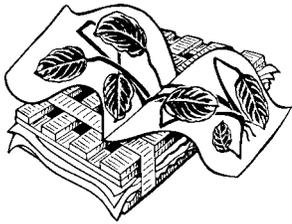


Department of Botany and the U.S. National Herbarium



The Plant Press

National Museum of Natural History
Smithsonian Institution

New Series - Vol. 1 - No. 6

November - December 1998

Department Profile

A New Victorian Age For Biodiversity

By Robert DeFilipps

Her laboratory is laden with the tools of her trade, including sets of the heavy buckled belts and iron tree-climbing spikes usually associated with mountaineers and lumberjacks.

Originally from Owensboro, Kentucky, Vicki Funk, Curator of Botany, has been directing the National Museum of Natural History's (NMNH) Biological Diversity of the Guianas Program for eleven years. Funk, a specialist in evolutionary biology, cladistics, biogeography, and the study of unusual Asteraceae adapted for surviving in temperate climates at tropical latitudes, arrived in the department in 1981.

In the course of fieldwork in numerous Latin American and other countries, Funk's botanical rewards have sometimes been gained in the face of adversity, including an erupting volcano in Costa Rica, and clouds of tiny, combat-style "T90" mosquitoes on the white sand savannas of Guyana. Now, slowly but surely, an understanding of the complex biological mysteries of the Guianas' undisturbed interior forests is emerging under her tutelage.

The three Guianas demonstrate approximately 30 different vegetation types in an area high in the sweltering equatorial shoulder of northeastern South America. The three nations are, from west to east, Guyana (the erstwhile British Guiana); Suriname (formerly Dutch Guiana); and French Guiana, an integral part of France. While its scope embraces all three countries, a substantial

amount of the research conducted under the umbrella of the Guianas Program is performed mainly in Guyana. To the general public, the most familiar symbols of Guyana are perhaps the indigenous cannonball tree (*Couroupita guianensis*); the royal water lily (*Victoria amazonica*); majestic Kaieteur Falls which is three times the height of Niagara Falls; and the asphyxiating curare poisons made by Indians such as the Wai Wai. The term "Guiana" recalls as well the legendary exploits of Sir Walter Raleigh in search (1595, 1617) of El Dorado in Spanish Guiana (now Venezuela), and in fact, geographers now believe that the elusive city of gold he sought near "Lake Parima" is actually Lake Amuku, a "wet weather lake" in the savannas north of the Kanuku Mountains in Guyana.

Today, the natural treasures of the Guianas under investigation by biologists are not often intangible, but they are sometimes as elusive as the ones which haunted the dreams of Raleigh centuries ago. In today's terms, the biotic treasures are felt to comprise the vast ecological and evolutionary interrelationships and vital phytochemical diversity inherent to the region.

Everything in the rainforest has consequence and significance, e.g., when pollinators such as bats and other mammals are interfered with for any reason, such as hunting them for food, the many unserved flowers and would-be fruits are lost to the immediate reproductive output of the host trees. Over the past several years, plant collecting expeditions under

the Guianas Program have yielded species new to science, including a diminutive epiphytic species of *Hecistopteris* fern (Vittariaceae) from the Kaieteur Falls which is being published by Carol Kelloff and Greg McKee, and a new member of the Lauraceae from montane southern Guyana assigned to the genus *Rhodostemonodaphne*.

In addition to Funk, the Guianas biodiversity program is staffed by Carol Kelloff (assistant director) and Tom Hollowell (data manager for collections and georeferences). The program has produced major breakthroughs in our knowledge of the Guianas, often in tandem with the Centre for the Study of Biological Diversity, created in 1992 with a building located at, but independent of, the University of Guyana in Georgetown, and originally funded mainly by the Royal Bank of Canada. For the Centre's development, Funk was, and still is, a central dynamic of leadership values, inspired self-sufficiency, and advice.

With the cooperation of more than 90 institutions, the overall NMNH program has yielded products such as 30 publications under the auspices of the Centre in Guyana; many thousands of Guianan plant specimens obtained by 12 years of resident collectors appointed by NMNH; a *Vegetation Map of Guyana* (1995) utilizing satellite imagery; two editions of a highly useful *Checklist of the Plants of the Guianas*, now on-line; and a *Preliminary Checklist of the Plants of Kaieteur National Park* (1998) which is available

Continued on page 6

Gery Allan, a Post-doctoral Fellow, will be working with **Liz Zimmer**, **Warren Wagner** and Chrissen Gemmill (University of Waikato, New Zealand) at the Laboratory of Molecular Systematics. His project will focus on breeding system evolution in South Pacific and Hawaiian *Pittosporum* (Pittosporaceae), and will involve developing molecular markers, or “micro-satellites,” for resolving evolutionary relationships among the Hawaiian species. The study of variation in floral phenology of the Hawaiian species, in order to better understand temporal differences in sexual expression, will provide information on the reproductive function of different floral phenotypes in remote insular floras. A clearer understanding of taxonomic relationships can lead to a more accurate floristic inventory of the Hawaiian Islands, and help in deciding conservation management issues that pertain to a number of

rare and endangered *Pittosporum* taxa. **Molly Nepokroeff**, a Post-doctoral Fellow, is working with **Warren Wagner** and **Liz Zimmer** on the systematics of Pacific and Hawaiian *Psychotria* (Rubiaceae), focusing on intensive sampling of the Pacific *Psychotria* in order to better resolve sister group relationships and the evolution of floral dimorphism in the Hawaiian lineage. She will be utilizing molecular and morphological data for phylogeny reconstruction, and also highly polymorphic molecular markers, AFLPs, to look at species relationships. Additionally, she plans to revise the taxonomy of the Hawaiian species.

Ellen Murphy is a new volunteer at the department’s research greenhouse. She is a senior in International Studies at George Washington University, Washington, D.C.

New Species Discovered

A dilleniaceous vine with stems containing potable water, collected by **John Pruski** in 1987 along the Rio Falsino in Amapa, Brazil, has recently been described as representing a new species, *Doliocarpus pruskii* Aymard, *Kew Bull.* 53: 719 (1998).

Visitors

Jefferson Prado, Univ. of São Paulo, Brazil; Brazilian ferns (Sept. 1-30).

Michael Kessler, Albrecht-von-Haller-Institut (GOET); Bolivian flora (Sept. 3-30).

Sadao Sakamoto, Ryukoku Univ., Japan; Amaranthaceae (Sept. 5-10).

Lena Struwe, New York Botanical Garden (NY); Gentianaceae (Sept. 21-23).

Cintia Kameyana, Univ. of São Paulo, Brazil; Brazilian Acanthaceae (Sept. 28-Oct. 18).

Teuvo Ahti, Univ. of Helsinki, Finland (H); Cladoniaceae (Sept. 30-Nov. 30).

Humberto Mendoza C., Instituto Humboldt, Colombia; Melastomataceae (Oct. 1-7).

Paul Manos, Duke Univ. (DUKE); *Quercus* (Oct. 3).

Brent Mishler, Univ. of California-Berkeley (UC); Bryophytes (Oct. 3-8).

Fabian Michelangeli, Bailey Hortorium, Cornell Univ. (BH); Rubiaceae (Oct. 6-8).

Cristina Rolleri, Museo de la Plata, Argentina (LP); Ferns (Oct. 7-10).

Fernando Bretos, Center for Marine Conservation, Washington, DC; Techniques (Oct. 8-Dec. 20).

Mu Mu Aung, Forestry Research Institute, Yezin, Myanmar (Burma); Myanmar Checklist (Oct. 19-Nov. 13).

Yin Yin Kyi, Forestry Research Institute, Yezin, Myanmar; Myanmar Checklist (Oct. 19-Nov. 13).

Ann Sakai, Univ. of California, Irvine, CA; Hawaiian rarities (Oct. 26-28).

Paulo Windisch, São Jose do Rio Preto, Brazil (SJR); Brazilian ferns (Oct. 26-30).

George Taylor, George Mason Univ., Fairfax, VA (GMUF); *Lepidium* (Brassicaceae) (Nov. 5).

Donald Windler, Towson Univ., Towson, MD; *Mucuna* (Fabaceae) (Nov. 24).

Delores Piperno, Smithsonian Tropical Research Institute (STRI/SCZ); Cucurbitaceae phytoliths (Dec. 7-8).



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The Organizing Biological Principles in Natural History Science

As we continually evaluate our scientific directions and mission as a natural history museum, it is important that we maintain a broad perspective on how we can best contribute to society and the planet. Recent discussions among the Chairs of the various departments at NMNH resulted in the following statement on the organizing principles which guide our biological research. I think it appropriate to share these thoughts with readers of *The Plant Press*:

A central issue facing the world today and the major challenge for scientists in natural history research is defining an effective and central strategy for integrating biological diversity with global economics and human social structure. The earth's biological resources are currently besieged by an unprecedented level of social and economic development that threatens massive levels of species extinction and environmental change. These impending changes in the basic biological functioning of the planet will clearly have a profound effect on human populations and call for a concerted effort to integrate biodiversity resources, economic needs, and social organization.

The operating principle that drives natural history research, be it geological, paleontological, neontological or anthropological, is to provide the scientific information necessary for this multidisciplinary integration. Only if we understand the extent of biological diversity, the processes of diversification, and the history of life on earth, can we provide a predictive classification of the natural world that can successfully integrate biodiversity with social and economic development. Never before have museum scientists been faced with such a clear and immediate mandate to understand the natural world. This inventory and classification of life can not wait. What was once viewed as nearly infinite diversity by our scientific predecessors, is now all too clearly finite and threatened.

Biological scientists in the Museum focus on the study of classification, phylogeny and ecology with both contemporary and historical perspectives. As curators

we share similar scientific questions, scientific methods and basic scientific principles, our governing doctrine being Darwinian evolution. The taxonomists and systematists in the Museum employ a wide spectrum of evidence for reconstructing phylogeny, both traditional and experimental, both morphological and molecular. Our initial descriptive work is the data upon which these phylogenies are constructed. In turn these phylogenies are translated into predictive classifications of life. Within the ecological framework of our research are the principal factors of space and time. The entities we study (e.g. species and populations) are not fixed, but change from generation to generation and from place to place. The study of museum collections by ecologists, in many cases the same specimens described by the taxonomists, reveal biological patterns upon which our principles of evolution and ecology are formulated. Predictive classifications coupled with a knowledge of the fundamentals of ecological organization provide the biological context for understanding today's changing planet.

Our scientific challenge at NMNH is to find order in the natural world. How is organic diversity organized in space and time? How was the biological world assembled in the past and how is it organized in the present? How are lineages of organisms maintained over time in a changing environment? The solutions to these biological problems will provide scientific answers for coping with the massive economic and social change occurring in the world today.



Chair

With

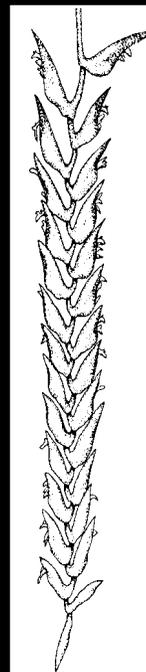
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John
Kress



Revised *Manual of the Flowering Plants of Hawai'i*

It has been nearly a decade since the first edition of the *Manual of the Flowering Plants of Hawai'i* (1990) by Warren L. Wagner, Derral R. Herbst, and S.H. Sohmer was published, and it has been out of print for more than two years. A revised edition will be published in early 1999 by the University of Hawaii Press and Bishop Museum Press. The two-volume set includes an updated listing of endangered and threatened plants, and a supplement listing new native and naturalized species as well as recent changes in classification and nomenclature. The revised edition will bring the total angiosperm flora to 152

families, 737 genera, and 2089 species.

Due to the availability of the *Manual*, knowledge of Hawaii's naturalized and native species has increased significantly because of intensive fieldwork. When the manuscript for the *Manual* was submitted for publication, 19 Hawaiian plants had been federally listed as endangered or threatened; that number has dramatically increased to 271. In addition, curation of the Herbarium Pacificum grass collection at the Bishop Museum by Derek Clayton (Kew), funded by the National Science Foundation, has produced numerous updates, especially for naturalized grasses.

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Staff Research

John Kress and **Mike Bordelon** traveled to Southeast Asia in July to conduct fieldwork as well as attend a conference. In Myanmar one of their prime goals was to meet with U Uga, director of the Nature and Wildlife Conservation Division of the Forest Department, to continue discussions on the revision of the Fourth Edition of Hundley's *List of Trees, Shrubs, Herbs, and Principal Climbers Recorded in Burma*. They also met with U Thein, director of the Forest Department in Taunggyi in Shan State, and Daw Yin Yin Kyi, assistant director of the Herbarium at the Forest Research Institute in Yezin.

Kress and Bordelon then traveled from Yangon to the mountains in Shan state collecting material of Zingiberaceae, Marantaceae, and Commelinaceae. After Myanmar, they traveled to Thailand to connect with Kress' long-time friend Mark Collins, who has been studying the gingers of Myanmar for ornamental plant purposes. They had a chance to visit the northwest corner of Thailand and saw the border of Myanmar this time from the eastern side. As a result of their trip, over 100 new accessions primarily of Marantaceae and Zingiberaceae were brought back, most of which are now dormant in the greenhouse.

After Thailand, they traveled to Singapore for the 10th Heliconia Society International Conference. The two weeks of field work complimented the title of the conference, "Gingering Across Southeast Asia". Kress presented the keynote address, and two papers entitled "Heliconias-Flames of the Colombian Forests" and "*Orchidantha*-Heliconia's poorly Known Cousin from Southeast Asia". Over 150 people representing 17 countries attended the conference.

The Greenhouse staff hosted a meeting of the local area chapter of the American Gloxinia and Gesneriad Society (AGGS) in October.

Paul Peterson and **Rob Soreng** participated in the International Symposium on Grass Systematics and Evolution in

Australia. Peterson presented the results of his research on the morphological and molecular systematics of the Muhlenbergiinae. Soreng used morphological and molecular data to perform a cladistic analysis of the Poaceae subfamily Pooideae and discussed the distribution of sexual and asexual reproduction in bluegrasses (*Poa*).

Following the symposium, Peterson and Soreng traveled to Perth, Western Australia, where they were joined by **Gene Rosenberg** for three weeks of collecting in an area encompassing 5,500 km. The group's collecting itinerary included a trip through arid and semi-arid country to reach Shark Bay; Mount Augustus (the world's largest stone monolith); the mountain-and-gorge country of the Karijini National Park in the Hamersley Range; and the summit of Mt. Meharry, the highest mountain in Western Australia, at 1,250 m.

Another loop from Perth brought them to the lush forests of giant eucalyptus (*Eucalyptus diversicolor* F. Muell., or karri) in the southwest where the trees reach 80 m in height. Along the southern coast, massive dunes, several kilometers wide, provide a habitat where many beach grasses flourish. The NMNH botanists were fortunate to be accompanied for part of the time by Terry Macfarlane, a knowledgeable agrostologist from the Western Australia Herbarium. The expedition yielded over 300 collections (numbers) that will be catalogued at US and shared with the Western Australian Herbarium and the Queensland Herbarium in Brisbane.

Liz Zimmer was elected Treasurer of the NMNH Senate of Scientists.

Charles Fenster (Principal Investigator) and Zimmer (co-P.I.) have been awarded a grant of \$241,654 from the Population Biology Program of the National Science Foundation for a project entitled "Quantifying Epistasis for Fitness in the Native Legume, *Chamaecrista cristata*." On October 3-5, Zimmer attended the Executive Steering Committee meeting of the Green Plant Phylogeny Research Coordination Group (GPPRCG) to discuss plans for coordinating eight symposia and related publications for IBC'99. The committee also met with USDA, NSF and DOE officials involved with the sponsorship of the GPPRCG and discussed plans for submitting a Plant Genome Program proposal to continue the work of the

group. The group also decided to sponsor a limited number of DEEP GREEN student travel awards to the Congress. For more information on these awards, see the Systematic Biology Web site at <http://www.utexas.edu/depts/systbiol/info/deepgren.html>).

On October 8-11, **Alice Tangerini** attended the Fourth Annual Meeting of the American Society of Botanical Artists (ASBA) in Pittsburgh, PA. The meeting was held at the Hunt Institute for Botanical Documentation to coincide with the opening of the Hunt's Ninth International Exhibition of Botanical Art and Illustration. There were 150 attendees from the combined group of ASBA members and artists from the International Exhibit, representing the U.S.A., Canada, England, Italy, India, Japan, China and South Africa.

Jim White, the Hunt's curator of art, and former collections manager in the Botany Department, organized the exhibit and arranged for tours of the Hunt and viewings of its vast collection of historic illustrations for the ASBA members. A portfolio-sharing proved to be a delightful and informative way to meet the artists and exchange ideas and techniques on botanical illustration. The Botany Department's Art Collection is represented in the International Exhibition by artists Cathy Pasquale and Mary Emily Eaton.

Post-doctoral Fellow **Linda Prince** delivered a talk entitled "Toward an Understanding of the Tea Family" to a meeting of the Botanical Society of Washington, on Nov. 3. She also spoke at the department's seminar series on November 24 on the subject of "Generic and Tribal Relationships in Theaceae Subfamily Theoideae, Based on Morphological and Molecular Data".

On December 12, **Lynne Cherry** (the department's artist-in-residence) and ethnobotanist Mark Plotkin, co-authors of *The Shaman's Apprentice*, spoke at the National Zoo in Washington, D.C., and afterwards signed copies of their book.

Travel

Warren Wagner (9/10-9/28) traveled to Honolulu, HI to conduct research at the Bishop Museum and to St. Louis (10/8-10/15) to attend the Annual Systematics Symposium and conduct research at the Missouri Botanical Garden.

Vicki Funk (9/17-19) traveled to New York City to attend the Systematics Agenda 2000 meeting and discussion group; to Manaus and São Paulo, Brazil (9/21-10/3) to attend meetings and present a paper; and to Durham, NC (10/14-10/15) as Adjunct Professor to participate in a graduate student's defense at Duke University.

John Kress (9/24-10/5) traveled to Sydney and Cairns, Australia to attend the Second International Conference on the Comparative Biology of Monocotyledons.

Paul Peterson and Robert Soreng (9/25-11/1) traveled to Sydney and Perth, Australia for the Third International

Symposium on Grass Systematics and Evolution and to collect specimens.

Robert Faden (9/25-10/4) traveled to Sydney, Australia to attend the Monocots II conference and deliver a paper.

Linda Prince (9/27-10/2) traveled to Sydney, Australia to attend the Monocots II conference.

Joan Nowicke (10/9-10/14) traveled to St. Louis to attend the Annual Systematics Symposium and examine collections of Euphorbiaceae for pollen samples at the Missouri Botanical Garden.

Alice Tangerini (10/8-10/11) traveled to Pittsburgh, PA to attend the American Society of Botanical Artists annual meeting at the Hunt Institute at Carnegie Mellon University.

Robert DeFilipps (10/13-10/16) traveled to St. Louis for editorial consultations on the Flora of China at the Missouri Botanical Garden.

Dan Nicolson (10/15-10/19) traveled to St. Louis to attend a special meeting of the Nomenclature Section of the 16th International Botanical Congress and attend a Missouri Botanical Garden curatorial staff meeting with Werner Greuter.

Laurence Skog (10/18-10/22) traveled to St. Louis to conduct research at the Missouri Botanical Garden.

Laurence Dorr (10/24-11/10) traveled to Guanare, Venezuela to collect and study plants for the Flora of Guaramacal Project and to Chapel Hill, NC (11/13-11/15) to conduct research in the University of North Carolina herbarium.

George Russell (11/16-11/20) traveled to San Diego, CA to attend, give a lecture and moderate a session at the Partnership Opportunities for Federally Associated Collections conference.

Revised Checklist for the Flora of Myanmar

Unlike its bordering countries of India, Bangladesh, China, Laos and Thailand, no published flora, or partial flora, exists for the floristically interesting Union of Myanmar (formerly Burma). The most recent precursor to a flora is a checklist by H.G. Hundley, *List of Trees, Shrubs, Herbs and Principal Climbers Recorded from Burma*, Fourth Revised Edition (1987), which was initiated as a first edition by J.H. Lace in 1912.

In July **John Kress** and **Mike Bordelon** traveled to Myanmar to meet with U Uga, director of the Nature and Wildlife Conservation Division of the Forest Department, to discuss a revision of Hundley's fourth edition. As a result, it was agreed that a collaborative effort would begin and a revised edition of Hundley (1987) would be produced.

With the arrival of Yin Yin Kyi, assistant director of the herbarium at the Forest Research Institute (FRI) in Yezin, and Mu Mu Aung (Master's degree student at FRI) to the department on October 19, 1998, the project was immediately and intensively underway. The monocotyledons, as listed in Hundley and *Index Kewensis*, were the focus of the initial work which took place during their four-week visit.

Under the leadership of Kress, an

Access database was designed by departmental computer specialist **Ellen Farr**, and two core teams were assembled to participate in the project. One team was composed of **Chris Tuccinardi**, **Elaine Haug** and Mu Mu Aung, who inventoried and databased all monocot specimens from Myanmar housed in the US National Herbarium, as well as all references to Burma as a provenance of species in *Index Kewensis*. The other team was composed of Yin Yin Kyi, who added the current geographical distribution and Burmese common names; Kress who contributed and keyboarded the revised information pertaining to families of Zingiberales; and **Robert DeFilipps** and **Shirley Maina** who databased the scientific names, habit designation, habitat, and English common names for the approximately 1500 species in 56 monocot families. In the course of the activities, many updated generic and family concepts were introduced into the traditional framework of the original 1987 checklist, and *A Partial List of Monocotyledons* for a preliminary 5th edition of Hundley was produced.

Work on the dicotyledons will begin in 1999. An effort is being made to obtain funding for a return visit of Yin Yin Kyi and Mu Mu Aung to the department to

continue this joint project. Much additional literature remains to be consulted, and numerous experts will be invited to share their knowledge of the most current taxonomic information in their areas of expertise. It is anticipated that the Revised Checklist will be a three-year project, and it is hoped that it will be a useful prelude to the publication of the first Flora of Myanmar.

[by Shirley Maina]

Revised Manual continued from page 3

Included in the revised edition will be a large supplement which will present a summary of the numerous changes since the first printing, such as information on: new native taxa (33); records of naturalized species previously undocumented (108); records for naturalized species previously known only in cultivation or as adventives (75); new island (233) or significant intransland range extensions of both naturalized and native species (13); the rediscovery of species presumed ex-tinct (27); correct names for plants previously misidentified (25); changes in distribution status (5); and several miscellaneous notes.

Publications

Faden, R. B. 1998. Commelinaceae. Pp. 109-128. In: Kubitzki, K. (ed.). *The Families and Genera of Vascular Plants*. Vol. 4. Flowering Plants, Monocotyledons: Alismatanae and Commelinanae (except Gramineae). Springer, Berlin, Heidelberg, New York.

Peterson, P. M. and J. J. Ortíz-Díaz. 1998. Allelic variation in the amphitropical disjunct *Muhlenbergia torreyi* (Poaceae: Muhlenbergiinae). *Brittonia* 50: 381-391.

Wagner, W. L. 1998. A new species of *Wikstroemia* (Thymelaeaceae) from Hiva Oa, Marquesas Islands. *Novon* 8: 318-320.

Wagner, W. L. 1998. Species status for a Sonoran Desert annual member of *Oenothera* sect. *Anogra*. *Novon* 8: 307-310.

Walker, W. and **L. J. Dorr.** 1998. A note on indigenous uses of *Dypsis decaryi* in southern Madagascar. *Principes* 42(3): 136-139.

Weakley, A. S. and **P. M. Peterson.** 1998. Taxonomy of the *Sporobolus floridanus* complex (Poaceae: Sporobolinae). *Sida* 18: 247-270.

Department Profile

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electronically at <http://osfl.gmu.edu/~ckelloff/>. Studies of frogs, birds, mammals, termites, butterflies, fish and aquatic insects have also been promulgated in conjunction with local and overseas zoologists, and numerous botanists from the department and overseas institutions have been sent out to study the area under the aegis of the program.

Technical studies and inventories of species richness and areas of endemism in the Guianas, often plugged into standard GIS (Geographic Information System) methodology for modelling of non-biotic data such as latitude/longitude, rainfall and elevation, are yielding hard data for analysis. The results will aid in predicting, with a high level of confidence, the distribution of species and concomitantly

Art by Alice Tangerini

Alsinidendron obovatum Sherff (Caryophyllaceae), a rare, officially endangered species of shrub endemic to the Wai'anae Mountains, O'ahu, Hawaiian Islands, is apparently adapted for bird pollination. Its pendant flowers secrete black nectar and have fleshy sepals which may attract birds as dispersal agents, an exceedingly rare phenomenon in the family. This illustration will appear in a monograph of *Schiedea* and *Alsinidendron* by Warren L. Wagner, Stephen G. Weller, and Ann K. Sakai.



the sites of areas rich in biodiversity which may thus qualify for status as newly proclaimed national parks. As a result, the eastern Kanuku Mountains of Guyana, for example, seem ripe for designation as a national park in the future. Through GIS, park boundaries can thus be situated in affirmation of a burgeoning ecological awareness in the Guianas which, often unfortunately, is accompanied by irregular but increasingly frequent spurts of resource harvest that occur in the interest of economic progress.

In a wistful mood that suddenly came over her as we talked, Funk lamented the heavy environmental toll that is being

exacted daily by various perturbations in Guyana, such as those resulting from Asian timber and logging concessions; misguided intentions to clearcut forests for oilpalm plantations; wildlife traders; the development of diamond and bauxite mines; and gold mines which are subject to damaging cyanide spills. Perhaps the ghost of Sir Walter Raleigh is still "going for the gold" in the Guianas today.

At this point, Funk hopes that the Centre for the Study of Biological Diversity, which is currently operating under a grant from US-AID, will become self-sufficient in the next few years.