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At Columbia University, faculty and students in the Department of Ecology, Evolution, and Environmental Biology (E3B) and a host of related fields are pursuing topics critically important to all life on Earth. Their path to addressing challenges related to the accelerating biological impact of changes in the atmosphere, water, and soil may soon begin closer to home than ever: Columbia’s scientists are looking to outfit and operate, to modern laboratory standards, a remarkable 5,000 square-foot greenhouse on the roof of Schermerhorn Extension on the Morningside campus.

The Columbia Research Greenhouse will realize, for the first time, the potential of a facility created two decades ago to study basic plant biology. The site’s surprisingly large scale (especially for an urban campus) and openness (it remains largely undeveloped) make it possible to leapfrog in technology to create a laboratory greenhouse with unprecedented capacity to solidify Columbia’s leadership in key areas of plant and environmental sciences. It will offer a core facility serving faculty and students across departments and schools, fostering research and teaching on such timely topics as biofuel and food production, control of invasive and allergen-generating species, greenhouse gas formation, flux, cycles and regulation, and the pros and cons of genetically engineered plants.

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Which types of vegetation can mitigate natural disasters, such as the flooding that hit New Orleans after Hurricane Katrina and killed thousands in the 2004 Indian Ocean tsunami, the landslides that hit Kashmir in the 2005 earthquake and Haiti in the 2010 earthquake, and the floods that devastated China in 2010? Which plant communities can help control climate change by sequestering greenhouse gases such as carbon dioxide? Can plant management stem the enormous devastation created by exotic, invasive species such as kudzu and purple loosestrife? Which types of urban vegetation provide the best ecosystem services? Could native grasslands on rooftops improve air quality? How can urban forestes be managed more effectively to provide habitat for urban wildlife? How do urban trees respond to altered climate, soils, and disturbance regimes? Can urban forests be managed more effectively through better understanding of tree physiology? How do plants and soil microbes interact in novel environments like green roofs, weed lots, and agricultural fields? Can soil microbial communities be managed to improve soil quality, water infiltration, and other ecosystem functions? Will rapid environmental change affect the evolution of plants? How can plant biologists help us understand why certain types of vegetation are more stable than others when exposed to new plant diseases, increased insect outbreaks, or other environmental challenges such as floods, fires, or climate change?