



INSTITUTIONS

The Smithsonian Tropical Research Institute

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Plague, yellow fever, and malaria—the Smithsonian Tropical Research Institute (STRI) traces its origin to scientific interest in controlling the diseases that retarded construction of the Panama Canal at the turn of the century. After the canal opened, scientists who had been involved with the pathology studies and the biological surveys begun during the canal construction petitioned James Morrow, the governor of the canal zone, to establish a permanent biological reserve. In 1923, Morrow declared 1,600-hectare Barro Colorado Island (BCI), the largest island in Lake Gatun, a biological reserve. Since that time, BCI has become the most studied area in the Earth's tropics.

The 1946 U.S. Government Reorganization Act established BCI, under the name of the Canal Zone Biological Area, as a separate bureau of the Smithsonian Institution. In 1966, the board of regents of the Smithsonian, recognizing the need to pursue tropical research in habitats other than lowland seasonal forest, changed this name to the Smithsonian Tropical Research Institute.

Both the staff and facilities of STRI have gradually increased. STRI now has modern research facilities for multidisciplinary studies of plant ecophysiology, microclimatology, and molecular evolution. Recently, a grant from the Earl S. Tupper family matched with federal appropriations has funded construction of a modern, 67,000-square-foot laboratory and conference center. STRI also includes unique marine facilities that provide access to both the Atlantic and Pacific oceans.

Currently, 26 staff scientists, 12 pre- and post-doctoral fellows, and nearly 100 short-term fellows pursue ecological and evolutionary studies of tropical marine and terrestrial organisms, including humans. In addition, STRI hosts many visiting scientists from throughout the world. Last year at

STRI, staff, fellows, and visiting scientists from 22 nations published more than 200 theses, books, and articles. To aid research, the STRI library has 35,000 volumes and more than 1,000 periodical subscriptions in biology, anthropology, biochemistry, conservation, and related disciplines. The library also has on-line access to the catalogs of the Smithsonian Institution central library, the computer library center, and the electronic bibliographic services of "Dialog."

Most research at STRI pursues basic knowledge about life in the tropics. However, both environmental and developmental problems in the tropics receive considerable attention as well. In 1980, STRI ecologists Steven Hubbell and Robin Foster developed a 50-hectare study plot on BCI, in which every woody plant with a diameter greater than one centimeter at breast height was counted. More than 240,000 specimens were identified and measured. Every five years, the plot is re-examined to determine growth rates, death, new specimens, and spatial distribution patterns for the more than 300 species of plants included in the study. An identical study has been established by STRI on peninsular Malaysia in cooperation with the Forestry Research Institute of Malaysia. From these studies it will

shade-tolerant crops for carbohydrates, they hoped to develop a sustainable farming method that would not require loss of the forest canopy. Already, important progress has been made toward the domestication of the animals and the identification of suitable plant crops. Future research will try to integrate the projects into a program that can be applied by small farmers.

At one of STRI's Atlantic marine stations, coral reef and algal communities have been monitored for nearly 20 years. When an oil spill contaminated these marine communities in 1986, STRI was asked by the Mineral Management Service of the U.S. Department of Interior to conduct a five-year study of the recovery of reef populations from the effects of the oil. The results of this study will be of interest to coastal communities worldwide.

The isthmus of Panama acts not only as a land bridge between North and South America but also as a barrier between the Atlantic and Pacific oceans. Because the isthmus has separated the two oceans' populations of marine life for the last three million years, biologists can examine the differentiation and speciation of marine organisms for evidence of the ways in which evolution operates. Although some species have remained indistinguishable during their long period of isolation, others have

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be possible to identify fast-growing native species that are suitable for plantation forests. The methods developed for the BCI forest demography plot have attracted the interest of many tropical nations. With enough resources, a worldwide network of tropical research plots might help scientists answer some of the questions regarding the processes that regulate the enormous species diversity of tropical forests.

For many years, STRI scientists have engaged in studies of the ecology and behavior of forest vertebrates such as the *Agouti paca* and the green iguana. In 1983, with a grant from the W. Alton Jones Foundation, three STRI scientists, Dagmar Warner, Nicholas Smythe, and Gilberto Ocaña, began to explore alternatives to the nonsustainable agricultural technologies prevalent in Latin America. By growing iguanas as a protein source, pacas for a cash crop, and certain

evolved to the point where their former affinities are hardly discernable. Examining the evolutionary and ecological adaptations that have occurred during the long isolation has enabled STRI biologists to make meaningful predictions about the kind of interactions that might occur if these populations came together again. Such a scenario would be realized by the construction of a sea-level canal or by changes to the present canal that would permit the interchange of marine life through its fresh-water channels.

The negotiation and successful ratification of the Panama Canal Treaties of 1977 called attention to the long-term protection and management of Barro Colorado Island. The negotiators designated BCI a "nature monument" under the terms of the 1940 Western Hemisphere Convention for

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the Protection of Natural Areas and Wildlife Preservation. This action preserved and protected the area for exclusive scientific use and appointed the Smithsonian Tropical Research Institute as legal custodian of the area up to and beyond 1999, the year of termination of the Panama Canal Treaty. The new treaties also established a buffer zone around BCI by placing under STRI custodianship five adjacent mainland peninsulas comprising an additional 3,800 hectares of lowland seasonal forest. As part of the Barro Colorado Nature Monument, these peninsulas provide scientists with the opportunity to pursue types of research that might be incompatible with the strict reserve status of the island.

Despite occasional political tensions between the United States and the Republic of Panama, STRI has always been able to perform its strictly scientific mission without interruption. In 1985, the president of Panama extended to STRI the privileges and prerogatives of an international mission operating in the republic.

The Smithsonian's long-term commitment to the management of Barro Colorado Island has made it an attractive site for long-term environmental studies. For instance, STRI scientists have designed projects to evaluate the role of the dry season in the phenology of forest plants and to determine the contribution made by different tropical habitats to the production or storage of greenhouse gases. Gradually, scientists are

becoming more aware of the important role the tropics play in Earth's geosphere and biosphere. More information is needed about biological diversity and interactions in such high-diversity habitats as rain forests and coral reefs. The anthropogenic effects on the health of these systems also are in need of much greater scrutiny. Few institutions are devoted to increasing human knowledge of the tropics. (Institutions prepared to organize the sparse existing knowledge about the tropics into management plans for developing nations are more common and better endowed.) As a result, scientists do not know whether humans cohabit this planet with 3 million or 30 million other species.

STRI will continue to support basic research on the ecology, evolution, animal behavior, anthropology, geology, and climatology of the tropics. Toward this end, STRI is cosponsoring—along with the International Union for the Conservation of Nature and Natural Resources, the Panamanian government, and nongovernmental conservation organizations—the fourth World National Park Congress in Panama in 1992, in conjunction with the Columbus quincentenary. The congress will provide an opportunity for scientists from around the world to explore the scientific use of reserves, the contribution of research to the management of natural areas, and the impact of Europeans on the New World.