



WHAT'S UP?

THE NEWSLETTER OF THE INTERNATIONAL CANOPY NETWORK

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Linking the Complexity of Forest Canopies to Ecosystem and Landscape Function: IUFRO Canopy Processes, July 11-19, 2001

2ND ANNOUNCEMENT, CALL FOR PAPERS AND REGISTRATION

Sponsored by the International Union of Forestry Research Organizations (IUFRO), Oregon State University, and the US Forest Service, the conference will examine how structural complexity of forest canopies affects ecosystem function and response to global change. Structural complexity in forest canopies changes with forest age for even-aged forests and with species diversity and mean age for other forests. Structural complexity can alter canopy physiology and defines habitat for canopy-dwelling species. New tools are becoming available to measure canopy structure in great detail (canopy cranes) and over large areas (LIDAR remote sensing). However, links between canopy structure and function (for example, carbon, water, and energy exchange with the atmosphere, and species habitat) remain poorly understood. Through invited syntheses and offered presentations, we aim to further understanding of the linkages between canopy structure and function and provide a relaxed forum for the exchange of ideas, and for building and strengthening professional relationships.

The meeting will be a traveling workshop with scientific presentations interspersed with visits to the Wind River Canopy Crane near the Columbia River Gorge in Washington, Mount St. Helens, and the Metolious Ameriflux eco-

system monitoring sites in central Oregon. Selected papers from the meeting will be published as a special issue of *Tree Physiology*.

Keynote speakers are scheduled to include: Dennis Baldocchi, University of California, Berkeley: The influence of canopy complexity on carbon, water and energy fluxes; Toby Bradshaw, University of Washington: Canopies of the future: the role of domestication in forest trees; Nina Buchmann, Max-Planck Institute for Biogeochemistry: Canopy complexity and forest response to global change; Brian Enquist, University of Arizona: Universal scaling in tree allometry; Olevi Kull, Tartu University, Estonia: Canopy structure and tree growth; Michael Lefsky, Oregon State University: The role of remote sensing in describing canopy structure: new approaches and implications; John Marzluff, University of Washington: Biodiversity and canopy complexity; Cindy Prescott, University of British Columbia: Canopy complexity and nutrient cycling.



Visit our website for details of the meeting, registration, and submission of abstracts:
<<<http://www.cof.orst.edu/cof/extended/conferen/canopy/>>>

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Experimental studies of non-vascular epiphyte colonization on artificial substrates in the tropics

INTRODUCTION

The rationale behind these experiments was to test the hypothesis that the outcome of competition (for space) is largely governed by the arrival sequence, a process presumably dictated by chance. We share preliminary results of our long-term studies in this communication.

The objectives of these experiments were:

1. Test the principle of priority [4] reformulated by Wolf [5].
2. Test for possible effects of microclimate on colonization rates of bryophytes, introduced as a factor by varying the location of the artificial substrates (Experiment 1: position in the canopy, Experiment 3: different altitudes)
3. Test for effects of substrate used in the experiment (Experiment 2)
4. Test for effects of propagule input on colonization success (Experiment 3)

THE EXPERIMENTS

EXPERIMENT 1: WOODEN BOARDS IN DIFFERENT STRATA OF A PRIMARY FOREST (1993)

As a follow up to the survey of bryophyte diversity in montane rain forests in Colombia [5], A. Groot and J. Wolf constructed a series of wooden frames (40 cm by 30 cm) and placed them inside a small clearing of a *Weinmannia*-dominated cloud forest at 3370 m. The boards were placed 1.5 m above the ground at an angle of approximately 30° (Fig.1). Later, Groot placed the same sized wooden boards within tree crowns. They used Sajo (*Campnosperma panamensis*, Anacardiaceae), a locally available wood that originates from the Pacific coast. In subsequent years of monitoring, colonization was minimal. Between 1993-1997, fruticose lichens grew (*Oropogon* and *Usnea* were most abundant). Individuals



Fig. 1: One of the constructions of Experiment 1, set up in a small clearing within a mature forest at 3150 m.(1997)

present one year were often absent in the next, showing that there was both a low colonization rate and high mortality. In 1997, a small patch of bryophytes grew in the shadow of one of the wooden poles, indicating that the board

surface was too dry for good bryophyte growth. One of the boards that had fallen to the ground in December 1996 was completely covered by terrestrial bryophytes by February 1997, as was a PVC pipe lying on the ground. This suggested that even in this “mossy” cloud forest, moisture was the main constraint for colonization of the wood surface. The vegetation covering these substrates was vegetative propagation of the moss cover on the forest floor, and not new colonization. This indicated that limited input and/or viability of propagules may restrict epiphytic moss growth.



Fig. 2: Experiment 2, set up in a coffee plantation. (1999)

EXPERIMENT 2: WOOD COVERED WITH CLOTH (1997)

Janice Glime suggested the use of cheesecloth to facilitate colonization, since this material is used for creating moss gardens. We initiated a second set of experiments in 1997 to investigate differences between wood types and different levels of water retention.

The study was carried out at Finca Los Micos, a coffee farm near Santa Rosa de Cabal, Risaralda, Colombia (1500 m). First, the substrate was inoculated with 23 g dry weight of 10 species of bryophytes to make sure that we would have sufficient propagules to test for differences in substrate suitability. Sajo was cut into 10 cm² square pieces, and transversal sections of coffee were used as the second substrate type. Each piece of wood was covered with unbleached canvas, then with cheesecloth. Every other patch had a 10 cm² piece of cellulose placed on top of the wood surface before the canvas and cheesecloth were sewn on. Each experiment consisted of 30 patches, and was set up in a random block design with 4 treatments: 1) coffee wood 2) coffee wood with cellulose 3) sajo wood 4) sajo wood with cellulose.

We started the experiment on 28 July 1997, at the end of the dry period. The drought of El Niño set in just after the construction of the two experiments was completed, which most likely interfered with the results. The first monitoring

began on 2 December 1997 and continued until the beginning of 1999. At the beginning of 1998, some mosses and hepatics (especially *Fabronia ciliaris* (Bridel) Bridel and *Sematophyllum subpinatum* (Bridel) E. Britton) grew on some of the patches in the inoculated experiment, covering as much as 60% of the surface area. We found no difference in yield between coffee or sajo. The untreated experiment showed only occasional occupation by bryophytes. By the end of 1998, however, some saprophytic fungi (most conspicuously a species of the order Tremelales, with bright orange thalli) were seen on both substrates. The moss and hepatic cover did not extend much beyond the initial occupation and the linen covering started to tear (Fig. 2).

EXPERIMENT 3: WOODEN BOARDS WITH CLOTH FLOATING IN WATER (1998)

We started a third experiment in 1998 to make up for the apparent lack of moisture in the previous two. Our aim was to keep the surface constantly moist by floating the substrate

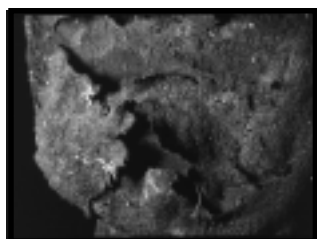


Fig. 3: Detail of Experiment 2 taken in 1999, after 1 year. This shows the deterioration of the canvas and cheesecloth. Bryophyte cover is restricted to the cloth, and did not proliferate on the bare wood surface (pictures with full detail available in electronic format on request).

in plastic drums. We built one model and tested it in three different sites at different altitudes; Los Micos (1550 m), Cartaguito (1750 m), and Terales (2100 m). Each model consisted of 15 pieces of substrate consisting of a piece of wood (radius = 15 cm; surface area = 1.8 m²), and was covered with a piece of unbleached canvas with cheesecloth on top. The experiments were covered with a shadow net with a density of 30% (light transmission). Flotation was controlled with styrofoam, and was adjusted to insure equal water exposure to all areas of the panel. Aside from some germinating herbs, there was no colonization by any kind of cryptogam during one year of monitoring.

DISCUSSION

The successful execution of colonization experiments under field conditions was not straightforward. Although sterilized bark squares are often suggested as an alternative to stem segments, they were not locally available. An alternative could have been palm or tree fern stems, as used in orchid cultivation, but we observed in the field that this is not a

propitious substrate for bryophytes. The problems with the Sajo could have been anticipated, but time was always a constraint when setting up the experiments, and with the incredible abundance of mosses in the forests, we did not expect a marked effect of local climatic conditions. This was further reinforced when the initial results of Experiment 2 were inconclusive about the suitability of both wood types

for successful colonization. The observation of saprophytes on substrates in Experiment 2 presents the question of whether wood should be used at all if epiphytes are the group of organisms under study. The successful experiments on artificial leaves [1] are more elegant in this sense.

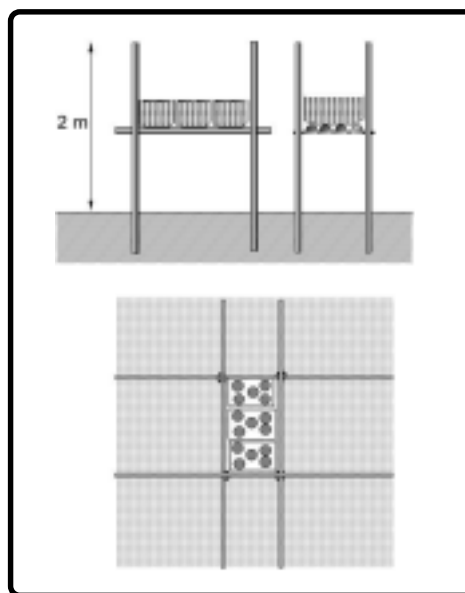


Fig. 4: Construction drawing of the colonization experiments at three different altitudes

RECOMMENDATIONS

From these experiments, we can recommend the following:

- Whenever possible, use non-organic substrates, which can withstand long-term exposure to the local climate and not become overgrown with fungi.
- Design a preliminary experiment in which the substrate is inoculated by the researchers, and allow sufficient time for this experiment to show results (more than one year).
- Incorporate the desiccating effect of wind, even at low speeds, in the experimental design.
- Be aware of the potentially long-term return of experiments.

ACKNOWLEDGEMENTS

The study required long-term permission and proper care in constructing the experiments, both of which were graciously provided by Jairo Ruiz (Los Micos) Doña Aida Arbelaez (Terales), and Tonyo Ramirez (Cartaguito). Juliane Hanke and Joost Wilms assisted with the

(Continued on next page)

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construction of Experiment 2. Guido van Reenen helped brainstorm ideas for setups.

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Tropical Ecology in Review: The ATB Bangalore Conference July 2001

The Association for Tropical Biology (ATB) will be holding its annual meeting in Bangalore, India (July 15-18, 2001). The following description of the workshop is from the NSF proposal that was recently funded to support travel to the meeting.

Titled "Priorities in Tropical Biology", the meeting will bring together approximately 40 scientists from different geographical regions worldwide to fulfill two goals: First, we will provide a set of syntheses of the subfields that constitute the broad domain of tropical biology. Second, we will stage structured discussions to begin the process of setting an agenda for future research. The workshop will begin with 6 to 8 presentations that will summarize past work and identify top research needs in their subdisciplines of tropical biology. Possible speakers include Madhav Gadgil, Nalini Nadkarni, Ken Oyama, Vicor Toledo, Jeff McNeely, William Laurance, Yves Basset, Hal Mooney, Ariel Lugo, Guadalupe Williams-Linera, and Servio Ribiero.

During its last meeting in Indiana (June, 2000), the Council of the Association for Tropical Biology held a series

of workshops in Asia, Africa, and Latin America to develop an agenda for priorities in tropical biology. This agenda is based on five criteria:

- a) recent developments in tropical biology, b) full participation of tropical-country scientists, c) integration of natural and social sciences approaches, d) understanding the current threats to tropical ecosystems, and e) filling the pressing need to develop mitigation strategies to curtail losses in tropical biodiversity.



The first of these workshops will be held directly following the ATB conference. This

will draw immediately upon the content of the papers presented during the conference, thus fulfilling our first criteria. Our second criteria will be met by incorporating ideas generated in the recent NSF-sponsored workshop on forest canopy research in several ways. First, before the workshop, we will send out and request input on an agenda to prospective participants and to those who cannot attend because of financial or other constraints. Second, during the workshop we will establish a website that is updated daily with workshop notes and queries to those not attending. Third, within six months

of the conference, we will write and widely disseminate a final report on the workshop. This report will also be sent to other academics, policy-makers, funding agencies, and non-governmental conservation groups.

The latter three criteria outlined by the ATB Council in Indiana will be met through structured group discussions among the workshop participants during the second day. Our goals will be to incorporate the ideas and beliefs of as many individuals as possible, allow discussions of proposed solutions among all participants, and produce a prioritized list of “doable” solutions to the community.

To streamline the discussions, we will use the “nominal small group process” (J. Miller, personal communication). Prior to and during the main ATB conference, the convenors of the workshop will identify 4-6 specific questions that address particular areas of tropical biology. Examples of questions under discussion might include: Within the next decade, what specific and tangible activities can scientists take to enhance our knowledge of tropical diversity? What cross-site comparisons might illuminate the relationships between tropical forest structure and function? How can we motivate the general public and policy makers to support tropical ecology? How might institutions in temperate regions contribute to tropical biology conservation in tropical countries? How might biologists and social scientists interact more effectively?

These questions will be presented for feedback to the entire group of participants (and non-attendees via the website) two days before the workshop. At the workshop, everyone will be split into small groups of 6-8 people, and a group leader will present one of the questions and elicit responses from each participant without editorial comment. A recorder will transcribe the responses verbatim on paper, which will be hung up for display. Open discussion will be held for 20-30 minutes. Each participant will then be given three “stick-on” dots and will place a dot on his/her choices for the three suggestions s/he considered the best. The “votes” will be tallied, and the four responses that received the most votes will be presented to the entire group. The whole group will then reconvene and develop comments and discussion. All of the papers and responses will remain on display so that all of the comments (not just the most “popular”) can be examined. Using this method, consensus can be reached without sacrificing the visibility of minority opinions.

The Co-PIs [of the NSF grant] will assume the responsibility of writing the preliminary report, which will be put on

the web. Comments from the ATB members and associates of OTS will be sought and discussed during the second and third workshops in this series. These will be held in Panama, August, 2002, which will draw many Latin American scientists, and Africa, January 2002. Comments from these subsequent meetings will be incorporated into a final report, which will be published in *Biotropica* and *Liana*, the publications of ATB and the OTS, respectively.

Contact: Dr. K. N. Ganeshaiah, Chair, IOC; Dr. Kamal S. Bawa, President, ATB, Member IOC; International Conference on Tropical Ecosystems Structure, Diversity and Human Welfare or Secretariat; ATB 2001, c/o ATREE, No 659 5th A Main, Hebbal, Bangalore 560 024, India; Phone: 91 80 353 3942; Fax: 91 80 353 0070; <atb2001@vsnl.com>; Website: <<<http://www.atb2001.org>>>.

ADVISORY BOARD BIO-SKETCH

Julie Ivker was first introduced to the mysteries of the forest canopy while in the Ecuadorian Amazon, where she worked as naturalist/guide. She has been an advocate for canopy exploration ever since. Julie is the current Program Director for the Children’s Environmental Trust (CET) Foundation, International, a US-based, international environmental education non-profit organization. CET designs and facilitates natural science and cultural immersion workshops in the Peruvian Amazon and in the tropical wet forests of Costa Rica for North American middle and high school students. Experience in the canopy of the tropical rainforest is an integral part of every CET workshop.



Julie recently completed her Master’s degree in Environmental Management from the Nicholas School of the Environment at Duke University. Her focus of study was community development in relation to natural resource management in developing countries. She also completed a graduate certificate in Latin American Studies and a Certificate in Non-profit Management.

Julie loves to spend time in the great outdoors all around the world. Although she is a novice tree climber, she is a canopy enthusiast who is honored to be a part of the ICAN Advisory Board. She is delighted to have the opportunity to bring her expertise in environmental education and her background in non-profit management to ICAN.

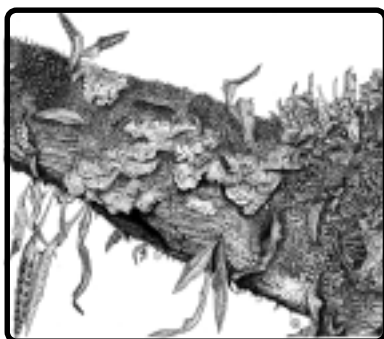
REPORTS ON CANOPY SYMPOSIA

CANOPY BIOLOGY: THE FOREST AND THE SEA AN OVERVIEW AND SUMMARY OF THE "RAIN FOREST TO KELP FOREST SYMPOSIUM"

As a high school student in the 1970's, I read pioneer canopy biologist Marston Bates' book *The Forest and the Sea* (1960, Random House, New York) and was fascinated by his poetic comparisons between life in the forest and life in the sea. The book was popular at the time, as evident from conversations with fellow students and scientists, and by the many printings it had gone through. Yet often overlooked in the enchantment of Bates' rich metaphors was a deeper message that, in forging even more subdisciplines and schools of thought in biology, we end up fragmenting our view of the world at our peril.

As a lover of insects since childhood, my own world view was so similar to an ant's that even then I wondered if Bates had taken his metaphors far enough. Surely from an ant's-eye-view, a meadow is as worthy of comparison to life in the sea as is a forest? What, if anything, is so special about the forest?

In the spirit of Marston Bates (and in an attempt to answer the question of what might be special about forests), I teamed up with marine ecologist James Eckman of the Office of Naval Research to organize the first symposium directed at comparing terrestrial forests to an aquatic habitat. In making forest comparisons, Bates treated the sea very broadly, as a three-dimensional matrix occupied by life. Jim and I were more interested in specific comparisons between architecturally complex communities on land and in water. As a starting point, we chose to compare rainforests on land to kelp beds in the sea.



The symposium was held on 28 December in Portland, Oregon as a session of a convention of the Western Society of Naturalists, a group presently dominated by marine biologists. Winter storms forced the cancellation of three speakers-including Jim Eckman. Still, the symposium was a success, judging both from the discussion forum following the talks and from the e-mail messages written by marine biologists that I continue to receive six weeks later.

Terrestrial researchers presented an overview of forest ecosystems to a marine-biased audience. In his talk "What matters about the organization of matter in canopies?", Geoffrey (Jess) G. Parker of the Smithsonian Environmental Research Center explained how recent technologies are enriching concepts of how terrestrial forests are assembled through a broad range of scales in time and space. Nalini Nadkarni of Evergreen State College summarized her work on the stability and complexity of epiphyte communities and the role of canopy plants in nutrient cycling, and described the efforts of ICAN to organize terrestrial forest canopy information in a database. I gave a general prospectus on terrestrial canopy biology, defining the discipline (as I did in a recent *Biotropica* article) as the study of the aboveground parts of any plant community. I then outlined six core areas of canopy study that may apply across systems, both terrestrial and aquatic.



Sponge Upon a Sea-Weed
(fished up from a depth of sixty fathoms)

Marine researchers included Brian P. Gaylord and Daniel C. Reed of the University of California at Santa Barbara, who looked at propagule dispersal into, out of, and through these forests. They described the importance of release height, sinking speed, and the effects of both local turbulence and broad-range currents. Michael H. Graham of the University of California at Davis discussed the coupling of spore production by kelp in relation to flow rates through different portions of the forest interior. In both talks, the vocabulary was remarkably reminiscent of the words used by terrestrial researchers in this field, though the speakers emphasized that some factors such as an air-water interface and wave-related effects are unique to aquatic systems. Todd Anderson of San Diego State University spoke on fish ecology in kelp canopies, presenting a series of examples of the importance of canopy architecture and stratification to the organization of fish communities. Ross Clark of the California Coastal Commission lectured on his manipulations of the several canopy layers in a kelp stand. Kelp forests can reach 50 m in height and typically contain five strata of plants (algae). Clark and his col-

leagues were able to distinguish algal species by light requirements and response to canopy clearings (gaps).

The practice of applying the term “canopy” to kelp began in the 1930’s with Jack Kitching, who, using a milk can with a window made from a glass cookie box, was the first scientist to successfully dive into this ecosystem. Perhaps the word “canopy” comes to mind only for ecosystems we experience from within. This may explain why this word is scarcely used in places where human-biased perspective is limited, such as in viewing canopies of a prairie or a moss mat or a kelp bed viewed from above. The “Rain Forest to Kelp Forest” symposium suggested the potential for a comparative biology of canopies, and for an expanded vision of canopy biology that is very much in its infancy.

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BRAZILIAN CANOPY WORKSHOP SUMMARIES

Two workshops, “First Brazilian workshop on canopy ecology-Copa no Brasil” and “Insect biodiversity of tropical forests: theory, prospects in quantitative analysis, and techniques of canopy access” were held this past year in Brazil. This report summarizes both workshops, aiming towards a unified future in canopy studies.

The “First Brazilian Workshop on canopy ecology-Copa no Brasil” was held from July 24-27, 2000 at the Universidade Estadual de Campinas, São Paulo State. The course, led by Talita Fontoura (Universidade Estadual de Santa Cruz, University Estadual de Campinas), A. Mantovani (Universidade Federal do Rio de Janeiro), and four Brazilian climbing instructors was attended by 12 people. The main goal of the course was to teach tree-climbing techniques to professionals, graduate, and undergraduate students. Moreover, the meeting aimed to boost discussions about canopy research in Brazil. In the three days of practice, the climbing instructors did an excellent job teaching the basics of single-rope technique, free climbing, and proussic. Beyond the practical instruction, two review seminars, “The state of art in canopy research” (T. Fontoura) and “The next steps on canopy research in Brazil” (A. Mantovani) were given. Four sets of research data were presented, including climbing techniques for children, arboriculture, new adaptations for tree-climbing, and epiphytes.

The companion workshop, “Insect biodiversity of tropical forests: theory, prospects in quantitative analysis, and techniques of canopy access”, was developed by Sérgio P. Ribeiro (Universidade Federal de Ouro Preto) and Yves Basset (Smithsonian Tropical Research Institute). The meeting,

which was attended by 12 people, was held at the Universidade Federal de Ouro Preto, Minas Gerais State from September 4-8, 2000. Participants included lecturers and researchers from different institutions in Brazil, and undergraduate students enrolled in Ouro Preto’s biology course. Two contrasting approaches on insect-plant interaction were discussed: the entomocentric viewpoint on insect herbivores (diversity, vertical stratification, generalists versus specialists) and the phytocentric viewpoint (associated fauna, genetic diversity, theoretical models of plant defenses).

Statistical techniques were also presented, particularly the most promising analyses for studying insect-plant interactions. These included canonical correspondence analysis, canonical variate analysis, and nested analysis of variance (CVA-discriminant analysis). In addition, T. Fontoura gave a demonstration of the single-rope climbing technique. The final discussion centered on the need for a Brazilian scientific organization to endorse different studies related to the canopy.

Both meetings brought together professionals from all over Brazil, and emphasized the need for continuity. The first step in bringing this to life is in place: participants from both meetings keep in touch to discuss canopy research, problems about canopy access, and spread national and international news via a discussion list on the internet. The second step has been initiated: a second meeting is being discussed over this list. Since November 2000, suggestions from participants have been collected and discussed, and the invitation of overseas participants has been a primary consideration. In addition, the need for a third, more practical step towards establishing canopy research in Brazil is under discussion, namely the establishment of a Brazilian canopy network. This network will aim to provide contrasting study sites in different habitats and ecosystems (relevant to a large country like Brazil), with minimal logistical conditions to canopy research. This cooperative project among national and international institutions would favor studies of various topical areas and promote long-term comparative studies. We hope to make significant decisions related to this ambitious task after the next meeting in 2001.

These meetings were funded by FAEP (Fundação de Apoio ao Ensino e Pesquisa/Unicamp), Fundação O Boticário, and Universidade Federal de Ouro Preto (Pró-Reitoria de Pesquisa). Collaborators included Jardins Suspensos Jardinagem Vertical, Soluções Verticais, Reserva Florestal de Santa Genebra, and the International Canopy Network.

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ANNOUNCEMENTS

Climate Change 2001: The Scientific Basis.

On January 22, the Intergovernmental Panel on Climate Change (IPCC) issued the most comprehensive and dire report to date on global warming and climate change. Over three years in the making, the full report includes contributions from 123 lead authors and runs over 1,000 pages. The report finds that global temperatures could rise as much as 10.5° over the next century and that this is primarily the result of pollution. These findings were unanimously approved by about 150 scientists and 80 members of environmental and industry groups present at the IPCC Working Group I meeting in Shanghai. The full report is not available online, but the IPCC has posted a detailed eighteen-page summary for policymakers at its website. At the site, users will also find additional publications, press reports, background information, and other resources. <<<http://www.ipcc.ch/>>>.

From: Kamal Bawa; <kamal.bawa@umb.edu>.

WEBSITES

Tropical Forests On-line:

This e-bulletin introduces articles published in the International Tropical Timber Organization's (ITTO) free journal, the Tropical Forest Update (TFU). The TFU, which is published every three months both in hard copy and on the ITTO website, promotes the conservation and sustainable development of tropical forests. Each issue contains articles, reports of recent developments in tropical forestry, current literature, noticeboard, course calendar, and forthcoming meetings. To receive the journal, contact: *International Tropical Timber Organization, International Organizations Center - 5th Floor, Pacifico-Yokohama, 1-1-1, Minato-mirai, Nishi-ku, Yokohama 220-0012, Japan; Phone: 81-45-223 1110; Fax: 81-45-223 1111; <tfu@itto.or.jp>; <<http://www.itto.or.jp>>>.*

Biodiversity and Ecosystem Function On-line:

Hosted by the University of Aberdeen, Scotland, this new site aims to bring together researchers who are actively interested in the effects of species richness on ecosystem function in a variety of habitats. It also has an extensive relevant literature listing and provision for conference and other announcements/bulletins. Visit <<<http://www.abdn.ac.uk/ecosystem/>>>.

Enature.com:

This website provides online searchable field guides to over 4,800 plant and animal species. The database is derived from 35 Audubon Society Field Guides, Regional Guides, and Nature Guides and is searchable by keyword within each broad taxonomic group or browsable within the subheadings of each group. Users can also conduct an advanced search by size, color, habitat, region, and other options within each group. The website also includes additional features such as habitat guides and a message board. <<<http://www.enature.com>>>.

EarthPrint:

The official online bookshop of the United Nations Environment Programme (UNEP), EarthPrint is a full-service online bookshop that has been operating since August, 1999. It provides a central location for purchasing environmental publications from the world's most respected international organizations. Publications in EarthPrint are organized by searchable categories. Visit <<<http://EarthPrint.com>>>.

NeoFlora:

Launched on August 9, 2000, this new site bills itself as the world's largest plant database, indexing over 38,000 plants. Aimed at gardeners and horticultural enthusiasts rather than botanists, the site is easily searched by keyword or "sounds like." Advanced search options include multiple options under four categories: plant types, plant characteristics, plant ranges, and plant descriptions. Listings for individual plants are fairly comprehensive, including lists of plant requirements, characteristics, and care tips. A glossary section links to definitions for selected terms, and additional photos are accessed by clicking on the plant image. Users are invited to submit photos or tips for any of the plants indexed. Other resources at the site include some plant care tips and information on common pests and diseases. Visit <<<http://www.neoflora.com>>>.

From The Scout Report, Copyright Internet Scout Project 1994-2000. <<<http://scout.cs.wisc.edu>>>.

The Rainforest Database:

Hosted by Living Earth (<http://www.livingearth.org.uk/>), The Living Earth Rainforest Database is a huge collection of text and visual material collected from books and articles, as well as many that are specifically written for the site. The site gives an overview of all aspects of rainforest ecology, people, uses and deforestation issues. <<<http://www.gn.apc.org/LivingEarth/RainforestDBintro.html>>>

The Organization for Tropical Studies:

The Organization for Tropical Studies (OTS) is developing the National Bibliography on Tropical Biology (BINABITROP), which contains information on studies in Costa Rica. The site is located at <<<http://www.ots.ac.cr/binabitrop/>>>.

JOBS

Assistant Professor of Forest Landscape Ecology

Warnell School of Forest Resources, University of Georgia

The Warnell School of Forest Resources seeks to fill a full-time, 12 month, tenure-track (50% teaching, 50% research) faculty position in forest landscape ecology.

The successful candidate will be expected to develop an active, externally funded research program in landscape ecology focused on forests and related natural resources. Research emphasis is expected to include spatial and temporal aspects of forest resource ecology and management, and the integration of ecological, physical and societal processes as they impact forest resources. The faculty member will be expected to teach two or more courses per year. These will include a course in his or her specialty (including graduate level) and either forest ecology or silviculture in the undergraduate core curriculum.

The successful candidate must have the ability to collaborate effectively with scientists from a wide range of forest resource disciplines, including forest ecology, biology, and management; wildlife ecology and management; forest hydrology; and geographical information systems. The ability to advise graduate students with cross-disciplinary academic interests, especially wildlife, is desirable, as is experience with GIS. Active involvement with natural resource professionals and a commitment to work on issues relevant to southern forests will be necessary.

A Ph.D. in landscape ecology or equivalent is required. At least one degree in forestry or a closely related field and a wildlife landscape ecology background is desired. Applications should include a cover letter, curriculum vitae, university transcripts, a sample of significant relevant publications (no more than 5), and names and contact information for three references. Salary will be competitive and commensurate with qualifications and experience.

For full consideration, applications should be received by April 15, 2001. Applications and inquiries should be directed to: *Dr. Ronald Hendrick, Chair of Forest Landscape Ecology Search Committee, Warnell School of Forest Resources, University of Georgia, Athens, GA, 30602; Phone: (706) 542-1385; Fax (706) 542-8356; <rhendric@archesuga.edu>*.

PUBLICATIONS OF INTEREST

The Climate Crisis and Carbon Trading

A recent briefing paper on Global Warming from the Foreign Policy in Focus project is now available online. Ross Gelbspan's analysis addresses the complexities of an international carbon trading system, Washington's startling inactivity in dealing with climate change, and the drawbacks of the current language in the Kyoto Protocol. Copies of the four-page briefing paper are downloadable in .pdf format at: <<<http://www.foreignpolicy-infocus.org/briefs/vol5/v5n20climate.html>>>.

NCSE Strategic Plan

The new strategic plan for the National Council for Science and the Environment (NCSE) is now available online. The strategic plan describes how the NCSE will significantly improve the scientific basis for environmental decision-making. The entire document is accessible via the web at <<<http://www.cnie.org/strategy>>>. For hard copies, reply mail with your name and address to: *Kevin Hutton, Webmaster; National Council for Science and the Environment, 1725 K St. NW Suite 212, Washington, DC 20006*.

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, 2001. 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 (.jpg format preferred). The deadline for submissions is May 15, 2001. For further information, please contact the ICAN office:

David Franklin, Outreach Coordinator/Editorial Assistant; (360) 866-6788; <canopy@evergreen.edu>.

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 monthly literature searches (AGRICOLA, CAB, and FORESTRY ABSTRACTS).

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MODELING

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- Sala, A. 1999. Modelling canopy gas exchange during summer drought. Pp. 373 in F. Roda, ed. *Ecology of Mediterranean evergreen oak forests*. Springer-Verlag, Berlin Heidelberg, Berlin; New York.
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