

WHAT'S UP?

THE NEWSLETTER OF THE INTERNATIONAL CANOPY NETWORK

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Hyla, high!

Since the Leipzig Canopy Crane Project (see *What's Up?* Vol. 7 No. 3 Spring 2001) began in 2001, we have made some exciting observations that will contribute to our long-term interdisciplinary research projects (Morawetz and Horschler 2002).

After a strong decline of the amphibian fauna between 1950-1985, we are observing a slow but steady recovery of amphibian populations (Grosse 2001). This is due to improved water quality and controlled inundations of some forest areas.

We found snail species (*Arianta arbustorum* and *Cepea* sp.) foraging on mosses in the upper canopy. We observed Blue Tit birds (*Parus caeruleus*) seeking prey in flowers of the European Ash (*Fraxinus excelsior*) trees, hence acting as potential pollinators for this typically wind-pollinated tree species. Another 'unusual' potential pollinator is the squirrel (*Sciurus vulgaris*), which were observed licking nectar from flowers of the Norway Maple (*Acer platanoides*).

The most interesting discovery we've made is the first proof (in Germany) of the Greenback frog (*Hyla arborea* L.) in the forest canopy. Although its name indicates an arboreal lifestyle, it has never been collected at such a height. We detected the frogs during our regular inspection of traps installed in branches in the canopy to catch crawling arthropods. Four dead individuals were found in traps of two lime trees (*Tilia cordata*) on 5 June and 1 August 2002. The traps were located at 18.6 m, 22.4 m, 25.4 m, and 27.2 m above ground. The animals encountered were three juveniles (25 mm, 26 mm, and 28 mm long) and one adult (38 mm long). Two adult greenbacks have been observed at ca. 22 m height in the upper exterior part of a Sycamore (*Acer pseudoplatanus*) crown located at the edge of an old gap. One of the animals has been regularly observed sitting at the same place over a longer period (10 September to 25 October 2002) (Fig. 1).

Adhesive discs on their toes enable the frogs to climb up and sit in sunny hedges and shrubs at the edge of forests or near water during summer. Average sitting sites are 1-3 m above ground (Grosse 1998). Bioacoustic methods (Bitz *et al.* 1996)

have documented that greenbacks are able to climb higher than that to reach the canopy. Until now, direct evidence was missing because the cryptic frogs elude direct observation beyond 2 m above the ground.



Fig. 1 *Hyla arborea* sitting on a leaf of a Sycamore crown at ca. 22 m height.

It was supposed that mainly adult frogs climb up to the treetops (Bitz *et al.* 1996). However, half of the animals we found were juveniles. The total number of reg-

istrations is low; the phenomenon will be studied in more detail in the future.

Carsten Schmidt, Martin Unterseher,
Peter Horschler and Wilfried Morawetz

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The Forest Canopy Project: Branching out for conservation

Forest canopies are an emerging focus for conservation. These complex and integral parts of our landscapes are attracting increasing attention as centers of biodiversity, critical functional components of ecosystems, wildlife habitat, and providers of resources for humans. However, the window of opportunity to conduct canopy research is dwindling rapidly as forests become degraded and fragmented due to human activities. Ecologists have been alerted to conserve elements of the forest canopy and to awaken the awareness of the importance of forest canopy organisms in scientists and non-scientists.

Past work in conservation of other habitats indicate that humans tend to conserve only those objects or places whose values have been assessed and articulated. Understanding the value of tree canopies and their habitats is essential to their conservation. However, we have only a poor ability to assess their total value. Scientists have tended to focus only on their ecological values, which may not be considered compelling by policy-makers, for example, who are pressured to meet immediate social needs. Only recently have conservation-minded economists added the benefits of "ecosystem services" that forests perform (e.g., watershed protection, filtration of groundwater) to the traditional worth of forests (timber and fiber products). The aesthetic and spiritual values of forests are extremely difficult to quantify in any "currency", and so those values have been almost totally overlooked in previous assessments. Traditional assessments have also been limited by the cultural biases and historically-bound misconceptions that accompany single-discipline studies.

Our "Forest Canopy Project", sponsored by the Conservation Trust program of the National Geographic Society (2002), is part of a large vision for forest canopy conservation around the world, a vision that encompasses - but goes beyond - traditional approaches to conservation. It is serving as a case study to address issues that accompany human attempts to conserve complex ecosystems in ways that address multiple facets of the human spirit. Our objectives are to understand how to measure and then consciously integrate the ecological, economic, and aesthetic values of forest canopy organisms and interactions. We assembled an interdisciplinary team of scientists and non-scientists to examine these values in mosaics of forests that include pristine and human-affected stands (early successional and managed forests, forest fragments).

The general approach was to bring together people from a diversity of backgrounds to a single set of forest stands under consideration for conservation. I first assembled a team of "forest experts" - ecologists, economists, and nature artists - who documented values of forest canopies of trees located in areas of different land use histories, using the tools of his/her specialty. I then brought in a group of "forest novices" - people

who have not been formally trained or who historically lack exposure to forests, and therefore can provide us with new and potentially important insights.

The "forest experts" included: a) ecologists, who measured certain ecological values (e.g., canopy structural diversity, diversity of mosses and lichens); b) traditional forestry workers, who understand the economic values of timber extraction; and c) nature artists, who can articulate the aesthetic/spiritual values (e.g., inspiration for artists; places for personal, tribal, and societal renewal). The two groups of forest non-experts included: a) adult inhabitants of polar regions (Inuits from Nunavut, Canada, a tundra habitat), who have been culturally exposed to a treeless landscape and who did not have the language or background that classifies trees and forests in ways that temperate and tropical region dwellers have; and 2) blind people who have not experienced forests in the same visual ways as sighted people.

Our group of 28 individuals from all regions of the country focused on a single watershed in the Pacific Northwest, Ellsworth Creek. This 5000-acre landscape is a coastal temperate rainforest that is the locus of an active conservation effort by The Nature Conservancy (TNC). We set up temporary camps for two separate weeks in July/August, 2002. Canopy access techniques included single-rope techniques to get access to the four hanging platforms we constructed from plywood, pipe, and webbing, modelled after mountain-climber platforms, but much less expensive (Fig. 1, \$110 each).



Fig. 1: Artist Deborah Stachowic in the platform

Ecologists documented aspects of canopy structure and did a rapid assessment of the biodiversity of canopy and forest floor bryophytes and lichens. Forestry company executives initiated

discussions on the relative values of old-growth vs. secondary forests amongst the group. Visual artists brought their canvases to the platforms and produced representations through the media of pastels, acrylics, and charcoal, many of them successful at conveying the "new perspective" they gained by elevating themselves above their previous groundbound points of reference. Musicians created new aural images with their oboe, bamboo flute, and classical and jazz guitar. An opera composer and a video artist (both from

New York City) used the forest canopy as inspiration for classical and current expressions.

All of these captured the multiple values - ecological, economic, and aesthetic - of the forest canopy and were documented with audio and visual taping. Each individual was given a notebook and time was set aside for journaling each day. The National Geographic Society sent in a film crew, and the resulting piece will be aired on "National Geographic Today", April 8-9, 2003). We discussed our experiences and "debriefed" around the campfire each night, listening to each others' insights and incorporating them into our own.



David Franklin recording on the canopy platform

The insights from the forest novices were of special interest. Discussing forests with people who have rarely or never encountered trees was a novel experience that allowed those of us familiar with trees to see them with a renewed sense of wonder. The questions that arose from our Inuit participants and blind colleagues seemed fresh and insightful, rather than naïve. The Inuits had a deep sense of the values of trees - especially the large old-growth western red cedar trees - that exactly paralleled those of the "hard core" ecologists who have been living and working in such forests all their lives. The ways in which the blind participants overcame the challenges of climbing without the benefit of sight was an inspiration to all, and provided a hopeful metaphor about how we might overcome the challenges of conservation in an increasingly human-dominated world.

We are now digesting and disseminating these activities through archiving the materials produced, writing integrative articles, and presenting displays of the work. The first formal exhibit of art and music is a show entitled "Branching Out: New Views of Trees and Forests", as part of the Art/Science Chautauqua at The Evergreen State College (April 8-13, 2003), in Olympia, Washington. <<http://www.evergreen.edu/artscience>>.

We anticipate applying this approach to other forest canopies in other forest types around the world by linking to other researchers and study sites with whom I have contact via the existing networks of the ICAN and the Global Canopy Programme. This project has launched new and interdisciplinary ways to understand the biota of forest canopies - and other habitats - and human effects on them. Integrating the fields of ecology and economics with input from expressive artists and novices will help breach the wall that has often blocked traditional efforts to implement conservation. This could provide a model approach for other emerging areas of

science. If you are interested in instituting a related study at a site where you are involved in forest canopy research, education, or conservation, contact us at the ICAN office.

Nalini Nadkarni; President, ICAN, Faculty, Evergreen State College

Acknowledgments: We thank John Francis and the Conservation Trust program at the National Geographic Society for support of this project. Other supporting individuals and institutions are listed on our website <<http://www.geocities.com/canopylab>>.

AUSTRALIAN CANOPY CRANE UPDATE

The long awaited rains have finally arrived in Northern Australia, with 2002 being the driest year since 1887. These conditions had obvious effects on the rainforest as well as on our water storage tanks at the research station. Just when we thought we would have to bring in a truck of water to fill the tanks, a few good downpours in December changed the situation and the trees and epiphytes are looking healthy again. A slow year's-end gave us the opportunity to carry out maintenance work on the crane and to install a new generator to power the research station and residence.

We are now seeking more scientists to use the facility. We have had a fantastic first three years of operation, with the crane booked to 80% of capacity and some excellent science resulting. We are now accepting more bookings for next year and for the following year. With an on-site staff of four people, we are geared up to have the facility fully running at all times.

Romina Rader's study of "vertical distribution of small mammals" is in its final stages, and plans on follow-up projects. We are interested in new projects as well. The rainforest birds and the arboreal frogs have not received much attention in the past, not to mention the great opportunities for botanical and entomological research. Considering the economic and political stability that this country offers, and the fantastic currency exchange rate, there are many advantages to carrying out research here.

The canopy eco-tourism at our crane facility is going well, and we have decided to expand our activities by introducing a range of field courses designed to suit university students and environmental groups as well as the general public. Choice of topics include "Evolution of Australian Rainforests", "Mangrove ecosystems and local habitats", "Crocodile biology" and more. The short courses comprise of both lectures and field work delivered by qualified staff using modern visual equipment, all presented at the Coconut Beach Resort. The various modules can be arranged to client's specific requirements and time frame. With help from a local tour company, we are now able to gain access to Cooper Creek and get a close look at some of the mangrove inhabitants, including the Estuarine crocodiles. By using the established boardwalks in the Daintree National Park, we take our guests into the rainforest and mangrove interior in safety and comfort during the day or night.

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The role of women in conservation of forest reserves in Mpigi, Uganda

INTRODUCTION

The Mpigi district in Uganda consists of about 40 forest reserves, all of which are invaluable to the people living around them. Impoverished people, with nothing else to depend on, surround the reserves. Ninety percent of these reserves have been massively encroached upon, and, as a result, biological diversity has been drastically decreased. Exploitation of resources in these forests has been haphazard, excessive, and uncontrollable, seriously affecting the ability of these forest reserves to recover. The forests are also a major catchment area for the rivers' emptying waters to Lake Victoria, an international water body serving hundreds of millions of people. Forests such as Lufuka, Kyansozi, Nsowe, Lwamuda, Navugulu, Kalandazi and Kalombi provide much of the charcoal, timber and poles for the up-market Kampala, 40 km. They are also a major source for drum flames, medicinal herbs, wood for burning bricks, sand, and clay. Only one forest remains intact in Mpigi: Mpanga forest.

Mpigi's forests cover about 260 km², ranging from 1150-1190 m.a.s.l. The forests have great biodiversity, and host 28% of Uganda's total

plant species. Some of these forests are classified as Guineo-Congolian rainforests, once a block of dense forest joining Western Kenya, across Uganda and Zaire. This summarizes their role in conservation of important endemic and rare species.

These forests host over 190 bird species, 198 butterfly species, 170 species of moths, 20 species of small mammals, and a host of rare insects. Some species, such as the Uganda Red Colubus, have been eliminated, with others on the verge.

In 2001, a project was initiated to conserve these forests and promote economic development in the area. With funding from the European Development Fund, Forest Resources Management and Conservation Programme of the Forest Department, Uganda and Voluntary Services Overseas, Uganda Programme Office, programs targeting primarily women and youth were initiated. These programs include a Reforestation and Agroforestry project, an Environmental Education Project, the hoarse radish (*Moringa oleifera*) tree and

neem (*Azadirachta indica*) tree project, a bee-keeping project, and a sustainable crafts project. The projects have had tangible positive results.

In 2002, women in Mpigi district, on a quest to bring resources together for the sake of their families and conservation, decided to form a steering committee to oversee their crafts program (Friends of Mpigi Forests Conservation and Development Organization (FOMAF)). The women also decided to implement an ecotourism and environmental education for schools program. Membership to the crafts program is ca. 200 women, representing some 190 families. The environmental education program has reached 17 out of 100 schools in Mpigi district, planting over 1200 seedlings with 4500 more being distributed around the district.

KEY OBJECTIVES OF THE PROGRAM

At the inception of FOMAF, the major objective was to conserve forests and wetlands in Mpigi district. However, people realized there were other problems associated with deforestation. The HIV/AIDS epidemic has rendered many families

poor, and left behind many widows and child-headed families. There was no way to convince them not to encroach to the forest when they had nothing to eat.

Family planning was tackled first. The family leaders, especially women, had to be empowered financially to feed their families. School's environmental education programs were vital in reaching a greater audience through school children. Involvement of women and youth in ecotourism educated them on other values of forests, and other ways of how income could be generated from forests, instead of direct encroachment.

THE SUSTAINABLE CRAFT PROJECT: A POSITIVE EXAMPLE OF WOMEN IN CONSERVATION AND DEVELOPMENT

The Sustainable Craft Project trained 200 women to make export-quality crafts using local materials. These are exported to Europe or sold in the local tourist destinations, at fairer prices than if sold locally. Thirty women were trained to show



other women ways of making international market selling designs.

The impact has been high. About 190 families now have direct income from sale of crafts. This extends to about 1000 individuals directly benefiting from craft income. As a result, people now view forests with greater interest-not on what they can directly utilize them, but how they can use them to raise income while keeping them intact. Many families have been able to plant trees. The craft project alone has distributed 200 trees to female participants.

A forum for educating women on socio-economic issues in the society was created through the project. Topics discussed include family life, HIV/AIDS prevention, and community relations. Information on forest conservation is also passed on during these sessions

GENDER MAINSTREAMING AS A WAY OF FOREST CONSERVATION

Mpanga forest reserve in Mpigi is a living example of how ecotourism, crafts, and environmental education can enhance conservation and protection. An ecotourism site at Mpanga has played a key role in employment and revenue generation. Villagers have also benefited by providing facilities to visitors. Initially, the people sabotaged the ecotourism sites' programs by tree-felling in the forest, because they perceived that the people were being denied access to their own resources, e.g. flames for the drum market, poles to support banana stands, poles for building, timber, charcoal, sand, clay, medicinal plants, mushrooms, wild honey, papyrus, raffia palm, bisalu grass, mud fish, pine sap, small mammals, and birds. Farming in the forest was also extensive. People had to be taught the importance of the forest reserve, which is the only source of clean drinking water.

An environmental education program was initiated for schools and the community, relying on the local administration. We recognized the power of the woman in the household, who are the primary consumers of the forest's products. Most of the meetings were attended chiefly by women, who also participated in the planning process of education on forest values.



Today, Mpanga forest is today not as encroached as it was three years ago. Some of the patches that had been caused due to farming in the forest have almost recovered. Drum businesses that depended on flames from the forest have had

to find alternative sources.

However, these forest encroachers might be shifting their bases to other nearby forest reserves, which would require similar programs to counter illegal encroaching. Finally, people are understanding that this forest is the source of livelihood for thousands of people. This makes the FOMAF's Sustainable Crafts Project a mouthpiece for development and conservation in Mpigi district from

which other forest reserves may learn.

Kunga Ngece, Technical Adviser, and Mildred Nafuna, Coordinator, Friends of Mpigi Forests Conservation and Development Organization (FOMAF).

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CONTRIBUTE TO WHAT'S UP?

The International Canopy Network (ICAN) is currently seeking articles and information for the upcoming issue of What's Up?, set for publication in June, 2003. ICAN accepts articles, meeting and workshop announcements, related website addresses, and citations. Contributions can be sent via e-mail attachment, fax, or snail mail. Articles up to 1500 words are accepted (WORD format preferred) and graphics are welcomed. The deadline for submissions is May 15, 2003. For further information or to send contributions, please contact the ICAN office:

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GLOBAL CANOPY PROGRAMME UPDATE

A 20:20 vision for forest canopy research

Over the past several months, the Global Canopy Programme has been involved in discussions regarding the mission of the Programme and its long term goals. The resulting mission has been coined the "20:20 Vision".

Two of the greatest challenges facing the natural world are the loss of biological diversity and the impact of climate change. These threats affect every nation, and nowhere more acutely than in the forests. Forest canopies hold a vital key to understanding the great risks such threats pose to society, yet this unique environment remains almost completely unexplored. The significance of forest canopies has only recently been recognized by scientists, and is largely unknown to policy makers. Research is showing that perhaps half of all terrestrial biodiversity exists in forest canopies, and much of it is likely to become extinct before there is even time to document its function or value. Rising CO₂ levels in the atmosphere directly affect the functioning of the forest canopy with severe potential impacts on the composition of arthropod communities, forest quality, and possible flood risk. Following the GCP's intervention, the Convention on Biological Diversity now recognizes the urgent need to tackle these issues and has called on governments to support efforts to investigate forest canopies in its new Workplan on Forests ratified at the Hague in April 2002.

The GCP is proposing a strategic international network of 20 forest canopy observatories. These would serve to investigate the "whole forest", from the air above the canopy to the soil, over a 20-year period. Its purpose is to monitor biodiversity and the impact of global change. Recent advances in forest canopy access methods, primarily with large construction cranes and balloons, now make it possible to launch such a global effort for the first time. These sites will become centres of excellence managed by universities and research centres, delivering vitally needed information to policy makers and governments. After 18 months of preparation, the GCP is bringing together scientists with international funding agencies from around the world to launch this important initiative at a key meeting in London in July 2003. The proposed initiative will combine research, conservation, education, and community projects worldwide. It will create a powerhouse of innovation in science and technology and launch the first major international programme to focus on the canopy. A list of the proposed projects and the expected outcomes is on our website: <http://www.globalcanopy.org>

At the heart of our proposal is the existing network of ten canopy cranes situated in temperate forests in Europe, Japan, and the USA, and in tropical forests in Panama, Malaysia, and Australia. Further sites are urgently needed. Ideal locations include the "biodiversity hotspots" of Brazil, Ecuador, India, and Africa. New techniques for accessing the canopy are in development. The "whole forest" approach will add a significant new dimension to existing forest studies and enable long term monitoring of biodiversity and the impact of global change in the world's richest-known and least-studied terrestrial habitat. Wherever possible, we will create new "canopy observatories" at existing centres of excellence, such as the long-term 50 hectare forest plots managed by the Smithsonian Institution. We are also collaborating with FLUXNET, a global network of 150 towers investigating the carbon balance of forests.

WHAT KINDS OF PROJECTS WOULD BE CONDUCTED AT THESE "WHOLE FOREST" OBSERVATORIES?

The GCP has helped fund the development of a series of harmonized protocols for studying herbivory, arthropod diversity, forest structure measurements, and epiphytes. These harmonised protocols serve as the basis for projects conducted at each site. Further protocols will be required to cover areas such as pollination biology, fruiting and dispersal, hydrology, and impact of climate change. We welcome suggestions and discussion on what other projects could be conducted collaboratively using such a network.

WHAT OUTPUTS CAN WE EXPECT IF SUCH A NETWORK WERE TO EXIST?

The role of canopy biodiversity in the maintenance of ecosystem function and the provision of ecosystem services remains unknown. What role do epiphytes play in this process? Can they be used to predict global change? What part do they play in the sequestration of carbon and decomposition of organic material in the canopy? These latter two areas have largely been ignored in models of climate change prediction. An estimation of herbivory at the stand level could be provided using such a network, which has important implications for quality of forests and woodland management. Such a network could help with scaling studies of ecosystem processes from the leaf, crown, to regional and global scales

and improve predictive models. We know little about the impact of global change on flowering patterns and pollinator relationships with trees, which may be disrupted by climate change. The impact of rising CO₂ levels has rarely been investigated in diverse, whole forest ecosystems, and existing studies would benefit from replication as part of this network. Enhancing the biodiversity of forest canopies in managed forests is increasingly being called for as consumer demand places pressure on retailers to deliver “forest friendly” products rather than timber from monotypic forest stands. A key component of the “whole forest” approach is to incorporate studies in the forest canopy with those going on in the soil. A network of research sites enabling investigations across this gradient would be revolutionary. The first steps are being planned in a joint research project in Panama in the fall of this year, combining studies from the Smithsonian canopy crane at Fort Sherman with balloon access to the canopy provided by the French “Radeau des Cimes” team. This will be one of the first attempts to simultaneously assess arthropod biodiversity from the canopy to the soil.

Andrew Mitchell and Katherine Secoy

Comments on this proposal are welcome: k.secoy@globalcanopy.org.

TROPICAL FOREST CANOPIES, FROM TOP TO ... BOTTOM?: A REVIEW BY MARK MOFFETT

Linsenmair, K. E., Davis, A. J., Fiala, B., Speight, M. R., (eds.) (2001). *Tropical forest canopies: ecology and management*. Kluwer Academic Publishers, Dordrecht, Boston, London. 370 pp., plates, figs, tables, index. Hardback: Price EUR 125.00, *79.00, USA \$115.00. ISBN 079237049X.

Tropical Forest Canopies (TFC) takes over where *Forest Canopies* (Lowman & Nadkarni 1995) left off, with chapters surveying experts and the literature on selected topics to address trends and to discuss problems arising from climbing methods or conceptual issues needing further study. The book is good reading, but I especially enjoyed the overview by Martin Barker and Michelle Pinard and the chapter on invertebrates by Yves Basset and on vertebrates by Roland Kays and Allen Allison.

Frans Bongers' assessment of tropical rainforest canopy structure should have been Chapter 1, especially given that his is the only chapter to attempt to clarify the book's topic by asking what a “forest canopy” is. He uses the term to describe the “total above-ground part of the forest,” including the herbs down by our feet. Elsewhere in TFC, Bongers' definition is used (at least implicitly) only in the chapters on throughfall by Calder and by Chappell et al. In all other chapters for which I could glean information, there are phrases to suggest that, for those authors, canopy biology variously encompasses either: 1) parts of the forest beyond everyday human reach; 2) all trees (or tree crowns) in combination, regardless of their height (but one assumes not herbs and shrubs); or 3) the uppermost tree crowns alone. Other variations, such as using canopy to describe the outermost leaves

(i.e. the “outer canopy”) are absent from TFC but common elsewhere. Some TFC authors try to reduce ambiguity with the phrase “upper canopy” but never say what a “lower canopy” might be. Confusion abounds in the literature: it is not unusual to see “understory” used to describe a stratum that is separate from the canopy stratum (or strata), and then, at another point in the same article, to find the same word used to describe “part of a canopy” or perhaps equivalently, “one of the several canopy layers.”

Given the intense media interest in canopy research, in reading TFC I found myself asking how “canopy biology” stands today as a subject of scientific inquiry. I was surprised how often it is possible to remove the word “canopy” (or change it to “forest”) in the book without changing the meaning. In fact, the accuracy of many statements appear to be improved by such an edit. As a result, attempts by book authors to focus on conservation in the canopy fell flat. How likely is it a forest will harbor a “significant” canopy flora and fauna and at the same time be found “insignificant” for ground or soil species? It is impossible to conserve the top portion of an system without conserving its bottom. To succeed as conservationists, forest canopy biologists need to work as equals with other forest specialists to develop programs that make this explicit.

A millennium is a time for reflection in all things, canopy biology among them. Assertions about the “maturation” of canopy biology are common in the book, most of them very simplistic. Techniques in canopy biology have been a reflection of their time, and canopy ecology has grown as ecology has grown. Several authors stressed the need for standardized protocols and data sets. Standardization has its uses (e.g., in conservation), but to develop a robust science, the idea could be deadening. As ecology has grown, the available points of view on issues and the options for attacking a problem have expanded, not shrunk; the range of possibilities is what attracts the best minds to a field. Bongers hits the nail on the head in his section “Canopy structure: what do you want to know?” Further, as long as we are ambiguous as to what strata we have in mind by the term “canopy” (and indeed what we mean by “strata:” Parker & Brown 2000, Moffett 2001), attempts to manage common data sets or any efforts towards synthesis will contain serious flaws, and canopy biology, regardless of other successes, will not reach its much-heralded intellectual maturity.

For a more complete review, see Moffett (2002).

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ANNOUNCEMENTS

Tree Wars and the Biotech Revolution Hit Leavenworth, Sleeping Lady, March 28 -31, 2003. Presented by the Seattle-based Hazel Wolf Environmental Film Network, the festival is the premier Pacific Northwest event for environmental films, bringing together activists, media makers, educators, funders, scientists, and public officials for four days. Nestled in a spectacular mountain setting, this year's festival will showcase dozens of films throughout the weekend on topics such as Forest Conservation, Sustainable Agriculture, GMOs, and Food. Additional topics include energy, global warming, toxics, and spirituality and the environment.

The festival will open Friday, March 28th. Evening films will focus on forest conservation. Acclaimed director Ben Saboonchian will present 'War of the Woods, The Last Stand,' a look at the great timber wars of the Pacific Northwest and the battle between mill owners and environmentalists over the last great scraps of old growth forests on public lands. Guest Speaker Nalini Nadkarni from the International Canopy Network will take us 100 feet or more above the earth's surface to explore Tim Scoones' Emmy-award winning 'Rainforest: Heroes of the High Frontier'.

A complete program listing of events will be posted at <<www.hazelfilm.org>>.

Organization for Tropical Studies-Science for the 21st Century, March 30-April 5, 2003. Join us for a week-long program in tropical education, research and conservation as we celebrate our 40th Anniversary. The mix of hands-on learning, presentations by leading environmental researchers and social functions will expand your view of tropical science. The events are open to all. Join us for the entire week or choose the activities that fit your schedule. The program includes Tropical Biology (Rubber) Boot Camps, Celebration Banquet, Tropical Science for the 21st Century Scientific Symposium featuring Edward Wilson (Harvard University) on the future of tropical biology, and an Assembly of Delegates Annual Meeting. To register, visit: <<<http://www.ots.duke.edu>>>.

Association for Tropical Biology (ATB)/British Ecological Society (BES) Joint meeting and Symposium on "Biotic Interactions in the Tropics", 7-10 July 2003, University of Aberdeen, Scotland. The three-day meeting will comprise morning plenary sessions on biotic interactions and afternoon sessions for contributed papers. A fourth day will be dedicated to workshops on Research Priorities in Tropical Biology. For more information, contact David Burslem <<d.burslem@abdn.ac.uk>>, Michelle Pinard <<m.a.pinard@abdn.ac.uk>>, or Mike Swaine <<m.swaine@abdn.ac.uk>>.

Congress on 'Globalisation, localisation and tropical forest management in the 21st century', 22-23 October 2003, Roeterseiland, Amsterdam, the Netherlands. The start of the 21st century has been marked by a multitude of forest-related international agreements and initiatives. Notwithstanding these efforts, deforestation continues unabated at the cost of 500 million people who depend on forests for their livelihoods. At the same time, tropical forest management is being reshaped through the emergence of new actors and partnerships. Of particular interest is the potential of new global-local multi-stakeholder partnerships.

The objectives of the congress are:

- to bring together current knowledge on and experience with international partnerships and their effects on tropical forest conservation, management and poverty alleviation;
- to identify 'lessons learned' and conditions for successful and effective multi-scale partnerships;
- to discuss opportunities and bottlenecks in relation to multi-scale partnerships for the livelihoods of forest-dwelling people and communities at the forest fringe, including potential exclusion of stakeholders under the new management arrangements;
- to define recommendations for policy and research on tropical forest management in a globalising environment.

The two-day congress programme will include plenary sections, regional and thematic workshops and a poster session. Keynote speakers and experienced scientists will be invited to make presentations at plenary sessions. Proposals can be submitted for plenary sessions, symposia and workshop sessions, paper presentations, and poster presentations.

Organizing agencies include: The Amsterdam Institute for Global Issues and Development Studies (AGIDS), Centre for Latin American Research and Documentation (CEDLA), Institute for Environmental Studies (IVM), Amsterdam Institute for International Development (AIID), Tropenbos International (TBI)

Schedule: Pre-registration 1 March 2003; Abstracts due 1 March 2003; Selection of abstracts-1 April 2003; Second announcement-1 April 2003; Registration-1 July 2003; Third and final announcement-1 August 2003; Papers due 1 September; Congress-22-23 October 2003

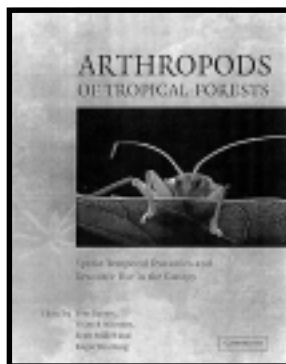
Registration information will be available in the second announcement and on the web <<<http://gp.fmg.uva.nl/agids>>> and <<<http://www.tropenbos.org>>>. Pre-registering at <<<http://www.tropenbos.org>>> will ensure you receive regular updates by e-mail.

Contact: Dr Mirjam A.F. Ros-Tonen, Amsterdam Research Institute for Global Issue and Development Studies (AGIDS), University of Amsterdam; <<m.ros@frw.uva.nl>>.

PUBLICATIONS

“Arthropods of Tropical Forests: Spatio-temporal Dynamics and Resource using the Canopy” edited by Yves Basset, Vojtech Novotny, Scott Miller & Roger Kitching.

Arthropods are the most diverse group of organisms on our planet and the tropical rainforests represent the most biologically diverse of all ecosystems. This book, written by 79 authors contributing to 35 chapters, provides an overview of data collected during recent studies in Australia, Africa, Asia, and South America. The book focuses on the distribution of arthropods and their use of resources in the rainforest canopies. This provides a basis for comparison among the forest ecosystems of major biogeographical regions. Topics covered include the distribution of arthropods along vertical gradients and the relationship between the soil/litter habitat and the forest canopy. The temporal dynamics of arthropod communities, habitats and food selection are examined within and among tropical tree crowns, as are the effects of forest disturbance. This book is a valuable addition to the literature used by community ecologists, conservation biologists entomologists, botanists and forestry experts. To order, go to: <<<http://titles.cambridge.org/catalogue.asp?ISBN=0521820006>>>.



Conservation Ecology Online. *Conservation Ecology* is an electronic, peer-reviewed, multi-disciplinary journal devoted to the rapid dissemination of current research. At six month intervals, the Issue-in-Progress is declared a New Issue, and subscribers receive the Table of Contents of the issue via e-mail. Content of the journal ranges from the applied to the theoretical. In general, papers cover topics relating to the ecological, political, and social foundations for sustainable social-ecological systems. Specifically, the journal publishes articles that present research findings on the following issues: (a) the conservation, management, and sustainable use of ecological systems, resources and biological diversity at all levels, (b) the role natural systems play in social and political systems and conversely, the effect of social, economic and political institutions on ecological systems and services, and (c) the means by which we can develop and sustain desired ecological, social and political states. Visit: <<<http://www.consecol.org/Journal>>>.

JOBS

Mentors needed at La Selva Biological Station

The Organization for Tropical Studies (OTS) is looking for mentors for the second year of its Research Experience for Undergraduates (REU) program at La Selva Biological Station in Costa Rica. Mentors will be responsible for guiding one or two undergraduate students in ecological research projects at La Selva. Students will participate in the program for 10 weeks from June 9 to August 18, 2003.

Mentors will be asked to have several project ideas that students can select from. Students will work with the mentor to develop an idea into a feasible project involving approximately seven to eight weeks of fieldwork. Mentors should plan on spending at least three weeks of this period at La Selva, during which they will help students with the design, implementation, and analysis of projects.

REU student participants will have all of their expenses covered by the program, as well as a small budget for equipment. Mentors participating in the REU program will be provided with three weeks station fees, or the equivalent in airfare per student.

Primary mentors are expected to have completed their graduate studies. To participate in the program, send a letter with a short summary of potential project ideas and an estimate of the time that you could expect to spend at La Selva.

For more information, please contact:

Evan Notman; <evan@ots.ac.cr>; <<http://www.ots.ac.cr/en/education/under_summer_reu.shtml>>

WEBSITES

ConserveOnline, created and maintained by the Nature Conservancy in partnership with NatureServe, The Society for Conservation Biology, US Forest Service, and the American Museum of Natural History, makes conservation tools, techniques, and experience available to a broad community of conservation practitioners. The site is intended to provide information and support to anyone making conservation-related decisions. ConserveOnline is an open forum for sharing successes and failures, and for connecting scientific research with field-based conservation practice. It provides a comprehensive online library, making knowledge and experience of the Nature Conservancy field staff and other conservation practitioners available and searchable online at <<<http://conserveonline.org>>>.

RECENT CITATIONS IN CANOPY SCIENCE

[Ed. note: Since there is no central journal on canopy science, it is useful to publish citations on canopy studies in the recent literature. Some of the papers listed below were obtained from ICAN subscribers sending in reprints; most were discovered through weekly literature searches on Current Contents on Diskette (CCOD).

CANOPY STRUCTURE

- Anten, N. P. R., and T. Hirose. 2001. Limitations on photosynthesis of competing individuals in stands and the consequences for canopy structure. *Oecologia* 129:186-196.
- Osada, N., H. Takeda, A. Furukawa, and M. Awang. 2001. Leaf dynamics and maintenance of tree crowns in a Malaysian rain forest stand. *Journal of Ecology* 89:774-782.
- Soares, P., and M. Tome. 2001. A tree crown ratio prediction equation for eucalypt plantations. *Annals of Forest Science* 58:193-202.

FOREST MANAGEMENT

- Parren, M., and F. Bongers. 2001. Does climber cutting reduce felling damage in southern Cameroon? *Forest Ecology and Management* 141:175-188.
- Portela, R., and I. Rademacher. 2001. A dynamic model of patterns of deforestation and their effect on the ability of the Brazilian Amazonia to provide ecosystem services. *Ecological Modelling* 143:115-146.

FOREST STRUCTURE

- Gale, N., and P. Hall. 2001. Factors determining the modes of tree death in three Bornean rain forests. *Journal of Vegetation Science* 12:337-346.
- Hoshino, D., N. Nishimura, and S. Yamamoto. 2001. Age, size structure and spatial pattern of major tree species in an old-growth *Chamaecyparis obtusa* forest, Central Japan. *Forest Ecology and Management* 152:31-43.
- Minchinton, T. E. 2001. Canopy and substratum heterogeneity influence recruitment of the mangrove *Avicennia marina*. *Journal of Ecology* 89:888-902.
- Tatsuhara, S., and H. Kurashige. 2001. Estimating foliage biomass in a natural deciduous broad-leaved forest area in a mountainous district. *Forest Ecology and Management* 152:141-148.

FOREST-ATMOSPHERE INTERACTIONS

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- Gomez, J. A., J. V. Giraldez, and E. Fereres. 2001. Rainfall interception by olive trees in relation to leaf area. *Agricultural Water Management* 49:65-76.
- Roderick, M. L., G. D. Farquhar, S. L. Berry, and I. R. Noble. 2001. On the direct effect of clouds and atmospheric particles on the productivity and structure of vegetation. *Oecologia* 129:21-30.
- Sirois, A., R. Vet, and D. MacTavish. 2001. Atmospheric deposition to the Turkey Lakes watershed: Temporal variations and characteristics. *Ecosystems* 4:503-513.

INVERTEBRATES

- Alvarez, G., I. Armbrrecht, E. Jimenez, H. Armbrrecht, and P. Ulloa-Chacon. 2001. Ant-plant association in two *Tococa* species from a primary rain forest of Colombian Choco (Hymenoptera: Formicidae). *Sociobiology* 38:585-602.
- Basset, Y. 2001. Communities of insect herbivores foraging on saplings versus mature trees of *Pourouma bicolor* (Cecropiaceae) in Panama. *Oecologia* 129:253-260.
- Leps, J., V. Novotny, and Y. Basset. 2001. Habitat and successional status of plants in relation to the communities of their leaf-chewing herbivores in Papua New Guinea. *Journal of Ecology* 89:186-199.
- Strazanac, J. S., C. D. Plaugher, T. R. Petrice, and L. Butler. 2001. New Tachinidae (Diptera) host records of eastern north American forest canopy lepidoptera: Baseline data in a *Bacillus thuringiensis* variety kurstaki nontarget study. *Journal of Economic Entomology* 94:1128-1134.

LIGHT TRANSMISSION

- Hikosaka, K., H. Nagashima, Y. Harada, and T. Hirose. 2001. A simple formulation of interaction between individuals competing for light in a monospecific stand. *Functional Ecology* 15:642-646.

MICROMETEOROLOGY

- Nojd, P. 2001. Instantaneous PAR estimated using long records of daily temperature and rainfall. *Agricultural and Forest Meteorology* 109:47-59.
- Proulx, O. J., and D. F. Greene. 2001. The relationship between ice thickness and northern hardwood tree damage during ice storms. *Canadian Journal of Forest Research Revue Canadienne de Recherche Forestière* 31:1758-1767.

MODELING

- Bigelow, S. 2001. Evapotranspiration modelled from stands of three broad-leaved tropical trees in Costa Rica. *Hydrological Processes* 15:2779-2796.
- Dobbertin, M., and P. Brang. 2001. Crown defoliation improves tree mortality models. *Forest Ecology and Management* 141:271-284.
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- Kumagai, T. 2001. Modeling water transportation and storage in sapwood - model development and validation. *Agricultural and Forest Meteorology* 109:105-115.
- Lhomme, J. 2001. Non-steady-state modelling of water transfer in a Mediterranean evergreen canopy. *Agricultural and Forest Meteorology* 109:77.
- Tickle, P. K., N. C. Coops, and S. D. Hafner. 2001. Assessing forest productivity at local scales across a native eucalypt forest using a process model, 3PG-SPATIAL. *Forest Ecology and Management* 152:275-291.

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- Hall, R. J., D. R. Peddle, and D. L. Klita. 2000. Mapping conifer understory within boreal mixedwoods from Landsat TM satellite imagery and forest inventory information. *Forestry Chronicle* **76**:887-902.
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MISCELLANEOUS

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