PLANT TALK

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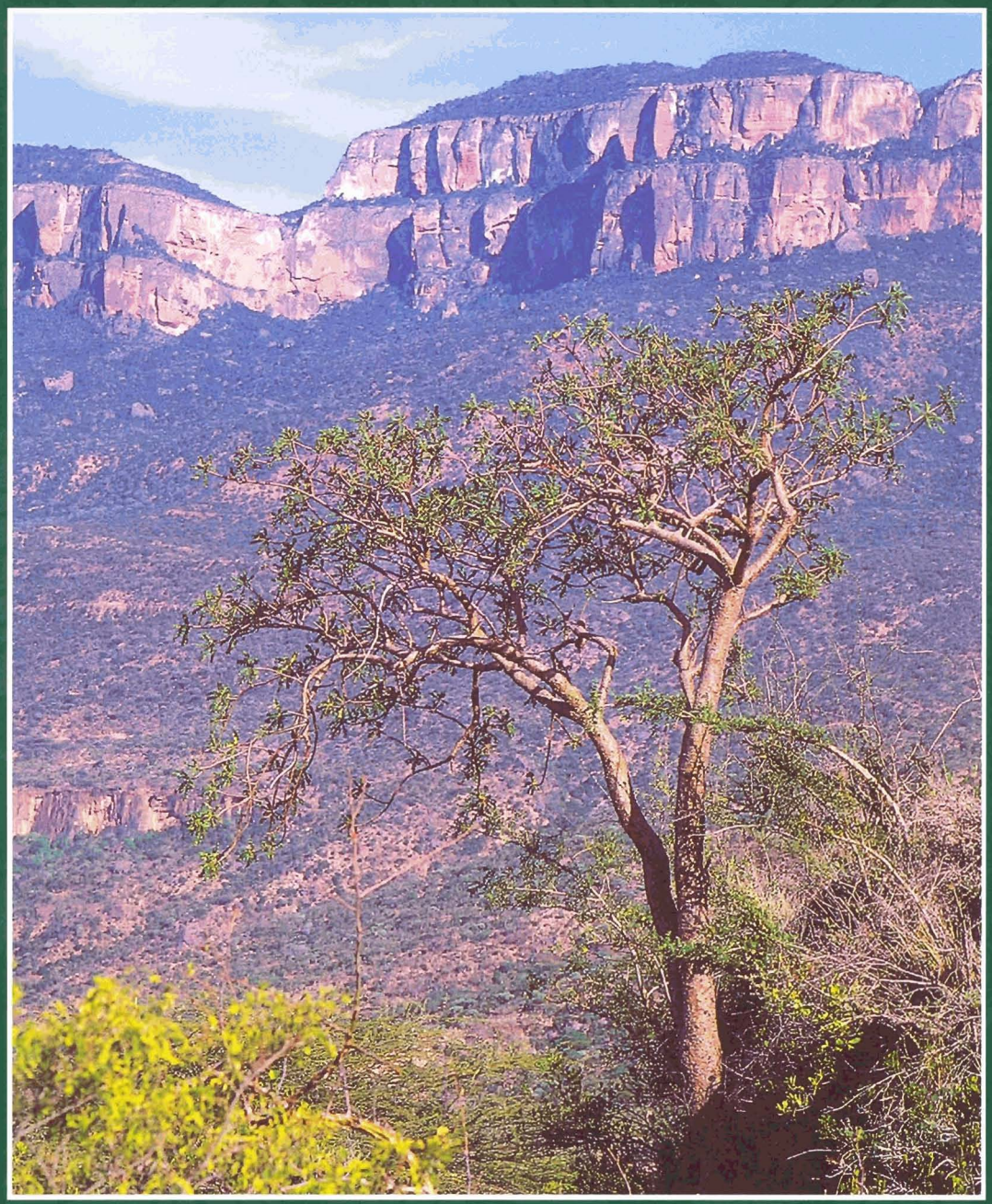

- A Cry for Help from the Surud Mountains of Somaliland
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NEWS FROM THE

NATIONAL TROPICAL BOTANICAL GARDEN

Under its 1964 Congressional charter, the privately funded National Tropical Botanical Garden administers gardens of extraordinary beauty and historical significance, advancing scientific research, public education, and conservation of tropical plants.

In each issue of PLANT TALK, we will report recent activity in scientific research, conservation, and education at the NTBG of local, national, and international significance.

In the 1970s, the tropical rainforest entered the world of conservation and to our amazement its very future seemed in doubt. Yet, thirty years on, and with many rainforests depleted or felled, the destruction still continues, as the news of increased loss in the Amazon basin demonstrates (p.12).

As the concluding event in the ceremonies surrounding the award to Francis Hallé of the NTBG's highest medal (see p.6), on 8 February NTBG held a symposium at The Kampong on the rainforest canopy. We were privileged to have four distinguished speakers, including Professor Hallé. Moderated by Paul Cox, a lively discussion followed. The focus was the tropical rainforest canopy, the place where life seems to explode in its diversity and interactions. It is sobering to think that only a decade or so earlier, we knew very little of what was happening in the rainforest canopy. But now, thanks in part to Professor Hallé's rainforest raft, and other initiatives, the canopy has emerged as a major focus for study.

We present here a short summary of each of the four papers. But this cannot of course catch the cut and thrust of the debate, nor the excitement of the evening, as the NTBG colleagues and guests sat in David Fairchild's beautiful garden and considered what still remains perhaps conservation's greatest challenge – how *do* we save the tropical rainforests? – Hugh Synge.

Botanical Attributes of the Rainforest Canopy

BY FRANCIS HALLÉ

The most important attribute of the rainforest canopy is its richness in plants and animals. Among the plants, besides the diversity of trees and lianas, there is a huge diversity of epiphytes; according to Ozanne & *al.*[1], "10% of all vascular plants are epiphytic canopy dwellers". For animals, the figures are much higher: Basset & *al.*[2] estimate 6 million insects; 20–25% of all arthropods could be only in the canopy.

Why so many species? The classical explanation is that such a high biodiversity is due to the complex three-dimensional structure of the canopy, which affords many opportunities for vertical stratification and niche diversification. Of course this is true, but it's not enough. My suggestion is that the most efficient mechanism to generate biodiversity is co-evolution between plants and animals, as defined for the first time by Gilbert[3]: this is a true spring of new species, and plant/animal co-evolution is at its best in equatorial canopies.

The rainforest canopy is never cold, it is never dry and the light is never dim. In this environment plants and animals no longer face physical or abiotic constraints, as they do at high latitudes. Instead the constraints they face are biotic; up here the driving forces of Darwinian evolution are biological forces. Life is driving itself – this the most fascinating aspect of canopy biology. In my opinion, co-evolution (in the broadest sense of plant/plant, animal/animal or plant/animal) is the key reason why equatorial canopies have the highest biological diversity on Earth.

This biodiversity can even be traced inside the crown of an old tree, where several variants of the genome can be found. At the moment we can just speculate what this is for. It could be a sort of insurance against climatic changes that are likely to occur during the tree's long life-span.

The topography of the canopy is related to geography, depending on the continent. Neotropical canopies are neither flat nor closed; if you want to deposit a 'raft', due to the many holes, you can use less than 10% of the forest surface. Old World canopies – Africa, Asia, Australia – are much more comfortable!

Canopies clearly disclose man-made disturbances; if I had only 15 minutes to assess the conservation conditions of a particular rainforest, I would not spend time in the understorey, but would look at the canopy. In the primary forest, the canopy is closed and shyness gaps can be seen. No dead branches are visible. Rain and fauna take their place in the landscape. If the canopy is broken, due to logging, the forest is no longer primary. Branches and trunks become visible. Vines and pioneer-trees appear. In the secondary forest, you see the first dead trees; fires are more and more frequent. Lianas and softwood pioneers are everywhere; it is the beginning of the end. And in the final stage of disturbance, grasses come in, fueling large fires during the dry season; young trees can no longer grow. Due to fires grass becomes more and more abundant. The forest is vanishing, replaced by a savannah.

1. Science 301: 183–186, 11 July 2003
2. "Arthropods of Tropical Forests: Spatio-Temporal Dynamics and Resource use in the Canopy". CUP, 2003
3. In "Coevolution of Animals and Plants", University of Texas, 1975

Canopy Conservation Initiatives

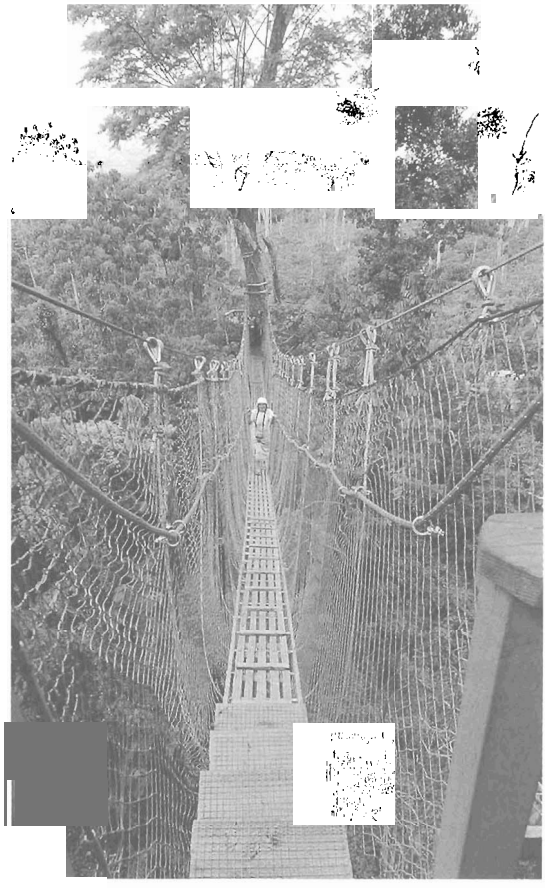
BY MEG LOWMAN

In 25 years, canopy biology has matured from a pioneering hobby to a technical branch of forest biology. New methods now allow us to test hypotheses and accumulate rigorous data sets, something that was not possible before the advent of good canopy methods for tree-top exploration.

However, if we simply collect biological data but do not implement conservation management, then tropical rainforests as we know them will no longer remain. As the functions and processes of the canopy have become scientifically quantified, biologists can begin to integrate important conservation initiatives with rigorous scientific field studies. Similar to the practice of tithing one's income to the church, if every scientist were to tithe his or her time, giving 10% of all research hours to conservation, perhaps the decline of our environment would be reversed. Let me offer three case studies of canopy science linked to conservation initiatives.

Radeau des Cimes. In 1991, a team of 51 scientists worked together in the lowland tropical rainforests of Cameroon, Africa. After working with colleagues to quantify herbivory in the canopies of these endangered rainforests, we worked with Bernard Nkongmeneck, botanist from the University of Yaounde, on a collaborative conservation initiative. He and I received a National Geographic grant to survey orchids in the canopies around the village regions of Cameroon where Bernard grew up. We used the grant to train local people to identify the orchids growing in their rainforest canopies. In a future phase, Bernard hopes to initiate orchid farming. If we westerners can assist Cameroon villagers to understand that their forests contain important sustainable products, such as orchids, perhaps there will be less pressure to log these remaining tracts of tropical lowland forest.

Highways to Heaven. Over many years, I have built canopy walkways as a tool for my research. Walkways have advantages over other canopy methods including permanence, all-weather access, and the ability to bring educational groups into the tree-tops for teaching and research observations over time. In one instance, I worked with Paul Cox to design a canopy walkway in Samoa for the village of Falealupo on the island of Savai'i where Paul has conducted research on ethnobotany. We were able to create a plan that led to the construction of a canopy walkway for ecotourism, giving the village some income and representing a sustainable use of the forest. In PLANT TALK 31 (pp. 19–23) Paul explained the full story of the walkway (*right*).



Jason Project for Education. Combining good science with education for young people is vital for the future of science. Over ten years, I have worked with the Jason Project for Education. Its founder, Bob Ballard, developed a form of satellite technology to give students in classrooms direct contact with scientists working in remote places. For three years, I have worked with Bob from the rainforest canopy, broadcasting my research methods and results to millions of students around the world. Students can ask me questions directly and receive instant answers, almost as if they were on a field trip with the scientist! Through this and other initiatives, we hope to recruit the scientists of the next generation. This indeed is very important to the future of conservation.

The fate of tropical rainforests, as well as other ecosystems, will depend in part on the success of scientists to integrate good conservation within the structure of their research programmes. Scientific data and technical publications are not enough.

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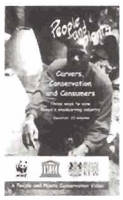
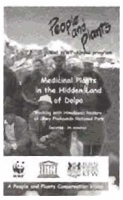
PEOPLE, GORILLAS AND FORESTS: ethnobotanical methods and multiple-use management in Uganda
Duration: 27 minutes
Camera, script and direction: Tony Cunningham

SAVING THE WOODEN RHINO: ethnobotanical methods and Kenya's woodcarving industry
Duration: 25 minutes
Camera, script and direction: Tony Cunningham

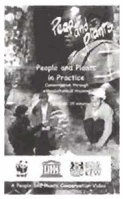
CARVING A FUTURE: 10 lessons for sustainable wood-carving enterprises
Duration; 24 minutes
Camera, script and direction: Tony Cunningham
Editing: Gary Burke, Production Function
Music: Mpingi Drummers
Narration: Michael Loney



CARVERS, CONSERVATION AND CONSUMERS: three ways to save Kenya's woodcarving industry
Duration: 10 minutes
Camera, script and direction: Tony Cunningham



MEDICINAL PLANTS IN THE HIDDEN LAND OF DOLPO: working with Himalayan healers at Shey Phoksundo National Park
Duration: 26 minutes
Camera, script and direction: Yildiz Aumeeruddy-Thomas



PEOPLE AND PLANTS IN PRACTICE: conservation through ethnobotanical training
Duration: 25 minutes
Scripted and edited: Tony Cunningham
Filmed: Tony Cunningham, Yildiz Aumeeruddy-Thomas and Gary Martin

TREE SKIN: methods for studying people's use of bark
Duration: 26 minutes
Camera, script and direction: Tony Cunningham
Editing: Nic Zimmermann & Pippa Hetherington

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