WHAT IT IS, WHAT WE DO

The Wilson Botanical Garden (a.k.a. JBW, Jardín Botánico Wilson) is part of the ***Las Cruces Biological Station*** (LC), located on the mid-elevation ridge of the Fila Zapote, 287 km south of Costa Rica's capital city of San José. A major attraction in the county of Coto Brus, Las Cruces is a center for public education, scientific training and natural history studies as well as for biological, agroecological, and botanical research.

Aroids, palms, ferns, bromeliads, heliconias and marantas are abundant on the 10 hectares (25 acres) of cultivated grounds. The total area including forest reserves of 266 ha (657 acres) is extremely rich in native plant life—approximately 2,000 species, of which 600 are woody genera. In the Garden area, planted among the native species, are exotic plants numbering 5,028 species. The palm collection alone numbers 700 species. Many plant species from around the tropical world, threatened with extinction, are maintained ***ex situ*** in lathhouses and on the grounds. The fauna is abundant with 322 bird species on the Las Cruces (LC) bird list, and numerous mammals, such as monkeys, sloths, armadillos, peccaries, weasels, kinkajous, and olingos, plus 37 species of bats identified to date. The LC Forest Reserve protects a wide variety of reptiles and amphibians, plus an astonishing fauna of moths and butterflies.

Las Cruces is one of three biological field stations in Costa Rica owned and operated by the Organization for Tropical Studies, a not-for-profit consortium of 56 universities and research institutions in the United States, Latin America and Australia. OTS was formed in 1963 to ***provide leadership in education, research and the responsible use of natural resources in the tropics.*** To this end, OTS offers intensive field courses for graduate and undergraduate students and professionals in the pure and applied areas of the natural sciences, facilitates research, conserves tropical forests and conducts environmental education programs. OTS also maintains two other field stations in Costa Rica: La Selva in the Atlantic lowlands (Sarapiquí) and Palo Verde in the Pacific northwest (Guanacaste).

Because of the rich collections and proximity to the Amistad Park, the Garden was declared by UNESCO part of the Amistad Biosphere Reserve in 1983. The Biosphere is a 472,000 ha area of parklands and buffer zones along the mountainous backbone of southern Costa Rica and western Panama. Important opportunities exist in the area of conservation biology and all branches of ecology.

The Garden is a very tranquil and beautiful place. Approximately eight km of trails wind through the gently sloped landscapes in cultivated areas, offering vistas of the Talamanca Mountains. Biologists particularly enjoy the primary forest on the west bank of the Río Java. The climate is cool at 1,100 m (3,630 ft); temperatures average in the 21-26° C range (70s° F) during the day and the 15-21° C range (60s° F) at night. Student accommodations are bunkrooms (with four or six beds per room) in the Wilson Hall, and biologists and natural history visitors have accommodations in private cabins. Guests enjoy simple, deicious food.

We invite you to come and share the tropical diversity of Las Cruces. For more information write:

Las Cruces/JBW, Apdo. 73-8257, San Vito, COSTA RICA.
Fax from US 011 506 773-3665; Tel. 011 506 773-4004; email <lcruces@hortus.ots.ac.cr>
WEB SITE: WWW.OTS.AC.CR

OTS North American Office: Box 90630, Durham, North Carolina 27708-0630, Tel. (919) 684-5774; Fax (919) 684-5661; email nao@duke.edu
WEBSITE: WWW.OTS.DUKE.EDU

FOR RESERVATIONS: (OTS San José office) FAX 011 506 240-6783; tel. 011 506 240-6696; <reservas@ots.ac.cr>; or write: OTS, Apdo. 676-2050, San Pedro de Montes de Oca, COSTA RICA

The Garden at Las Cruces was named for its founders, Robert and Catherine Wilson, now deceased. To their vision in 1961—to create a unique tropical garden—and their accomplishment, we dedicate ourselves.

AMIGOS NEWSLETTER

NO. 53 APRIL, 2000

KEYS AND NOTES BY LUIS DIEGO GOMEZ, DIRECTOR

What It Is, What We Do 1
Fourteen Years Before the Mast 2
***In memoriam*: Warren H. Wagner, Jr.** 3
LC Congratulates Paul and Anne Ehrlich 3
Greetings to Peter Crane 3
New Staff Member, Virginia Monge-Acuña 4
Gratitude for Library Gifts 4
Botany in the Central Market: "Tobacco" 4
LC Recommends 6

BIOLOGISTS AT WORK

Nesting Bird Communities in Forest and Coffee at Las Alturas by Catherine Lindell 6
White-colored Stickers by Julián Monge-N 8
The Future of Botanical Drugs by Varro E. Tyler 9

FROM THE COMMUNITY: LC, LOCAL, GLOBAL

A Sense of Place by Catherine Simpson-Bainbridge 12
Santa Comes to Las Cruces 14
The Convention on Biological Diversity: What Can You Do? A CBD Checklist for Public Gardens 14
LC Cuisine 15
Notes to LC 16
Thank You to Our Donors 16

Editor, *ex officio*, Luis Diego Gómez
Editor and Designer, Virginia Monge-Acuña
Cover drawing from 19th Century Gardeners' Chronicle

DIRECTOR'S KEYS AND NOTES

by Luis Diego Gómez
ldgomez@hortus.ots.ac.cr

Fourteen Years Before the Mast

One of the first books I read in English beyond the Run, Spot, Run literary style, was Richard Henry Dana's Two Years Before the Mast which my dear Father placed in my hands knowing how much I loved the sea, sailing and stories about them.

It was also the title of one of the early versions of the AMIGOS newsletter, which I composed, typed and mimeographed for distribution to a baker's dozen of readers. That issue was on the occasion of completing my first two years in residence at Las Cruces. Now I am back to square one, but our readership now is in the hundreds.

This new year, I shall count fourteen years before the mast, at the helm, on the riggings, in the galley and, why not say it, also dragged under the hull a couple of times. Much has happened in fourteen years. I have put in the grounds several hundred plantlets now very large; I have interred a good friend and teacher, Mr. Wilson, and many of my beloved furry pets. I also planted dreams and hopes of many kinds, some of which vanished while others still go strong or are just taking shape from nebulous starts.

The past decade has also been the most productive time of my life as a botanist and mycologist, having published a score of articles on new families of flowering plants, geographical extensions, monographic revisions of macro and microfungi, popularizing ethnobotanical topics, and teaching and lecturing to an ever growing number of audiences. From the remoteness of Las Cruces, I was immersed in the turmoil of the National Museum's crisis in the Department of Natural History that eventually gave origin to INBio, the National Institute of Biodiversity. It was also the period when one of my cherished dreams of yesteryear, the founding of a National Academy of Sciences of Costa Rica, came to fruition. Those are all nice memories that pale, however, with the marvelous things that science has wrought in the fields of molecular biology, genetic engineering, conservation biology, restoration ecology, not to mention momentous achievements in physics, space research and medicine.

What is this year 2000 bringing to us, the first of a century born surrounded by wonderful promises? Already at 6 billion inhabitants, we brag of the Eistein-Bose condensate while millions die of thirst and hunger. Drinking water will be lacking for two out of three people around 2030. We have catalogued many of the genes on the human chromosomes and yet, new viral diseases catch us by surprise. Even bacterial ailments that were thought of as under control or eradicated are coming back with vengeance. There is the threat of global warming that can change the patterns of crops and commodities that give the upper hand to the world's richest nations. With those atmospheric alterations of our making, hurricanes and storms are fiercer and more frequent. The 20th century, paradoxically, has been one of the most destructive for our planet.

What can we do, as institutions, as individuals, as humane entities to prevent this new century from being perhaps the last for the species? Because with all the technology at hand and forthcoming, humankind could forge miracles or catastrophes. Will we be able, at last, to coexist in a friendlier attitude toward the natural resources and, particularly, to that magnificent resource which is the human being whose mind is capable of reaching the stars, writing poetry, inventing new things? How shall we structure and direct our efforts to help nourish and develop the minds of the young citizens of the planet and instill in them the sense of sharing a single island in the space, our island,
our home on Earth? How can we convince all of the necessity for a shift in values away from

unnecessary material consumption?

How can botanical gardens and zoos, and museums, convey that message in such a way as to leave an indelible sense of solidarity with Mother Nature based on sound pillars of ethics and equity? How can the scientists in the field or their labs and think tanks go forth to heal the wounds of the ravages and pillage and warfare of the past hundred years? How do we go about making this new century, which expects everything from us, known as that of the ecology of hope?

In memoriam: Warren H. Wagner, Jr.

I was attending meetings in La Selva when the news reached me: Warren "Herb" Wagner had died on Saturday, January 8th.

One of the greatest American botanists of this century, Herb Wagner shaped the minds of a generation of pteridologists and systematists. His innovative "ground plan" approach to biosystematics of plants was the alternative for the later Hennigian cladistics. As a teacher he excelled, peppering his always well-documented lectures with a humor that was legendary. I witnessed a class on genetics with Herb in the garb of a monk (Mendel) and one on pollination with a silly and utterly funny pair of antennae that did not make him look like a bee but an alien leprechaun.

Our friendship goes back to the late '60s when surrounded by a cloud of thick smoke from his cigar, he walked in the company of Rafael Lucas Rodríguez --who wanted us to get acquainted-- into the classroom where I was teaching Plant Anatomy. After class he introduced himself, and I almost fainted in front of the great man. We took off into the field that very day and thus began two decades of close collaboration on the research of Costa Rican ferns, their natural history, taxonomy and genetic makeup, with Florence Wagner as part of the trio that early explored this fern-rich flora. Herb, also a superb lepidopterist and collector of rare minerals, was always a rich ore of knowledge for me and hosts of students.

I had the pleasure to spend some time with him during the 16th International Botanical Congress in St. Louis, when he and Florence promised to come to the Gardens in the year 2000. Herb, representing OTS and I representing the Wilsons, were members of the Las Cruces Botanical Garden Committee appointed to oversee the development of the nascent OTS involvement in Coto Brus in 1973. I now believe David Lellinger (from the Smithsonian) and I are the only extant members of that early steering group, one which Herb presided. I shall miss Herb and his exciting correspondence, always inspiring, joyful and scholarly. The international botanical community has suffered an irreparable loss. He is survived by Dr. Florence Wagner and their children Warren and Margaret, all from Ann Arbor, Michigan, and to whom Las Cruces Station sends heartfelt condolences.

-Luis Diego, January 2000

LC Congratulates Paul and Anne Ehrlich

On behalf of the staff and friends, The Las Cruces Biological Station and the Wilson Botanical Gardens are happy to congratulate Paul and Anne on the occasion of having received the 1999 Blue Planet Award, a prestigious prize from the Asahi Glass Foundation of Japan. Thank you so much for your significant and on-going research to maintain biodiversity in disturbed environments.

Greetings

The Wilson Botanical Gardens greets Dr. Peter Crane for his position as the new Director at Kew. Peter will be spearheading the Royal Botanic Gardens BIODIVERSITY 2000 initiative. Our best wishes!

New Staff Member

The Las Cruces Biological Station and Wilson Gardens welcome Ms. Virginia Monge who joined the staff on January 17th. Virginia is working on Public Relations, Visitor Services and Development. Virginia brings to Las Cruces twenty-two years of combined experience in business administration, education and translation and a love for people, nature and the arts. Because of her strong academic background and working experience, in addition to her musical talents, we are sure she will be an asset to Las Cruces. We are happy to have her and wish her the best.

Gratitude for Library Gifts

The library has been enriched by generous contributions from G. Hartshorn, Mr. and Mrs. Mark Larson, Jay Savage, Frances Studnicka and Arthur Welden. Many thanks for your help!

Botany in the Central Market
by Luis Diego Gómez

TOBACCO

Lance Leaved Petum, from l'Ecluse's HISTO MEDICINAL, Antwerp, 1579

Some of you may have noticed that the last issue of AMIGOS did not include this section. The writer was on a holiday or, rather, suffered from a severe case of writer's block.

Some of those who did notice, wrote me e-mails suggesting that *AMIGOS* not drop this favourite of theirs. Another fan asked why had I, of late, written so much about South American subjects and not about Costa Rican or Central American stuff, finishing with the question, "Are there no indigenous groups in Central America, anymore?"

Of course there are. In Central America, outside of Guatemala which has the largest populations of Amerindians, the native groups are very reduced and, with the exception perhaps of the Kuna of Panama, they are all losing their traditions and even their language, as in El Salvador, where the last person to have known the original "pipil" language died in 1997.

As with languages that incorporate words and usages from other idioms and thus get diluted, so do traditional crops and uses of plants and animals get forgotten or transculturalized being after all, commodities for trade. A market, even in Guatemala, would be loaded with produce of European origin and only here and there will the expert eye find the oddity that makes writing this column so much fun.

For this issue of *AMIGOS,* I have chosen tobacco. It is an excellent example of this transcultural phenomenon. Most of my readers have heard of "Calumet," the peace pipe of some North American natives, and have seen wooden sculptures of the ersatz Indian smoking big cheroots. Certainly, most of you have read somewhere that in North America some tribes use tobacco as a purifying smoke in their sweat lodges. Most people, when asked about the origin of tobacco, would think of North America. However, tobacco originated in South America and found its way north via the Caribbean Islands and mainland Central America. Of this traffic there is ample archaeological evidence. Furthermore, "cheroot" is a Filipino word for "small trumpet" and, by extension, a cigar.

When Columbus landed in Juana, today's Cuba, in November 1492, he sent two sailors to explore the hinterland: Luis de Torres and Rodrigo de Jerez, who after four days returned with the following report of peoples who they found. *"The men always carried in their hands a firebrand, and certain herbs to take their*

smokes, which are some dry herbs put in a certain leaf, dry also after the fashion of a musket (squib, or tube), lit at one end and at the other they chew or suck and take in with their breath that smoke which dulls their flesh and as it were intoxicates and so they say that they do not feel weariness. Those muskets, they call tobacos." This is the account of tobacco smoking as recounted by Las Casas in 1527, freely embellishing upon the Admiral's Journal.

Broad Leaved Petum, from l'Ecluse's HISTO MEDICINAL, Antwerp, 1579

Tobacco is obtained from plants of the genus *Nicotiana in the potato family Solanaceae* The genus contains some 60 species of which 72% are exclusively found in the New World, 27% occur in the Austral-Pacific region and one apparently endemic species in Namibia (Africa). The two species mostly used for the production of tobacco are *Nicotiana tabacum* and *N. rustica*, possibly selected for their high content of nicotines, alkaloids that are found in other plant groups as well but richly synthesized by the nightshade family. It must be noted that the use of tobacco has pertained to the horticulturalist indigenous societies and was the predominant intoxicant of the rainforest peoples, rarely found in non-horticultural groups such as the tribes of the southern cone of S. America. Its use by other native groups was expanded, very likely, after European contact.

With the expansion of Spanish travels, the use of tobacco was documented by the chroniclers far and wide: in Mexico under the name "picietl," "uppowoc" in Virginia, "petun" in Brazil, "saire" in Peru, and "zemi" in the Caribbean. In actuality, the use of the word "tabaco" by Las Casas was in error, as that was the name of the Y-shaped tube used to inhale tobacco stuff and smoke and not the tobacco leaves.

I have mentioned the nicotines (nicotine, nornicotine) main alkaloids of tobacco which were not obtained in pure chemical form until 1828. After tobacco seeds were first taken to Portugal by the physician Francisco Hernandez in 1558 for medicinal purposes, the then French Ambassador to Lusitania, Jean Nicot de Villemain introduced the plant to France in 1560, and the genus and later the alkaloids commemorate his name. Just about the same time, Cardinal Prospero Santa Croce introduced tobacco to Italy where the herb was aptly named Erba Santa Croce, Herb of the Holy Cross. While there is no documented social smoking in Europe as late as the 16th century, smoking was very popular among the captains, sailors and soldiers returning from the New World.

Tobacco was planted as a curious and wonderful medicinal plant, used for the bites of animals, headaches, colds, asthma, bruises, rheumatism, ulcers, apoplexy and even the plague. Herbals abound with the almost miraculous properties of *Nicotiana*, variously mentioned as "*herba panacea*," cure-all herb, *"herba sancta*," holy herb, *"san sancta indorum"*

Smoking Indian, from Thevet's SINGULARITEZ, Paris, 1558

or Indian sacred cure. In 1586, Ralph Lane, first

Governor of Virginia and Francis Drake brought smoking materials to Sir Walter Raleigh through whom the custom of smoking—or tobacco drinking as it was then referred to in England—, became fashionable among the debonaire of Europe. The rest is history, and we now witness a complete turnabout of the societal attitude on smoking, at least in the country most responsible for its introduction and, in the past hundred years, globalization through industrial cigarette production. A cultural counter-current is the apparition of so-called Cigar Clubs, which cater to a growing clientele in search of fine, hand-made cigars and smoking accoutrements. Such refinement! And what of the peculiar choice of humidors of some very public figures?

But what about the use by Amerindians? Some groups use tobacco in rituals, smoking fat cigars as long as 100 cm (39") that require special supports. Others chew it or take it as snuff, individually or blown into one's nasal passages by others. Still, a paste obtained from the slow decoction of tobacco, called *ambil* in Amazonia, is rubbed onto the oral mucosa for rapid absorption, an early version of transdermal administration of a chemical. Tobacco juice, a potent potion, is drunk in rites of passage from puberty to manhood or the initiation of shaman's apprentices, the effect so powerful that it is described as "dying" and repeated many times during the rituals. One less known method of nicotine intake is by enema. You may be interested to learn that the South American Indians invented a syringe made of the hollow, long bone of a bird or a cane provided with a rubber bulb to apply enemas of various

Fanciful Cigar, from l'Obel's NOVA STIRPIUM, Antwerp, 1576

one of them, which makes smoking a pipe seem rather innocent and so much preferable when in company.

Las Cruces Recommends the following URL's:

www.oneworld.org People and the Planet
www.egfar.org Global Forum on Agricultural Research
www.kew.org.UK/peopleplants/ethnobotany

Biologists at Work

Nesting Bird Communties in Forest and Coffee at Las Alturas

e-mail: **lindellc@pilot.msu.edu**

Catherine Lindell
Zoology Department
Michigan State University

Tropical biologists have recently begun focusing on the potential contributions of agricultural systems to the maintenance of biodiversity. Coffee plantations in particular have received a great deal of attention because some types of plantations, particularly those with a mixed-species canopy, have been shown to provide habitat for many species of birds, mammals, insects, and plants. Most work to date, however, has documented only the presence or absence of species in plantations, rather than their long-term use of the habitat. In the following paragraphs I present preliminary findings from work this past season based at Las Alturas field station. The objectives of the on-going study are to document and compare the species nesting in the two habitat types, forest and old coffee plantations, and to determine how often nesting attempts are successful.

The Las Alturas field station is located in the proximity to Las Cruces Biological Station, 50 meters from the Las Tablas protected area and Amistad National Park, comprising tens of thousands of hectares of primary forest. Also adjacent to the station are forest, pasture, and

coffee habitats owned by Señor Roig Mora. Señor Mora has been extremely generous in allowing me and my colleagues from Michigan State University access to his lands for our studies. The coffee plantations on the land have a short canopy five to eight meters tall, composed of several different species, and are no longer being cultivated.

Our field season began in March 1999 when our team arrived at Las Alturas. The team was composed of myself, my husband and colleague, Walter Chomentowski, and two enthusiastic field assistants, Danny Holley and Mike Roberts. The team also included my three-month old daughter, Madeline, and my mother, Annette Lindell. As Gretchen Daily observed, such early exposure to field work probably ensures that Madeline will grow up to be a girl who enjoys spending lots of time at malls.

Las Alturas Café

Our first task involved laying out our rectangular plots, two in the forest and two in the coffee, which Mike and Danny would faithfully search every week for nests. We began in the forest. The plots were 200 meters by 300 meters, which doesn't sound very large until one begins trying to place markers in straight lines every twenty meters. Rare was the time when we could see the person at the end of the 20-meter tape measure. Luckily Danny and Mike were very good sports and, after days stumbling around in the forest, worrying about the poisonous snakes, and thinking that there must be a better way, we finished. After working on the forest plots, setting up the coffee plots was a breeze. The searching could begin. From April through early August, Danny and Mike searched each plot once per week, trying to find active nests. Their work yielded many interesting results. First, finding nests in the forest was very difficult. From April through June (data from later in the season are yet to be compiled), they found 59 nests in the coffee and only 7 nests in the forest. The reasons for the difference are unclear, but may involve 1) the much taller canopy in the forest which may allow the nests to be more spread out vertically than in the coffee, 2) lower densities of nests in the forest, and/or 3) more secretive behavior by forest-nesting species. It was at times very difficult for Mike and Danny to determine if a nesting attempt was still in progress in the forest because the birds were extremely wary of their presence and seemed to avoid going to the nests. Second, the success rate of forest nests was higher than that of coffee nests (71% vs. 41%) although the number of forest nests was low, as mentioned, making conclusions tentative at this point. Both nest predation and abandonment by the parents were causes of nest failure. Third, no species that nested in the

forest also nested in the coffee, indicating that this type of coffee plantation, while providing nesting habitat for many species, does not support nesting by forest birds. Fourth, much remains to be discovered about the nesting habits of Costa Rican birds. Danny and Mike found several nests that had rarely been seen. They discovered a nest of the Golden-crowned Warbler at the base of a tree, only the second Golden-crowned Warbler nest ever found in Costa Rica. They found a nest of the Tiny Hawk while it was being built, only the second nest of this species ever reported anywhere. And, most exciting for all of us, they found a nest of the Ochre-breasted Antpitta, which had never been described previously.

Briefly stated, the research work we did at Las Alturas field station this past season provided us with important and significant information about the value of coffee plantations as nesting habitat. In addition, it indicated potential differences in success rates for coffee and forest-nesting species and led to some exciting findings for species with poorly known nesting habits. Future investigation will build on these discoveries.

White-colored Stickers

By Julián Monge-N
Julianm@cariari.ucr.ac.cr
Editor in Chief, *Revista de Biología*, UCR

"Julian, I have an onychophoran. Would you like me to send it alive or do you prefer it preserved?"

That message from the Garden's Director brightened my day not only because finding an onychophoran is a rare event by any standards, but also because I knew that it was, quite probably, a white-collar peripatus, *Epiperipatus geagi*. The species had never been reported from Costa Rica (it is a Panamanian species), so this meant both a new record and a range extension. Luis Diego had seen it before and had mentioned the white band near the base of its head.

When my wife saw the velvet worm, as that is their common name, she asked about the function of that collar, a good evolutionary question, by the way. Of course, no one knows the answer and in all my time studying these organisms, I had not seen that question asked. Before venturing a hypothesis as to why a collar, let us refresh our reader's memory about Onychophora, assuming that the reader studied some zoology in the past. The onychophorans are important evolutionary evidence because they have remained as living proof of the worm-myriapod relationship. Everywhere in their anatomy one finds characteristics that evolved 515 million years ago in the Cambrian seas, according to fossils recently described from Yunnan, China.

Present day velvet worms live on land, where they ambush small prey at night. Since they never evolved jointed legs, like those of an insect or ours, they are very slow and depend on a spectacular capture mechanism: from two specialized organs in the head, they forcefully expel a liquid that expands to form a sort of sticky net. Additional squirts glue the victim to the ground and neutralize its jaw and legs. The velvet worm then injects digestive enzymes and waits a while, finally sucking up the rich soup that was, minutes before, a living insect.

When I began my work with cryptic *Hamadryas* butterflies sometime ago, I studied protective coloration in some detail and those readings and observations allow me to offer one possible explanation for the white collar: it may disguise the region where the velvet worm really ends, and thus it will protect it from the enemies that can be after its sticky head. In this case, protective coloration really makes sense.

The Future of Botanical Drugs and the Rain Forest

By Varro E. Tyler
Dean and Prof. Emeritus,
School of Pharmacoly,
Purdue University

Some 40 years ago, I made a presentation on botanical drugs to a group of pharmaceutical scientists at Washington State University. I remember the occasion well because at that time medicinal agents from plants were undergoing a very steep decline in popularity. In the decades following World War II, many new synthetic drugs ranging from tranquilizers and anti-inflammatories to anti-hypertensive agents were entering the market. It appeared to many that the age of natural drug products had passed.

However, to those of us who had studied the field intensively—unfortunately, we were few in number—this seemed to be an overly pessimistic viewpoint. *Rauwolfia* and its alkaloids, especially reserpine, were just entering the market, and it was quite likely that a more intensive screening of members of the plant kingdom would serve as a viable source of useful therapeutic agents.

I therefore made a prediction to the assembled audience that when cures for the various types of cancer were discovered, drugs from plants would play a very important role in such treatment. My bold statement was greeted by considerable

Varro E. Tyler

sniggering among the many synthetic medicinal chemists present. They seemed sure that the compounds produced in their laboratories would be far superior to Mother Nature's for that purpose; many obviously believed my prediction was one which would never be fulfilled.

But as you examine the oncologists' chemotherapeutic armamentarium today, you will find there vinblastine, vincristine, etoposide, and taxol, all derived from higher plants. In addition, dactinomycin, bleomycin, adriamycin, and daunorubicin from various actinomycetes will be present. All of these are natural products, and there is a sufficient number to satisfy me that my prediction was an accurate one.

Although I take great satisfaction in that, I must hasten to point out that there isn't anything magical or mystical about drugs from plants. As will become apparent, it's simply that nature is the best place to look for remedies to diseases, which are themselves manifestations of nature. Allow me to explain.

During the past year, I have attended conferences on botanical drugs held on four continents. Somehow I missed Africa and Antarctica. Many of these events, anticipating the coming of the new millennium, dealt with the future prospects of the whole field. There is good reason to be concerned. Pharmaceutical companies, in general, are reducing their efforts in natural products research. Pharmacologists and other natural product specialists are being replaced in academia by molecular biologists. After enjoying vigorous growth for a decade or more, the herbal medicine market has leveled off in the United States.

However, there is real hope for the future of botanical medicines both as pure compounds and as plant extracts. It appears that the decision-makers in our pharmaceutical companies and universities who are engaged in sounding the death knell for natural products simply haven't done their homework.

Instead, they have become intrigued with two relatively new procedures, namely, combinatorial chemistry and high throughput screening techniques. When

employed together, these techniques permit the synthesis of thousands of derivatives of a chemical structure and the testing of them for physiological activity without ever having to isolate the individual compounds. In addition, several million novel compounds of known structure, produced by classical synthetic techniques, are available in pure form for testing.

In comparison, only about 90,000 natural compounds have been structurally described. This is a very small pool, indeed, compared to the millions of chemicals, synthesized by one technique or another, which await testing. Decision-makers in the drug industry have looked at these relative numbers and decided that the small number of natural products did not hold much promise in comparison to the immense number of synthetics. Hence, the current de-emphasis of natural products research.

A recent study conducted at Bayer AG Pharma Research in Wuppertal, Germany, and reported last July by Dr. H. Mueller at the joint meeting in Amsterdam of four natural products research societies, showed just how wrong these decision-makers are. A detailed statistical analysis of the types of compounds in both the synthetic and the natural pools showed that, in terms of molecular diversity, the two groups are highly complementary. A mere 90,000 natural compounds make up about 40% of the total possible new drugs while several millions of synthetics comprise the remaining 60%.

At first glance, the extreme importance of the relatively small number of natural chemicals in comparison to the vast quantity of synthetics seems almost unreal. However, after some thought, it becomes apparent that it is the way it has always been. Natural compounds and their direct derivatives account for about one-half of all the drugs today. If indirect derivatives –that is, molecules resembling in their structure a natural chemical—are counted, at least three-fourths of today's drugs may say to be derived from natural compounds. Why is this the case? The answer is simple. Only a limited number of different molecules are involved in, or have a beneficial effect upon, the life process. Those are the ones selected by nature over millions of years of evolution to perform or to influence specific metabolic roles in all living things.

Many of the more complex natural compounds play only an indirect role in assuring survival of living organisms. Our knowledge of their true utility is relatively recent. When I was a graduate student (not so awfully long ago), most alkaloids were viewed either as metabolic errors or waste products which accumulated in plants because they had no excretory mechanism. All this has changed. We now believe that many bitter and/or toxic principles play an important role in assisting plant and animal survival by discouraging predators that would otherwise feed upon them.

Some of these interactions have been extensively studied. The role that toxic pyrrolizidine alkaloids play in plants such as senecio and comfrey is one of the best known. Most insects refuse to eat plants containing those compounds. But certain herbaceous moths and beetles are not only able to feed on such plants with impunity but also sequester the toxic alkaloids in their own bodies to prevent other predators from consuming them. Thus, many natural compounds not directly involved in metabolism are nevertheless of considerable value in helping to sustain life.

Such compounds involved both directly and indirectly in the life process of plants and animals must be viewed as nature's successes. Combinatorial or organic synthetic chemistry may occasionally duplicate one of those molecules, or, very rarely, a modification with improved action. But, on the whole, synthetic molecules which do not resemble natural products, are nature's failures, at least as far as their beneficial influence on the life process is concerned. This becomes obvious when the complementary nature of a relatively small number of natural compounds to a much larger pool of synthetic ones is fully realized.

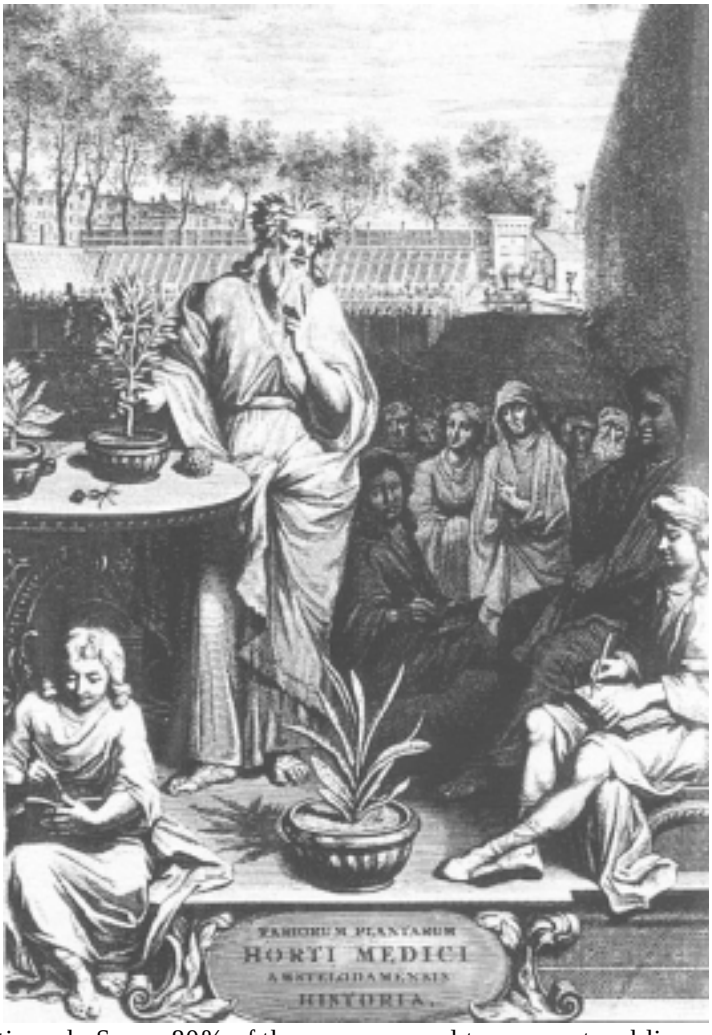
Scientists like to put concepts into numbers, so a little math reveals that it is about 30x times more likely that a natural compound will have a beneficial effect as a drug than will a synthetic chemical. To me, this favorable ratio justifies a lot of things, including continued ethnobotanic investigation in the rain forest. After all, two thirds of the 250,000 species of higher plants are found there, so it becomes the obvious place to look. The rainforest with its vast reserve of unstudied species must be looked upon as a treasure beyond compare. And, of course, it should be preserved until its many species can be investigated chemically, pharmacologically, and therapeutically. Growing up in

the heartland of the United States, as I did, I have always been a strong supporter of the "American way of life" and the capitalist system. However, I would be the first to recognize that capitalism has some disadvantages. In general, the only monopolies that are permitted in our system are those granted under patents. Because drug research is such an expensive venture, only novel compounds are worthy of the investment required to prove their safety and efficacy. That is why new, as yet unstudied, species from the rain forest stand a greater chance of being developed into useful drugs than long known botanical remedies which may also be affective.

Another drawback to the capitalist system is that much of the research conducted by large private entrepreneurs is never made public because of the fear of assisting competitors. No one knows how many potentially useful drugs remain unknown or undeveloped because the information gathered by an individual firm did not appear fruitful. But if the findings of several firms could be pooled, the result could be must useful.

All of us have probably fantasized from time to time about the things we would do if we were absolute monarchs. If I were king, I would implement a drug-approval system that would stimulate, not retard, the investigation of non-patentable entities. I would also decree that the results of scientific studies not developed into a commercial product within a suitable period—say 25 or even 50 years—would enter the public domain. While I recognize such proposals sound revolutionary, I am convinced that in the long run they would prove beneficial in many ways, including the health of all citizens.

Returning to our consideration of the tropical rain forests, let me remind you that in spite of their immense value, their destruction is continuing at the astounding rate of a football field a second. The most optimistic estimates indicate they will be almost totally destroyed in another 80 years. Almost everyone agrees that this should stop, but there are enormous population pressures and economic considerations that cause it to be continued. Some 80% of the destruction is caused by illegal logging operations. At least one country, namely, Costa Rica, has decided to do something about it.



Approximately 25% of the 51,100 square kilometers of national territory in Costa Rica has been placed in a special protection category. A national biodiversity Institute designated INBio has been created to conserve and manage Costa Rican diversity. Among INBio's several programs is one dealing with bioprospecting, which develops collaborative agreements with interested industrial partners, especially pharmaceutical companies. Since 1991, this program has raised more than $8 million of which $2.5 million has been used to support public universities and conservation areas. There may be other means by which Governments can profitably limit rain forest destruction, but this one appears to be workable. It could well serve as a model for other countries with similar

resources. So what have I learned from those various conferences where the future of plant drugs was considered? Indeed, what does the future hold? At the risk of suffering the same fate as most of the Biblical prophets who came to ignominious ends, I offer my conclusions.

1.Natural products, because they represent nature's metabolic successes as opposed to synthetic chemicals which include all of nature's failures, will continue to serve as important sources of useful drugs for the foreseeable future.

2.Pharmaceutical company executives, most of whom are non-scientists, will recognize these successes because a significant proportion of their companies' profits will continue to be derived from natural drug sources. Consequently, programs in this area will become reinvigorated in the industry.

3.Academic administrators will also recognize the same trend, and instruction in pharmacognosy and related natural product areas will once again assume importance in universities.

4.Phytomedicines, a term basically synonymous with herbal extracts, particularly standardized ones, will continue to gain favor with the American public because of their gentle, but significant, actions and their lack of side effects. Most such products will eventually be approved as drugs and will eventually form an appreciable part of conventional medical practice.

5.This is a very difficult prediction for me because it is completely contrary to my hopes and desires. However, I do not believe that any appreciable portion of today's rain forests can be preserved in their present form. Their short-term economic value and the world's immense population pressure will preclude that option. It would be my hope that an appreciable portion of the flora's germ plasm could be preserved in botanic gardens in the developed and the developing nations. This could serve a very useful purpose. But when it comes to insects and other seemingly insignificant fauna, as well as certain fungi and microorganisms that cannot be cultivated, I suspect these will be lost forever—and the loss will be a great one, indeed.

Rather than conclude my remarks on such a negative note, let me conclude on a more hopeful one because I am basically an optimist. If all of us will do what we can to enjoy, but not to destroy, nature as we see it today, then the life of the things we value can be prolonged, if not forever at least for a long, long time. The rainforest with its unique flora and fauna is here today, right now, for all of us to help conserve.

From the Community: LC, Local, Global

A Sense of Place by Catherine Simpson-Baindbridge

e-mail: simpsonbainbridge@yahoo.com

In November 1996, Catherine Simpson-Bainbridge was invited by one of the trustees of The Natural History Museum in South Kensington to donate a painting. This piece was auctioned at the Museum's annual corporate ball and raised L3,000 on behalf of the Museum's development trust. In September 1997, Catherine Simpson-Bainbridge had a solo exhibition at The Groucho Club in SoHo, London on behalf of The Royal Botanic Gardens Kew. In that same year in November and December, two more of her paintings were auctioned on behalf of The Natural History Museum and of Botanic Gardens Conservation International, respectively. In January 1998 she was elected a Fellow of The Royal Geographical Society.

In July 1998 her paintings themed the corporate marquee at the Gala Preview of the Hampton Court Palace flower show in association with and raising funds for The Royal Horticultural Society.

In September of 1999, Catherine Simpson-Bainbridge had a solo exhibition of 50 paintings and recent works on paper at

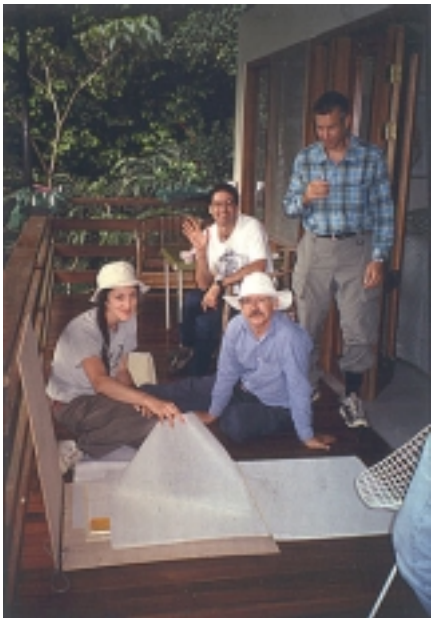
The Royal Commonwealth Society, Trafalgar Square, London. The exhibition was formally opened by Professor Sir Ghillean Prance, former director of RBGKew, now scientific Director of The Eden Project. To accompany the exhibition, Catherine Simpson-Bainbridge organized a series of four lectures from eminent speakers, responding to the challenges of global plant conservation. These lectures were hosted at the Commonwealth Society. Speakers included Dr. Peter Wyse-Jackson, Secretary General of BGCI; Professor Jameson Seyani, Chair of the Commonwealth Institute; Andrew Mitchell, Earth Watch Institute; and Beth Rothschild, UK Horticulturalist. Proceeds from this event benefited Botanic Gardens Conservation International.

When Luis Diego first asked if I would write something for *AMIGOS,* I set off up the "What is Art" and "What is a Garden" path, intending to say something about the link which undoubtedly exist between these two, and the role that each might play in the conservation of biodiversity. There are rime examples of the kind of thoughts which began formulating in my mind as a direct result of the four months I have spent living on site at Las Cruces, as Artist-in-Residence. However, en route, it began to dawn on me that I had set off in quite the wrong direction. Whilst these are crucial issues for discussion, and certainly relevant to the work with which I have become involved, they nevertheless come after the fact of my painting. In being invited to write this piece I was in fact being presented with the opportunity to reflect upon the mysteries of an experience which has changed my life significantly. As such, I should speak on more personal terms: to say something about that which is entirely mine, and therefore essential. But what then?…

For me, Las Cruces has come to mean many things. The most important, perhaps, is that it is a place where I have often felt and found strong similarity between my inner state of being and the way in which I experience the world. The result of such a confluence has been profound and the root of tremendous energy.

Living in close proximity to such diversity as is found in the Garden environment, certainly sharpens one's awareness as to natural processes, to the qualities of light, movement, sound, growth and decay. All of which are fundamental qualities which I attempt to martial in my work. Through intensive observation, scrutiny and contemplation of nature, we come closer to greater understanding. What we begin to appreciate is change, and it is that which sparks creativity, allowing one a sense of what it means to be "living in the moment." Here, one encounters natural energy, which is a positive driving force in Art. Or, at least it should be!

In a tropical climate change occurs over brief periods of time, it is often intense, and substantially less predictable than its temperate mate. During the two years when I have visited Las Cruces, I have arrived at the beginning of the rainy season which has in turn brought with it an undeniable feeling of vitality and urgency. In practical terms, this often demands that I find a means by which to translate ideas to paper as quickly and purely as possible. Quite a challenge in itself. Whenever change does occur, it cannot help but alter the idea itself and when this happens it is necessary to wait patiently until such circumstances, similar to the original, return. Sometimes the idea is lost for good!



Catherine Simpson-Baindridge, and M. Hasbrovek
Artists show the work in LasCruces

I could not finish writing this without speaking briefly about what has inspired me most in my work. In nature all forms are found. Plants just so happen to have served my own purposes, and provided stimulus and the forms which best express that which I have chosen to explore and communicate. I am intrigued by the sculptural aspects of plants and those which display unusual textures. During my most recent visit to the Garden, this led me to make a series of studies, principally in graphite and charcoal, from the hosts of palms, bromeliads, and philodendrons, collections for which the

garden is well known. At the same time, I became interested in trees. To me, their totemic

qualities and equivalence to the human form is intriguing. I have grown especially interested in Cecropia and feel a strange fondness for one of the Garden's examples in particular (although I won't say which one!). Also, Guayaba for its smooth, sand-pink bark. The Melastomes for their grays, fawns and moss greens. And all of the wondrous growth forms frequently associated with the fig family. Last, but by no means least, the delightful and improbable nature of the rainbow gum.

I can well imagine how Gaugin must have felt when he first set foot upon Tahitian sands! That's the life!

SANTA COMES TO LAS CRUCES

Mr. James Caldwell, Director of Costa Rican Children's Relief Fund, based in Orange Park, Florida, came to visit the Wilson Garden for the first time in his thirteenth year of playing Santa Claus to the children of San Vito.

Mr. Caldwell, Jim to his friends, arrives every December with a large cargo of several duffel bags full of clothes, shoes, toys and candy which he personally delivers to various communities in this area, although his focus is Teresa Marin's nascent orphanage, the Home of the Child Jesus, which she and her husband keep out of their own money and with the help of some of us in the area. In the orphanage, twenty-three homeless Costa Ricans have found loving care and home. These children who otherwise would probably be lacking the care they need, range from toddlers to young adults.

This year alone, the "peluches" (soft, stuffed toys) given by Jim totaled 4,300 in San Vito, 2,000 in nearby Corredores and several hundred given to PANI officials in San José. The PANI is the government agency in charge of the protection of youth.

Jim came to Las Cruces just before heading to Teresa Marin's home, where his young friends were to treat him to a farewell lunch and trim his beard and hair in what is now a yearly ritual that will undoubtedly keep bringing this self-appointed Papa Noel to the county.

"Why do you choose to do this, Jim?," I asked.

"Well, I believe that if children grow up knowing that at least someone cares for them, they will be better citizens in turn," was his response.

In our next AMIGOS, we will tell you about Teresa Marin's project and her accomplishments.

Virginia Monge and James Cadwell

THE CONVENTION ON BIOLOGICAL DIVERSITY: WHAT CAN YOU DO? A CBD CHECKLIST FOR PUBLIC GARDENS

***Obtain and read a copy of the text of the Convention on Biological Diversity and make it available to others in your institution.**

***Ensure that staff of your garden know about CBD and understand its provisions and implications.**
***Initiate a debate in your garden towards the formulation and agreement of an official policy on the CBD and a strategy for its implementation.**
***Prepare and follow an institutional Code of Conduct on collecting and the acquisition of plant material.**
***Develop Material Transfer Agreements to ensure that benefits arising from plant material distributed is fairly and equitably shared.**
***Review your garden's current activities that are relevant or contribute to the implementation of the CBD—undertake a "CBD—audit" or strategic review for your garden and its collections.**
***Consider how the mission of your garden is relevant to the CBD and to biodiversity conservation in general or/and consider reviewing your mission to become more involved in biodiversity conservation strategies and offer advice on plant diversity matters to national policy-makers.**
***Ask for your government's support and official recognition for your garden's role in implementing the CBD.**
***Seek to be included or represented in official delegations sent by your government to the Conference of the Parties of the CBD or to SBSTTA, or seek accreditation and attend meetings in your own right as a non-governmental organization.**
***Become involved in processes and working groups established by organizations such as BGCI to develop international policies for botanical gardens.**
***Develop and strengthen partnerships with institutions in other countries, particularly those that are rich in biodiversity but poor in resources and assist them in all ways possible to meet their challenges and obligations in implementing the Convention.**

Taken from an article by Peter S. Wyse-Jackson, "Convention on Biological Diversity," in the April 1997 issue of The Public Garden 12(2) 14-17.

LC CUISINE

Chef Roger

All of our visitors have praised the Las Cruces delicious, varied, healthy and abundant food which offers both the home cooking quality of freshly made meals and their unique and enticing taste.

Whether from national and international cuisines or from his very own creation, Chef Roger's dishes all have the unparalleled touch of the great cook.

LC CUISINE features in this issue of *AMIGOS* one of Chef Roger's alluring deserts, "Tres Leches" (Three Milks).

"Tres Leches" is usually served for desert, but it can also be enjoyed mid-morning or mid-afternoon with a dark brew of the best Costa Rican coffee. Try this recipe; or even better, come to Las Cruces for the real thing!

TRES LECHES

Ingredients

Metric/English

11 eggs
250 grams/8 ounces of sugar or equivalent substitute
250 grams/8 ounces of flour

1 cup of orange juice
1 large can of evaporated milk
1 large can of sweetened condensed milk
½ liter/1 pint (2 cups) of whipping cream
1 teaspoon of vanilla

Preparation

Put the eggs in a metal bowl and add the sugar; stir together over moderate heat until sugar is completely melted.

Remove the mixture from the stove and beat with an electric mixer until it reaches three times the original volume.

Add orange juice and flour and quickly fold them in.

Grease and flour a rectangular baking pan, pour in the mixture and bake for 45 minutes at 176° C/350° F.

Beat ¼ liter/1 cup of whipping cream and the evaporated and condensed milks until they are well mixed.

Pour them over the cake and cover until the mixture is well absorbed.

Beat remaining whipping cream until stiff, add vanilla and use like frosting.

Serves 18.

Notes to LC

Luis Diego Gómez
Director
Las Cruces Biological Station

12 December, 1999

Dear Luis,

I am now at the end of my 13-week stay here at your station, and time has come for me to say good-bye. I would like to offer my most sincere thanks to you and your staff for a most wonderful stay. I found the food to be excellent, the cleaning team almost Swiss, and the entire staff very courteous and hospitable.

My long stay here would not have been possible without the help of a "Las Cruces Fellowship." I hope that OTS will continue to support long-term research by graduate students this way. My field work was made bearable during this rainy season of the year thanks to the comfortable life at the station. In return, I pledge to spread the good word about this wonderful little station, both in any future publications that should come out of this field work and through word of mouth.

I look very much forward to my next visit here, and in the meantime wish you and your crew all the best.

Martin Schlaepfer
Fernow Hall
Department of Natural Resources
Cornell University

Thank You to Our Donors

Our heartfelt thanks to everyone who has demonstrated support since our November AMIGOS issue by sending a gift. Your support is much needed and appreciated. If you have made a gift to Las Cruces between September 1999 and March 2000, and your name does not appear below, please let us know.

Adamson, Marie and Donald, CA
Alverson, Dr. William, WI
Atkins, Elizabeth and Elisha, MA
Banks, Peter and Joan, CANADA
Bellinger, Peter and Carolyn, CA
Biesanz, Barry, COSTA RICA
Boerger, Mr. and Mrs. Jack, CA
Bode, Hank and Susan, MA
Bohmfalk, Barbara, VA
Bolster, Ann and Archie, VA
Bones, William and Ella, MA
Bowen, Bonnie and Koford, Rolf, IA
Campbell, Alan, CA
Carley, Jean V., OR
Caudill, Phillip and Maureen, CA
Cherry, Dr. Joe H.
Club de Jardines de Grecia, COSTA RICA
Combined Federal Campaign
Cutler, Albert, CA
Daniel, Louise, CA
Daniels, Gilbert and Emily, IN

Davidson, Christopher, ID
Davis, Thomas and Bush, Ellyn, CA
Dolhinow, Jack and Phyllis, CA
Duerr, Jon J., IL
Emery, Donald R., CA
Enderlein, Margaret, WA
Faber, Phyllis, CA
Fadiman, Maria G., CA
Fassnacht, Raymond and Joan, WA
Fellner, Gertrude E., CANADA
Fisher, Dr. Jack B., FL
Fisher, Dr. Robert L., PA
Fleischman, Susan
Forsyth, Ben and Elizabeth, AZ
Fowler, Marylu J., TN
Freitag, Christine D., OH
Gibson, Julie A., VA
Godshalk, Mr. James,Jr. and Lundy, Ms. Marjorie, IL
Goff, Barbara and Frederick, NJ
Golladay, Stephen and Hax, Carolyn, GA
Goodman, Peter P., CA
Goodwin, Dr. Richard H., CT
Graham, Alan, OH
Guardia, Sally B., MD
Guidotti, Ronald A., NM
Harrington, Joseph Lawrence III, DC
Hartman, Willard and Mary, IL
Heard, Clinton and Rose, TX
Heinz, Elva I., WA
Hellhorn, Ellis
Hermie, Albert, DC
Hewson, Gail and Hull, Harry, CA
Hochschild, Mr. and Mrs. Alan, CA
Hodnett, C. Graham, NC
Hoganson, Barbara and Jerome, VA
Holt, Scott and Joan, TX
Horrigan, Cliff, NH
Hoshizaki, Barbara J., CA
Hughes, David and Jean, MI
Jackson, Thomas V., WI
Jukofsky, Diane and Wille, Chris, COSTA RICA
Kennedy, Coleman, MA
Kolb, Muriel, NC
Kramer, Phyllis and Howard, RI
Larson, Amy and Weltbach, Mitch, CA
Larson, Mark W., PA
Larson, Robert E., AZ
Ledbetter, Bonnie, SC
Leue, Ellen F., IL
Lewis-Lovett, Lauren Hartz, CA
Lindgren, Gwenith A., NY
Mackey, John and Virginia, CO
Main, Betty J., WA
Marvin, Lawrence and Muriel, CA
Matlack, Albert and Elsie, DE
MacIntosh, Mr. and Mrs. Bert, Jr., CA
McLaughlin, David and Esther, MN
Methven, Dr. Andrew S., IL
Miller, John and Faye, MI
Mueller, Gregory and Strack, Betty, IL
Mulroy, Joseph and Jean, CA
Neighbors, Margaret, CA
Olmstead, Katherine, AZ
Passarelli, Donald and Anne, WA
Peacock, Thomas and Kay, CA
Pertzoff, Margaret H., VA
Petersen, Ronald H., TN
Popenoe, Dr. Hugh, FL
Pugh, F. Harvey, AZ
Puglisi, Vincent A., NY
Racy, Ann and Anis, CT
Reeve, Mr. and Mrs. Leonard. OH
Riegelhaupt, Judith and Norbert, MA
Rising, Dr. James D., CANADA
Rolston, Mr. and Mrs. Charles H., NJ
Ross, Marie W., CA
Ruge, Daniel F., NY
Russman, Burton and Michele, IL
Rutherford, Elaine, FL
Schlaepfer, Martin A., NY
Seawright, James and Mimi, NY
Sherman, Marion, WA
Short, Lester L., KENYA
Simmons, Steven P. and Miller, Tobey, FL
Slatkin, Murray and Lillian, MD
Smith, June M., CANADA
Sohmer, Dr. Seymour H., TX
Speed, Alton E., MN
Spinelli, Christina, COSTA RICA
Spurney, Robert and Florence, OH
Stanberry, Charles D. and Dublisky, Helene, J., CA
Stephens, Ann C., CA
Sterling, Peter and Zigmond, Sally, CA
Stevens, Dr. Peter F., MA
Stiles, Dr. Edmund W., NJ
Stoltenberg, Richard, OH
Stone, Dr. and Mrs. Donald E., NC
Stucker, Martha J., NC
Thoma, Allen J. and Fong, Diane J., CA
Thompson, Dr. and Mrs. Donald E., WI
Twining, Dr. Ralph H., MD
Ungar, Arthur and Dana, UT
Wake, David and Marvalee, CA
Wallerstedt, Kris, CA
Weeks, Clover B., MI
Weiss, Dr. T. Edward, Jr., VA
Welch, Morton and Dorothy, MA
Wilson, Dr. Lawrence A., NE
Wiseman, Donald E., NM
Woodley, Laurel, CA

"To him who in the love of Nature holds Communion with her visible forms, she speaks a various language..." from THANATOPSIS by William Cullen Bryant (1794-1878)