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UNH Scientist Reaches New Heights Studying the Earth-Air Interface

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DURHAM, N.H. - The forest canopy -- the crowns of trees in a forest -- represents the interface between Earth and sky, between the Earth's biosphere and atmosphere. It is where 90 percent of the globe's terrestrial biomass undergo direct exchange with the atmosphere, and where up to half of all animal species make their homes. It also is among the most highly threatened of terrestrial habitats.

A report published in the July 11 issue of *Science* advocates increasing the canopy access so scientists can better understand its role in global ecosystems, atmospheric chemistry and climate change. The report details across disciplines what canopy research since the 1980s has revealed about biodiversity, ecosystem function and responses to global change.

"To understand the biological processes that regulate the atmosphere-biosphere exchange, we need to understand forest canopy processes. And in order to understand those processes we've got to be able to get to them," says Michael Keller of the U.S. Forest Service.

Keller, who works at the University of New Hampshire's Institute for the Study of Earth, Oceans, and Space (EOS), co-authored the report and has spent time dangling in a big basket loaded with scientific gear in the forest canopies of Panama.

States the report, "Given the significance of the canopy and the fact that it is fragmenting faster than any other habitat, we ignore it at our peril."

The forest canopy is a critical environment for scientists to understand. Historically, this has been a difficult place to probe because of limited access. But new technologies like cranes, cat walks and bucket trucks now provides scientists with the ability to peer down into this world. Just as the invention of the aqualung helped unlock the secrets of the ocean, these technologies have opened up a window onto the world at the tops of trees.

The canopy, Keller says, "is where the action is." The leaves atop the trees get direct sunlight and exchange water vapor, carbon dioxide and other gases. This is a "real world system" and, immersed above and inside this world, scientists can make direct measurements of what happens when, for example, elevated carbon dioxide (a greenhouse gas) levels exist at the leaf level.

"With a crane you can pick apart the effects of all the different processes and players," Keller says.

Keller notes that one important aspect of forests and forest canopies is their role in providing a habitat for pollinators like bees. In many areas, as forests are fragmented or removed entirely, pollinators disappear as well. In such cases, for vast industrialized agricultural areas, bees must be imported to pollinate crops. "We're losing this pollination service that used to be free. Without pollinators there are no fruits. Forests can stop reproducing when there are no pollinators. It's quite shocking," he says.

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