



Annual Report Fiscal Year 1999

July 1, 1998 - June 30, 1999

 **OTS** Organization for Tropical Studies

 **OET** Organización para Estudios Tropicales

***Dedicated to providing leadership in education, research and
the responsible use of natural resources in the tropics.***

The Organization for Tropical Studies is a nonprofit consortium of 56 universities and research institutions from the U.S., Latin America and Australia. OIS was established in 1963 to provide leadership in education, research and the responsible use of natural resources in the tropics. To address this mission, OIS offers graduate, undergraduate and professional field courses in tropical ecology, facilitates research, participates in tropical forest conservation, maintains three biological stations in Costa Rica and conducts environmental education programs.

Table of Contents

3	Message from the President and CEO
4	Board of Directors
4	Consortium Member Institutions and Assembly of Delegates
5	Board of Visitors
5	Offices and Personnel
6	Education
12	Research
19	Environmental Policy
22	Biological Stations
25	Development
27	Finances

Message from the President and CEO

Fiscal Year 1999 was a watershed year for OIS. In addition to the tremendous progress made by OIS' various programs and the improvements to our biological stations in Costa Rica, the OIS Board initiated sweeping changes to the Consortium at its annual meeting in March. The Board unanimously approved the strategic plan, which culminated two years of meetings, discussions and draft revisions. The Board also took the first steps to implement the plan by approving new bylaws and articles of incorporation.



Photo: Pete Carmichael

The strategic plan, posted for public perusal on the OIS website, defines major goals and objectives for the Consortium, including "improved governance and management." In Fiscal Year 1999 OIS began to address this objective by changing its incorporated status from OIS Florida (where the Consortium was founded) to OIS North Carolina (recognizing its tenure of more than two decades at Duke University).

With nearly unanimous approval at the March meeting, the Board of Directors, comprising two representatives from each institution, became the Assembly of Delegates on 1 July 1999. The Assembly will continue to meet annually in Costa Rica and, among other responsibilities, will elect the new members to the Consortium's governing body. This group, formerly known as the Executive Committee, is now the Board of Directors. It is noteworthy that the [old] Board effected a seamless transformation by electing all of the [old] Executive Committee to the new Board of Directors. These and other governance changes are highlighted in the thoroughly revised OIS Handbook for Assembly members.

Fiscal Year 1999 will also be remembered for three other actions taken in March. First, the Board acknowledged the accomplishments of University of Miami professor emeritus and OIS founder and former president Jay Savage by electing him to the Board as an honorary member. Secondly, the Board recognized the tremendous loss of Roger Perry, long-time member of the OIS Board of Visitors who died in January. Roger's counsel to OIS staff and the Executive Committee is greatly missed. Finally, the Board unanimously and enthusiastically approved James Cook University (Queensland, Australia) as the newest member and the first non-western hemisphere institution to join the consortium.

Fiscal Year 1999 was also a successful year for OIS programs and field stations. The reports that follow outline the progress made toward our mission of providing leadership in education, research and the responsible use of natural resources in the tropics. Especially noteworthy was the electrification of Palo Verde and the expansion of the academic program into the Peruvian Amazon. From the financial perspective, the Annual Fund exceeded \$300,000, while the operating budget closed with a modest positive balance. We hope you will enjoy this summary of OIS' fiscal year and as always, we welcome your feedback. Thank you for your continued interest and involvement in the Organization for Tropical Studies.



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Indiana University

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Braulio Vilchez A.

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University of Kentucky

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Louisiana State University

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Barbara Thorne

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Tom Burton

Peter Murphy

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Franklin Barnwell

University of Missouri-Columbia

Tim Holtsford

Rose-Marie Muzika

University of Missouri-St. Louis

Bette Loisel

Victoria Sark

Museo Nacional de Costa Rica

Silvia Lobo Cabezas

Melania Ortíz V.

Universidad Nacional de Costa Rica

Claudia Charpentier E.

Victor Cartín

University of North Carolina

David Pfennig

Seth Reice

North Carolina State University

Paul Mueller

Ted Shear

Ohio University

Don Miles

Jan Salick

Oregon State University

Darlene Judd

Phillip Sollins

Pennsylvania State University

Stephen Beckerman

Jack Schultz

University of Pittsburgh

Walter Carson

Billie DeWalt

University of Puerto Rico

James Ackerman

T. Mitchell Aide

Purdue University

Dennis LeMaster

Kerry Rabenold

Rice University

David Brown

Alan Thornhill

Rutgers University

Jean Marie Hartman

Smithsonian Institution

David Roubik

Don Wilson

Southern Illinois University

Karen Lips

Beth Middleton

State University of New York-Stony Brook

Charles Janson

Patricia Wright

University of Tennessee

Sally Horn

Gary McCracken

Tulane University

Thomas Sherry

Julie Whitbeck

Universidad Estatal a Distancia de Costa Rica

Héctor Brenes

Oscar Bonilla

US Forest Service-Research

John Ewel

Richard Snythe

University of Utah

Dinah Davidson

Donald Feener, Jr.

University of Washington

John Maron

Shahid Naeem

Washington University

P. Mick Richardson

Jonathan Losos

University of Wisconsin-Madison

Wisconsin-Madison

Tom Givnish

Stanley Temple

Yale University

James Bryan

Junhyong Kim

Honorary Delegate

Jay Savage

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Eli Lilly and Company
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The Gene Media Forum
Marigold Murray de Genis
Hacienda Cachí
Gordon Orians
University of Washington
Arthur Pappas
A.M. Pappas & Associates
Tamra Raven
Environmentalist

Carlos Rodríguez E.
MINAE
Roblfo Silva
Former Costa Rican
Ambassador to the U.S.
Stephanie Stone de Feoli
CTAPA
Richard White
Duke University

Offices and Personnel

North American Office

Box 90630, Durham, NC 27708-0630
Telephone: (919) 684-5774
Fax: (919) 684-5661
E-mail: nao@duke.edu
<www.ots.duke.edu>

Gary S. Hartshorn
President & CEO
Nora Bynum
Academic Director
Jean Scovil
Corporate Controller
Jonathan Giles
Development Director
Christina Cheatham
Annual Fund Director
Sandra Rodríguez
Assistant Academic Director
Amy Barbee
Office Manager/Administrative Assistant

Las Cruces Biological Station and Wilson Botanical Garden

Apartado 73, 8257 San Vito, Coto Brus,
Costa Rica
Telephone: (506) 773-4004
Fax: (506) 773-3665
E-mail: lcruces@hortus.ots.ac.cr

Luis Diego Gómez
Director
Emilce Ramírez
Station Manager
Charles Acuña
Administrative Assistant
Rodolfo Quirós
Station Naturalist

Costa Rican Office

Apartado 676, 2050 San Pedro de
Montes de Oca, San José, Costa Rica
Telephone: (506) 240-6696
Fax: (506) 240-6783
E-mail: oet@ots.ac.cr
<www.ots.ac.cr>

Jorge Jiménez
Director in Costa Rica
Maritza Fernández
Accounting Manager
Barbara Lewis
Academic Coordinator
José María Rodríguez
Environmental Policy Coordinator
Rodney Vargas
Development Coordinator
Karin Gastreich
Director, Undergraduate Programs
Eric Sánchez
Head of Informatics
Henry Salazar
Computer Systems Analyst
Aisha Mora
Group Marketing & Services Coordinator
Ana Carter
Groups and Courses Coordinator
Ana Beatriz Azofeifa
Librarian
Javier Mateo
Environmental Policy Specialist
Marvel Godoy Useche
Assistant to the Director
Silvia Alvarado
Public Relations Coordinator
Yolanda Elliot
ESINTRO Manager

La Selva Biological Station

Apdo 53-3069, Puerto Viejo de Sarapiquí,
Heredia, Costa Rica
Telephone: (506) 766-6565
Fax: (506) 766-6535
E-mail: laselva@slth.ots.ac.cr

Robert Matlock
Scientific Director
Agustín López
Administrator
Rosa Sandoval
External Affairs
Addy Rosales
Accountant
Matthew Clark
GIS Lab Manager
Tania Brenes
Research Laboratory Manager
Ruth Rodríguez
Head of Education Services
Orlando Vargas
Station Naturalist
Carlos Barquero
Environmental Education Coordinator

Palo Verde Biological Station

Telephone: (506) 284-6105/6106
Contact via Costa Rican Office

Eugenio González
Director
David Guadamúz
Education Services
Mauricio Solís
Administrative Assistant

Education

In fiscal year 1999, OTS offered eight graduate courses, including a new Spanish language course in Peru, two undergraduate semesters and a new summer program, two new opportunities in East Africa and an increased variety of research fellowships. In past OTS Annual Reports we have listed the graduate courses based on the calendar year instead of the fiscal year. In order to be consistent with other program areas, such as Research and Environmental Policy, this year we have only included courses that occurred in fiscal year 1999 (July 1, 1998 - June 30, 1999).

Graduate Education

Tropical Biology: An Ecological Approach (98-3)

The resource people for this course provided exceptional lectures, field problems and discussions and included Larry Gilbert (U. Texas), Cindy Sagers (U. Arkansas), Jack Putz (U. Florida), Don Wilson (Smithsonian), Eduardo Carrillo (UNA, Costa Rica), Brian Inouye (Duke U.), Sean O'Donnell (U. Washington) and Pedro León (U. Costa Rica), as well as many OTS notables—Jorge Jiménez, Deborah Clark, David Clark, Luis Diego Gómez and Erika Deinert. This was the first fundamentals course to stay at the newly-opened San Miguel station at Cabo Blanco on the tip of the Nicoya Peninsula; the magnificent tidal lagoon was an irresistible and unique site for field problems. After the course 13 students traveled to Panama for a three-day stay on Barro Colorado Island hosted by the Smithsonian Tropical Research Institute.

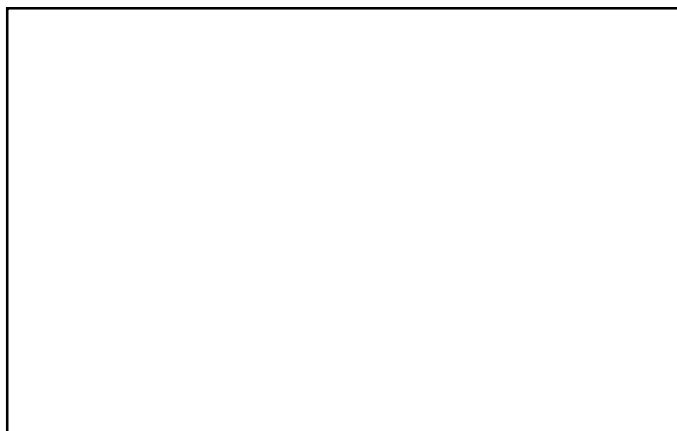


Photo: Deedra McClearn

Coordinator: Dr. Deedra McClearn, OTS

Co-coordinator: Celia Harvey, Cornell U.

Teaching Assistant: Victor Carmona, OTS

Participants:

Elizabeth Archie, Duke U.
Jennifer Baldacci, U. California-Davis
John Bellow, U. Florida
Ted Cheeseman, Duke U.
Michael Collins, U. Tennessee
Anne Danielson-Francois, U. Arizona
Kevin Eddings, Yale U.
Cristian Estades, U. Wisconsin-Madison
Aaron Gassmann, SUNY-Stony Brook
Ian Gilby, U. Minnesota
Luciana Griz, U. Missouri-St. Louis
Kathleen Kay, U. Washington
Edward LeBrun, U. Utah
Satya Maliakal, Louisiana State U.
Randall Moorman, Duke U.
Jason Piluk, U. Georgia
Erin Questad, U. Utah
William Schaedla, Arizona State U.
Justin Schuetz, Cornell U.
Adam Smith, U. Washington
Amy Sproston, U. Kansas
Suzette Stephens, U. Massachusetts-Amherst

98-3 students had diverse interests including herbivore resistance in plants from forest fragments, brood parasitism among finches and polymorphisms among dung beetles.

Agroecología Tropical (98-7)

The hard work and knowledge of local resource people and short-term faculty were crucial to the success of this course. At Ochomogo, Cartago resident Luis Acuña set up farm sites and helped students evaluate agro-economic factors in the field; Jennifer Powers (Duke U.), La Selva researcher, covered critical soil analyses; and Carlos Ugalde (U. Costa Rica) directed insect biodiversity comparisons. Introductory lectures were provided by Gilbert Vargas (U. Costa Rica), Diógenes Cubero (Tropical Science Center) and Carlos Jiménez (U. Costa Rica). UCR biologists Walter Marín, Monica Springer and Vernon Arias led multi-day faculty field problems at La Selva. Ana Meza set up the community visits in San Carlos and led the socioeconomic evaluations, while Julio Arias (Instituto Tecnológico de Costa Rica) made logistic arrangements at ITCR-San Carlos and accompanied the community field problems. Walter Marín (U. Costa Rica) also assisted students with independent research projects at Las Cruces.

Coordinator: Dr. Mickie Swisher, U. Florida

Co-coordinator: Dr. José Manuel Mora, U. Costa Rica

Teaching Assistant: Juan Carlos Rodríguez, U. Florida

Participants:

Dora M. Alvarez, Panamá
Yelinda Araujo, Venezuela
Nadiejda Barbera, Venezuela
Diego Bonilla, Ecuador
Amengol J. Caballero, Bolivia

María M. Collazo, U. Puerto Rico
Verónica Cordero, México
Byron Córdova, U. Nacional, Costa Rica
Jorge A. Cruz, México
Enrique J. Dalmou, Cuba
Eligio García, México
César Guillen, U. Costa Rica

Erivelio Hernández, Honduras
Maltiano Moreta, República Dominicana
Yolanda Nava, México
Victoria E. Reyes, U. Florida
Ruth Rodríguez, U. Nacional, Costa Rica
Oscar Sánchez, U. Costa Rica
Susan E. Swales, U. Florida
Itavclerh Vargas, Perú

Tropical Plant Systematics (98-9)

Demand for the third-ever offering of this course was high, with 42 applicants for the 22 available spaces. The selected group of participants represented diverse interests ranging from traditional plant taxonomy and molecular systematics, to plant community ecology, paleobotany and cultural anthropology. Sites visited over this six-week course included Las Cruces, Palo Verde and La Selva, as well as Albergue Cuericí in Cerro de la Muerte and the Las Alturas Biological Station, located in the rich and still poorly collected region of the southern Cordillera de Talamanca. Topics covered during the course included surveys of representative monocots, dicots, ferns and fern-allies of Costa Rica, the preparation of floras and monographs, theory and technique of phylogenetic analysis, vegetative identification of tropical woody plants and inventory techniques for tropical vegetation. Several excellent keys were produced and should prove highly useful to researchers at the OTS stations. The capstone of the course was an all-day symposium of research results held at Las Cruces during the final week of the course.

Coordinator: Dr. Brad Boyle, OTS

Co-coordinator: Dr. Robbin Moran, New York Botanical Garden

Teaching Assistant: Mario Blanco, U. Costa Rica

Participants:

Mac Alford, Duke U.

Deby Arifiani, U. Missouri-St. Louis

Sandra Borgardt, Cornell U.

Catherine Cardelus, U. Connecticut

Jennifer Cruse, U. Georgia

Charles Davis, Harvard U.

Meredith Dudley, Tulane U.

Susan Grose, Smithsonian Institution

Jocelyn Hall, U. Wisconsin-Madison

Carlos Jaramillo, U. Florida

Rebecca Kershmar, New York U.

Kendra Millam, U. Wisconsin-Madison

Andrew Miller, U. Illinois

Michael Moody, Washington State U.

Roland Roberts, Louisiana State U.

Eugenio Santiago-Valentin, U. Washington

Brian Spitzer, U. California-Davis

Amy Trauth-Nare, Arizona State U.

James Watkins, Jr., Iowa State U.

N. Mia Werner, U. Georgia

Kyle Williams, Duke U.

Alan Yen, U. Washington

Tropical Biodiversity (98-10)

This course, an introduction to tropical ecosystems and their conservation, included a diverse but cohesive group of 16 undergraduate and graduate students and one faculty participant. Rigorous science and plenty of muddy field work was the rule as students, led by faculty resource people, studied everything from spatial patterns of monocot diversity in the understory, to bird feeding guilds in different habitat types, to ant agonistic behavior in relation to tree density in the *Acacia-Pseudomyrmex* complex. A theme that ran throughout the course was that of humans and biodiversity, including interviews with residents near the park and park rangers at Palo Verde, discussions with banana plantation workers, managers, and nearby residents at La Selva and understanding the campesinos' concerns with reforestation around Las Cruces. Course participants explored the complexities of trying to maintain ecological systems and biodiversity in human dominated landscapes.



Photo: Alan Thornhill

To test a hypothesis on leaf-cutter

ant leaf preferences, Molly

Timmers preps oatmeal extracts

from La Selva area trees.

Coordinator: Dr. Alan Thornhill, Rice U.

Co-coordinator: Dr. Peter Sherman,
U. Arizona

Participants:

Laura Alley, Middle Tennessee State U.

John Andersland, Western Kentucky U.

Martin Arford, U. Tennessee

Carlos Barquero, OTS

Rebecca Hubbard, U. Pittsburgh

Nakia Jackson, Tulane U.

Jason Leathers, U. Kentucky

Michael McKay, U. California-Berkeley

Timon McPhearson, Rutgers U.

Patrick Owen, U. Connecticut

Heather Patti, North Carolina State U.

Janice Ragsdale, U. Utah

Molly Timmers, Hamilton College

Jeffrey Townsend, Harvard U.

Eileen Weinstein, Lehman College

Rickie White, U. North Carolina

Ecología da Floresta Amazônica (OTS 98-12)

There were 50 applications for the 20 available slots for this field course held in Manaus, Brazil. The 20 students selected came from 11 institutions: five Brazilian and six outside of Brazil. The course visited a wide range of forest types, ranging from a low forest on sandy soil to *terra firme* forest, to black- and white-water flooded forests. More than 20 visiting faculty participated in the course including William Eberhard (U. Costa Rica). The students also attended over 23 seminars on various topics related to the course curriculum. Of special note, last year's El Niño drought allowed the students to experience a tropical rainforest at its driest.

Co-Coordiators:

Dr. Eduardo Venticinque, Biological

Dynamics of Forest Fragments Project

Dr. Aldicir Scariot, CENARGEM

Sandra Regina Baptista, Rutgers U.

Karina Boege Paré, UNAM

Sarita Borges de Faveri, INPA/CPEC

Marcelo de Oliveira Gonzaga, UNICAMP

Ek del Val de Gortari, UNAM

Patrícia Guidão Cruz Ruggiero, USP - IB

Arlindo Gomes Filho, UNICAMP

Rogério Hartung Toppa, U. Federal de São Carlos

Flávia Nogueira de Sá, UNICAMP

Silvia Elena Pacheco, LILEY - UNI

Nestor F. Pérez Buitrago, U. Puerto Rico

Norma Júliana Salcedo Maútua, Museo de

Historia Natural - UNMSM

Ricardo J. Sawaya, IB - USP

Marcos Silveira, UnB

Maira Smith, INPA/CPEC

Joanna Marie Tucker, U. Arizona

Carolina Volkmer de Castilho, INPA/CPEC

Tropical Biology (99-1) and Ecología Tropical y Conservación (99-2) Collaboration

OTS is committed to programmatic integration and cross-fertilization. This past winter the OTS English language *Tropical Biology* (99-1) and Spanish language *Ecología Tropical* (99-2) courses overlapped for several days of joint field activities at La Selva. Field topics ranged from the effect of land use on the distribution of the cycad *Zamia* to the biomechanics of tree bark. Bilingual communication proved to be less of a problem than anticipated, as many students and most faculty members were functional or better in both languages. Student groups presented their results in a well-attended symposium at the end of the joint activities.

Tropical Biology: An Ecological Approach (99-1)

The winter *Tropical Biology* worked at a number of sites, including Monteverde, Palo Verde, La Selva, the Cuericí station in Cerro de la Muerte, Las Cruces and Corcovado. Palo Verde was the most popular site on this course, largely due to the intense student interest in management issues at this site, fueled by Drs. Gordon Frankie (U. California-Berkeley), Doug Gill (U. Maryland) and Eugenio González (OTS). Student independent projects embraced a wide range of topics, including protozoan diversity in canopy bromeliads, the distribution of leaf litter around tree trunks, the effects of trichomes on the drainage of water from leaves and host specificity of batflies on bats.

Coordinator: Dr. Deedra McClearn, OTS

Co-coordinator: Dr. Marco Tschapka, U. Erlangen, Germany

Teaching Assistant: Corine Vriesendorp, Michigan State U.

Participants:

Amy Angert, U. Washington

Daniel Ardía, Cornell U.

Lisa Belden, Oregon State U.

Chad Brassil, U. Maryland

Nina Brown, SUNY-Stony Brook

Anja Brunet, U. Minnesota

William Cook, U. Kansas

Jenny Dimevich, Arizona State U.

Joshua Erdman, U. Wisconsin-Madison

Heather Ewell, U. Colorado

David Hearn, U. Arizona

Andrea Huberty, U. Maryland

Gina Hupton, U. Kentucky

Dena Hyman, U. Miami

Lisa Infante, U. California-Berkeley

Meera Iyer, Michigan State U.

Wendy Marussich, Arizona State U.

Kailen Mooney, U. Colorado

Albert Owen III, U. Arizona

Geoffrey Parks, U. Missouri-Columbia

Alejandro Royo, U. Pittsburgh

Jeremy Zujko-Miller, Smithsonian Institution

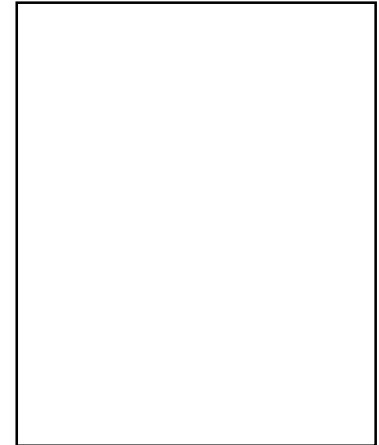
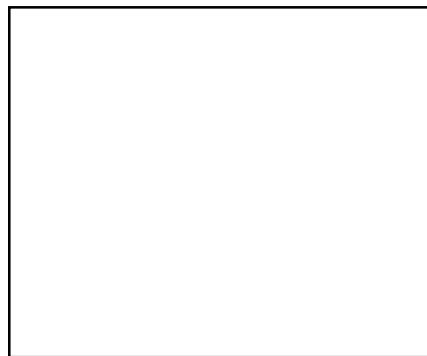


Photo: Deedra McClearn

Lisa Infante and fellow students experienced the Cerro and its unique ecosystem, complete with Puya bogs and páramo forests.

Ecología Tropical y Conservación (99-2)

The Spanish language fundamentals course included 22 students from 11 countries, selected from more than 115 applicants. Symposia in the dry forest (Palo Verde) and wet forest (La Selva) challenged the 99-2 students who completed individual research projects professionally. Conservation issues were the focus at Volcán Cacao, overlooking a broad expanse of Guanacaste National Park. The 21 resource people, including Drs. Bill Eberhard (Smithsonian/U. Costa Rica), Rodolfo Dirzo (U. Nacional Autónoma de México) and Klaus Jaffe (U. Simón Bolívar, Venezuela), gave lectures and led field projects and discussions.



Hands-on research included group field problems, such as this one in a palm plantation, individual projects and post-course projects.

Coordinator: Dr. Alejandro Farji, U. Comahue, Bariloche, Argentina

Co-Coordinator: Dr. Gilbert Barrantes, U. Costa Rica/U. Missouri-St. Louis

Teaching Assistant: Caty Frenkel, U. Costa Rica

Participants:

Beatriz Baker, U. Sao Paulo, Brazil

Ricardo Bedoya, Fundación TUVA, Costa Rica

Susana Bravo, Museo Argentino de Ciencias Naturales, Argentina

Johel Chaves, U. Costa Rica

María del Carmen Chávez, U. Nacional San Antonio Abad, Perú

Francisco Durán, Museo Nacional de Costa Rica

Tomás Easdale, U. Tucumán, Argentina

María del Carmen González, UNAM, México

Carlos Alberto Gutiérrez, U. Antioquía, Colombia

Dayaní Hernández, Instituto de Geografía Tropical, Cuba

María Cristina López, U. Antioquía, Colombia

Bonifacio Mostacedo, Proyecto de Manejo Forestal Sostenible BOLFOR, Bolivia

Angela María Ortega, U. Nacional de Colombia

Natalia Ramírez, U. Costa Rica

Fabián Eduardo Rodas, U. Azuay, Ecuador

Adriana Rubinstein, U. Tucumán, Argentina

Adriana Ruiz, U. Los Andes, Venezuela

Jennifer Saucedo, Smithsonian Tropical Research Institute, Panamá

Eduardo Toral, Eoociencia, Ecuador

Noé Velázquez, U. Nacional Autónoma de México

Rudolf von May, Centro de Investigación Tambopata, Perú

José Manuel Zolotoff, Fundación Cocibolca, Nicaragua

Ecosistemas Amazónicos (99-13)

A new course, *Ecología de Ecosistemas Amazónicos*, was offered for the first time in Peru in collaboration with the Amazonian Center for Environmental Education and Research (ACEER) and the Universidad Nacional de la Amazonía Peruana (UNAP). Latin American graduate students and natural resource managers from eleven countries were selected to participate in the inaugural course. The stellar cast of faculty and visiting resource people included Rodolfo Vásquez (Missouri Botanical Garden), Luis Diego Gómez (OTS), Gary Hartshorn (OTS), John Terborgh (Duke U.), Fonchii Chang, Hernan Ortega and Lily Rodríguez (Museo de Historia Natural de la Universidad Mayor de San Marcos), Mo Donnelly (Florida International U.), David Clark (U. Missouri-St. Louis) and Dinah Davidson (U. Utah).

Following the inauguration of the course in Iquitos, the course moved to the Explorama Inn on the Amazon for three days of introductory lectures and talks by each of the students describing their work prior to the course. From the Inn, the course moved to the flooded forests surrounding the ExplorNapó camp on the Río Sucusari. Dry land was easier to find when the course moved from the ExplorNapó camp to the ACEER biological station with its canopy walkway for another round of group and independent projects. The course finished up with three days back at the Explorama Inn in order to complete the write-ups of group and independent projects. Nineteen course participants (a new OTS record) received post-course fellowships to conduct independent research at sites across the Amazon region. In addition, thirteen students participated in a practical course on the use of Geographic Information Systems (GIS) in natural resource management offered by ACEER.



Photo: Nora Bynum

Boats served not only as the primary means of transportation during the Peru course, but also as an invaluable asset for the aquatic field projects in the flooded forests, where land was a scarce commodity due to record flood levels.

Collaborations

OTS offered two new opportunities in East Africa to member institution students. Three students, Clay Corbin (Ohio U.), Emily Stecker (U. Florida) and Scott Glynn (U. Kentucky), participated in summer courses in Kenya and Tanzania run by the *Tropical Biology Association* (TBA). Two students, Chris Weaver (U. Georgia) and Frank Wolff (U. Missouri-St. Louis), participated in the Smithsonian Institution-sponsored *Field Course in Conservation Biology and Wildlife Management* that took place in Uganda.

Co-Coordiators: Dr. Alejandro Farji, U. de Comahue, Argentina

Dr. Bette Loiselle, U. Missouri-St. Louis

Teaching Assistant: Grace Servat, U. Missouri-St. Louis

Participants:

Carlos Ignacio Piña, CONICET, Argentina

Ana B. Portugal, Bolivia

Sandra Bibiana Correa, U. del Valle, Colombia

Sacha Lozano, U. del Valle, Colombia

Claudia Astrid Núñez, Colombia

Hugo Mantilla, U. Nacional, Colombia

Noelia Garita, UNA, Costa Rica

Vera Selene Baez, Pont. U. Católica, Ecuador

Carmen L. de la Torre S., Ecuador

Cecilia Díaz, Instituto de Ecología, A.C., México

Heydí María Herrera, Nicaragua

Yaxelis G. Mendoza, SIRI, Panamá

Arturo Acosta, U. de la Amazonía Peruana, Perú

Nelly Concepción Llerena, U. San Marcos, Perú

Wendy Tori, La Molina, Perú

Víctor A. Reátegui, Parque Turístico Quistococha CIAR Loreto, Perú

Elsie Rivera, U. Puerto Rico

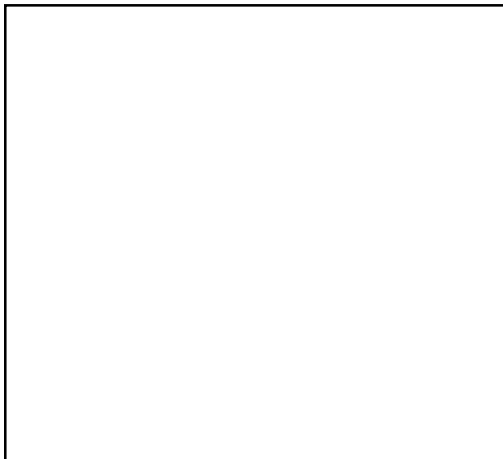
Hermógenes Fernández, U. Puerto Rico

Carlos José Calandriello, Florida International U.

Iván Jiménez, U. Missouri-St Louis

Alicia de la Cruz, La Molina, Perú

César Antonio Aponte, U. Simón Bolívar, Venezuela



The Tanzania course was held in relic tropical rainforests, serving as "islands" for both plants and animals, in the East Usambara Mountains. Ecologically, this situation was ideal for many field problems and projects.

Photo: Clay Corbin

Undergraduate Education

OTS' Undergraduate Study Abroad Program (USAP), offered in collaboration with Duke University, includes both semester and summer programs. The semester program consists of four courses, *Fundamentals of Tropical Biology*, *Field Research in Tropical Biology*, *Environmental Science and Policy of the Tropics*, and *Spanish Language and Latin American Culture*. A summer course, *Tropical Ecology* was offered for the first time in June 1999.

Fall Semester 1998

Fiscal year 1999 was a period of personnel and curricular changes for USAP. Two new faculty members, Erika Deinert and Chris Ivey, joined the teaching staff in the fall. In the same semester, USAP initiated collaboration with a language school (Centro para Potencial Humano, CPH) to administer intensive Spanish classes at its Santa Ana campus. The Fall 98 students spent their first three weeks in Santa Ana and then hit the road for Las Cruces (2 weeks), Palo Verde (2 weeks), Cerro de la Muerte (1 week) and La Selva (4 weeks). Drs. Bill Pfistch (Hamilton College), Marteen Kapelle (INBio) and Ethan Temeles (Amherst College) joined the group as visiting faculty, gave lectures and led field projects on various topics, including a comparison of aquatic insect communities in pristine versus highly disturbed streams, an investigation of relationships between floral morphology and nectar robbing and a study of altitudinal shifts in plant communities at the Cerro. Visits during the semester included an oil palm plantation, a banana plantation, a coffee farm and an old fashioned sugar cane processing plant. Throughout the semester, students conducted several short-term projects and one long-term project based on 2 weeks of independent fieldwork at La Selva.

Jessica Lynch and Cory Tyszka
work on data analysis at CATIE
Biological Station. As part of
short-term and long-term
independent projects, students
collect, analyze and present
research data.



Photo: Erika Deinert

Fall Semester 1998 Participants:

Serena Black, Bryn Mawr College
Athena Dodd, Reed College
Kristen Ford, Duke U.
Jennifer Havlik, Amherst College
Abigail Keys, Ohio U.
Jessica Lynch, Northwestern U.
Gregory Mitchell, Duke U.
Brita Dempsey, Smith College
Nicole Donovan, Middlebury College
Heather Fowler, Duke U.
Michelle Hersh, Bryn Mawr College
Andrew Knoll, Tufts U.
Darren Miao, Duke U.
Susannah Nicholson, Duke U.
Naamal Desilva, Pomona College
Brad Feldman, Duke U.
Jessica Greenston, Washington U.
Sarah Huber, Duke U.
Sophia Kuo, Williams College
Jonathan Micancin, Skidmore College
Carl Salk, U. Illinois
Lisa Stano, Duke U.
Margaret Yu, Washington U.
Cory Tyszka, Wheaton College
Raivo-Evik Vihman, Bowdoin College

Spring Semester 1999

The spring 1999 semester saw additional changes in the program. USAP director Todd Shelly accepted a position with the USDA in late January. Ethel Villalobos took over as Interim Director, and coastal ecologist Philippe Hensel joined the faculty team. The 24 students spent 14 weeks involved in a diverse range of biological and cultural activities and travelling extensively throughout Costa Rica. After the intensive Spanish instruction and home stay, the program headed to Guanacaste to take advantage of the dry season. At Palo Verde, Lynn Loveless (College of Wooster) provided a series of lectures on the genetics of tropical trees and on the management strategies of tropical species used for timber. She also led a field project comparing pollen movement in plants with the help of fluorescent dyes. The course then moved to Las Cruces, where the emphasis was on the role of fragmentation in tropical forests. Monika Springer (U. Costa Rica) joined the course and led a project on aquatic insect community diversity. At La Selva the students balanced their independent research projects with lectures and field visits. Ken Foster (Purdue U.) delivered lectures on environmental policy and cost-benefit analysis in management of natural resources. In addition, the students benefited from a series of visits to small farmers in the Puerto Viejo area. Talking to these farmers gave the students not only a chance to practice their Spanish but to see first-hand how land-use and agricultural decisions are made.

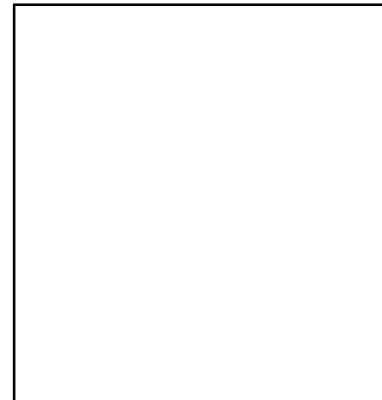


Photo: Ethel Villalobos

Students participate in activities to
introduce them to Latin American
culture, including homestays,
cultural field-trips and workshops on
local music, dancing and cuisine.
These students used their new-found
knowledge in fruit identification as
they taste jocotes at Palo Verde.

Spring Semester 1999 Participants

Kara Albright, Whitman College
 Beth Cronin, Amherst College
 Justin Harbison, Macalester College
 Geetha Jayabose, Cornell U.
 Jennifer Lewis, Bryn Mawr College
 Carey McGilliard, College of Wooster
 Matthew Anthes-Washburn, Cornell U.
 Brooke Edmond, Rhodes College

Jason Jones, U. Utah
 Marla Maltin, Tufts U.
 Monique Monteverde, Middlebury College
 Mary Brevdo, Williams College
 Joseph Famely, Bowdoin College
 Alyssa House, Smith College
 Davis Lessinger, Oberlin College
 Jessica Massanari, Colgate U.

Elizabeth Nichols, U. Texas
 Christine Paczkowski, Duke U.
 Megan Phifer, Duke U.
 Rehema Trimiew, Bryn Mawr College
 Eli Samat, U. California
 Dan Smyth, U. Oregon
 Craig Zesiger, U. Kentucky
 Erin Smith, Brown U.

Following an international search, Karin Gastreich was named the Director of Undergraduate Programs. Karin comes to OTS following teaching positions with the Institute for Central American Development Studies (ICADS) and the Fundación Neotrópica in Costa Rica. Her research interests include arthropod-plant interactions, multi-trophic ecology and the impact of environmental education in shaping attitudes in the tropics.

Tropical Ecology - Summer 1999

The inaugural version of the *Tropical Ecology* summer course for undergraduates included 22 participants from 16 institutions. The course traveled from Las Cruces to Cerro de la Muerte to Palo Verde and La Selva, learning tropical biology through field problems and lectures from Ethel Villalobos, Don Brightsmith and TA and USAP alumna Sarah Huber. The students also visited Rincón de la Vieja, Volcán Arenal, a banana plantation and a FUNDECOR tropical forestry research project.

Through scholarship funds from the National Science Foundation, OTS was able to offer eight full scholarships and two partial scholarships to economically disadvantaged students or students from groups underrepresented in the sciences. OTS' ability to offer funding had a great impact on the course that went well beyond the academic learning experienced by the scholarship students. In the words of one participant, *"I really enjoyed learning from and with the other students. I was especially grateful to have the opportunity to meet and study with other minority students interested in ecology. I believe we each enhanced the course for all involved. I hope that the funding to support minority students will continue to be available for future courses."*



Photo: Sara Huber

Participants in the Summer Program experienced contrasting ecosystems including rainforest, dry forest, cloud forest and this, the Páramo at Cerro de la Muerte.



Photo: Sara Huber

Students were introduced to tropical field ecology through lectures, discussion groups and by conducting field work.

Summer 1999 Participants:

Stacey Baltensperger, Doane College
 Christy Bellamy, Hampton U.
 Christopher Bourassa, U. Maryland
 Corey Brandon, Hampton U.
 Elaine Budreck, U. Pennsylvania
 Ryan Caltagirone, Duke U.
 Jonathan Cox, U. Arizona
 Marc Diamond, Duke U.
 Raymond Hubbard, U. Pittsburgh
 Lea Jaeger, Davidson College
 Clinton James, U. Kansas
 Lianette Laria, U. Miami
 Jessica Lucas, U. Southern Illinois
 Myesha Mooney, Hampton U.
 Karla Nieves, Dickinson College
 Barbara O'Brien, Tulane U.
 Jordann Russell, Arizona State U.
 Clark Smith, Duke U.
 Adrián Tejedor, U. Miami
 Carolyn Tracy, Truman State College
 Abram Watson, U. California-Berkeley
 Catherine Williams, Bowdoin College

Research

OTS Fellowships and Awards

In fiscal year 1999, OTS awarded 62 fellowships totaling \$52,141 to U.S. and Latin American graduate students who were either enrolled in degree programs at OTS member institutions or who were OTS course alumni. In addition, OTS made seven awards totaling \$11,446 through the Stanley Smith Horticultural Fellowship for curation of living collections, interpretive signage and documentation of the Wilson Botanical Garden.

ANDREW W. MELLON GRADUATE FELLOWSHIP AWARDS

Elizabeth Archie (Duke U.) & Adam Smith (U. Washington), Male manakin response to conspecific and heterospecific acoustic displays

Selene Baez (Pont. U. Católica, Ecuador), Pteridophyta, Rubiaceae, and Gesneriaceae as biodiversity indicators

John Bellow (U. Florida), Understory light availability in monospecific tree stands

Nelly Llerena (U. San Marcos, Perú), The associations among epiphyte species are predictable based on local conditions

Anne Danielson-François (U. Arizona) & Justin Schuetz (Cornell U.), Stabilimentum construction in *Micrathena* at La Selva

Cecilia Díaz (Instituto de Ecología, México), Richness and distribution of extrafloral nectars and homopteras in the vegetation of La Mancha, Veracruz, México

Nico Mario Franz (U. Costa Rica), The floral biology of some species of Cyclanthaceae and the natural history of its associated Curculionidae

Aaron Gassmann (SUNY-Stony Brook), Ant defense and extrafloral nectaries

David Heam (U. Arizona), Plant identification tool for rapid plant characterization in ecological studies

Kristina Hufford (U. Georgia), Viability selection at three early life stages of the tropical tree, *Platypodium elegans*

Lisa Infante (U. California-Berkeley), Anthocyanin demystified: the antifungal defenses of young leaves

Meera Iyer (Michigan State U.), Characterization of the nutrient flush associated with the rainy season in a dry tropical forest

Kathleen Kay (U. Washington), Pollinator effectiveness in *Calathea crotalifera*: Is there potential for specialization in a "generalist" plant?

Kathleen Kay (U. Washington), The systematics and evolutionary genetics of floral adaptation in a diverse lineage

Edward LeBrun (U. Utah), Distribution of *Solenopsis geminata* and its phorid parasitoid *Pseudocacteon* sp. at Corcovado National Park

Timon McPhearson (U. Rutgers) & Jeffrey Townsend (Harvard U.), Testing a model of harvesting behavior of *Atta cephalotes*

Yaxelis Mendoza (SIRI, Panamá), Diversity of macrofungi at Las Cruces Biological Station

Michael Moody (Washington State U.), Floral phenology and pollination biology of *Clusia flava* (Clusiaceae)

Kailen Mooney (U. Colorado), Spatial variation in *Triga* sp. (Mimosaceae) extra-floral nectary reward

Randall Moorman (Duke U.), Protected areas and local community relations: A case study at La Selva

Víctor Reátegui (Parque Turístico Quistococha CIAR Loreto, Perú), *Cecropia*: herbivory and production of Mullerian bodies

Satya Rhodes-Conway (U. California-Irvine), Establishment of tropical tree seedlings in abandoned pasture

Elsie Rivera (U. de Puerto Rico), Patterns of genetic diversity in *Pterocarpus officinalis* (Fabaceae)

Alejandro Rojo (U. Pittsburgh), Spatial distributions of litterfall at La Selva Biological Station, Costa Rica

Brian Spitzer (U. California-Davis), Pilot study of genetic structure in two Acridid grasshoppers

Suzette Stephens (U. Massachusetts), Distribution of *Heliconia* species at La Selva according to soil type

James Watkins (Iowa State U.) & Catherine Cardelus (U. Connecticut), Epiphytic fern diversity and stratification on the trunk of *Hyeronima alchorneoides*

ANDREW W. MELLON ECOSYSTEM GRADUATE FELLOWSHIP AWARDS

Catherine Cardelus (U. Connecticut), The relationship between vascular epiphytes and canopy microclimate

Saara DeWalt (Louisiana State U.), Comparative ecology of a tropical shrub in its areas of origin (Costa Rica) and introduction (Hawaii)

Jennifer Sarah Powers (Duke U.), Soil organic carbon following deforestation in a spatially variable tropical landscape

CONSERVATION BIOLOGY FELLOWSHIP AWARDS

Beth Anderson (U. Georgia), An investigation of existing and proposed hydropower projects in Sarapiquí, Costa Rica

Cesar Aponte (U. Simón Bolívar, Venezuela), The effect of *Alouatta seniculus* on the regeneration of fragmented forests in Lake Guri, Venezuela

Kevin Eddings (Yale U.), Conservation research and education at the Isla Juan Venado Mangrove Reserve, Department of León, Nicaragua: A Collaborative Initiative

Randall Moorman (Duke U.), Protected areas and local community relations: A case study at La Selva

Claudia Núñez (Colombia), Vegetative carbon, nutrients and regeneration in soils of anthropic regeneration, Colombian Amazon

John Prather (U. Arkansas), Examination of the reasons for a dietary switch by migratory birds during pre-migration and migration periods

Wendy Tori (U. de La Molina, Perú), Distribution effect and abundance of seeds in the abundance of granivorous birds in the Lachay National Reserve.

GLAXO PHARMACEUTICAL LATIN AMERICAN GRADUATE FELLOWSHIP AWARDS

Carlos Alberto Gutiérrez (U. Antioquia, Colombia), Edaphic variation and richness of palms in a humid tropical forest

Vernon Eduardo Arias (U. Costa Rica), Structure in a community of bats inside an abandoned tunnel in the dry forest in Costa Rica

Pedro Blendinger (Argentina), Ecomorphology of cockroaches (Birds: Troglodytidae: *Thyothorus* and *Heniccozhina*) of a tropical forest

Sandra Correa (U. de Valle, Colombia), Ichthiofauna of Lake Taraira, Lower Apaporis River, Colombian Amazonian

Hermógenes Fernández (U. Puerto Rico), Fungi of *Mycocyclus*

Heydi Herrera (Nicaragua), Evaluation of the stems of individuals of *Carcharinus levas* hunted in three sectors of Lake Nicaragua

Ivan Jiménez (U. Missouri-St. Louis), Nutritional composition of the food of two species of curassow (*Mitu salvini* and *Crax alector*) in the CIEM, Tinigua National Park, Colombia

Sacha Lozano (U. del Valle, Colombia), Lunar and tidal settlement cycles in *Lutjanus guttatus*

Hugo Mantilla (U. Nacional, Colombia), Comparative study of the chiropteran community in two forest strata

Carlos Pifa (CONICET, Argentina), Sexual reversion in eggs of *Caiman latirostris* incubated at male producing temperatures

Johnny Villarreal, (U. Nacional, Costa Rica), Population size and sites of reproduction and foraging of Jabirú (*Jabiru mycteria*) in the Tempisque River basin, Costa Rica

STANLEY SMITH HORTICULTURAL FELLOWSHIP AWARDS

David Bart (Rutgers U.), Restoration of wetlands for horticultural purposes: A feasibility study

Tania Bermúdez (U. Costa Rica), Interpretive trail to Río Java

Luis Espinoza (U. Costa Rica), Botanical collection signage

Katherine Maidman (Fairchild Tropical Garden), Curation of palm collection

Yaxelis G. Mendoza (U. Panamá), Mycoses in horticultural conditions

Tanya Rehse (U. Oregon), Plant collections database

Catherine Simpson-Bainbridge (independent), Artist-in-Residence

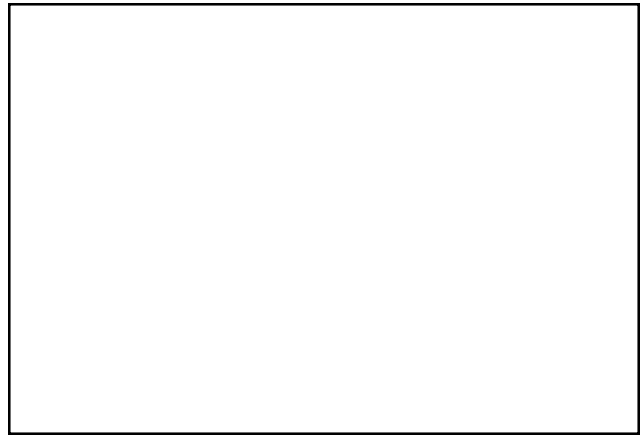


Photo: Pete Carmichael

PEACE FROGS AWARDS FOR AMPHIBIAN RESEARCH

Rudolf von May (Centro de Investigaciones Tambopata, Perú), Fallen bracts of *Iriartea deltoidea* as aquatic habitats for insects and tadpoles

DONALD AND BEVERLY STONE ENDOWMENT

Daniel Ardia (Cornell U.) & Anja Brunet (U. Minnesota), Individual variation in pelage coloration in *Peromyscus nudipes* at the Monteverde Cloud Forest Reserve

Eileen Hebets (U. Arizona), The sensory ecology of *Phrynos parvulus* (Arachnida: Amblypygi)

Adam Smith (U. Washington), Testing hypotheses for the benefits of group living in the Neotropical eusocial wasp *Polistes instabilis* (Hymenoptera: Vespidae)

Rexford Daubermire Fellowships

Heather Ewell (U. Colorado), Frugivory and the tanagers of the La Selva Biological Station, Costa Rica

Dena Smith (U. Arizona) & Cesar Nufio (U. Arizona), Herbivory in two lowland tropical rainforests: La Selva and Corcovado

Dole Foods Fellowship

Jeremy Zujko-Miller (Smithsonian Institution), Biogeography of erigonine spiders in the Americas (Araneae, Linyphiidae)

OTS post-course fellowships, such as the one awarded to Adam Smith to study wasps at Palo Verde, provide the means for students to continue working in the tropics after their course experiences.

Emily P. Foster Fellowships

Alicia de la Cruz (La Molina, Perú), Epiphytes and their relationship to termites' nests

Lucía de la Torre (Ecuador), Inventory of stingless bees (Apidae: Meliponinae) in four vegetation types

María del Carmen Chávez (U. Nacional San Antonio Abad del Cusco, Perú), Herbivory in recently germinated plantlets of *Dipterix panamensis* by density effects and distance from the parental tree

Caty Frenkel (U. Costa Rica), Characteristics, function and variability of the vocalizations of *Hemidactylus frenatus* (Sauria: Gekkonidae)

Lisa Infante (U. California-Berkeley), Effect of soil pathogens on the structural dynamics of seedling communities in tropical wet forest

Catherine Numa (U. Nacional, Colombia) & Elisabeth Wehnke (Museo de Ciencias Naturales, Argentina), Evaluation of possible differences between *Alouatta palliata* and *Cebus capucinus* as seed dispersors in a tropical dry forest

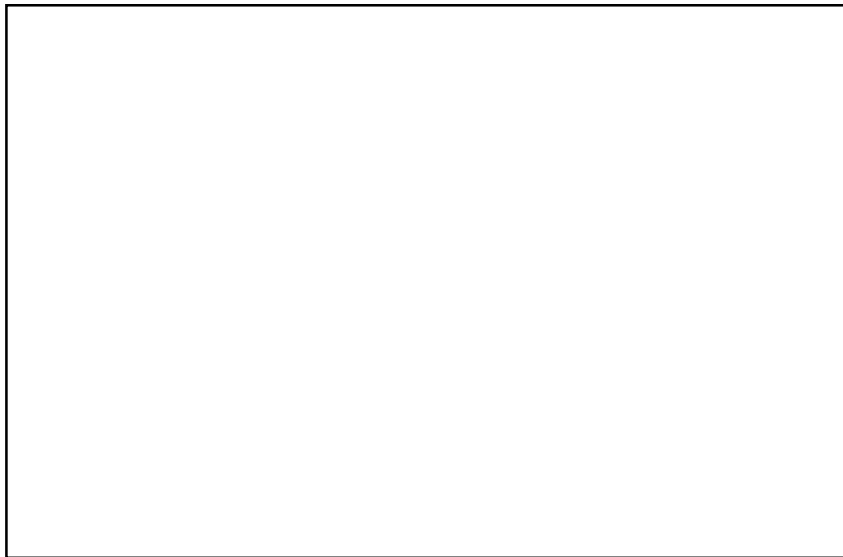
Ana Portugal (Bolivia), Seed dispersion by *Canis culpaeus*

Research at OTS Biological Stations

Project Title / Principal Investigator(s) / Researcher(s) and Assistant(s)

LAS CRUCES BIOLOGICAL STATION

Avian diversity in the agroscape / Catherine Lindell (Michigan State U.)	Fossil flora of El Brujo, Buenos Aires, Costa Rica / Luis Diego Gómez (OTS)	Mycota of Costa Rica / Luis Diego Gómez (OTS)
Biodiversity assessment: Distribution of biodiversity in forest patches and the agricultural landscape / Gretchen Daily (Stanford U.)	Guide book to common plants of Costa Rica / Margaret Gargiullo (Rutgers U.)	Nesting feeding rates and prey items in the blue-crowned motmot / Thomas Rodd Kelsey (Princeton U.)
Birds in coffee plantations / Catherine Lindell (Michigan State U.)	Genetic and hormonal correlates of cooperative lekking behavior in lance-tailed manakins (<i>Chiroxiphia lanceolata</i>) / Emily Duval (U. California-Berkeley)	Nutrients in fruits eaten by birds and mammals / Edmund Stiles (Rutgers U.)
Blood parasitism and male mating success in Cherrie's scarlet-rumped tanager (<i>Ramphocelus costaricensis</i>) / Terry Krueger (U. Miami)	Herpetological distribution and abundances on IC Ridge Trail and nearby forest fragments: The long-term effects of habitat fragmentation on populations of Costa Rican amphibians and reptiles / Martin Schlaepfer (Cornell U.)	Paleoecology of the Las Cruces area: Sediment records of environmental history / Sally Horn (U. Tennessee)
Collection of Curculionidea / Christopher Lyal (The Natural History Museum, UK)	Hummingbird use of premontane forest fragments in southern Costa Rica / Allison Snow (Ohio State U.)	Paleoecology of the Las Cruces area: Soil charcoal record of environmental history / Robert Sanford (U. Denver)
Conservation of biodiversity in tropical moist forest fragments / Paul Ehrlich (Stanford U.)	Implementation of an "Adopt-a-Stream" project in Coto Brus, Costa Rica / Douglas Parsons (U. Georgia)	Phosphorus release and conservation in the litter of a modified Costa Rica slash-mulch bean production system (frijol tapado) / Isidor Ruderfer (U. Georgia)
Countryside biogeography of neotropical mammals / Gerardo Ceballos (U. New Mexico), Jesus Pacheco (U. New Mexico), Gerardo Suzan (U. New Mexico)	Improving cover systems: Frijol tapado / Arnoldo Gadea-Rivas (UCR-CIID)	Pollination of <i>Chamaedorea costaricana</i> / Tania Bermudez (U. Costa Rica)
Countryside biogeography of moths: Survival in the matrix of a fragmented landscape / Taylor Ricketts (Stanford U.)	Interaction of plant defenses of <i>Loasa triphylla</i> and <i>Solanum acerifolium</i> with their herbivores / Marie Ann de la Fuente (U. Colorado)	Metadata project / Pablo Arroyo (OTS)
Countryside biogeography: The future of biodiversity in human dominated landscapes / Gretchen Daily (Stanford U.)	Leaf litter Curculionidae of Costa Rica / Robert Anderson (Canadian Museum of Nature)	Reproductive and evolutionary biology of Lepidoptera / Edward Morrow (U. Liverpool, UK)
Cultivation of free-living tropical protozoa / Thomas Cavalier-Smith (U. British Columbia, Canada)	Lichen and microflora growth on leaves of plants in the piper family / Andrea Gager (Princeton U.)	Reproductive biology of butterflies / Gage Matthew (U. Liverpool, UK)
Cyanoglucosides in <i>Passiflora</i> spp. / Gordon Ward (U. Georgia)	Mass mortality of the anuran fauna at upland sites in Costa Rica and western Panamá / Karen Lips (Southern Illinois U.)	Research toward sustainable land use and biodiversity in a mosaic of agriculture and tropical forest / Bruce Haines (U. Georgia), Christopher Peterson (U. Georgia)
Elateridae (Coleoptera) of Costa Rica / Paul J. Johnson (South Dakota State U.)	Molecular study of the origins of the unisexual lizard <i>Lepidophyma reticulatum</i> (Xantusiidae) / Robert Bezy (Los Angeles County Museum of Natural History)	Resupinate basidiomycetes of Costa Rica / Luis Diego Gómez (OTS)
Establishment of tropical tree seedlings in abandoned eroded pasture: Relative importance of above and below ground competition / Satya Rhodes-Conway (U. California-Irvine)	Mycorrhizae in epiphytic and other Costa Rican ferns / Luis Diego Gómez (OTS)	S-allele diversity in the Solanaceae / Ann Elizabeth Petscher (U. California - San Diego)
Evolution and maintenance of color pattern polymorphisms in litter frogs (<i>Eleutherodactylus</i>): Ecological genetic and phylogenetic approaches / Andrew Crawford (U. Chicago)	Mycorrhizae in roots of palms / Jack Fisher (Fairchild Tropical Garden)	Stratiomyidae (Diptera) of Costa Rica / Vladimir Berezovsky (Natural History Museum of Los Angeles)
Flora costaricensis: Droseraceae, Orobanchaceae / Luis Diego Gómez (OTS)	Mycota of Costa Rica / Gregory Mueller (Field Museum)	Stream macroalgae: Systematics and biogeography / Robert Sheath (U. Guelph, Canada)
		Study of lice and their use in taxonomy of birds / Robert Fisher (Juniata College)
		Systematics and evolutionary genetics of pollination systems in <i>Justicia</i> (Acanthaceae) / Kathleen Kay (U. Washington)



Satya Rhodes-Conway and Isidor Ruderfer use the facilities at Las Cruces to analyze soil samples. In addition to providing facilities and equipment for researchers to pursue projects, OIS also provides logistical support, such as help with research and export permits.

Photo: Pete Carmichael

Systematics of parasitic phorid flies (Insecta: Diptera: Phoridae) / Brian Brown (Natural History Museum of Los Angeles)

Sustainability of biological corridors in Coto Brus / John Schelhas (Cornell U.)

Tachinid flies of Fila Cruces / Manuel Zumbado (INBio)

Taxonomy and systematics of Talamancan species of *Collobia* (Agaricales) / Juan Luis Mata (U. Tennessee)

LA SELVA BIOLOGICAL STATION

A guide book to common plants of Costa Rica / Margaret Gargiullo (NYC Parks Department)

A new tool for rapid plant characterization in ecological studies / David Heam (U. Arizona)

A test of metapopulation incidence function parameters: Comparison of predictions from census data and from experimental data / Derek Johnson (U. Miami)

A xerox herbarium for Monteverde / Willow Zuchowski (Monteverde)

Adopt a stream / Douglas Parsons (U. Georgia)

Allele diversity in neotropical species of Solanaceae / Elizabeth Fetscher (U. California-San Diego)

Alternative reproductive strategies and cooperative breeding in birds / Elena Berg (U. California-Davis)

The role of mycorrhizal fungi in determining success of forest tree species establishment in former pastures of southern Costa Rica / Laura Aldrich-Wolfe (Cornell U.)

Tricholomataceae of Costa Rica / Gerhard Kost (U. Marburg, Germany)

Tropical moist forest recovery from human-induced disturbance - Las Alturas primary site / Karen D. Holl (U. California-Santa Cruz)

Altitudinal migration of butterflies in Costa Rica / William Haber (Monteverde)

An examination of the attraction and initiation phases of courtship behavior of the amblypygid of La Selva (Arachnida; Amblypygi) / Eileen Hebets (U. Arizona)

An investigation of existing and proposed hydropower projects in Sarapiquí, Costa Rica / Elizabeth Anderson (U. Georgia)

Animal biodiversity conservation in managed forests: possible role of faunal loss in the recruitment of tree species in Sarapiquí / Vicente Herra (CATE), Jesús Rosales (CATE)

Ant taxonomy / Elí Samat (U. California-Berkeley)

Antiparasitoid mechanisms in tropical Lepidopteran larvae / Lee Dyer (Mesa State College), Grant Gentry (Mesa State College) / Nicholas Bishop (Mesa State College), Dory Owen (Freelance)

Use of an agricultural countryside by tropical forest birds / Jennifer Hughes (Stanford U.)

Vegetation and hydrology of Gamboa Wetland / David Bart (Rutgers U.)

Water beetles of Costa Rica / Rob Roughley (U. Manitoba, Canada)

Wilson Botanical Garden database maintenance and reorganization / Stefan Schaefer (U. Washington)

Architecture and growth form of trees / David King (Australian National U.)

Arthropod diversity in a lowland tropical rain forest / Robert Colwell (U. Connecticut), Jack Longino (Evergreen State College), Henry Hesperheide (UCLA), Valerie Behan-Pelletier (Agriculture Canada), Lawrence Kirkendall (U. Bergen, Norway), Evert Linquist (Agriculture Canada), Jerry Powell (U. California-Berkeley), David Wagner (U. Connecticut) / Danilo Brenes (OIS / INBio), Ronald Vargas (OIS / INBio)

Arthropods in banana and other tropical monocultures under different pesticide regimes / Robert Matlock (OIS) / Michael Dietze (Duke U.), Gwen-Alyn Hoheisel (OIS)

Bee pollination of trees in a tropical wet forest / Rainer Thiele (U. Tübingen) / Ju-Lin Weng (U. Costa Rica), Jasper Oestlund (Volunteer)

Behavior and ecology of stingless bees / Tilberg Chadwick (U. Colorado)

Brood parasitism by cowbirds (Icteridae) on Montezuma Oropendola / Emma Cunningham (Cambridge U.)

Changes in soil organic matter with land use change in Sarapiquí / Jennifer Powers (Duke U.) / Melissa Kalicin (Hartwick College).

Chemical ecology on plant-insect interactions / John Schultz (Penn State U.)

Coexistence of insects in the fruits of *Apeiba membranacea* / Brian Inouye (Duke U.)

Common plants of Costa Rica / Larry Kimball (U. Colorado)

Community ecology of exotic species / Terrence McGlynn (U. Colorado)

Comparative anatomy of *Pelliciera* / William Dickinson (U. North Carolina)

Continued studies on *Heliconia* and pasture spittlebugs (Homoptera: Cercopidae) at La Selva / Vinton Thompson (Roosevelt U.)

Contribution of fine roots to budget of wet forest / Julie Whitbeck (Tulane U.)

Contribution to the validation of the use of dung beetles (Coleoptera: Scarabaeinae) and butterflies (Lepidoptera: Nymphalidae) as indicators in rapid evaluations of biodiversity / Naïka Aguilar (CATE)

Current and future carbon budgets for tropical rain forests: a cross-scale analysis / Steven Oberbauer (Florida International U.), David Clark (U. Missouri-St. Louis), Deborah Clark (U. Missouri-St. Louis), Patrick Crill (U. New Hampshire), Bob Evans (U.S. Forest Service), Edward Rastetter (Marine Biology Lab), Edzo Velokamp (U. Göttingen, Germany) / Hank Loescher (U. Florida), Joseph O'Brien (Florida International U.), Jens Mackensen (U. Göttingen, Germany), Julie Bentz (U. Missouri-Columbia), Andrew Mosedale (U. New Hampshire), Tara Gregory-Madsen (Western Washington), Nate Grulz (U. Florida)

Demography & ecophysiology of regeneration of tropical rain forest trees / David Clark (U. Missouri-St. Louis), Deborah Clark (U. Missouri-St. Louis)

Demography and ecology of the shrub *Clidemia hirta* (Melastomataceae) in its areas of origin (Costa Rica) and introduction (Hawaii) / Sara DeWalt (Louisiana State U.)

Diatoms in streams at La Selva / Leathaina Filhnan (U. Costa Rica)

Diet breadth and genetic structure in populations of flightless tropical grasshoppers / Brian Spitzer (U. California-Davis)

Digestion in the fruit eating fish *Machaca* (*Brycon guatemalensis*) / Michael Horn (California State U.), Anna Gawlicka (National Research Council, Canada), Sandra Banack (California State U.) / Kristen Chavez (California State U.), Wasila Dahdul (California State U.)

Discharge characterization of nutrients at the beginning of the rainy season in a dry tropical forest / Meera Iyer (Michigan State U.)

Dispersion and seedling survival / Corine Vriesendorp (Michigan State U.) / Mike Hanewald (Michigan State U.), Reuwei Mount (Michigan State U.)

Distribution and phylogeny of *Rivulus* and *Brachirhaphis* / Daniel Fromm (AT&T ANSP)

Distribution of *Heliconia* species at La Selva according to soil type / Suzette Stephens (U. Massachusetts)

Diversity of forest litter Coleoptera / Chris Carlton (Louisiana State U.), Vicky Moseley (Louisiana State U.), Alexey Tishchkin (Louisiana State U.)

Dynamics of regeneration in wet tropical forests: establishing a baseline for long-term monitoring / Robin Chazdon (U. Connecticut) / Marvin Castillo (ITCR, Costa Rica), Brianna Haab (Bradley U.), Stephanie Pimm, Tatiana Robles (U. Costa Rica), Braulio Vilchez (ITCR, Costa Rica)

Dynamics of tree seedling recruitment in second-growth tropical rain forests: an experimental approach / Juan M. Dupuy (U. Connecticut)

Ecological basis of sustainability in reconstructed tropical ecosystems / Jack Elwell (US Forest Service Institute for Pacific Island Forestry) / Seth Bigelow (Institute for Ecosystems Studies), Miguel Cifuentes (OIS), Anika Hiremath (U. Florida)

Ecological land use history at La Selva / Sally Horn (U. Tennessee)

Ecology of bromeliads / Dimitri Jacobs

Ecology of epiphytes in the HUEBRIOS sites / Nalini Nadkarni (Evergreen State College) / Mark Merwin (Evergreen State College), Steve Rentmeester (Evergreen State College)

For long-term research, such as the Arthropods of La Selva project shown here with technicians Ronald Vargas and Danilo Brenes, OIS is often the financial and administrative manager.

- Ecology of exclusive male parental care and polygyny in Tinamous / Patricia Brennan (Cornell U.)
- Ecology of nectar-feeding bats / Otto von Helversen (Erlangen U., Germany) / *Christiane Heindenfelder (Erlangen U., Germany)*, *Marco Tschapka (Erlangen U., Germany)*, *Dagmar von Helversen (Erlangen U., Germany)*, *York Winter (Erlangen U., Germany)*
- Ecomorphology of wrens (Troglodytidae : *Henicorhina* and *Thryothorus*) of a rainforest / Pedro Blendinger (CRICYT, Argentina)
- Edaphic variation and species richness of palms in a tropical wet forest / Carlos Gutiérrez (U. de Antioquia, Medellín, Colombia)
- Edge effects on stream-dwelling frogs of La Selva / Jennifer Sheridan (U. Miami)
- Effect of fungal pathogens on seedling distribution patterns / Lisa Infante (U. California-Berkeley)
- Effects of collecting procedures in the survival of several tropical plant species based on tissue growing / Valerie Pence (Cincinnati Botanical Garden) / *Susan Dunford (Cincinnati Botanical Garden)*, *Bernadette Plair (Cincinnati Botanical Garden)*
- Effects of herbivory on tropical tree diversity / Walter Carson (U. Pittsburgh) / *Gregory Bartus (U. Pittsburgh)*, *Troy Mielke (U. Pittsburgh)*, *Sean Tankin (U. Pittsburgh)*
- Effects of volcanic processes on tropical streams / Cathy Pringle (U. Georgia) / *Minor Hidalgo (OIS)*, *Alonso Ramirez (U. Georgia)*
- Environmental heterogeneity and woody plant diversity in tropical secondary forest / Tatiana Robles (U. Costa Rica)
- Evolution of fish egg size in Cichlidae / Ronald Coleman (U. of the Pacific) / *Robin Whittall (U. of the Pacific)*
- Evolution of polymorphic color patterns on leaf litter frogs / Andrew Crawford (U. Chicago)
- Examinations of the reasons for diet switching in migratory birds / John Prather (U. Arkansas)
- Experimental forestry with native & exotic tree species / Richard Fisher (Texas A&M U.) / *Rablo Arroyo (OIS)*
- Fallen *Triarteia deltoidea* bracts as aquatic habitats for tadpoles and insects / Rudolf von May (Centro Investigaciones Tambopata, Perú)
- Flora of La Selva / Reinaldo Aguilar (INBio)
- Floral evolution in *Justicia* spp. (Acanthaceae) / Kathleen Kay (U. Washington)
- Follicular lichens on plant leaves / Robert Lücking (U. Bayreuth, Germany)
- Follicular lichens on plastic leaves: investigating the mechanisms maintaining diversity in tropical rain forests / Robert Lücking (U. Bayreuth, Germany)
- Forest regeneration after cacao removal / Carol Horvitz (U. Miami) / *Harold Beck-King (U. Miami)*, *Rachel Beck-King (U. Miami)*, *Mario Blanco (U. Costa Rica)*, *Annamarie Jameson (U. Miami)*, *Derek Johnson (U. Miami)*, *Dionne Skervin (U. Miami)*, *Harsh Bardhan Vasistha (U. Miami)*
- Frugivory in La Selva Tanagers / Heather Ewell (U. Colorado)
- Genetic variation measure by satellites / Helga Rodríguez (Yale U.)
- Herbivory in *Dipteryx panamensis* seedlings and genetic variability / María del Carmen Chávez (San Antonio de Abad, Perú)
- Herbivory in two tropical rain forests / César Nufio (U. Arizona), Dena Smith (U. Arizona)
- Herpetofauna monitoring on cacao plots / Maureen Donnelly (Florida International U.) / *Andres Vega (U. Costa Rica)*
- Hybrid study on *Bactris coloradensis* and *Bactris* spp. / Robin Sears (Columbia U.) / *Steve Gracey (Columbia U.)*, *Jenya Kauffman (Columbia U.)*
- Improving nurseries for native species production / Theodore Shear (North Carolina State U.)
- Interaction between nocturnal butterflies and their predators / Lutz Thilo Wasserthal (Erlangen U., Germany), *Marco Tschapka (Erlangen U., Germany)*
- Investigation of the skin secretions of frogs from Costa Rica / Amanda Salmon (The Queens U. of Belfast, UK)
- Key to reptiles and amphibians of La Selva / Craig Guyer (Auburn U.)
- Leaf litter decomposition and incorporation of soil nutrients in second growth forests / Hannía Segura (ITCR, Costa Rica)
- Light transmission in monospecific plantations / John Bellow (U. Florida)
- Long-term monitoring of parasitoids / John Pickering (U. Georgia)
- Maintenance of bird populations in forest fragments / Robert Matlock (OIS) / *Gwen-Alyn Hoheisel*
- Male Manakin response to nonspecific and heterospecific acoustic displays / Elizabeth Archie (Duke U.), *Adam Smith (Washington State U.)*
- Mixed plantations of native trees for the rehabilitation of disturbed habitats / Florencia Montagnini (CATIE, Costa Rica)
- Modeling the consequences of heterogeneous light environments for seedling performance in tropical wet forest / Rebecca Montgomery (U. Connecticut)
- Mortality factors in leaf miners: a comparison of ants as predators and parasitoids / Joachim Moeser (U. Costa Rica)
- Natural history of the paper wasp *Mischocyttarus collarellus* and behavior of males at the natal nest / Elizabeth Smith (U. Kansas)
- Natural resource management / Manrique Rojas (U. Costa Rica)
- Neotropical frog investigations / Andrew Gray (Manchester Museum, UK)
- Nesting success of birds in forests and fragments / Bruce Young (The Nature Conservancy) / *Jim Zook (Freelance)*
- Nitrogen dynamics of two rainforest soils in northwest Costa Rica / Maren Heincke (U. Höhenheim, Germany)
- Parental effects on offspring fitness in *Dendrobates pumilio* / Maura Maple (U. Kentucky)
- Pilot investigation of biotic structures in two grasshopper species / Brian Spitzer (U. California, Davis)
- Plankton of Costa Rica rivers / Astrid Michels (U. Costa Rica)
- Plant images from the tropics / Hugh Wilson (Texas A&M U.)

Pollinization of Cyclanthaceae / Nico Franz (U. Costa Rica)

Pollination and phenology of *Clusia flava* / Michael Moody (Washington State U.)

Population response of insect herbivores and pathogens to native tree plantations / Elizabeth Braker (Occidental College) / Andrea Azuma (Occidental College), Erika Schwillk (Occidental College), Heather Snookal (Occidental College), Elliot Wilkinson (Occidental College)

Prehispanic settlement at the La Selva Biological Station / Felipe Sol (U. Costa Rica)

Protected areas and local community relations: A case study at La Selva and Braulio Carrillo, Costa Rica / Randall Mooman (Duke U.)

Recuperation of *Cireos* / Natasha Ribeiro (CATE, Costa Rica)

Reproductive success in the bat *Saccopteryx bilineata* / Otto von Helversen (Erlangen U., Germany), Gerald Heckel (Erlangen U., Germany), Christian Voigt (Boston U.) / Oliver Behr (Erlangen U., Germany), Eva Daubert (Erlangen U., Germany)

Reproductive yield estimation of *Dendrobates pumilio* in captivity / Rodolfo Canacho (U. Nacional, Costa Rica)

Silviculture of plantations / Carlos Reiche López (CATE, Costa Rica)

Soil organic matter fractions and dynamics in experimental tropical ecosystems / Ann Russell (Iowa State U.)

Soil respiration in two topographic positions at La Selva / Flavio Moreno (Florida International U.)

Case study of the Río Sarapiquí hydroelectric dams / Alejandra Aguilar (U. para la Paz, Costa Rica), Christian Sibaja (U. para la Paz, Costa Rica)

Study of *Micrathena stabilimenta* / Anne Danielson (Arizona U.)

Taxonomy of the Cerambycidae family (Coleoptera) / Frank Hovore (UCIA)

The behavior and ecology of carrion decomposing insects / Chad Tillberg (U. Colorado)

The interaction of plant defenses in *Loasa* and *Plantago* with insect herbivores and environment / Marie Ann de la Fuente (U. Colorado)

The international cooperation / Joann Aviel (U. Costa Rica)

The role of *Cecropia*-inhabiting ants on insect herbivore community structure and herbivore diversity on the *Cecropiaceae* / Louis LaPierre (UCLA)

Thermoregulation in various reptiles and amphibians with emphasis in lizards and frogs / Richard Reams (Dallas Zoo), Ann Stevens (Dallas Zoo)

Tree seedling dynamics in primary lowland rain forest / Johnny Serrano (U. North Dakota)

Tri-trophic plant-herbivore-parasitoid interactions in three tropical forests / John Barone (Mississippi State U.), Rhyllis D. Coley (U. Utah), Winnie Hallwachs (U. Pennsylvania), Daniel Janzen (U. Pennsylvania)

Winter habitat and behavioral ecology study of willow flycatchers (*Empidonax traillii*) in Costa Rica / Thomas Koronkiewicz (Northern Arizona U.), Susane Langridge (Northern Arizona U.)

PALO VERDE BIOLOGICAL STATION

Cartographic databases for Palo Verde National Park / Vladimir Jiménez (Instituto Tecnológico, Costa Rica), Edgar Ortíz (Instituto Tecnológico, Costa Rica)

Biology of the large flesh fly (*Peckia gulo*: Fabricius) in Palo Verde / Magnus Anderson (U. Stockholm, Sweden)

Characterization of the nutrient flush associated with the rainy season in a dry tropical forest / Meera Iyer (Michigan State U.)

Study of the chrono-sequence of the tropical dry forest at Palo Verde Biological Station / Zaida Hernández (Instituto Tecnológico, Costa Rica), Ruperto Quesada (Instituto Tecnológico, Costa Rica), Eugenio González (OIS)

Study of the regeneration dynamics of tropical dry forest in Palo Verde Biological Station / Adrián Monge (Instituto Tecnológico, Costa Rica), Ruperto Quesada (Instituto Tecnológico, Costa Rica), Eugenio González (OIS)

The harvest prohibition of 18 Costa Rican timber species: Considerations for their use and conservation. *Guaiacum sanctum* L. (Guayacán Real) A particular case study / Quirico Jiménez (INBio/Instituto Tecnológico, Costa Rica)

Population size and reproduction and foraging sites of the jabirú (*Jabiru mycteria*) in the Tempisque River basin / Johnny Villarreal (U. Nacional, Costa Rica), Carmen Hidalgo (U. Nacional, Costa Rica)

Taxonomy and ecology of the fungi *Lentinus* and *Hymenochaete* and the group of steroid fungi *Podoscyphaeae* / Leif Ryvarden (U. Oslo, Norway), Haugerud Kristine (U. Oslo, Norway), Rolen Tage (U. Oslo, Norway), Elf Ronny (U. Oslo, Norway)

Water chemistry and flow rates to determine hydraulic loading rates from rice fields discharging into Poza Verde and Quebrada La Mula / Michael Stevens (U. Florida)

Dynamics and spatial distribution of primary tropical dry forest / Jorge Jiménez (OIS), Eugenio González (OIS)

Population state and demographics of *Guaiacum sanctum*, *Astronium graveolens* and *Sideroxylum capiri* in the Palo Verde National Park / Angel Guevara (ACT/MINAE), Eugenio González (OIS)

Determining factors for the establishment and distribution of *Laguncularia racemosa* in high sedimentation environments in the Pacific Coast / Philippe Hensel (Louisiana State U.), Patricia Delgado (Louisiana State U.)

Gene flow into tropical forest fragments / James Hamrick (U. Georgia), Victoria Apsit (U. Georgia), Dorset Trapnell (U. Georgia)

Genetic variation of the wild rice population found at Palo Verde / Alejandro Zamora (U. Costa Rica), Ana E. Espinoza (U. Costa Rica)

Seed ecology of *Parkinsonia aculeata* at Palo Verde National Park / Rolland Cochard (James Cook U., Australia)

Wetland hydrology / Ted Shear (North Carolina State U.)

Environmental Policy

In fiscal year 1999, the Environmental Policy Program offered three short courses for policymakers (North American, Hispanic Latin American and Brazilian), two seminars targeting Central American business leaders and a forum in Washington D.C. on the future of tropical forests for North American policymakers. The goal of the Environmental Policy Program is to reach professionals who devise and implement policies that affect tropical resources but who often have minimal training in environmental sciences.

Principios Ecológicos para el Desarrollo Sostenible en América Latina (OTS 99-6)

The 1999 Latin American Decision Makers Course was the eleventh successful rendition of this training event. Participants came from nine countries in Central and South America and the Caribbean, representing the executive, legislative and judiciary branches of government, one university and one environmental NGO. The course itinerary circled the northern portion of Costa Rica, with major stops at Santa Rosa National Park, Monteverde Cloud Forest Reserve and La Selva Biological Station. The program focused on ecological and economic principles, including talks on land use, the Costa Rica Conservation Area System, biodiversity management, ecotourism impact on parks, payments for environmental services, natural disasters, sustainability of coastal and marine resources, economic development and natural resource conservation. An external review of the Latin American course began in 1999. This review focused on documenting the impact on participants and compiling specific recommendations for improving course content.

Coordinator: Raúl Solórzano, Centro Científico Tropical

Co-coordinator: José María Rodríguez, OTS

Participants:

Claudia Acuña, Temuco Municipal Government, Chile
Ruth Alpízar, Agrarian-Environmental Court, Liberia, Costa Rica
Félix Barrionuevo, Sienra del Rosario Ecological Station, Cuba
Julieta Benavides, Ministry of Public Works & Transportation, Costa Rica
Carlos Bolaños, Agrarian-Environmental Court, Pocosí-Sarapiquí, Costa Rica
Walter Canessa, University of Costa Rica
María del Rosario Castedo, Forest Service, Bolivia
J. Alfredo Cea, National Tourism Agency (CORSAITUR), El Salvador
Luis Diego Hernández, Environmental Public Prosecution, Costa Rica
Jorge Laínez, Public Prosecution for Environment and Health, El Salvador
Mercedes Martínez, National Institute of Land Studies (INETER), Nicaragua
Omaira Maya, National Planning Agency, Florencia-Caquetá, Colombia
Richard Méndez, Forest Service, Bolivia
Leonardo F. Pastorino, Senate, Province of Buenos Aires, Argentina
Gisela Pittevil Stolk, Foundation for Nature Defense (FUDENA), Venezuela
Gustavo Rivera Sibaja, Legislative Assembly, Costa Rica
Pedro Ruíz, National Center for Protected Areas, Cuba
Maximiliano Viquez Rojas, Agrarian-Environmental Court, Ciudad Neilly, Costa Rica

Carlos Manuel Rodríguez, Vice-Minister of the Environment and Energy, addresses the group on biochemical prospecting contracts.

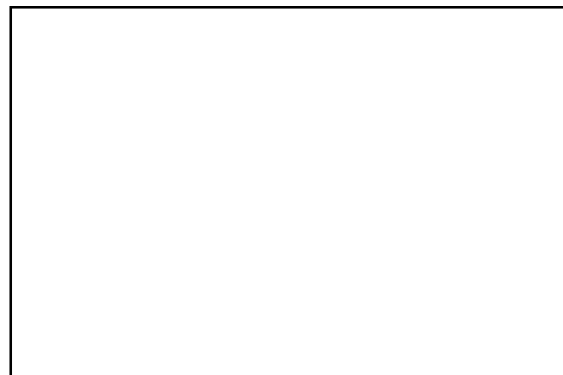


Photo: José María Rodríguez

Interdependence: Economic Development and Environmental Concerns (OTS 99-8)

The twelfth U.S. Decision Makers course added Santa Rosa and a visit with Dan Janzen (U. Pennsylvania) to the regular itinerary of La Selva, Palo Verde and the Arenal region. The one-week course had a total of 21 participants including congressional staff members, staffers from various federal agencies and Executive Branch departments, individuals from non-governmental organizations, a trade association representative and participants from corporations. This mix represented a balance at several levels: between government and non-government staff, between Hill staff and Administration staff, between political parties and policymakers in public service and those in the private sector. The course traveled throughout Costa Rica and focused on eight themes including parks, protected areas, and wildlife management, global warming and carbon sequestration, tropical forest ecology, use and management, ecosystem services, ecotourism, land-use contrasts and developing country concerns. An explanation of biodiversity and related conservation issues was the most fundamental theme of the course. The emphasis within this component was threefold: 1) to introduce the definition of biodiversity and what it means “on the ground”; 2) to review issues related to biodiversity conservation and loss; and 3) to instill first-hand experience with the tremendous diversity that exists in the tropics.

Coordinators: Dr. Katrina Brandon, U. Maryland
Dr. Walter Reid, World Resources Institute
José María Rodríguez, OTS

Participants:

Julie Anderson, Director Congressional Relations, White House
Climate Change Task Force
Nigel Asquith, Center for International Forestry
Jean Flema, Professional Staff, Minority, U.S. House Committee on
Natural Resources
Patrick Gonzalez, AAAS Fellow, U.S. AID
Irene James, International Affairs Specialist, U.S. Fish & Wildlife Service
Stephen Jones, Environmental Issues Coordinator, Southern Company
Mark Kasran, International Relations Specialist, U.S. EPA
Ann Klee, Chief Counsel, Majority, U.S. Senate
Siew-Kong Loong, Executive Director, Barama Company Ltd.

Christopher Mann, Legislative Management Officer, U.S. Department
of State
Catherine Morris, Senior Policy Analyst, Center for Clean Air Policy
Richard Obermann, Professional Staff Member, U.S. House
Debra Reed, Legislative Assistant, Sen. Robert Kerrey, U.S. Senate
Marda Robillard, Administrative Assistant/Chief of Staff, Rep. John
Dingell, U.S. House
Chris Rose, Legislative Affairs Assistant, U.S. Forest Service
Frances Sharples, Senior Policy Analyst, Office of Science & Technology
Policy
Jennifer Sheetz, Legal Assistant, International Fund for Animal Welfare
Charlie Stek, Projects Director, Sen. Paul Sarbanes, U.S. Senate
Jack Waide, Systems Ecologist/Natural Resource Program, USDA Forest
Service
Edward R. Yawn, Director Government Relations, Edison Electric Institute
Keith Yehle, Deputy Legislative Director, Sen. Pat Roberts, U.S. Senate

Policy Dialogue Series for U.S. Decision Makers

Recognizing the need to provide course alumni with additional training opportunities and to address new environmental issues, as well as to expand this training to reach other policymakers who have not taken the course, OTS initiated the Policy Dialogue Series for U.S. Decision Makers centered in Washington D.C. The first event was a reception in June 1998 at the National Zoo's Amazon Exhibit, featuring guest speaker Tom Lovejoy (Smithsonian Institution). During this event, participants discussed current environmental issues and concerns and networked with other alumni. The second event was a forum held in February 1999 on Capitol Hill, entitled "The Future of Tropical Forests: Issues and Answers." The event was attended by more than 65 participants, who represented a variety of government and non-government organizations instrumental in setting U.S. policies affecting tropical forests worldwide. Speakers at the forum included Kathryn Fuller, President of the World Wildlife Fund U.S., Katrina Brandon, editor of the recently published book, *Parks in Peril: People, Politics, and Protected Areas*, and David Hales, Director of the Global Center for Environment at the U.S. Agency for International Development.

Principios Ecológicos para a Tomada de Decisões na Amazônia (OTS 99-14)

The second course for Brazilian Decision-Makers was sponsored in part by INPA (Instituto Nacional de Pesquisas da Amazonia), the Smithsonian Institution and USAID. Participants came from 19 different institutions. There was an excellent group of instructors, who greatly contributed to discussions, by allowing the expression of diverse points of view. The four main themes were an introduction to ecological principles and concepts, environment planning and development models, biodiversity and environmental economy and urban planning and development. These topics were introduced through lectures, round tables, group activities, fieldwork and interviews.

Coordinator: Dr. Rita Mesquita, INPA
Co-coordinator: José Luis Camargo, INPA

Participants:

Celeste Maria Lima Matos, Secretaria de Estado da Fazenda - AM
José Adilson Vieira de Jesus, Comissão Pastoral da Terra - CPT
Alex Sandro Marques do Nascimento, Coop. de Desenv. Sustentável do Turismo e do Meio Ambiente - CODESTMA
Lúcia de Fátima R. Magalhães, Tribunal de Contas da União
Fernando Luiz da F. Ramos, Ministério do Meio Ambiente
Luiz Ribeiro Margarido, TV Amazonas
Héctor Daniel Garibotti, Associação Amazônia
Angélica Maria Vieira da Cruz, Secretaria Municipal de Educação SEMED
Raimunda Creuza T. Pereira, Sindr. Trabalhadores Madeireiros de Itacoatiara AM
Ermani José Pilla, USAID - DF
José Maria Pantoja Vaz, Instituto de Desenvolvimento Rural do Amapá
Monika Naumann, Secretaria de Estado de Meio Amb., C. & T. do Amapá
Euler Lima de Assis, Instituto de Pesos e Medidas IPEM - AM
José Carlos do N. Ladeira, Ruschmann Consultores de Turismo
Francisco Silva de Albuquerque, Inst. Brasileiro de Meio Ambiente e Recursos Naturais Renováveis - IBAMA
Virgínia da Conceição P. Brandão, Universidade do Amazonas
Jorge Cláudio Serra Gonçalves, Instituto Nacional de Colonização e Reforma Agrária INCRA
Kenneth Harry Pierce, Dept. Estadual de Meio Ambiente de Roraima
Trailton de Lima Souza
Senado Federal - Gabinete da Senadora Marina no Acre
Edênis Alexandre Barbosa de Moraes, Câmara Municipal de Iracema - AM

Toma de Decisiones Empresariales y Calidad del Ambiente en América Central

A grant awarded by the Tinker Foundation was originally meant to finance two seminars for Central American corporate leaders, one in the spring of 1998 and the other in the fall of 1999. However, OTS was successful in raising enough tuition among participants to impart a third seminar in June. The two fiscal year 1999 seminars spent two days at La Selva and two days in the San José area, visiting three firms where case studies were analyzed and discussed with instructors and firm managers. Other seminar activities included talks on environmental management systems, certification, trends in Central American environmental legislation and the introductory talks and forest walks on ecological principles for businesspersons.

Coordinators:

José María Rodríguez, OTS
Ana Lorena Quirós, ECOGLOBAL

November Seminar Participants:

Leonardo Acuña Wing-Ching, Flora Tropical del Este, Costa Rica
Harold Arango Moreno, ONG Asociación Río Cali, Colombia
Patricia Araya Westover, Corpa Costa Rica
Diana Maribel Banegas, Asociación Nacional de Industriales, Honduras
Rommel Barahona, Unidad Nacional de Apoyo Tecnológico a la Industria de Honduras
Hernán Camacho Soto, Universidad de Costa Rica
Patricia Eugenia Cárdenas Farero, Punta Vista Bahía, Costa Rica
Magda Judith Chávez Escandún, Ecoforest, Guatemala
Marvin Cruz Osorno, Cámara de Industrias de Nicaragua
Myrtille Danse, ECOGLOBAL, Costa Rica
Juan Mario Dary Fuentes, Fundación Mario Dary, Guatemala
Sonia Espinoza Valverde, Secretaría Técnica Nacional del Ambiente, Costa Rica
Wilson González Arce, EnaComercio e Industrias, Panamá
Mario Alberto Mossi Reyes, Fundación para la Inversión y Desarrollo de Exportaciones, Honduras
Terry V. Nelidov, Consultor Independiente, Costa Rica
Carlos Luis Rodríguez Rodríguez, Consultor Independiente, Costa Rica
Guillermo Saborio Mesén, Corporación Bananera Nacional, Costa Rica
Marizenia Solás Cigarruista, Ministerio de Comercio e Industrias, Panamá
Lil Soto Muñoz, Corporación Privada de Inversiones de Centro América, Costa Rica

June Seminar Participants:

Edwin Araya, Consultant in Environmental Forestry, Costa Rica
Sandra G. Arredondo, National Environmental Technical Secretariat, Costa Rica
Daniel E. Ayes, Corporación Cressida, Honduras
Eric Chaves, Central American Training Center for Industrial Development, Costa Rica
Ángela González, Universidad de Monterrey, Costa Rica
Walter González, Universidad de Costa Rica



Photo: Sandra Rodríguez

The seminar for Central American corporate leaders included participants from a variety of industries, associations, development NGOs, consultant firms, government and academia.

Sergio Laprade, National Banana Corporation, Costa Rica
José I. Madrigal, Dupanel S.A., Costa Rica
Minor May, Legislative Assembly, Costa Rica
Camilo Osorio, R.P.A. de Costa Rica
Miguel A. Paniagua, Universidad Politécnica de El Salvador
Luis A. Retana, Abonos Superior, Costa Rica
Guillermo Solórzano, Alimentos Kern de Guatemala, S.A.
Óscar Torres, Natural Resource Economics Research Program, Costa Rica

Environmental Education

The OTS Environmental Policy Program works to educate a broader audience, specifically communities surrounding the biological stations, to promote sustainable development activities. In fiscal year 1999, OTS conducted the following environmental education activities:

Traditional Nature Walks. More than 900 school children and local residents visited OTS biological stations to learn about biodiversity and the significance of science in protecting tropical forests.

Adopt-A-Stream. As part of the Adopt-A-Stream program the students of the Umberto Melloni High School in San Vito started sampling and assessing the quality of the water in the creek that crosses the school grounds and comparing these characteristics with the ones for the Río Java inside Las Cruces Biological Station.

Introduction to Environmental Conflict Resolution Management. A participatory workshop was held on August 29, 1998 with 11 participants from San Vito area organizations. Participants discussed conflict analysis and identified two main environmental conflicts for the San Vito region: poor management of waste and the deforestation in areas near the water intake for the San Vito aqueduct. In addition, strategies for conflict management, negotiation and resolution were also discussed.

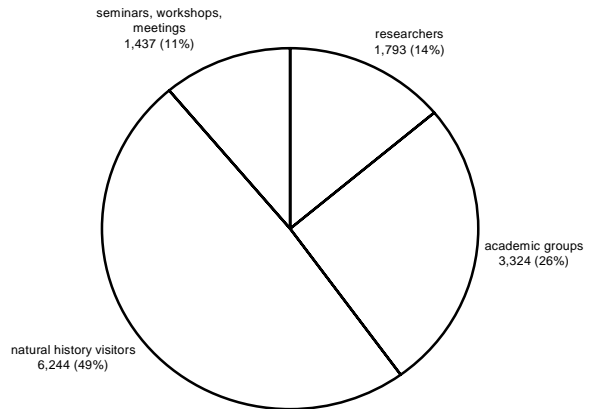
Science Education for Local Communities. La Selva recently implemented a new environmental education program in the local schools. Twenty-two classes of fourth graders were brought to La Selva this fiscal year for three separate activities in the field. In the first, the students were introduced to local trees and taught identification and the role these trees have as habitat indicators. *Dipteryx panamensis* was used as an example of canopy emergent trees and to illustrate seed predation. Its role as a keystone food resource for the endangered Great Green Macaw was also described. *Hymenolobium mesoamericanum* was employed to illustrate endangered species with low reproductive potential. The *Cecropia* tree was used as an example of an indicator of disturbed habitats, and palms were used as an example of a primary forest indicator. Another module involved reptiles and amphibians. Snakes and their valuable role in ecological communities and the general biology of reptiles and amphibians were taught to the students. In addition, a field activity was conducted for students to estimate the home range size of *Dendrobates pumilio* from distances measured between calling males on La Selva trails.

Las Cruces Biological Station

Las Cruces is located on Costa Rica's southern Pacific slope and is OTS' 266-hectare reserve of mid-elevation rain and cloud forest. Las Cruces is also home to the Robert and Catherine Wilson Botanical Garden, a 10-hectare managed area consisting of one of the most important living botanical collections in Central America.

Visitation

During fiscal year 1999, usage of Las Cruces totaled 5,700 visitors including 4,596 natural history visitors, 574 students, 366 people with seminars, workshops and meetings and 164 researchers. This is a 34% increase above the fiscal year 1998 total of 4,259 people. In contrast, the total visitation days of 12,798 person-days was 19% lower this year than in fiscal year 1998 and is outlined in the pie chart. Notwithstanding the decrease in total visitation days, it is important to note that compared to fiscal year 1998, student use (both OTS and nonmember institution courses) and research use increased significantly.



5,700 people visited Las Cruces in fiscal year 1999 and totaled 12,798 person-days, as outlined above.



Melissa's Meadow was divided into plots and sections will be subject to grass removal, controlled burning and/or planting of native tree species.

Conservation

Melissa's Meadow, the pasture contiguous to the Las Cruces primary forest, was divided into 1 ha plots and a grid of metal, numbered and coded stakes were placed to identify each plot. The tall grass (*Pennisetum setosum*), which in some areas reached a height of 9 feet, was cut to the ground in all but four plots to observe succession. Two randomly chosen plots will be subjected to controlled fire in order to observe the effect of burned pasture on natural regeneration. The remaining plots will be planted with native species in different combinations. All along the Río Jaba, seedlings of *Lonchocarpus* sp. and *Tabebuia ochracea* will be planted to reduce erosion and protect the watershed. An *ad hoc* committee for the final planning of Melissa's reforestation was also appointed.

Research Highlights

In fiscal year 1999, there were 48 principal investigators and their projects at Las Cruces. Several projects were particularly noteworthy, including a multi-disciplinary approach to assess biodiversity conservation in fragmented landscapes involving a team from Stanford University supervised by principal investigators Paul Ehrlich and Gretchen Daily. The group devoted several weeks in February and March and in June and July to the study of biota in forest fragments and added for comparison a coffee plantation. In addition, a project was led by Gerardo Ceballos with Gerardo Suzan and Jesus Pacheco (U. de México) to inventory the mammal fauna.

Facilities and Resources

There were no major construction or renovation of facilities in fiscal year 1999. The shelving for the growing technical library was enlarged. In addition, plans and proposals for new faculty housing and a small fireproof and dehumidified building to house library and reference collections (herbarium, insect collection) were developed.

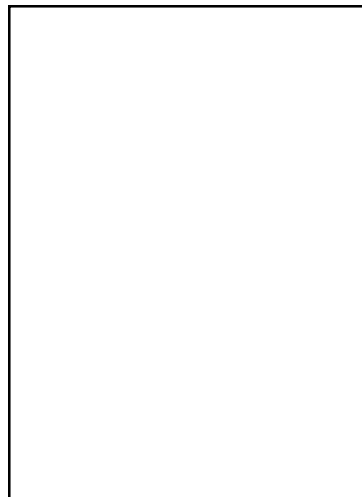


Photo: Pete Carmichael

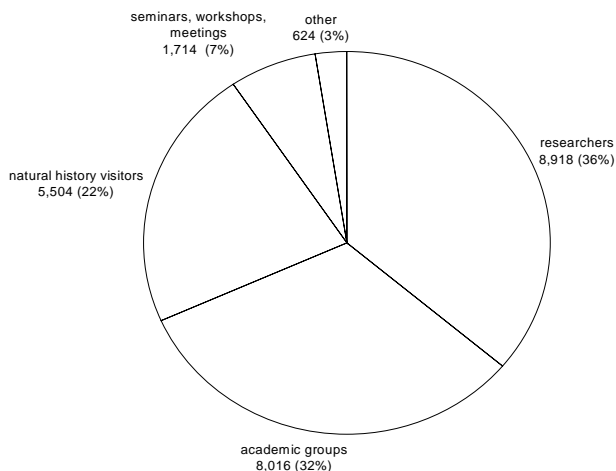
The Wilson Garden attracts more than just biologists and naturalists. Artist Luis Manuel Espinoza takes advantage of the tranquility to sketch biodiversity.

La Selva Biological Station

With its state-of-the-art laboratories, on-line geographic information system, extensive trails and large forest reserve bordering Braulio Carrillo National Park, La Selva is one of the world's most important sites for tropical forest research. La Selva is located in the Caribbean lowlands of Costa Rica and comprises 1,537 hectares of old and secondary growth forests, plus experimental habitats.

Visitation

Station visitors to La Selva totaled 9,571 in fiscal year 1999 and included 4,495 natural history visitors, 2,533 students, 1,384 people from seminars, workshops and meetings and 968 researchers. Although this was a decrease from the total number of visitors in fiscal year 1998, the number of person-days increased 3% to 24,776, as shown in the pie chart. Academic groups and natural history visitation both increased 21% and research increased 4%.



9,571 people visited La Selva in fiscal year 1999 and totaled 24,776 person-days, as outlined above.

Facilities and Resources

This year, efforts focused on updating the site plan and the location of a proposed education facility that will house classrooms, offices and a teaching laboratory.

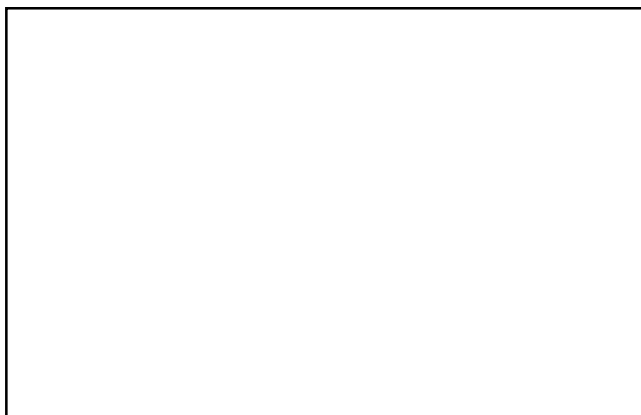
Regarding La Selva's current equipment, the technician autoanalyzer was refurbished and now La Selva offers automated chemical analysis services. The aging GIS SUN workstation was upgraded to a new, faster, SUN Ultra Spark 1, and two additional Pentium II PC's were added to the laboratory. A color plotter and printer were also added to the GIS lab for map production. A GPS base station was set up for public use. This base station allows U.S. Defense Department noise to be filtered from GPS signals, providing much more precise GPS locations. The La Selva Digital Flora project was initiated in fiscal year 1999 to assist station scientists and students with the identification of La Selva's 1,800 vascular plant species. More than 900 digital images covering 500 species were collected for this practical, illustrated, web-based plant identification tool.

Conservation

Deforestation along the banks of the Puerto Viejo and Sarapiquí rivers has caused substantial erosion. This creates a sedimentation problem downstream in the Río San Juan. Sedimentation has also been blamed for the death of coral reefs along Costa Rica's Atlantic Coastline. The Comisión de Recursos Naturales de Sarapiquí (Sarapiquí Natural Resources Commission), composed of 19 different institutions, including OTS, wrote a proposal to the World Environment Fund to reforest the banks of both rivers. The proposed activities focus on reforestation of the entire margins of both rivers over a five-year period, education and involvement of farmers who own lands adjacent to the rivers, payment through MINAE (Ministry of the Environment) of environmental services to farmers who participate in the reforestation project and establishment of reforestation study plots to test candidate tree species for their capacity to control erosion and stabilize banks.

Research Highlights

Dr. York Winter (Erlangen U., Germany) was awarded a five year grant from the Volkswagen Foundation to investigate the mechanisms that different species of nectar-feeding bats use to orient between floral food locations. The HUERTOS LTREB proposal was renewed and will fund complementary soil research by Dr. Ann Russell (Iowa State U.). The CARBONO DOE grant was also renewed, providing funds to continue eddy covariance measurements of carbon dioxide flux on the CARBONO tower.



Orlando Vargas, Assistant to the Scientific Director, provides the essential service of plant identification to La Selva students and researchers.

Palo Verde Biological Station

Unique in its landscape richness and wildlife, Palo Verde National Park contains one of the most extensive marshes and some of the oldest patches of dry forest remaining in Central America. The OTS facilities are in the heart of the Palo Verde National Park, located in the northwest Costa Rican lowland of Guanacaste Province.

Visitation

During fiscal year 1999, 1,324 people visited Palo Verde, including 777 students, 232 natural history visitors, 121 people from seminars, workshops and meetings and 96 researchers. Person-days totaled 4,371, which is slightly below the person-days for the previous fiscal year. This could be the result of the two-year visitation cycle for some academic groups. In general, all visitor categories have been relatively constant for several years, with academic groups representing the most important visitors for the station.

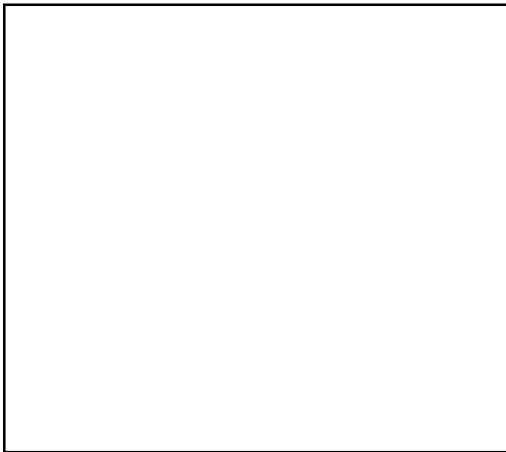
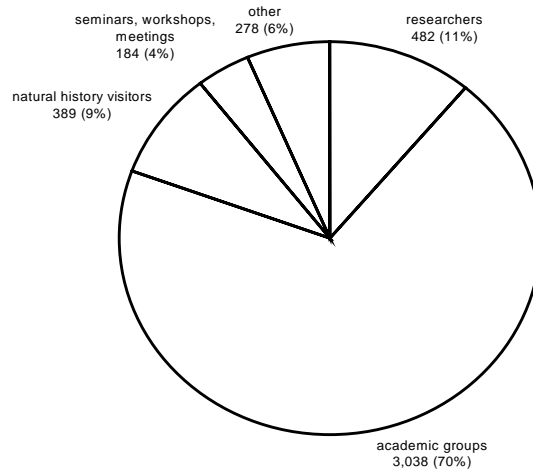


Photo: Pete Carmichael

In 1999, a new patio was built in front of the Palo Verde dining hall. Other improvements included partial remodeling of the staff housing facility, landscape enhancements and the addition of much needed furniture.

Facilities and Resources

Fiscal year 1999 marked a major milestone for Palo Verde in terms of facility improvements: with support from the National Science Foundation, electricity was brought to the station. Thus, for the first time ever, the station has dependable electrical power. Three new computers in the library-herbarium and the administration office were installed, plus air-conditioning units to protect the new equipment. A computerized weather station donated by the U.S. Fish and Wildlife Service was also installed for reliable climatic data, including temperature, precipitation, wind, solar radiation and derived weather variables.



1,324 people visited Palo Verde in fiscal year 1999 and totaled 4,371 person-days, as outlined above.

Research Highlights

Research activities at Palo Verde in fiscal year 1999 consisted of 27 researchers conducting 16 projects. Of special note is Quirico Jiménez's (INBio/Instituto Tecnológico, Costa Rica) project - The harvest prohibition of 18 Costa Rican timber species: Considerations for their use and conservation. In addition, Johnny Villarreal and Carmen Hidalgo (U. Nacional Costa Rica) initiated a project on an endangered tree and an endangered bird species restricted to Palo Verde (*Guaiacum sanctum* and *Jabiru mycteria*).

Conservation

The OTS-ACT Commission (joint project between OTS and Area de Conservación Tempisque) met regularly to coordinate several activities, including the implementation of the electrification project, the development of the Palo Verde arboretum and the digital cartographic database and the establishment of permanent plots for monitoring the dynamics of the Palo Verde vegetation. Also, preliminary plans have been made for joint efforts in developing marketing programs and activities for the Park and Station.

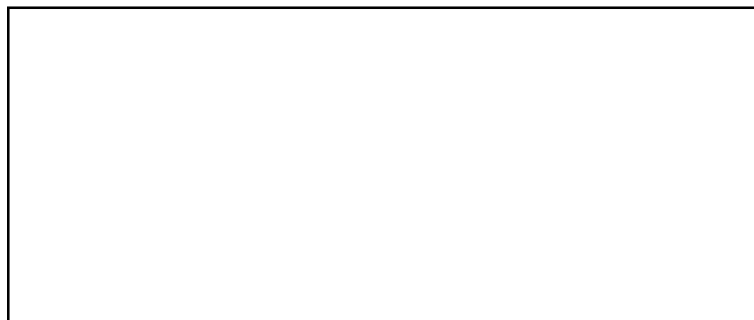


Photo: Pete Carmichael

Academic groups use the upgraded facilities at Palo Verde Biological Station as a base to explore the variety of ecosystems in the 19,804 hectare Palo Verde National Park.

Development

Annual Fund

The OTS Annual Fund raised a total of \$316,982 in unrestricted revenues during fiscal year 1999. This was a 23% increase in revenue over the previous year. As in the past, many donors targeted their contributions to specific program areas: \$16,709 for La Selva Biological Station, \$108,866 for Las Cruces Biological Station/Wilson Botanical Garden, \$2,619 for Palo Verde Biological Station and \$188,788 for general operations. Gifts to the Annual Fund support the organization's on-going operations.

Restricted Grants and Contracts

The following grants and contracts were awarded to OTS in fiscal year 1999:

<i>Donor</i>	<i>Purpose</i>	<i>Amount</i>
Association Liaison Office for University Cooperation in Development	Tropical Ecology Training in Peru (1999-2001)	\$100,000
Compton Foundation	Environmental Leadership Training in Latin America	\$90,000
CRUSA Foundation	Microbial Workshop in Guanacaste and La Selva	\$23,000
International Fund for Animal Welfare	Policy Dialogue Forum in Washington D.C.	\$10,000
Andrew W. Mellon Foundation	Joint Program in Tropical Biology with STRI	\$225,000
Andrew W. Mellon Foundation	Facilities Development Fund	\$250,000
National Science Foundation -International Division	Scholarships to the Undergraduate <i>Tropical Ecology</i> Course	\$50,000
Peace Frogs	Amphibian Research Fellowships	\$7,500
Rainforest Alliance	Environmental Education Activities at La Selva	\$10,000
Stanley Smith Horticultural Trust	Las Cruces Newsletter, Brochure and Map	\$20,000
US Fish and Wildlife Service	U.S. Decision-Makers Course	\$25,000
US Fish and Wildlife Service	Latin American Decision-Makers Course and Program Evaluation	\$40,000
US Fish and Wildlife Service	Latin American Reserve Managers Course in Park Management	\$60,000
Winslow Foundation	Reforest Melissa's Meadow at Las Cruces	\$5,000
World Wildlife Fund-Russell E. Train Education for Nature Fund	Computers for Latin American Education Program	\$5,800
Total Grants and Contracts		\$921,300

Donors

A special thanks to the following individuals, foundations, corporations and government agencies for their support in fiscal year 1999 (July 1, 1998 - June 30, 1999). It is only through such support that OTS can continue to provide leadership in education, research and the responsible use of natural resource in the tropics.

Grand Sponsors / Gran Patrocinadores (\$100,000+)

Andrew W. Mellon Foundation	Association Liaison Office for University Cooperation in Development	National Science Foundation	U.S. Fish and Wildlife Service
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Sponsors / Patrocinadores (\$50,000+)

Compton Foundation

Major Benefactors / Gran Benefactores (\$20,000+)

CRUSA Foundation	Stanley Smith Horticultural Trust	Zemurray Foundation
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Benefactors / Benefactores (\$10,000+)

Anonymous	Edison Electric Institute	Mr. and Mrs. Benjamin Hammett	Rainforest Alliance
Michelle Cloud	GlaxoWellcome Brazil	International Fund for Animal Welfare	Laurance S. Rockefeller Fund

Champions / Campeones (\$5,000+)

Joan Slatkin Barton	W. Hardy Eshbaugh III	Peace Frogs	World Wildlife Fund-Russell E.
Dole Foods/Standard Fruit of Costa Rica, S.A.	Faucet Family Trust	PINDECO	Train Education for Nature Fund
	Fred Levinson	Winslow Foundation	

Stewards / Administradores (\$2,500+)

Doris Brown	Paul and Anne Ehrlich	Mr. and Mrs. Robert Kramer	Richard J. Tait
Chevron Research & Technology	Daniel Kemper and Joanna Mason	Lillian and Murray Slatkin	F. Christian and Betty Thompson
Bobby Dori6n			

Partners / Asociados (1,000+)

Susan Ackerman	Florida Ice and Farm	A. Stephen Johnson, Jr.	Laurence and Janet Phelps
Eric Anderson	John and Lila Foster	Randall Jones	Portico, S.A.
Banco Interfin, S.A.	Robert Goodman	Leonard Kurz	Helen Preston
BBC-Natural History Unit	Reid Harris and Sherry Morris	Linda Leigh Wright and Phillip Wright	Marilyn and Blake Reeves
Robert and Kay Cheatham	Gary and Lynne Hartshorn	David and Evelyne Lennette	Remington Products
Lanna Cheng	Robert and Julie Heck	Ralph and Lanna Lewin	Jay Savage and Rebecca Papendick
Virginia Clarkson	Joseph and Barbara Hirt	Dr. and Mrs. Robert McNaughton	James and Ligia Shank
Clemens Family Foundation	Walter Hodge	Gary and Nancy Meffe	Jarid Simons
Dr. and Mrs. David Coleman	Jacqueline Hoefler	James Moore	Andrew Sinauer
Mary and Harry Cornwall	Claude Hope	George Müller-Loeffelholz	Ann Stephens
CORBANA	Horizontes Nature Tours	OTS 98-1 & 98-3	Michael and Karen Taylor
Patricia DeCoursey	Hotel Presidente	Art Pappas	Christophe and Christiane Tyson
Dale Doepke	Hotel Marriott		George Wiatt
Ruth Ferguson	Frank Hovore		Frank Witebsky

Patrons / Patrocinadores (\$500+)

Jeanne Aragon	DHL	Lyla Lampson	Pamela Ridgeway
Ingrid Arcieri	Mark Druckenbrod	Gertrude Lange	Norman and Alice Rubash
Bali, S.A.	Carol Dolinskas	Jean Langenheim	Eva and Robert Slatkin
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Mr. and Mrs. Francis Cabot	Albert Gates	Allen Morgan and Patricia McClung	Tracy Thompson
Alan Campbell	Jonathan Giles and Karen Steinhour	Richard and Mary Murphy	George Tuttle and Ben Cushman
C. Ronald Carroll	Peter and Carolina Gilmore	Peter Nelson	Virginia and Riley Willcox
Gale Carter	Jim and Karen Hamrick	Dan and Alice Nicolson	Mr. and Mrs. Alfred Wilsey
Paul Christianson	Samuel Jones	Heidi Nitze	Don and Kate Wilson
David and Margaret Cooke	Dale and Davida Kalina	Gordon and Betty Orians	Paige Winebarger
Gilbert and Emily Daniels	Trudy Kareus	Beverly Potts	Alvin Yoshinaga
Christopher Davidson	Suzanne King	Tamra Raven	
Thomas Davis and Ellyn Bush	Dorothy Kirsch	Red Butte Garden & Arboretum	

Sustainers / Colaboradores (\$250+)

Raymond and Margaret Adams	Dinah Davidson	Barbara Lewis	James Rodman
Marie Adamson	John Earhart	Bette Loiselle and John Blake	David Roubik
Kinsey Anderson	James and Rebecca Eisen	John McCoy	John Sauer
Robin Andrews	John and Katherine Ewel	Lucinda McDade and John Lundberg	Margaret Schaeffer
John Batson	Far Hills Country Day School	Mark McMahon and Earl Robinson	Ted Shear and Francine Durso
BBC TV	John Fauth	Rogers McVaugh	Charles and Yolanda Shemely
Edward Beals	Jonathan Fink	Eugene Morton	John and Margaret Sparks
Barbara Bentley	Benjamin Foote	Marigold Murray and Jim Genis	Charles Stanberry and Helene Dublisky
Veronica Boswell	Carol Foss	Steven Oberbauer	Michael Steinberg and Lisa Shapiro
Bert Brehm	Daniel and Gretchen Funk	Brent Opell	Peter F. Stevens
Gary Brewer	Norris and Iris Gaddis	Paul Opler	Richard Stoltenberg
William Brooks	Dr. and Mrs. William Gamble	John Pankhurst	Carter and Mary Thacher
Calgary Cooperative Assoc, Ltd	Richard Goodwin	Oliver and Anita Pearson	Allen Thoma and Diane Fong
Lynne Carmichael	Alice Graefe	Wim Persoon	Russell Train
Peter Chabora and H. Roberta Koepfer	Murray Honick	Ronald Petersen	Stephen Wainwright
Claudia Charpentier E.	Thomas Hubbard	Thomas C. Peterson	Douglas Waits
Alvaro Chaves Nuñez	Thomas Jackson	F. Harvey Pough	Peter Watkins
Robin Chazdon and Robert Colwell	Russell and Rebecca Jaffe	David Queller and Joan Strassmann	Jeff and Missy Wert
Christina Cheatham and Matt Alfermann	Amal Jasentuliyana	Bob and Bertha Rains	Paige Wineburger and Robert Teetshom
Jack and Joan Citron	JWM Productions, LLC	Ann and Anis Racy	Christopher Woods
Samuel and Diane Crothers	William Kelly	Carl Rettermeyer	Greg Yost
James Cupery	Cecily and Jeffrey Kingston	Paul Rich	Chris and Verna Young
Peter Curtis and Allison Snow	Elysabeth Kleinhans	Robert Ricklefs and Susanne Renner	Catherine Ziegler
Evelyn Jean Daubermire	Muriel Kolb		
	William Lange		
	Pedro León		
	Joseph Levine		

In addition, many thanks to our friends for the various forms of in-kind support given to OTS throughout fiscal year 1999. These gifts included equipment, books, periodicals, gift-shop merchandise and services. A very special thank you to members of our Board of Directors, Assembly of Delegates and Board of Visitors for their generous gifts of time and expertise and for absorbing many costs associated with their involvement in this organization.

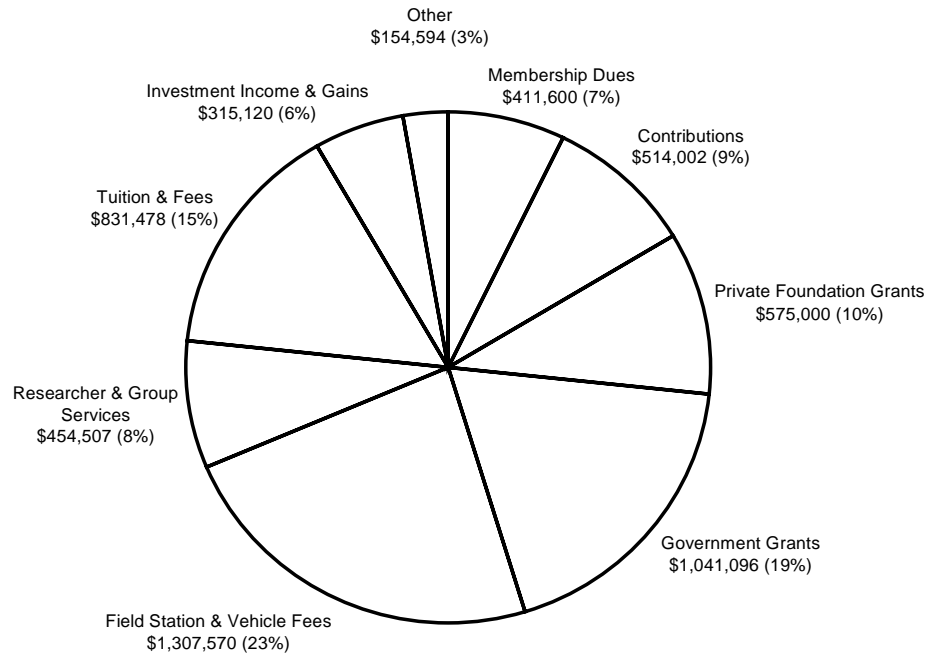
Despite every effort to avoid them, errors may occur in the process of producing this annual report. If your name has been omitted or misprinted, please notify us and accept our apologies.

Finances

Fiscal year 1999 showed more modest growth than the immediately preceding fiscal year. Increase in the annual fund (21%) and investment income (16%) contributed to growth in net assets, which increased \$225,537 in fiscal year 1999.

Support and Revenue

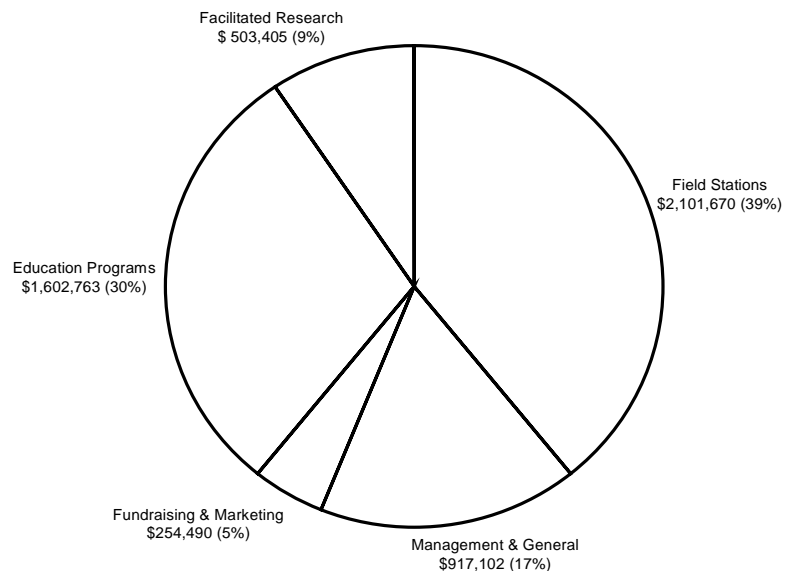
\$5,604,967



The following audited financial statements contain columns for both OTS and for ESINTRO, the for-profit Costa Rican corporation created in the fall of 1995 to handle OTS sales and related taxable items.

Expenses

\$5,379,430



Audited Financial Statements

Independent Auditors' Report

The Board of Directors
Organization for Tropical Studies, Inc.:

We have audited the accompanying consolidated statements of financial position of the Organization for Tropical Studies, Inc. and subsidiary (the "Organization") as of June 30, 1999 and 1998, and the related consolidated statements of cash flows for the years then ended, and the consolidated statement of activities for the year ended June 30, 1999. These consolidated financial statements are the responsibility of the Organization's management. Our responsibility is to express an opinion on these consolidated financial statements based on our audits.

We conducted our audits in accordance with generally accepted auditing standards. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Organization for Tropical Studies, Inc. and subsidiary as of June 30, 1999 and 1998, and their cash flows for the years then ended and the changes in their net assets for the year ended June 30, 1999 in conformity with generally accepted accounting principles.

Our audits were made for the purpose of forming an opinion on the consolidated financial statements taken as a whole. The supplementary information included in the consolidated statement of financial position and the related consolidated statements of activities and cash flows related to the Organization for Tropical Studies, Inc. and the Estudios E Investigaciones Tropicales S.A. (ESINTRO), collectively "the Organization," is presented for purposes of additional analysis of the consolidated financial statements rather than to present the financial position, changes in net assets and cash flows of the Organization. The supplementary information included in the accompanying schedule is presented for purposes of additional analysis and is not a required part of the consolidated financial statements. Such information has been subjected to the auditing procedures applied in the audits of the consolidated financial statements and, in our opinion, is fairly stated, in all material respects, in relation to the consolidated financial statements taken as a whole.

September 29, 1999

THE ORGANIZATIONAL FOR TROPICAL STUDIES, INC. AND SUBSIDIARY
 Consolidated Statements of Financial Position
 June 30, 1999 and 1998

	<u>Supplementary Information</u>			
	Organization for Tropical Studies, Inc. ESINTRO 1999 Total 1998 Total			
Assets				
Cash and cash equivalents (notes 3 and 8)	\$1,342,969	17,542	1,360,511	2,230,173
Accounts receivable, less allowance for doubtful accounts of \$9,400 in 1999 and \$3,900 in 1998 (note 7)	102,960	9,130	112,090	132,119
Contributions receivable, net	23,401	—	23,401	13,673
Investments (note 3)	3,851,357	—	3,851,357	2,702,726
Land, buildings and equipment, net (note 4)	2,627,895	3,736	2,631,631	2,628,435
Other assets	30,989	44,129	75,118	57,435
Total assets	7,979,571	74,537	8,054,108	7,764,561
Liabilities and Net Assets				
Liabilities:				
Accounts payable	52,197	15,496	67,693	45,741
Other liabilities	357,220	21,258	378,478	341,073
Accumulated postretirement benefit liability (note 9)	116,798	—	116,798	112,145
Total liabilities	526,215	36,754	562,969	498,959
Net assets:				
Unrestricted (notes 5 and 8)	4,702,783	37,783	4,740,566	4,322,521
Temporarily restricted (note 5)	1,929,246	—	1,929,246	2,135,639
Permanently restricted (note 5)	821,327	—	821,327	807,442
Total net assets	7,453,356	37,783	7,491,139	7,265,602
Contingencies (notes 8 and 10)				
Total liabilities and net assets	\$ 7,979,571	74,537	8,054,108	7,764,561

See accompanying notes to consolidated financial statements.

THE ORGANIZATION OF TROPICAL STUDIES, INC. AND SUBSIDIARY

Consolidated Statement of Activities

Year ended June 30, 1999

(with comparative amounts for the year ended June 30, 1998)

Supplementary Information

Organization

for Tropical

Studies, Inc.

Unrestricted

ESINTRO

Unrestricted

Total

Unrestricted

Temporarily

Restricted

Permanently

Restricted

1999

Total

1998 Total

(note 2)

Revenues:

Operating revenues and support:

Membership dues	\$ 411,600	—	411,600	—	—	411,600	392,850
Grants, contracts and similar agreements:							
Private foundation sources	300,000	—	300,000	275,000	—	575,000	981,539
Government sources	850,640	—	850,640	100,000	—	950,640	849,562
Grant indirect recovery	90,456	—	90,456	—	—	90,456	97,310
Total grants, contracts and similar agreements	1,241,096	—	1,241,096	375,000	—	1,616,096	1,928,411
Contributions	390,299	—	390,299	109,818	13,885	514,002	784,239
Field station fees	907,138	295,120	1,202,258	—	—	1,202,258	1,105,361
Vehicle rental fees	105,312	—	105,312	—	—	105,312	74,494
Researcher and group services	454,507	—	454,507	—	—	454,507	449,741
Tuition and fees	831,478	—	831,478	—	—	831,478	568,675
Investment income	62,253	—	62,253	146,866	—	209,119	133,218
Unrealized gains on investments	44,538	—	44,538	61,463	—	106,001	136,745
Other	71,236	82,998	154,234	360	—	154,594	146,247
Total operating revenues	4,519,457	378,118	4,897,575	693,507	13,885	5,604,967	5,719,981
Net assets released from restrictions	899,900	—	899,900	(899,900)	—	—	—

Total revenues and other support 5,419,357 378,118 5,797,475 (206,393) 13,885 5,604,967 5,719,981

Expenses:

Program expenses:

Field stations	1,742,852	358,818	2,101,670	—	—	2,101,670	1,907,982
Education programs	1,602,763	—	1,602,763	—	—	1,602,763	1,282,095
Facilitated research	503,405	—	503,405	—	—	503,405	526,560
Total program expenses	3,849,020	358,818	4,207,838	—	—	4,207,838	3,716,637
Management and general expenses	905,150	11,952	917,102	—	—	917,102	900,378
Fundraising expenses	254,490	—	254,490	—	—	254,490	222,914
Total management, general and fundraising expenses	1,159,640	11,952	1,171,592	—	—	1,171,592	1,123,292
Total expenses	5,008,660	370,770	5,379,430	—	—	5,379,430	4,839,929
Increase (decrease) in net assets	410,697	7,348	418,045	(206,393)	13,885	225,537	880,052

Net assets at beginning of year	4,292,086	30,435	4,322,521	2,135,639	807,442	7,265,602	6,385,550
Net assets at end of year	\$ 4,702,783	37,783	4,740,566	1,929,246	821,327	7,491,139	7,265,602

See accompanying notes to consolidated financial statements.

THE ORGANIZATIONAL FOR TROPICAL STUDIES, INC. AND SUBSIDIARY

Consolidated Statements of Cash Flows
Years ended June 30, 1999 and 1998

	Supplementary Information			
	Organization			
	for Tropical			
	Studies, Inc.			
	ESINTRO	1999 Total	1998 Total	
Cash flows from operating activities:				
Change in net assets	\$ 218,189	7,348	225,537	880,052
Adjustments to reconcile change in net assets to net cash provided by (used in) operating activities:				
Depreciation on buildings and equipment	277,639	1,006	278,645	273,284
Decrease (increase) in accounts receivable	27,767	(7,738)	20,029	8,776
Increase in contributions receivable	(9,728)	—	(9,728)	(2,342)
(Increase) decrease in other assets	3,954	(21,637)	(17,683)	27,513
Increase in accounts payable and other liabilities	43,553	15,804	59,357	108,752
Increase in accumulated postretirement benefit liability	4,653	—	4,653	10,805
Contributions restricted for permanent investments	(13,885)	—	(13,885)	(21,263)
Net unrealized gains on investments	(106,001)	—	(106,001)	(136,745)
 Net cash provided by (used in) operating activities	 446,141	 (5,217)	 440,924	 1,148,832
Cash flows from investing activities:				
Purchases of equipment	(278,282)	(3,559)	(281,841)	(139,837)
Purchases of investments	(1,752,483)	—	(1,752,483)	(1,152,144)
Net proceeds from sales of investments	709,853	—	709,853	857,049
Net cash used in investing activities	(1,320,912)	(3,559)	(1,324,471)	(434,932)
Cash flows from financing activities:				
Contributions restricted for permanent investments	13,885	—	13,885	21,263
Net cash provided by financing activities	13,885	—	13,885	21,263
Net increase (decrease) in cash and cash equivalents	(860,886)	(8,776)	(869,662)	735,163
Cash and cash equivalents at beginning of year	2,203,855	26,318	2,230,173	1,495,010
Cash and cash equivalents at end of year	\$ 1,342,969	17,542	1,360,511	2,230,173

See accompanying notes to consolidated financial statements.

ORGANIZATION FOR TROPICAL STUDIES, INC. AND SUBSIDIARY

Notes to Consolidated Financial Statements
June 30, 1999 and 1998

(1) Organization

The Organization for Tropical Studies, Inc. (the Organization) is chartered as a nonprofit corporation under the laws of the State of North Carolina for the purpose of furthering education and research in tropical sciences, and is supported by a consortium of institutions of higher education located in North and Central America. The Organization maintains its general office in Durham, North Carolina on the campus of Duke University, an administrative office in San Jose, Costa Rica, and three field stations in Costa Rica (La Selva, Las Cruces and Palo Verde) for instructional and research purposes.

Included in the consolidated financial statements of the Organization is *Estudios E Investigaciones Tropicales S.A.* (ESINTRO), a for-profit subsidiary of the Organization. ESINTRO was incorporated for sales made to field station visitors of food, lodging, clothing, beverages, and other miscellaneous items. The Organization is the sole stockholder of ESINTRO.

A summary of the financial data applicable to the operations in Costa Rica compared to total operations as included in the consolidated financial statements as of and for the years ended June 30, 1999 and 1998 is as follows:

	1999		1998	
	Costa Rican Operations	Total Operations	Costa Rican Operations	Total Operations
Total assets	\$ 2,901,433	8,054,108	2,909,585	7,764,561
Total liabilities	109,598	562,969	53,589	498,959
Total revenue and other support	3,990,452	5,604,967	4,146,490	5,719,981
Total expenses	\$ 4,251,428	5,379,430	4,369,652	4,839,929

Funding of the Organization is provided principally by dues from the member institutions, field stations and vehicle rental charges, tuition and fee charges for courses offered by the Organization, grants from the National Science Foundation and various private foundations, and private gifts. The Organization is dependent on the grants and private gifts to continue operating.

The Organization is exempt from Federal income taxes under Section 501(c)(3) of the Internal Revenue Code.

(2) Summary of Significant Accounting Policies

The consolidated financial statements of the Organization have been prepared on the accrual basis of accounting. The significant accounting policies followed are described below to enhance the usefulness of the consolidated financial statements to the reader.

Net assets and revenues, expenses, gains and losses are classified based on the existence or absence of donor-imposed restrictions. Accordingly, net assets of the Organization are classified and reported as follows:

Permanently restricted – Net assets subject to donor-imposed stipulations that they be maintained permanently by the Organization. Generally, the donors of these assets permit the Organization to use all or part of the income earned on related investments for general or specific purposes.

Temporarily restricted – Net assets subject to donor-imposed stipulations that may or will be met either by actions of the Organization and/or the passage of time.

Unrestricted – Net assets that are not subject to donor-imposed stipulations.

Revenues from sources other than contributions are reported as increases in unrestricted net assets. Contributions are reported as increases in the appropriate category of net assets, except that contributions which impose restrictions that are met in the same fiscal year they are received are included in unrestricted revenues. Expenses are reported as decreases in unrestricted net assets. Gains and losses on investments are reported as increases or decreases in unrestricted net assets unless their use is restricted by explicit donor stipulations or by law. Expirations of temporary restrictions recognized on net assets (i.e., the donor-stipulated purpose has been fulfilled and/or the stipulated time period has elapsed) are reported as reclassifications from temporarily restricted net assets to unrestricted net assets. Temporary restrictions on gifts to acquire long-lived assets are considered met in the period in which the assets are acquired or placed in service.

Contributions, including unconditional promises to give, are recognized as revenues in the period received. Contributions received for capital projects or perpetual or term endowment funds and contributions under split-interest agreements or perpetual trusts are reported as nonoperating revenues. All other contributions are reported as operating revenues. Conditional promises to give are not recognized until the conditions on which they depend are substantially met. Contributions of assets other than cash are recorded at their estimated fair value at the date of gift. Contributions to be received after one year are discounted at a rate commensurate with the risk involved. Amortization of the discount is recorded as additional contribution revenue in accordance with donor-imposed restrictions, if any, on the contributions. Allowance is made for uncollectible contributions based upon management's judgment and analysis of the creditworthiness of the donors, past collection experience and other relevant factors.

(a) Principles of Consolidation

All significant intercompany balances and transactions have been eliminated in consolidation.

(b) Cash and Cash Equivalents

Except for \$235,560 as of June 30, 1999 and \$282,447 as of June 30, 1998 in bank accounts in Costa Rica and temporary investments of \$206,034 as of June 30, 1999 and \$960,993 as of June 30, 1998, cash and certain investments are managed by Duke University. Monies managed by Duke University are invested in the University's "Institutional Reinvestment Account" (IRA). The rate earned on monies invested in the IRA is based on 100% of the 30-day U.S. Treasury Bill rate, regardless of the performance of the IRA's assets. The Organization considers all investments with original maturities of less than 90 days to be cash equivalents.

(c) **Land, Buildings and Equipment and Depreciation**

Land, buildings and equipment are stated at cost at date of acquisition or fair value at date of donation in the case of gifts. Depreciation of buildings and equipment is provided over the estimated useful lives of the respective assets on the straight-line basis.

(d) **Investments**

Investments in equity securities and debt securities are reported at fair value with unrealized gains and losses reported in the statement of activities. Investment income includes realized gains and losses on investments, interest and dividends.

(e) **Translation of Foreign Currencies**

Assets and liabilities denominated in Costa Rican colones (all "monetary items") are translated into U.S. dollars at the rate prevailing at the balance sheet date of 286.25 and 256.40 colones as of June 30, 1999 and 1998, respectively, to the U.S. dollar. Transactions in colones have been translated into U.S. dollars at rates prevailing at the transaction dates. Such rates ranged from 256.40 to 286.25 and 232.50 to 256.40 colones to the U.S. dollar during fiscal years 1999 and 1998, respectively. The translation of foreign currencies resulted in losses of \$7,909 and \$4,334 for fiscal years 1999 and 1998, respectively, which are included in the accompanying consolidated statements of activities.

(f) **Use of Estimates**

The preparation of consolidated financial statements in conformity with generally accepted accounting principles requires management to make estimates and judgments that affect the reported amounts of assets and liabilities and disclosures of contingencies at the date of the consolidated financial statements and revenues and expenses recognized during the reporting period. Actual results could differ from those estimates.

(g) **Comparative Amounts**

Comparative amounts for 1998 have been presented in the accompanying consolidated statement of activities in total but not by net asset class in order to provide an understanding of the Organization's operations. Such information does not include sufficient detail with respect to the consolidated statement of activities to constitute a presentation in conformity with generally accepted accounting principles. Accordingly, such information should be read in conjunction with the Organization's consolidated statement of activities for the year ended June 30, 1998, from which the comparative information was derived.

(h) **Reclassifications**

In certain instances, amounts previously reported in the 1998 financial statements have been reclassified to conform to the 1999 presentation. Such reclassifications have no effect on the change in net assets as previously reported.

(3) **Investments**

Temporary investments of \$206,034 and \$960,993 are included in cash and cash equivalents, at June 30, 1999 and 1998, respectively, were invested in money market accounts, earning interest at 3.86% and 4.5% at June 30, 1999 and 1998, respectively. Investments at June 30, 1999 and 1998 consist of the following:

	1999	1998
Bonds:		
U. S. Government	\$ 1,758,780	688,025
Corporate	—	400,000
Mutual funds:		
Common stocks	1,289,730	948,819
Corporate bonds	802,847	665,882
	<u>\$ 3,851,357</u>	<u>2,702,726</u>

(4) **Land, Buildings and Equipment**

Land, buildings and equipment are summarized at June 30, 1999 and 1998 as follows:

	1999	1998
Land	\$ 786,028	673,585
Land improvements	433,261	424,020
Buildings and improvements	2,264,827	2,233,168
Motor vehicles	343,645	325,645
Equipment	1,342,306	1,216,718
Furniture and furnishings	14,398	13,665
Construction-in-progress	40,315	64,654
	5,224,780	4,951,455
Less accumulated depreciation	(2,593,149)	(2,323,020)
	<u>\$ 2,631,631</u>	<u>2,628,435</u>

(5) **Net Assets**

The Organization has designated certain net assets classified as unrestricted for specific purposes or uses. As a result, substantially all of the net assets classified on the consolidated statements of financial position as unrestricted net assets at June 30, 1999 and 1998 have been invested in property and equipment or are designated for specific uses.

Unrestricted net assets consist of the following at June 30, 1999 and 1998:

	1999	1998
Net investment in property and equipment	\$ 2,631,631	2,628,435
Funds designated by governing board:		
Estimated severance pay	225,013	211,181
Asset renewal	935,297	520,655
Organizational support	508,469	520,930
Unrestricted and undesignated	440,156	441,320
	<u>\$ 4,740,566</u>	<u>4,322,521</u>

Temporarily restricted net assets consist of the following at June 30, 1999 and 1998:

	<u>1999</u>	<u>1998</u>
Term endowment funds to be used for fellowships	\$ 377,432	316,580
Contributions for station improvements and land acquisition	210,582	241,329
Educational programs	1,341,232	1,577,730
	<u>\$ 1,929,246</u>	<u>2,135,639</u>

Net assets were released from donor restrictions by incurring expenses satisfying the restricted purposes or by the passage of time. Purpose restrictions were accomplished by incurring \$899,900 in expenses for fellowships, station improvements, land acquisition and educational programs in 1999.

Permanently restricted net assets at June 30, 1999 and 1998 consist of perpetual endowment funds. The income from these investments in perpetuity is spendable for instruction, scholarships and operations.

(6) Functional Allocation of Expenses

The costs of providing the various programs and other activities of the Organization have been summarized on a functional basis in the statement of activities. Accordingly, certain costs have been allocated among the programs and supporting services benefited.

(7) Relationships with Duke University and Grantors

The Organization has an agreement with Duke University whereby the University acts as fiscal agent for the Organization. As a result of this agreement, federal and state grants and contracts are made to the University on the Organization's behalf. Private foundation grants and contracts are awarded to the Organization and managed through Duke University. Total amounts reported as revenues and expenses under grants and contracts to the University amounted to \$1,564,200 in fiscal year 1999 and \$1,637,600 in fiscal year 1998. Accounts receivable at June 30, 1999 and 1998 include \$873 and \$10,394, respectively, due from Duke University for amounts expended for grant purposes but not yet reimbursed.

During 1999 and 1998, the University provided administrative and other services to the Organization for which the University received a net indirect overhead allocation from the Organization which amounted to \$39,900 and \$49,482, respectively.

At June 30, 1999, the Organization had the following unexpired grants and contracts:

<u>Grantor</u>	<u>Purpose</u>	<u>Total award</u>	<u>Total unexpended</u>	<u>Expiration</u>
<i>U.S. Government Agencies</i>				
NSF-DEB-97-06976	Arthropod diversity at La Selva - Phase III	\$ 350,004	130,334	July 2000
NSF-DBI-96-12799	Administration, maintenance & development of La Selva Station	1,650,000	275,000	January 2000
NSF-DBI-12349	Database Management & Connectivity for three Tropical Field Stations	141,340	72,942	May 2000
U.S. Fish & Wildlife Service	International workshop in wetland management	4,200	490	No expiration date
U.S. Fish & Wildlife Service	Fund the Latin America Decision Makers Course	40,000	11,407	January 2000
U.S. Fish & Wildlife Service	International workshop on wildlife management	60,000	50,429	January 2000
<i>Non-Government Agencies</i>				
University of Connecticut	Woody species regeneration at La Selva	143,400	44,261	June 2000
Glaxo Holdings-Puerto-Rico	Support for Puerto Rican tropical biology students	33,333	3,025	No expiration date
A. W. Mellon Foundation	Training and research in tropical ecology (1993-1995)	850,000	8,719	No expiration date
A. W. Mellon Foundation	Training and research in tropical ecology (1996-1998)	850,000	38,457	No expiration date
A. W. Mellon Foundation	Training and research in tropical ecology (1999-2001)	945,000	747,597	December 2001
A. W. Mellon Foundation	Clark's ecological research	200,000	96,626	June 2000
A. W. Mellon Foundation	La Selva-STRI collaboration	175,000	31,499	No expiration date
A. W. Mellon Foundation	Planning for an undergraduate program	250,000	37,599	No expiration date
A. W. Mellon Foundation	La Selva-STRI collaboration	225,000	226,928	No expiration date
Compton	Environmental Leadership Program in Latin America	30,000	26,384	No expiration date
Raytheon Systems Development Co.	U.S. Army Lidar terrain mapping project at La Selva Station	52,593	2,450	No expiration date
George B. Storer	Bird monitoring station at La Selva Station	10,000	142	No expiration date
Stanley Smith Horticultural Trust	Curatorial fellowships, internships and documentation of plant records	20,000	16,822	No expiration date

Grantor	Purpose	Total award	Total unexpended	Expiration
Stanley Smith Horticultural Trust	Curatorial fellowships, internships and documentation of plant records	20,000	11,119	No expiration date
Stanley Smith Horticultural Trust	Interpretive bilingual literature and signage at the Wilson Garden	13,000	7,977	No expiration date
Tinker Foundation	Corporate decision-making in Central America	79,000	4,021	No expiration date
		<u>\$ 6,141,870</u>	<u>1,844,228</u>	

The Organization has received written communications for the following new grants and additional funding for existing grants subsequent to June 30, 1999:

Grantor	Purpose	Total award	Expiration
NSF-DEB-99-75235	Sustainability of Soil Fertility in model Tropical Ecosystems	<u>\$ 400,000</u>	July 2004
		<u>\$ 400,000</u>	

(8) Contingencies

Under Costa Rican law, an employee can receive as severance pay the equivalent of one month's salary for every year of employment, up to a maximum of eight years, if it is determined by the courts that his employment was terminated without just cause, plus one additional month's salary. If all employees of the Organization were terminated at June 30, 1999 and 1998 without just cause, the liability for severance pay would be \$225,013 and \$211,181, respectively. The Organization has designated cash of the identical amounts to make payments under the law, if necessary. The Board of Directors has designated a portion of the unrestricted net assets for the estimated contingent severance pay liability. Severance payments would be made from the designated net assets, and an amount equal to each year's increase or decrease in estimated liability will be transferred to or from the designated net assets.

The Organization is involved in claims and legal actions arising in the ordinary course of business. In the opinion of management, the ultimate disposition of these matters will not have a material adverse effect on the Organization's financial position, results of operations or liquidity.

(9) Benefit Plans

Duke University employees assigned to the Organization participate in either the University's contributory defined contribution pension plan or the University's noncontributory defined benefit pension plan. Net pension expense, which is funded annually, amounted to \$41,100 and \$49,300 for the years ended June 30, 1999 and 1998, respectively.

These employees are also participants in the University's unfunded defined benefit postretirement medical plan. The net periodic postretirement benefit cost amounted to \$4,653 and \$10,805 for the years ended June 30, 1999 and 1998, respectively, and the associated liability was \$116,798 and \$112,145 as of June 30, 1999 and 1998, respectively.

It is not possible to present separately the actuarial present value of benefit obligations or the net assets available for benefits under either the contributory defined contribution or the noncontributory defined benefit pension plans because no determination has been made of the allocation of such amounts between Duke University and the Organization. Furthermore, it is not possible to present separately the actuarially determined accumulated postretirement benefit obligation for the Organization for the postretirement benefit plan because no determination has been made of the allocation of such amounts between Duke University and the Organization.

(10) Year 2000 Issues (Unaudited)

During 1998, the Organization initiated a plan (the Plan) to identify, assess, and remediate "Year 2000" issues within each of its significant computer programs and certain equipment which contain microprocessors. The Plan is addressing the issue of computer programs and computer chips being able to distinguish between the year 1900 and the year 2000, if a program or chip uses only two digits rather than four to define the applicable year. Conversion and implementation activities for mission critical systems are in process and management expects implementation and testing to be completed by October 31, 1999. The Organization is expensing costs associated with these systems changes as the costs are incurred. Anticipated future expenditures relating to Year 2000 compliance are not expected to be material to the consolidated financial statements. However, new developments may occur that could affect the Organization's estimates of the costs relating to Year 2000 compliance.

The Organization is in the process of identifying and contacting critical suppliers and customers whose computerized systems interface with the Organization's systems, regarding their plans and progress in addressing the Year 2000 issues. The Organization has received varying information from such third parties on the state of compliance or expected compliance. Contingency plans are being developed in the event that any critical supplier or customer is not compliant.

The failure to correct a material Year 2000 problem could result in an interruption in, or a failure of, certain normal business activities or operations. Such failures could materially and adversely affect the Organization's operations, liquidity and financial condition. Due to the general uncertainty inherent in the Year 2000 problem, resulting in part from the uncertainty of the Year 2000 readiness of third-party suppliers and customers, the Organization is unable to determine at this time whether the consequences of Year 2000 failures will have a material impact on the Organization's operations, liquidity or financial condition.

