

## Life in the Forest Canopy

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Scientists have been devoting increased time and attention to the tops of trees. As made clear by results of their studies, the environment of the forest canopy is teeming with life. Perhaps because the crowns of trees are difficult for people to reach, and due to the micro-climates within them, they hold a rich and diverse collection of life forms. Advances in the use of ropes, ladders, and suspended walkways is now making it possible for humans to be more frequent visitors to these realms.

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### Monkeys

About a year ago, while I was on a professional trip to Colombia in South America, my host proposed a side trip to look at scenery to the west of Cali. We passed lush countryside, including impressive plantations of clonal eucalyptus trees. And then, as we continued over a pass and down in the direction of the Pacific Ocean, native trees began to encroach, partly covering the sky on each side of a newly reconstructed four-lane highway. At one point I noticed a pair of heavy ropes – connected to each other by a somewhat disorganized grouping of short ropes – stretching between trees on either side of the road. “That,” said my host, “is a bridge that the monkeys use when the seasons change. They use the rope bridge to migrate from the wetter part of the jungle to the drier part, or back again.” Sometimes, especially before the rope bridge was put in place, monkeys not using the rope have attempted long jumps across the break in the canopy and have fallen amid oncoming traffic on this highway.

Not being monkeys, it is perhaps all too easy for us to neglect the importance of tree crowns to the world’s environment. Fortunately, increased awareness of forest canopies is being promoted by educators and scientists. Lowman and Schowalter (2012) describe progress in canopy science that has been achieved since the 1980s. New climbing methods have allowed leaders in the field to introduce a new generation of students and fellow researchers to the biology, microbiology, climatology, and ecology to an oft-neglected habitat. Single-rope climbing methods were adopted in the 1970s for studying the treetops, and these methods were followed by the use of towers, balloons, and cranes. Scientists using these techniques have documented so many new species – some occupying only certain altitude niches in the canopy – that it has been claimed that 50% of the biodiversity of land-based life is associated with tree canopies. The high foliage can be described as a “salad bar”, supporting millions of insects, along with a food chain that includes birds, reptiles, and mammals.

### Climate

Treetops play a major role in climate regulation (Lowman and Schowalter 2012; Geiger 1950, <http://archive.org/details/climatenearthegr032657mbp>). During the day, a tall forest canopy cools the ground by as much as 12 °C. At night the canopy absorbs

radiation from the ground, maintaining ground temperatures warmer than they would have been in a deforested area. A large forested area will tend to support a low pressure system, encouraging precipitation. Take away the forest and one changes the climate.

## People

An article by Nadkarni *et al.* (2011) considers whether or not “canopy science” has yet achieved the status of an academic discipline. An attempt to start a journal dedicated to the field was not successful. No university, anywhere in the world, has established a graduate degree program with a focus in this area. Rather, scientists who work in the tops of trees identify themselves by terms such as “microbiologist”, “climatologist”, or “ecologist”. Whereas “marine biologists” have their own funded categories in grant-providing agencies, those who wish to study the upper foliage need to compete for funding against scientists interested in more general categories than “canopy biology”. On the other hand, the number of published scientific articles related to forest canopies has exploded since about 1980. From 1900 to about 1980 the numbers of such articles per year were in the single digits. The number took a surge upwards in the years 1990-1990 to over 100 per year, and by 2008 the number exceeded 500.

Nadkarni *et al.* (2011) note that, in contrast to marine biology, canopy studies have not yet attracted major corporate funding. Perhaps the very nature of micro-niches and biodiversity held within treetops might not be conducive to, say, a company wishing to mass-produce and sell products. Such companies, in general, prefer monocultures. For instance, if one wants to obtain uniform fibers for papermaking, then it makes sense to plant clonal forests rather than to attempt to harvest the jungle without damaging it.

Ecotourism is one “industry” that can be expected to show increased interest in treetop habitats in the coming years. As noted by Lowman and Schowalter (2012), such activities as canopy walks, bird watching, educational nature tours, and wholistic medicine may provide sustainable streams of income for local people in far-flung locations. In a recent presentation at North Carolina State University, Lowman (2012) described the enthusiastic response of various citizens in localities throughout the world once becoming aware of the value of the ecological diversity provided by “their” treetops. Even in places like Saharan Africa, where the remaining bunches of trees may be only a trace of what existed in the past, a new generation of committed conservationists is emerging.

The thrill and adventure inherent in the climbing of rope ladders to get into the tops of trees is clearly inspiring a new generation of potential scientists to care about forest canopies, leading to prospects of greater efforts to protect these fragile resources in years ahead. Whereas the monkeys of western Colombia are using a rope bridge to save their life, we can hope that the humans now entering the trees – albeit with the help of more secure rope bridges – will play a role in saving life itself.

## Cited References

- Lowman, M. D. (2012). Presentation given to “Friends of the Library” at North Carolina State University, McKimmon Center, October 22.
- Lowman, M. D., and Schowalter, T. D. (2012). “Plant science in forest canopies – The first 30 years of advances and challenges (1980-2010),” *New Phytologist* 194, 12-27.
- Nadkarni, N. M., Parker, G. G., and Lowman, M. D. (2011). “Forest canopy studies as an emerging field of science,” *Annals For. Sci.* 68, 217-224.