the preservation of the fundamental knowledge of ethnobotanical and other natural products needed to inform drug discovery.

Not surprisingly, given its role as the steward of medical and behavioral research for the nation, the National Institutes of Health (NIH) has a long-standing and abiding interest in the potential health benefits of natural products. Most NIH institutes and centers support research that involves natural products. A crude search using "natural products" to query the NIH's Computer Retrieval of Information on Scientific Projects reveals that more than five hundred grants were awarded in 2008 to researchers across the country.[2] And, in April 2009, the National Institute of General Medical Sciences sponsored a major symposium on

natural products in biomedical research.

The NIH's largest component, the National Cancer Institute (NCI), began its formal drug-discovery program in 1955 with the Cancer Chemotherapy National Service Center. As a part of its current effort in drug discovery, NCI supports the Natural Products Repository as a national resource. The Repository houses over 170,000 extracts taken from more than 70,000 plants and 10,000 marine organisms in over 25 countries, as well as more than 30,000 extracts of diverse bacteria and fungi. Samples from the Repository are available at no cost to those researching the treatment of any human disease.[3]

The NIH's Fogarty International Center is home to the International Cooperative Biodiversity Groups (ICBG) Program.[4] The ICBG Program is based on the belief that the discovery and development of pharmaceutical and other agents from natural products can promote the development of scientific capacity and economic incentives to conserve the biological resources from which the products are derived. Started in 1992 by the NIH, the National Science Foundation (NSF), and the United States Agency for International Development to address the issues of drug discovery, biodiversity conservation, and sustainable economic development, the program is currently funded by nine components of the NIH, and by the NSF and the U.S. Department of Agriculture. Today's ICBG Program supports seven awards of approximately $600,000 a year in nine countries in Latin America, Africa, Southeast and Central Asia, and the Pacific Islands. To date, more than five thousand plants, animals, and fungi have been collected in order to examine their biological activity in nineteen different areas, and hundreds of individuals have received research training.

For millennia, humans have been using plants and other natural products for healing, yet it is clear there is much left to discover. It is also known that clear-cutting and slash-and-burn agricultural methods destroy not only the trees and macro-fauna, but much of the associated micro-fauna and microbes that are invaluable and irreplaceable resources. The ACT biocultural ecosystems approach ensures that the ancestral ethnobotanical knowledge of indigenous peoples will be preserved and available for the discovery of treatments and cures that have wide application. In the short term, the success of the ACT lies in its having enabled the successful mapping of an increasing number of indigenous territories, the passing of ancestral indigenous knowledge from one generation to the next, and the empowerment of indigenous peoples. These are positive steps on the road to long-term biocultural preservation, a critical benefit for us all.

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1. Newman, David J. and Cragg, Gordon M. (2007) Natural Products as Sources of New Drugs over the Last 25 Years. *J. Natural Prod.* 70: 461-477.
2. See http://crisp.cit.nih.gov/.
3. Research is subject to a Material Transfer Agreement to protect the rights of all parties, including those of the source country and its pertinent organizations; see http://dtp.nci.nih.gov/branches/npb/repository.html.
4. See http://www.fic.nih.gov/programs/research_grants/icbg/.