

Amigos

Newsletter

No. 64, Nov. 2005

Wilson Botanical Garden
Las Cruces Biological Station
Apdo. 73-8257 San Vito, Coto Brus, COSTA RICA



**Organización para
Estudios Tropicales**

What We Do

The Wilson Botanical Garden Jardín Botánico Wilson

In the enchanting and remote southern zone of Costa Rica, a Central American botanical Garden, lush and serene, lies at the heart of the Organization for Tropical Studies' Las Cruces Biological Station. The Organization for Tropical Studies (OTS) acquired the Wilson Garden in 1973 as part of the Las Cruces Biological Station, one of three tropical field stations operated by OTS in Costa Rica.

Extraordinarily beautiful, the Wilson Garden is famous for its collections of tropical plants from around the world, including palms, aroids, bromeliads, gingers, marantas, heliconias and ferns. More than 5,000 species of plants can be found in the 12 hectare (approximately 30-acre) Garden property, including one of the largest collections of palms in the world.

The Wilson Garden is a "must see" stop on the itineraries of plant lovers, birders and other natural history groups. The Garden and the surrounding areas have an incredible diversity of animals. The most recently updated bird list includes 390 species. Commonly seen mammal species include agoutis, white-faced capuchin monkeys, kinkajous, olingos, tayras and nearly 40 species of bats. Reptiles and amphibians thrive in this moist, cloud-laden habitat; and the moth and butterfly populations continually astonish visitors.

The Garden is equally well known for its visitor-friendly amenities: comfortable private sleeping quarters, delicious meals, knowledgeable and enthusiastic staff, well-maintained pathways, and abundant wildlife.

Far from the noise and bustle of the country's capital city San Jose, Las Cruces lies between Corcovado National Park on Costa Rica's Osa Península and the enormous La Amistad Biosphere Reserve

spanning southeastern Costa Rica and western Panama. In fact, in 1983 the Garden was declared part of that Reserve by UNESCO due to its rich plant collections and proximity to this 472,000 hectare area of parklands and buffer zones, in the formidable and wild Talamanca Mountain Range.

The Station encompasses the Wilson Garden plus a much larger area of 256 hectares (640 acres), combining native old-growth forest, established secondary forest, and a regenerating forest known as "Melissa's Forest Restoration Project." This makes Las Cruces a fitting location for the observation and study of ecosystems and biodiversity.

At approximately 1,100 meters elevation (3,300 feet), the prevailing temperatures at the Garden are cooler than an inexperienced traveler might expect in the tropics. Temperatures range from 21-26 °C (70-80 °F) during the day and 15-21 °C (low 60's °F) at night. The annual rainfall here is approximately 4,000 mm or 157 inches!

Most visitors come to enjoy Las Cruces and the Wilson Botanical Garden during Costa Rica's "summer," the dry season months of December through April. The rainy season begins in May and lasts until the end of November.


Las Cruces is located in the southeast corner of Costa Rica, near the city of San

Vito, head of the Coto Brus County. San Vito was settled in the 1950's by Italian immigrants when the main road connecting San Vito to San Isidro del General to the north and Ciudad Neily to the south, was little more than packed dirt. By comparison, today it is a bustling town with two 24-hour service stations, three supermarkets, two bakeries, a café, a famous pizzeria and the Dante Alighieri Italian-Costa Rican Community Center.

We invite you and your family and friends to join us for an afternoon, an overnight or a week to see and experience firsthand the splendid tropical diversity of The Wilson Botanical Garden.

For more information please visit the OTS website at www.ots.ac.cr or contact us directly by email: lcruces@ots.ac.cr, regular mail: Jardín Botánico Wilson, Apdo. 73-8257, San Vito de Coto Brus, Costa Rica, or by telephone (from the U.S.): 011 (506) 773 4004.

Reservations can also be made by contacting OTS San José office by email: nat-hist@ots.ac.cr, regular mail: ESINTRO/OTS, Apdo. 676-2050, San Pedro de Montes de Oca, Costa Rica, or by telephone (from the U.S.): 011 506 524 0628.

The North American office of OTS is located at Duke University, telephone: (919) 684 5774 or email: nao@duke.edu 

The Organization for Tropical Studies is a nonprofit consortium of universities and research institutions in the U.S., Costa Rica, Peru, Mexico, South Africa, and Australia.

Founded in 1963, OTS is dedicated to providing leadership in education, research and the responsible use of natural resources in the tropics. To this end, OTS offers graduate, undergraduate and professional education, facilitates research, participates in conservation activities, conducts environmental education programs and maintains three field stations in Costa Rica: La Selva Biological Station in the Atlantic lowland rain forest; Palo Verde Biological Station in the Pacific deciduous dry forest; and Las Cruces Biological Station in the premontane cloud forest near the Panamanian border.

3

**Campaign to Honor an
Extraordinary Man**

4

What's New at Las Cruces?

6

From the Station

7

**Botany in the
Central Market**

8

Research Corner

Are Pesticides Affecting the
Survival of Forest Birds
at Las Cruces?

Aluminum in the Soil: Poisonous
for Some, Used as a Defense by
Others

Odonates Observed During
the "Little Wet Season"
(Part One)

11

Flora and Fauna
Palms are Big

How do Biologists Collect Data
From the Field?

14

**Celebrating the 10th
Anniversary of the
Las Cruces Library**

15

Our Donors

Editorial Committee: Alison Olivieri,
Silvia Pérez, Rodolfo Quirós and
Emilce Ramírez

Design: Laura Murillo.

Front cover: The Wilson Botanical Garden
shrouded in mist.

ANNOUNCING: The Campaign to Honor an Extraordinary Man Luis Diego Gómez

With this issue of the *Amigos Newsletter*, we present to you --our readers old and new-- a special request:

**Please join with us to celebrate
the career of Luis Diego Gómez
at the Organization for
Tropical Studies!**

We request the dual honors of your presence and your gift of a donation to pay tribute to don Luis -- a charismatic teacher, consummate scientist, talented administrator, devoted friend and incredibly gifted man.

Luis Diego's contributions to the sciences of botany and taxonomy are impressive beyond words. He played a formidable role at the Museo Nacional de Costa Rica as its director prior to joining the staff of OTS. For more than two decades, he has worked unceasingly within the scientific community of one of the most diverse and well-studied countries on earth. It's almost impossible to pick up a respected field identification guide of any group of Costa Rican animals or plants and not read right away acknowledgement of the author's gratitude for time, energy and help from Luis Diego Gómez.

Perhaps his most accessible and widely-read work is the first chapter of the seminal publication edited by Daniel H. Janzen, *Costa Rican Natural History*, entitled "Searchers on That Rich Coast: Costa Rican Field Biology, 1400-1980" (written with Jay Savage). His other contributions to this collection include "Marsh Fern", "Tree Ferns", "Parasitic Plants" and "Ferns" (with Warren H. Wagner). Certainly this fascinating and information-packed volume heads every "Must-Read" list for students



and travelers even today although it was first published more than 20 years ago!

By the time this article reaches you, we will have made a public announcement to kickoff the Campaign to honor Luis Diego Gómez at OTS' Board Meeting in San José, on the evening of November 2, 2005.

Our goal is to raise \$150,000 by July 2006 that will be added *in perpetuity* to the Las Cruces Endowment Fund as directed by our Honoree.

If we are successful in this endeavor, the Las Cruces Endowment Fund will be increased to nearly \$500,000 -- a respectable sum and one that will serve many purposes. In addition to providing untold number of students of all ages with the opportunity to study myriad aspects of tropical biology in a unique environment, the endowment will help protect our significant botanical collections housed and displayed to the public at the Wilson Garden.

Many people will work on creating events worthy of don Luis' stature in the scientific community here in Costa Rica, in the United States and abroad. Many others will strive to raise the necessary funds to reach the goal in the short time allotted.

In fact, a wonderful event to salute Luis

What's New at Las Cruces?


Rodolfo Quirós/Resident Biologist
rquiros@ots.ac.cr

Diego is in the works for next Spring at the Costa Rican Embassy in Washington, DC. Of course, our North American donors will be invited to attend alongside representatives from the OTS organization in Costa Rica.

We would enthusiastically welcome your efforts to help in both event planning and fund raising capacities. If you are willing to help us in any way, please contact Silvia Pérez at the OTS office in San Jose, CR, by email at: sperez@ots.ac.cr; by telephone (from the U.S.): 011 506 524 0628 or by regular mail: OET-Development, Apdo. 676-2050, San Pedro de Montes de Oca, Costa Rica OR contact Emilce Ramírez at Las Cruces by email at: emilce@ots.ac.cr; by telephone: 011 506 773 4004 or by regular mail: Jardín Botánico Wilson, Apdo. 73-8257, San Vito de Coto Brus, Costa Rica.

Straight from the pen of don Luis came these words -- quoted from the most recent issue of that *other* periodical published by OTS, the Liana: "Of course, my main and basically only love is Las Cruces....."

Please, let us join together to honor his high regard for Las Cruces and make this Campaign to Honor Luis Diego Gomez a huge and unforgettable success!

Please take the next few moments to fill out the enclosed Donation Card with as generous a gift as you possibly can, honoring don Luis Diego Gomez for all that he has accomplished and what his tenure at OTS has meant to so many people in the international science community and in the fellowship of natural history travelers. 

New Building Additions

Thanks to a generous donation from the Stanley Smith Fund for Horticulture and other sources, Las Cruces has been able to improve some facilities.

One of the shade-houses has been refurbished to accommodate tools and materials used by field workers. The building has enough space to store machinery and other tools for maintenance of the garden area, and a section has been isolated as a safe and dry storage area for organic products and planting soil.

As of August 1st 2005, a new building was started to house materials and equipment needed for building maintenance. It is a cement and metal structure with lots of natural light and ventilation. It has enough storage space for the large machinery used to cut metal and wood and to keep all kinds of other materials.

Eventually, we will demolish the old storage building, dating from the early years of the garden, to make extra parking space at a convenient distance from the cabins.

Spiders found

In a previous newsletter (Amigos No. 62, November 2004), we reported the discovery of a new species of spider by our friend Carlos Viquez, curator of arachnids at the National Institute for Biodiversity (INBio). At that time, he only found and described female individuals. A species' description has to include details of both sexes to be

accurate. Nonetheless, we have countless examples of taxonomical descriptions of animal species based only on individuals of one sex because the others have not been found. This is valid but not correct because the species' description remains incomplete.

Carlos visited the Station several times again after his first encounter to see if some type of seasonality was involved. He found more females but no males in all his attempts. He wanted to publish a complete description of the species but did not have all the material needed.

Last July, Carlos decided to make another trip to Las Cruces to search for the elusive male. This time he came accompanied by two other researchers: Luis F. de Armas and Randall Gutiérrez. After searching most of one day and part of the night, they finally found one male! A look of great satisfaction was evident on Carlos' face when he displayed the individual in a small container. Now he has the material needed to complete his description of the species.

The July visit was very productive. Among other things collected, they were very happy about an interesting finding: an individual of the Order Schizomida (one of the orders of arachnids). Luis de Armas



From left to right: Carlos Viquez, Luis de Armas and Randall Gutiérrez



New spider species found at Las Cruces

said “this is a peculiar individual and it may even be a new species in this order”. Arachnids are included in a large Class – Class Arachnida— containing eleven orders: Araneae (spiders), Acari (mites), Scorpiones (scorpions), Palpigradi (palpigrades), Uropygi (whip scorpions), Schizomida (schyzomids), Pseudoscorpiones (pseudoscorpions), Solifugae (windscorpions), Amblypygi (tailless whip scorpions), Ricinulei (ricinuleids) and Opiliones (harvestmen) (Figure 1). **A**

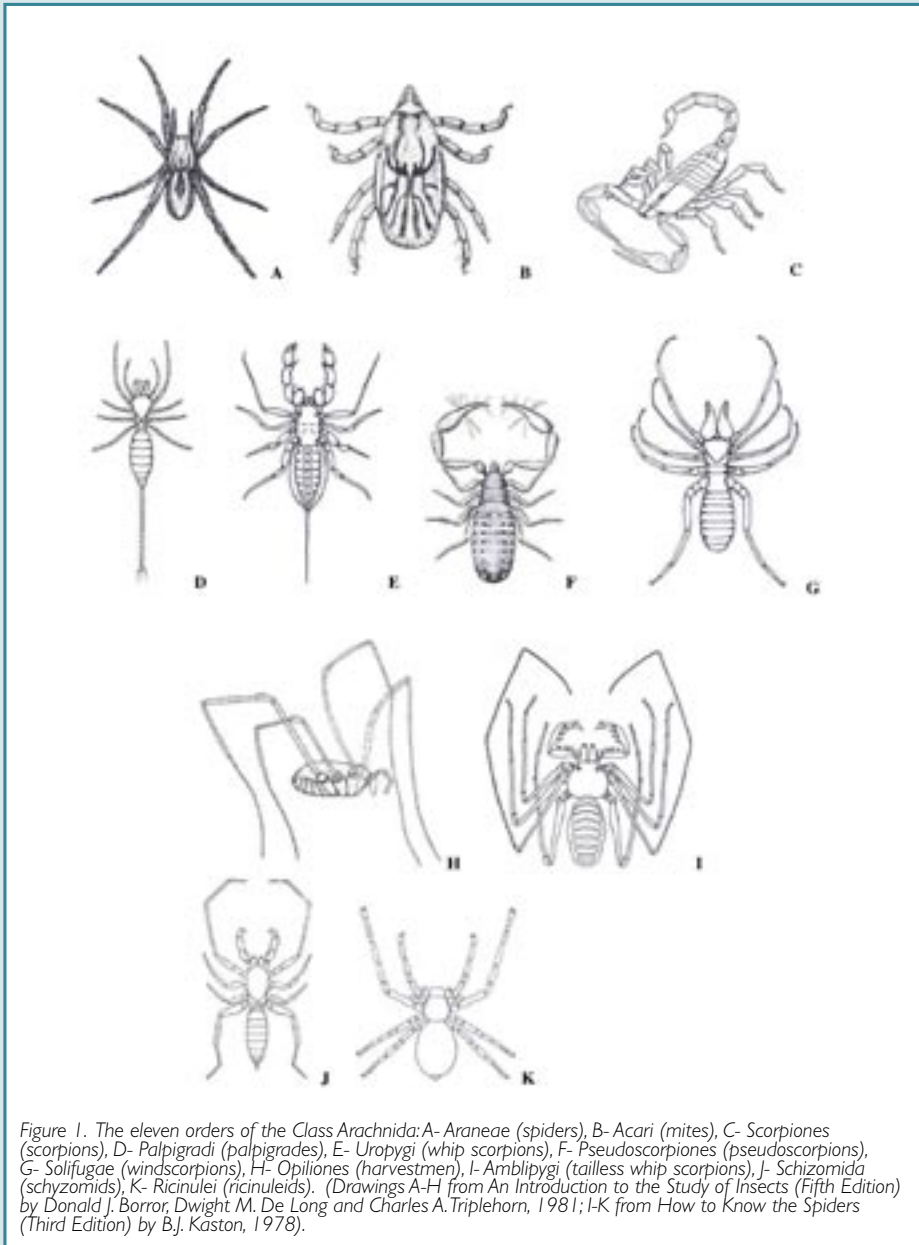


Figure 1. The eleven orders of the Class Arachnida: A- Araneae (spiders), B- Acari (mites), C- Scorpiones (scorpions), D- Palpigradi (palpigrades), E- Uropygi (whip scorpions), F- Pseudoscorpiones (pseudoscorpions), G- Solifugae (windscorpions), H- Opiliones (harvestmen), I- Amblypygi (tailless whip scorpions), J- Schizomida (schyzomids), K- Ricinulei (ricinuleids). (Drawings A-H from *An Introduction to the Study of Insects (Fifth Edition)* by Donald J. Borror, Dwight M. De Long and Charles A. Triplehorn, 1981; I-K from *How to Know the Spiders (Third Edition)* by B.J. Kaston, 1978).

A WORD ON SCIENTIFIC NAMES

In the accompanying article we included names of the eleven orders of the Class Arachnida. These names may sound strange and far from understanding to some of you. The following list provides some explanation, found in the book *An Introduction to the Study of Insects* (5th Ed.) by Donald J. Borror, Dwight M. De Long and Charles A. Triplehorn, 1981.

Arachnida: from the Greek, meaning a spider

Araneae: from the Latin, meaning a spider

Acari: from the Greek, meaning a mite

Scorpiones: from the Latin, meaning a scorpion

Palpigradi: *palpi*, palp or feeler; *gradi*, walk (referring to the leg-like character of the pedipalps)

Uropygi: *uro*, tail; *pygi*, rump (referring to the whiplike tail)

Pseudoscorpiones: *pseudo*, false; *scorpiones*, scorpion

Solifugae: *sol*, sun; *fugae*, flee (referring to the nocturnal habits of these animals)

Opiliones: from the Latin, meaning a shepherd

Amblypygi: *ambly*, blunt; *pygi*, rump

Schizomida: *schizo*, split (referring to the transverse suture on the prosoma)

Ricinulei: *Ricin*, a kind of mite or tick; *ulei*, small (a diminutive suffix)

A Geographical Information System (GIS) Laboratory at Las Cruces



Image of the Coto Brus and Limon River Bassins generated by the GIS lab at the station (image by Guillermo Durán and José Antonio Guzmán).

By Guillermo Durán and José Antonio Guzmán
gduran@ots.ac.cr


In 1977, Paul Rich, from the University of Kansas, made the first steps on the compilation of geographical information for the GIS laboratory of Las Cruces. His work gave as a result a total of 30 layers of information for Coto Brus and surrounding areas. It was not sooner than the year 2000 that a computer and specialized software for this GIS were acquired.

Due to the growing interest of OTS to build up a data base for the study of the hydrologic watersheds for each one of its field stations, the equipment and software have been upgraded, and as of last June we have a specialized technician to be in charge of the geographical information systems.

Since then, the amount of geographical information has been doubled, and the data base now includes data on hydrology, soils,

social issues, infrastructure, topography, aerial photographs and satellite images (Figure 1).

The objective of this laboratory is to broaden up this data base on a regional level, focusing on the watersheds of the Coto Brus, Limon and Coto Colorado Rivers; and aiming for it to be useful for the researchers based at the Station, as well as local governments and public institutions such as the Ministry of the Environment and Energy (MINAE), Ministry of Agriculture (MAG) and the Costa Rican Institute of the Coffee (ICAFFE). This information will help in the decision making and in the implementation of future research projects.

The data will be available to interested parties through the laboratory at the Station, and we hope in the near future the information will be available in a map server, accessible through the Internet. 

From the Station



Zak Zahawi, incoming Director

The New Director of Las Cruces

It is with great satisfaction that I take this opportunity to announce to you, AMIGOS, that Las Cruces already has a new director:

Zak Zahawi, is a tropical restoration ecologist that has been faculty of OTS' Undergraduate Studies Abroad Program, USAP for the last few years. He was selected from an impressive list of candidates to take over the position at the end of this Fall Semester where he is already teaching.

Zak is very well liked by everyone in OTS. Personable, and with an excellent sense of humor, he has a very clear idea, which I fully share with him, that the future of Las Cruces as a research site lies within the various approaches of Conservation Biology such as landscape restoration and forest fragmentation. He currently has an NSF funded project on reforestation in the Coto Brus area and within a few months from taking this position he already knows many of the locals and is familiar with the general layout of the County of Coto Brus.

I hope that with the support of all our AMIGOS, he will bring the Station and the Wilson Gardens to unsuspected heights and achievements, and as third in the succession of the throne, becomes a long-term resident of Paradise.

YOURS, **LUIS D. GÓMEZ**

Botany in the Central Market:

You can have your back rubbed and eat the rubber, too!

By Luis Diego Gómez / gomezp@ots.ac.cr

Every now and then I have a craving for lobster, cooked in some new Afro-Caribbean fashion, and eat it next to the reef where it was caught. So, once again, I took myself to Cahuita and placed my yearning at the mercy of my good friend and super chef, Miss Edith.

However, on the way to Cahuita one has to go through Port Limón (common usage is Limön, but Port Limón is how it is called in limonense creole) where I simply have to spend a few hours inspecting the stalls, their produce and the vendors.

This time I found an unusual vegetable which I immediately identified as a member of the Squash family or Cucurbitaceae. It was about 12 inches long by 2 inches in girth, smooth-skinned, pale chartreuse green. The vendor, whose name is Victor, was also its grower and was delighted to share with me some information on the unusual marrow. He said its name was *picuá* (pea-kuAH, a name I suspect to be a corruption of the Chinese, given him by one of the many Asian local residents) and it's eaten in hashes.

It grows from a creeping and climbing vine, its leaves have pointed

lobes and its flowers are bright Cadmium yellow. When the fruit is left on the vine to mature completely and then dry, its meaty contents disappear leaving inside a thick mesh of hardened fibers and, if shaken, one can hear the black seeds rattle inside. Have you guessed? No? Well, my friends, it is none other than *Luffa cylindrica*, the loofah hanging on your bathroom wall next to the shampoos and



gels and whatnots of modern cosmetology.

Now, loofahs have some rather esoteric uses. Did you know they are used in special oil-trapping filters to clean recycled water steamboats have to use in their boilers? Did you know that chopped up loofahs are used as fillers for pillows? (Who in their right senses would use such a pillow is beyond me.) Loofahs may be the cushioning inner sole of your slippers, too. But, would you eat your loofah?

I guess you would if you found it very young and tender at your greengrocer's. I knew it was a table vegetable in Asian countries. In China it is called *sooly-kua*, *shui-kua* (water gourd, smooth gourd), *sze kua* (silk gourd). In India, its probable area of origin, it goes as *ghia*, *jhinga*, *jhinga-toroee*, *hireballi*, *peerkankai* and H. Drury, in his *Useful Plants of India*, published in Madras in 1858, says that it is much used in curries and chutneys. In Sri Lanka it has the names *veta kola*, *dara vetakola*, and it is used in the same way while in Malaysia it is known as *ketola sagi* and

it is an important ingredient in many of their stir fries. Oliver, in his *Flora of Tropical Africa* (London, 1868) indicates that our loofah is the *papengaye* of the African Blacks. However, a perusal of Neuwinger's *Afrikanische Arzneipflanzen und Jagdgifte* (African Drug and Poison Plants, 1996) reveals 110 ethnic names as it is obviously a plant of high cultural significance. There, as in Austr-



lia, it has been used as an arrow and as a fishing poison. The ground seeds are commonly used as an anti-helminthic to kill intestinal worms.

Like most cucurbits, loofah may contain varying amounts of toxic substances easily removed by blanching or parboiling -- if you discard the water -- as I did with my three *picuás*: with French vinaigrette I found it bland; cooked as per don Victor's instruction with Costa Rican condiments (cumin, onion, garlic and minced beef), it was a little tastier, however, with pork marinated in sake, star anise and Maharajah curry from Madras, it was simply entheogenic!

Oh yes, the lobster was also hallucinatory, cooked in a ginger/coconut milk/curry and served with bread fruit boiled in a seafood *rondon* (creole for "run down", a broth made with meat, turtle or fish). Miss Edith, huge from any angle you look at her, cruising her kitchen like the QE II and who never tells me what is in them until I have had my piece of tail, as it were, and declared them paradisiacal, gave me one of her warm, wide, super bright smiles. Someone ought to collect her recipes. Humm... **A**

Research Corner

Are Pesticides Affecting The Survival Of Forest Birds At Las Cruces?

Viviana Ruiz / Department of Ecology and Evolutionary Biology,
Cornell University / vr45@cornell.edu

More and more coffee shops around the world are offering organic “bird friendly” coffee as an alternative to the more pesticide-intensive conventional coffee. How is non-organic coffee habitat affecting the survival of forest birds? Are there other factors that play a larger role in their survival? How well are birds surviving in areas dominated by agricultural habitats?

My research at Las Cruces focuses on the influences of agricultural land uses on the survival of forest-dependent birds. My advisor,



Figure 1. Cherrie's Tanager, captured with numerous puss-filled bumps throughout the body.



Figure 2. Lesser Elaenia (Flycatcher), captured missing most feathers from the face, and with liquid in its lungs.

Thomas Gavin, has been working at Las Cruces since 1993, monitoring over 12,000 birds in the Las Cruces forest as well as in some of the surrounding forest fragments. We have estimated survival parameters for a number of forest bird species in forest fragments of various sizes, with some estimates spanning more than a decade. We are now looking at how the different types of coffee and pasture that surround these fragments influence the survival of the forest-dependent birds living in the fragments.

During June and July of 2004, 1,675 birds were captured in forest, coffee, and pasture habitats in the Las Cruces area. To our surprise, an estimated 4% of all captures showed deformities or signs of disease and parasitism, representing a total of 18 species. Of these, 8 (44%) were species of birds known to rely both on forest and agricultural habitats; the remaining 10 (66%) were species known to use mainly agricultural habitats. We began to consider the fact that heavy pesticide use in this region might be an important factor influencing the survival of our study species. Are these levels of disease, parasitism, and abnormalities directly related to specific pesticides used in the region?

The potential effects of pesticides on wildlife populations, as well as diversity and abundance of species, have been an issue of concern since the 1970s. The effects of pesticides on populations are usually only recorded during massive die-offs or poisoning events. Therefore, studies focusing on potential effects of pesticide use on long-term survival of populations are lacking. Previous studies are also restricted to temperate habitats, ignoring tropical agricultural areas in developing countries where pesticide use and consumption is rarely regulated.

The effects of pesticides on populations may vary, depending on the species. Birds have

often been targeted as indicators of ecosystem health, and have been the subject of most of the work on pesticides thus far. Pesticides have been shown to weaken birds by bioaccumulation, possibly making them more susceptible to parasites, disease, or other illnesses. Therefore, pesticides might be an important source of mortality in populations, reducing survival.

Costa Rica uses around 19,000 kg of pesticides per hectare of cropland each year. There are at least six known detrimental pesticides used in the Las Cruces region. During the 2004 field season, four captured individuals of different species showed high deformities and poor health conditions, and died shortly after being captured. Two of the species, Cherrie's Tanager and Lesser Elaenia, mainly insectivorous species, were captured in a large tract of primary forest (Figs. 1 and 2). Upon closer examination of the study area, several tomato farms were found in the vicinity of the forest patch. The pesticides from these tomato farms can be smelled from the roads as you drive around the area. These birds are being stored at the Pesticide Residue and Analysis Lab at the Regional Institute of Toxic Substances (IRET) of the National University of Costa Rica. Before the end of this year, we will assay tissue samples from the four dead birds for the six pesticides used in the Coto Brus region.

To assess pesticide levels in seemingly healthy birds in comparison to the levels found in the four sick individuals from the 2004 field season, six blood samples were taken randomly from seemingly healthy birds during June 2005. Three samples were taken from coffee plantations, and three from tomato plantations. They will also be analyzed at IRET.

This component of my project promises to provide crucial baseline data that can be used to monitor pesticide levels in both resident and migratory birds that use agricultural habitats. This project also has the potential to provide information on sources of mortality and reduced survival for tropical and temperate birds worldwide. **A**

Aluminum In The Soil: Poisonous For Some, Used As A Defense By Others?

Kristin C. Young / University of California at Irvine
youngkc@uci.edu

Las Cruces Biological Station has become a very special place to me during the past two years. I first came to Las Cruces as a tourist to the Wilson Botanical Garden. I was of course impressed by the extensive collection of plant species, but also by the amount of wildlife I saw during this first visit. I returned several months later as a student with the Tropical Biology course run by OTS. During this course, Rodolfo Quiros introduced us all to the Melissa's Forest Restoration Project. It was then that I knew I needed to return to Las Cruces.

I am a Ph.D. student studying tropical restoration at the University of California, Irvine. My main research focuses upon uncovering methods of facilitating the successional process in severely degraded ecosystems. I am interested in using species of trees that can ameliorate the soil and microclimate to enhance growth of neighboring tree species. For example, I am planting nitrogen-fixing legumes in areas of nitrogen-depleted soil. Through a symbiosis with nitrogen-fixing bacteria, these legumes will add nitrogen to the soil, thus stimulating growth of neighboring trees. We have shown that this can indeed facilitate the growth of non-leguminous neighboring trees.

Another potential facilitator is the "mayo" tree. It belongs to the genus *Vochysia* (Vochysiaceae). Mayo trees have been shown to pull aluminum (Al) out of the soil in high quantities and sequester it in their leaves. This is significant in tropical ecosystems as the soils are characteristically acidic and, thus, have high levels of aluminum as part of the soil solution. This form of Al is toxic to plant roots and can severely limit root elongation and plant growth. Furthermore, aluminum is tightly bound to phosphorus (P), an essential plant nutrient in the soil. We believe that when *Vochysia* takes the aluminum from the soil and sequesters

it in aboveground tissues, the phosphorus is freed and may be more available in the soil. The ability to hyper-accumulate aluminum and concomitantly increase available soil phosphorus is a potential undescribed mechanism of facilitation by *Vochysia*.

Through an OTS post-course grant, I was able to return to the Melissa Restoration plots at Las Cruces in order to examine aluminum hyper-accumulation in *Vochysia* spp. I sampled fresh leaves of mayo blanco (*Vochysia guatemalensis*), mayo colorado (*Vochysia ferruginea*) and guaba (*Inga* sp.), a non-Al-accumulator. The leaves of both *Vochysia* species had approximately two orders of magnitude more aluminum than the leaves of *Inga* sp. (figure 1). With this knowledge I was able to initiate a large-scale experiment near Las Cruces to test the facilitative properties of *Vochysia*.

Many plants adapted to tropical soils possess mechanisms to resist aluminum toxicity, but these mechanisms require a significant energy investment. Thus, when we plant *Vochysia* trees as neighbors to non-Al-accumulators, it is possible that the *Vochysia* trees may draw down the pool of toxic Al in the rhizosphere (the area around the root system), thereby requiring less of an investment

in Al resistance in non-accumulating neighbors. If we see that growth of neighbors is enhanced in the presence of *Vochysia* trees, we may be able to demonstrate facilitative properties of *Vochysia*. We have planted several treatments in order to elucidate the mechanisms of facilitation.

Currently, I am interested in determining the adaptive significance of aluminum hyper-accumulation in *Vochysia*. From personal observation, I have noticed that levels of herbivory on the mayo leaves are consistently low in nature. I hypothesize that aluminum hyper-accumulation in the mayo leaves serves as a defense against herbivores.

I am starting an experiment to test this Defense Hypothesis. By increasing soil pH, one can decrease the levels of toxic aluminum in the soil. Thus, I will transplant very small mayo trees into pots with one of three soil treatments: low pH/high Al; moderate pH/moderate Al; higher pH/low Al. This will allow me to manipulate aluminum concentrations in the leaves of mayo seedlings. After one year of growth in the treated soils, I will expose the seedlings to herbivores. If the Defense Hypothesis is supported, seedlings with the highest levels of Al will suffer the least amount of herbivore damage; seedlings

with the least amount of Al will suffer the most damage, and the intermediate treatment will have intermediate herbivore damage. This will provide insight as to what the advantage of hyper-accumulating a typically toxic metal may be!

I am incredibly grateful to have the opportunity to conduct research at Las Cruces. I have had a wonderful experience this summer and can't wait to return! It is rare that you have the opportunity to meet so many interesting, intelligent, and friendly people from all walks of life. It has truly been a pleasure to be at Las Cruces this summer. **A**

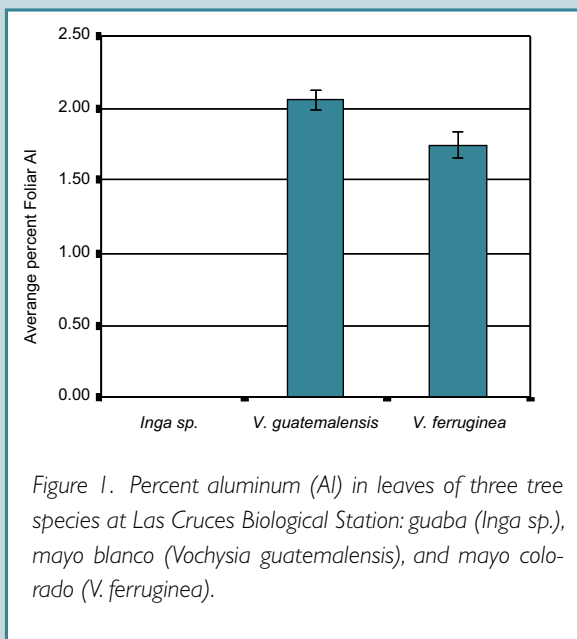


Figure 1. Percent aluminum (Al) in leaves of three tree species at Las Cruces Biological Station: guaba (*Inga* sp.), mayo blanco (*Vochysia guatemalensis*), and mayo colorado (*V. ferruginea*).

Odonates Observed During the “Little Wet Season”

(Part One)

Fred Sibley / fcsibley@empacc.net

On a previous visit to Las Cruces (reported in the Amigos Newsletter, May 2003), the November wet season lived up to its name. Our quarry, odonates (also known as dragonflies and damselflies), don't like even cloudy conditions and we had so much rain, that trip was not a good introduction to the fabulous tropical diversity that should be here.

A return visit during the dry season – January, to be exact – was suggested, the perfect solution for odonates, the flying jewels with two sets of wings and 10 segmented abdomens! We found the people as welcoming as before, the food as wonderful, warm and lush tropical vegetation enchanting and the rain was still here, too! Is “dry season” just another name for the other wet season? We drove into San Vito in a welcoming cloud burst but quickly settled into the cottage at Finca Cántaros where the pond, under a thick, gray, cloudy sky, was devoid of skimming jewels.

But even in the unofficial wet season, there are occasional glimpses of sun; just the slightest peek and a lovesick male dragonfly will race to the pond, stream or muddy marsh to await the arrival of his lover. Most odonates do their foraging and resting away from water and only return to their juvenile haunts to mate and lay eggs. Thus, each lightening of the skies produces some movement from the treetops, bushes and fields, toward the nurseries. The frustrated odonatologist can sit for hours waiting for the totally clear blue sky that will cause droves of fluttering dragons to descend on a pond. Making the problem worse are the gorgeous sunrises and blue, unblemished skies at dawn. There are always a few individuals of a few tolerant dragonfly species out before 10:00 a.m. (or even as early as 7:00 a.m. -

- and some species specialize in being active at dawn and dusk), but most of the activity is between 10:00 a.m. and 3:00 p.m.

with 11:00-1:00 being prime hours. When do the clouds cover the sun? See previous sentences!

Enough complaining. Thinking of being a dragonfly watcher? Bird watchers love to add up their list and run up Big Day totals. How does dragonfly watching compare? Travelers to the San Vito area often include a visit to the nearby Boruca Indians. A beautiful, clear stream runs through their village and an hour of searching turned up 12 species, including three not found in San Vito (one was a blue damselfly, metallic copper on thorax, with bright red eyes, *Argia oenea*).



After Fred Sibley retired from a distinguished career as an ornithologist at Yale University's Peabody Museum of Natural History, he and his wife Peggy decided to study dragonflies and damselflies all over the world. Along with the work reported on here, they research upstate New York (where they live) and have recently been to Africa, the British Virgin Islands, Nicaragua, and spent part of the summer of 2005 in chasing odonates in Nebraska.

Los Chocuacos, a boat-billed heron colony on a large, clean pond is a recent addition to the must-see list. It's off the road from Paso Real and offered the added bonus of a decent lunch of fresh tilapia. We found 18 species there, including four not in San Vito. This time the prize was a bright red “stretch” damselfly about the thickness of pencil lead, *Heteragrion erythrogastrum*.

With two other sites outside San Vito, the trip list came to 61, including one still unidentified and another new species still has not been described since being discovered in 1967.

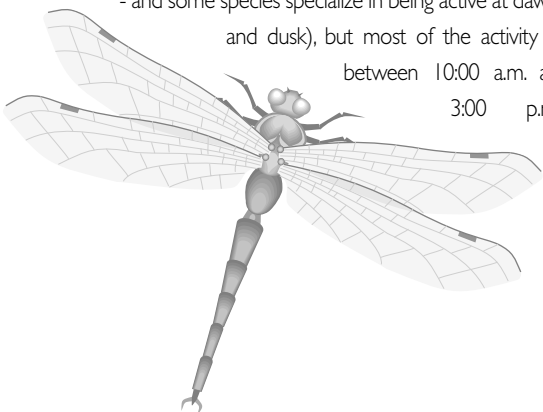
One of the common blue damselflies in backyard ponds near our home in New York State, *Enallagma civile*, was also on the Cántaros pond. Back home the temperature was -10 °F and the pond was under six inches of ice and a foot of snow, so this gringo is not serious when he complains about the January rains.

We had some visual surprises on this trip. On the property next to the Wilson Garden, Pino Collina, a forest stream contained a large and very distinctive damselfly, *Cora semiopacue*. It has large black wingtips and a faint iridescent blue on the wing closer to the body. When its wings are open the blue is not noticeable but, when the dragonfly brings its two wings together, the color is reinforced and there is a flash of intense blue –the color of a morpho butterfly. As the bug flies, one's eyes fix on and

try to follow the black dots that are the wing tips. Then there is a flash of blue that locks your eyes on one spot; then the blue vanishes and the black dots (which you are no longer watching) are lost. As intended, the insect has escaped!

In the same area there was a similar-sized damselfly, *Cora notoxantha*, with a bright yellow thorax and last time here we found a third species, *Cora obscura*, with a bright blue thorax. However, all three -- clear wings, pigmented wings, blue, yellow or drab thorax -- appear to be the same species based on behavioral studies.

A number of ponds were visited in the San Vito area. This addiction to ponds started in New York State where my census covered 60 ponds four times a year. Although all were very similar in vegetation and construction, none were identical to any of the others and many were extremely different. The same is true, perhaps not surprisingly, for the San Vito ponds and seemingly San Vito streams as well (not enough sunlight to check enough streams). As mentioned in the previous article, Dennis Paulson came through San Vito in April 1967 and checked the airport, San Joaquin Wetlands, Finca Cántaros and the Wilson Botanical Garden. His findings were quite different from mine of November 2002 and now turn out to be different from the recent survey. It's not clear if this is primarily change over time or a seasonal difference. **A**



Flora and Fauna

Palms Are Big

Christie Jones / Curator of Palms and Cycads / Fairchild Tropical Botanic Garden / crispyjones@hotmail.com

Big, big, big. Palms are big – both at Wilson and all over the world. Most of our Amigos probably already know that the Wilson Garden has one of the largest collections of palms in the world. In terms of conservation, the collection is a bank of genetic information for use by scientists and researchers; it is a living library to students of tropical taxonomy; and, to the average visitor, the palms form the backbone of the garden's beauty and elegance. (Who doesn't marvel at those majestic *Pigafetta* palms that line the path to the look-out like proud soldiers when silhouetted against the sunset?)

Palms have a *big* family tree. Distinct from all other groups of plants, about 2600 species make up the family Arecaceae, also called Palmae. About 90 of those species are native to Costa Rica. Most people recognize palms easily, although they can sometimes be confused with cycads and cyclanths. The majority of members of this great plant family call the tropics and subtropics home. However, there are a handful of species which can withstand winter's

chill, such as the European *Chamaerops excelsa* found at about 44° north latitude.

Palms are big, literally. The Wax palms of the Andes (*Ceroxylon* spp.) are capable of growing to more than 60 meters (200 feet) tall! The Talipot palm (*Corypha umbraculifera*) is the queen of flowerers. Its candelabra-like inflorescence, the biggest among plants, can be up to 6 meters (20 feet) tall and carry an estimated 10 million flowers. The largest seed you'll ever find weighs in at around 20 kg (45 lbs) and belongs to the double coconut (*Lodoicea maldivica*). And the longest leaf on any plant grows on the Central African Raffia Palm (*Raphia regalis*). Individual leaves have been measured at over 25 meters (80 feet) long.

Palms are a *big* part of human economy and culture; two species are particularly famous. The coconut palm (*Cocos nucifera*) has been cultivated for thousands of years and is the most economically important species. Early on, the nuts were prized by travelers as an excellent source of food and drink which naturally come "prepackaged" so that they won't dry out or

leak. Virtually every part of the coconut palm is utilized in some form or other: water from the green fruit makes a refreshing drink (a favorite among Costa Ricans who call it *pipa de agua*), fiber can be made into mats or woven into rope, shells can be burnt and made into charcoal, sap of the inflorescence is made into sugar and alcoholic beverages, and the list goes on.

The Date Palm (*Phoenix dactylifera*) is a staple part of the diet of millions of people. Low in protein and fat but energy rich, dates (the fruit of the palm) can have as high as 60 percent sugar content. They are an ancient crop which originated in North Africa and have been in cultivation since about 4000 BC. Today dried dates are the principle export crop for many Middle Eastern countries.

So there you have it. Big family. Big in size. Big to human economy. And palms are important at the Wilson Garden (in a *big way*, of course). Your support of the Wilson Garden supports the conservation of this great family of plants. **A**



How do Biologists Collect Data

From the Field

Rodolfo Quirós / Resident Biologist / rquiros@ots.ac.cr

In one way or another, we are all scientists. This is true if we consider ourselves as people interested in learning about our natural surroundings. At Las Cruces, we have a general denomination for these kinds of people: Natural History Visitors. Usually, we go out to the Wilson Garden or the Rio Java Trail carrying at least a pair of binoculars, some magnifying glasses, a camera, identifying guides of all kinds, and minds eager to find out things and learn.

The scientists studying at Las Cruces are not much different from the above description --the main difference is the way they obtain information to generate knowledge.

Once the researchers arrive at the Station, they need to orient themselves. The Station includes a total of 266 hectares of protected land, plus a large area of influence. A good source of information for this is the resident biologist, who keeps track of all projects and knows the region

well. After this introduction, hands on to work!

But, how they do it? How do they gather their data? Here is an account of several methodologies I have seen researchers using to investigate nature:

Botanists carry hand and extension clippers to collect samples (one or more small pieces of a plant with flowers and or fruits). The sample is marked with a number and put into a plastic bag for later processing or it is pressed on the spot. "Pressing" the plant means that a "sandwich" is made with a newspaper above and below the plant with a pair of flat wooden boards bound tightly with a belt --this is

what is called a "plant press". Descriptive field notes need to be taken, describing the kind of plant, size, maturity, colors and smells of flowers, fruits, leaves, seeds, bark, etc.; location, general environment and any other data of interest.

We usually recognize the entomologists, people studying insects, because of their nets and killing jars. Nonetheless, they use many other devices depending on what they are studying. For example:

- Flight intercept traps -- a fine mesh suspended in the air over a long container filled with water and soap, or alcohol, in order to capture fallen insects.
- Pit-fall traps -- a small jar containing bait, usually some kind of excrement to attract dung beetles and other insects crawling on the ground.
- Berlesse funnels -- these are suspended in the laboratory and have a jar filled with alcohol with a sac on top. Leaf litter is placed under a light bulb and the insects and other arthropods tend to move to lower places where the temperature is cooler, thus falling into the funnel and jar.
- Malaise traps -- a fine mesh tent with a dark roof and a jar with alcohol on one of the upper corners; it is used to collect all sorts of insects that move up to a light source.
- Fluorescent light traps -- used to attract insects that are active at night.
- Natural and artificial baits -- used to attract butterflies and other insects that feed on fruits or are attracted by scents.
- Sticky traps -- used to collect insects living in specific areas or that fly across different environments.

Most of the reptiles and amphibians are captured by hand. But there is an ingenious way to trap snakes in order to study their populations and diversity. A long fence, one or two feet high, is located in a suitable place in the forest. At each end of it a funnel feeds into a cylinder. The snake finds the fence and follows it to enter the

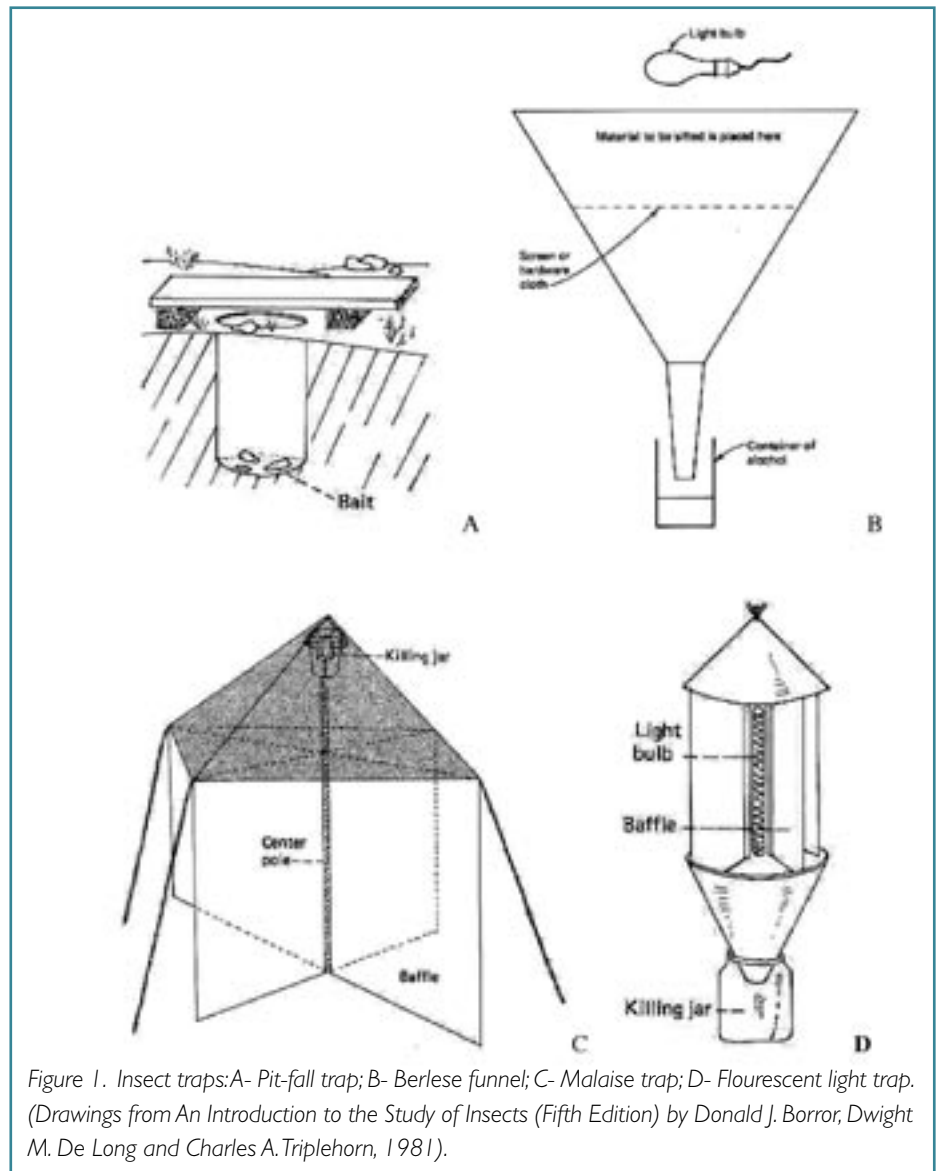


Figure 1. Insect traps: A- Pit-fall trap; B- Berlese funnel; C- Malaise trap; D- Fluorescent light trap. (Drawings from *An Introduction to the Study of Insects (Fifth Edition)* by Donald J. Borror, Dwight M. De Long and Charles A. Triplehorn, 1981).

wire cylinder. The next day the cylinders are checked, the snake is studied and later released, and the whole thing is moved elsewhere.

Mammalogists do not need to see their subjects to write accounts. When surveying an area these researchers use, besides the regular mammal traps, something else to "catch" the tracks of the animals not falling into their regular traps. At the base of some trees or at the edges of the trail, you may see a clean patch of about one foot square filled with a white powder, either flour or calcium carbonate. The mammals step into the powder and leave prints that are found in most mammal guides. Measuring tracks, researchers can tell whether the animal is a young one or an adult. Bats

can be captured with strategically located mist nets, opened at sunset. Feeding places for fruit eating bats can be located by searching the forest floor for small piles of fruit pieces or seeds.

Ornithologists learn bird calls for different species and establish areas for "point counts" where they both observe and hear the species of birds. To capture the birds, a mist net is required. A number of different data is taken: weight, age, lengths of various body parts, blood and feather samples to test for contents, such as parasites or chemical substances. Often times, bird studies require marking the animal. This is done with a very light metal or plastic ring appropriate to the width of the leg of each species. Other projects

require following the movements and activities of the birds over large areas. For this, a very small and light weight radio is placed on the back of the bird. A group of field assistants catches the signal of the radio with antennas and receptors.

Many times, studies require a measurement of diversity of organisms in an area. Terms like “transects”, “plots”, “point counts”, “grids” and others are associated with these studies. “Transects” are lines where you can count all the plants that a straight rope touches over a given distance. The transect can be converted into a long and thin “plot” by covering a given area on either side of the central line. Usually, these transects are 50 meters (ca. 150 feet) and 2 meters (6 feet) wide. A trail can be considered a transect when doing bird counts, following monkeys, or estimating how much food there is in the forest canopy for arboreal mammals. Plots can be larger and square or rectangular in shape and located in different places inside the forest at the edges or on any kind of field. “Grids” are used for smaller scale observations. For example, to study the area that lichens cover on the bark of the trees, a small grid of 10x10 centimeters drawn on a plastic sheet is appropriate; the sides of the square are divided every centimeter to create a grid of 100 centimeters. For larger organisms, larger grids of one to ten meters are needed.

For some studies it is also useful to take soil and water samples, locate a place with a GPS (Global Positioning System) unit, measure the area of the leaves, record sounds or behaviors, or set exclusion places by creating barriers such as greased branches (to exclude ants), covered flowers with thin cloth (to avoid pollinators), or fenced out plots. To study the fate of the pollen from a specific flower, a fluorescent powder is placed on the petals of the target flower. Pollinating insects get powder on their feet and deposit it on other flowers. You can follow this trail of pollen using a fluorescent light at night.

The work of field researchers – by daylight or at night – is full of activities! Often times it starts several hours before actually arriving at the field site and ends many hours after leaving it, for the work continues in the laboratory: putting data together and analyzing it. At Las Cruces you can see many researchers throughout the year. They have a smile in their faces -- even when tired -- because they are learning how this world revolves around each group of organisms they study. **A**

Continued from page 6

From the Station

A letter from the incoming Director

It is with great excitement that I take over the position as Director of Las Cruces and the Wilson Botanical Garden in January 2006. Of course it will not be an easy role to step into after 19 years of excellent leadership by Luis Diego Gomez, but I very much look forward to the opportunity.

I am a tropical restoration ecologist by training and have worked in Central America for over 12 years. For the last 2 years, I have co-taught the Duke-OTS Undergraduate Semester Abroad Program in Costa Rica. So I have likely seen, if not met, some of you on our many visits to Las Cruces. Of the 8 – 9 stations that we visit in the course, Las Cruces has always topped my list and I have always been eager to coordinate our visits to the station. Besides topping my list, the station has always been a top favorite for students, and I am committed to maintaining that level of satisfaction in the future.

In 2004, along with several collaborators, I initiated a long-term (> 20 years) research project in Coto Brus to examine forest recovery under different restoration treatments. The project is large and we now have fourteen 1-hectare sites scattered between Agua Buena and Las Cruces (including one replicate site at Melissa’s Meadow). But more on my research in another issue! Suffice to say that I already have roots in Coto Brus, and to be given the opportunity to direct the Las Cruces Biological Station and Wilson Garden is like being handed the missing piece of a large puzzle!

In my capacity as station director, I am keen to develop the station as a center for tropical restoration research. The landscape that surrounds the Las Cruces station, makes it ideally suited to such research. To facilitate this process, I plan on initiating an active land purchase program that will encourage restoration biologists to develop research projects at the station. A steady stream of researchers into Las Cruces would serve to not only bolster the station financially, but also help increase its scientific profile in an increasingly important field of study.

Last but by no means least, I will continue to manage the fantastic Wilson Botanical Garden home to over 5,000 species of plants. As a landscaper in a former life in Texas, I have a strong passion for gardening and an entire botanical garden is like a dream! However, given the size and scope of the garden I believe it is essential to hire a full-time horticulturalist to manage the grounds and develop a vision for its future. I will stop here and close by saying that I very much look forward to the opportunity to work in Las Cruces, and look forward to meeting and perhaps working with many of you in the near future.

All the best, **ZAK ZAHAWI** **A**

Celebrating the 10th Anniversary of the Las Cruces Library

New Location for the Technical Library of the Station

Last February, we started moving the library of the Station to a new place. When Luis Diego, our director, left the Station he suggested the library be moved to the building that originally was the director's house. So, pull out your Wilson Garden maps, locate the place ("Private – Residence"), and rename it "Library".

Most of you remember November of 1994, when a fire destroyed the "college" or Stanley Smith Building, the old building that originally housed everything related to academics and living quarters for staff and different kinds of visitors. After that sad moment, a reconstruction process began, giving place to the facilities that we have now and that you have enjoyed during your visits.

The new library is not larger than the previous one on the second floor of the Wilson House, but we have made better use of the space to distribute the books and journals that comprise the collection kindly donated by a large number of friends who believe in sharing the knowledge with other people (see our section on Book Donors).

The place has large windows to allow the natural light in for most of the day, and there is also a balcony overlooking the back of the Wilson Garden with a great view of the forest.

Because the building is somewhat distant from the others, the general environment is quieter. Furthermore, since it was built as a house, we enjoy the garden around it, inviting us all to visit, learn and enjoy a peaceful moment.

Book Donors

Our deepest ¡Gracias! to all our friends who have contributed to build up a library collection that is, by far, the largest in the Southern Region of Costa Rica. Your help and interest in sharing is an encouragement to maintain this place for many groups of students of all ages who want to learn about our natural world.

The following is a compilation of names of friends of the Station who have donated books and journals for the library during the last ten years. We apologize if we have not mentioned some of our donors; it may have happened that their names were not recorded at the time. Also, a number of anonymous friends have given their books as well; to all, then, our friendly thanks

George Alex Alcock ■ Preston Aldrich ■ John Atwood ■ Michael Balick ■ David Barrington ■ Friedrich G. Barth ■ Fred Berry ■ Jodi Bondy ■ William C. Burger ■ Pete Carmichael ■ Charles Cipolla ■ John Craig ■ Charles Collins ■ Jerry & Janet Connolly ■ Jorge Cortés ■ Gretchen Daily ■ Elina Degani ■ Greg & Mary Beth Dimijian ■ Betsy Dexter Dyer ■ Donald Eckelberry ■ Paul & Anne Ehrlich ■ Anthony & Don Ellison ■ Mr. & Mrs. David Emory ■ Mary Endress ■ Michael & Patricia Fogden ■ Elizabeth M. Frieders ■ Mary Nahon Galguri ■ Fay Geary Cooke ■ Julie Gibson ■ Luis Diego Gómez ■ Dick Goodwin ■ James Hamrick ■ Gary Hartshorn ■ Elva Heinz ■ Gail Hewson ■

Henry Hespenheide ■ Walter Hodge ■ Thomas Hoffmann ■ Charles Hubbuch ■ Christie Jones ■ John Kress ■ Mark Larson ■ David & Evelyn Lennette ■ Karen Lips ■ Bette Loiseau ■ Carl Luer ■ Luis Mata-García ■ Robin Moran ■ Linda Oestry ■ Michael & Alison Olivieri ■ Robert T. Orr ■ Charles M. Peters ■ Linda Prince ■ Rodolfo Quirós ■ Emilce Ramírez ■ DeeAnn Reeder ■ Carl Rettenmeyer ■ Mick P. Richardson ■ Marco Rojas ■ Jay M. Savage ■ Rudi Schmidt ■ Cagan Sekercioglu ■ James Solomon ■ Richard Stoltenberg ■ Donald E. Stone ■ Frances Studnicka ■ Sandra & Jerry Taylor ■ P.B. Tomlinson ■ Carlos Viquez ■ Arthur Welden ■ David A. West ■ Don Wilson ■ Mildred E. Mathias Estate ■ American Botanical Council ■ The Bromeliad Society ■ California Academy of Sciences ■ Fairchild Tropical Garden ■ Longwood Gardens ■ Marie Selby Gardens ■ Ministerio del Ambiente y Energía (MINAEC), Coto Brus Regional Office ■ Missouri Botanical Garden ■ Museo Nacional de Costa Rica ■ National Tropical Botanical Garden ■ The New York Botanical Garden ■ The Palm Society, Florida Chapter ■ The Standley Smith Horticultural Trust ■ Timber Press ■ Tropical Medicine Course ■ The University of Chicago Press

If you are interested in learning how you can contribute to improve our collection of books and journals, ask Rodolfo Quiros (Las Cruces assistant to the librarian) at rquiros@ots.ac.cr

It is all in the Spirit of Helping

Moving the library from one building to another has been a large endeavor. It involved a total of 16 people, and many hours of work. It all started by refurbishing the new location, adapting it for the needs of a controlled environment and better management of the space. Then the books and journals had to be removed from old shelves to be able to reuse the timber to make larger shelves to




fit in a different place. The major challenge was to move the books and journals to the new building in such an orderly way so that we did not make a mess! We spent a lot of time boxing books and tying journals together, and, like ants, we carried those boxes down the steps of the Wilson House, into a truck, down the driveway and into the shelves of the new location.

All the personnel of the Station as well as some local volunteers were involved in this project. We want to express our deepest thanks to all of them for moving such a valuable collection, by mentioning their names, and saying without your great help we could have not done it!

Juan Manuel Alfaro ■ Uriel Atencio ■ Yahaira Castro ■ Franklin Cortés ■ Andrea Hernández ■ Víctor Hugo Jiménez ■ Christie Jones ■ Corina Logan ■ Jesús Matarrita ■ Jose Mendoza ■ Christopher Montero ■ Terrie Moss ■ Alison Olivieri ■ Noemi Picado ■ Rodolfo Quirós ■ Emilce Ramírez

The Curious Librarian

- * The total number of books contained in the library to date is 1,225. They cover a wide variety of subjects. Almost all of the book titles are included in an electronic database to facilitate searching for and locating the books.
- * The oldest book in the library is one from 1925: A Laboratory Guide for a Course in General Botany, by Lee Donar, Richard M. Holman and Lucile Roush from the Department of Botany of the University of California.
- * The journal collection includes 200 titles and more than 2,500 issues.
- * The collection of theses includes a total of 65 works. Thirty eight are projects done at Las Cruces or its surrounding area of influence.
- * Due to the size of the journal collection, our library contributes a large number of scientific papers about the biology of Costa Rica to an electronic database developed by OTS and called BINABITROP, searchable all over the world at the following address: www.ots.ac.cr/en/rdms/binabitrop.html
- * The largest book in the collection is Exotica III, written by Alfred Byrd Graf in 1963. The book contains 1,830 pages and 12,025 illustrations. This is a "pictorial cyclopedia of exotic plants". It weights 6 kilos (ca. 12 pounds).
- * The biggest book is a volume of the Flora de la Real Expedición Botánica del Nuevo Reino de Granada, Tomo 44, published in 1957 as a joint effort between the governments of Spain and Colombia. The measurements of the book are 38 cm x 55 cm x 6 cm, and weights 6.5 kilos.
- * A similar book (36 x 47 x 6.5 cm, and 7 kilos) is a numbered copy of Orchidaceae, by P. Francis Hunt with the plates drawn by Mary A. Grierson, and published in 1973. This is copy number 170, subscribed by Robert Gardner Wilson. Only 600 copies of this book ever published. 

Our Donors

Our thanks, too, to all of you!!

Empleados, Jardín Botánico Wilson	Williamson, James & Linda
Matos, Jennifer A.	Caudill, Maureen & Phillip
Winther, John	Clement, Roland C.
Vander Pol, Vern	Romaine, William
Heck, Robert	Wagner, Lisa & Tim Spira
Wilson, Douglas & Linda	Stanberry, Charles D. & Helene Dublisky
Goodwin, Richard H.	Walker, Anne W. & Graham
Thoma, Allen & Diane Fong	Scott, Patricia J.
Reeves, Blake & Marilyn	Chacón, Alejandro
Rains, Bertha & Robert K.	Short, Lester L. & Jennifer Horne
Bell, Norton W.	Kinser, Samuel & Helene
Leopold, Carl & Lynn	Main, Betty J.
Lannert, Kent P.	Wallock, Mr. & Mrs. Joel A.
Knoble, Mary B.	Shapiru, Phyllis
Freund, Mathew & Blanche	Maher, Pamela A.
Benes, Elinor S.	Ehrlich, Robert & Marion
Jones, Christie	Hornor, Marilyn & Neil
Watkins, Peter J.	Rentz, David C.F.
Capek, William	

Our "Amigos" are a highly specialized group of generous donors who support our endeavors in many ways.

In this special year, 2005, we have new staff and volunteers with innovative ideas –large and small– to enrich each and every visitor's experience and to improve the condition and appearance of this unique place.

Right now, we ask for your financial contribution to our 2005 Annual Fund. Please use the enclosed donation form and self-addressed envelope to send your tax deductible, charitable gift to help us give the Wilson Garden/Las Cruces the attention it needs. Your support is appreciated more than you can imagine!

Please help us reach our \$50,000 goal by the end of this year.



Director Emeritus Luis Diego Gomez celebrating his career with Amigos and staff at the Wilson Botanical Garden. Left to right: Emilce Ramírez, Andrea Hernández with Sofía, Mariana Mora, Ana Herra, Luis Diego Gómez, Yorlenny Lara and Rodolfo Quirós.

Luis Diego with Garden Amigos George and Veneva Alcock



Estación Biológica
Las Cruces & Jardín
Botánico Wilson
Apdo 73-8257
San Vito, Coto Brus,
Costa Rica.