

Oregon Lecture Series Addresses Global Change

by Ruth Jacobs

The Center for Analysis of Environmental Change at Oregon State University is sponsoring a series of seminars focusing on current research on global biogeochemical cycles. The Center is a cooperative partnership between Oregon State University, the USDA Forest Service, the US Environmental Research Agency, and Battelle Pacific Northwest Laboratories. Topics addressed in the spring series of 11 talks at OR/State/U were the global carbon cycle, methane emissions, chemistry of rain water, responses of vegetation to global change, and biogeochemistry of Crater Lake. This series furthers the Center's objectives of creating new collaborative opportunities for its partners and providing a focus for research and discussion on causes and consequences of environmental change.

Peter Vitousek, Stanford professor of biological sciences, opened the series with a lecture on "Beyond Global Warming: Ecology and Global Change," constituting a pep rally for the scientific community. He argued that crucial decisions are being postponed by those who would argue that the scientific uncertainty is too great for effective decision-making. Undeniably a major amount of uncertainty exists about many facets of global change, but conversely, a sufficient core of knowledge exists to define some aspects of change, predict some of the consequences, and take action in treating some problems.

There are three major classes of change that are all global, well known and well-

related to human activity -- levels of atmospheric carbon dioxide are increasing, the global nitrogen cycle is changing, and monumental land-use changes are occurring. Causes of increasing levels of carbon dioxide are combustion of fossil fuels and changes in land use, both of which remove carbon from natural storage systems. Changes in climate, amounts of nutrients used by plants, composition and dynamics of biological communities, and even nutrient concentrations of some plants have been documented. These are profound changes, effective worldwide.

In terms of the nitrogen cycle, human activity has recently and rapidly doubled nitrogen fixation worldwide. Because many systems are naturally limited by nitrogen, rapid increases in nitrogen can alter the number of species in an ecosystem, change the diversity of landscapes, and alter grazing and decomposing food chains. These changes are generally viewed as negative, not positive. Increasing nitrogen levels in some communities, for example, have been shown to decrease species diversity.

The major global change in land use is the most important of the classes of change discussed by Dr. Vitousek. These land-use changes, deforestation for example, are occurring subtly, acre by acre. Remote sensing is the ideal tool for documenting the change, but the time span of the records that we can view with this tool is brief. We are left with indirect measures of the effects of the land conversions, such as the fact that between 30

and 50 percent of the net primary production of Earth is dominated, used, or foregone because of humans. That does not leave a lot for the millions of other species that exist on the planet.

These three major changes are coupled with other changes propagated by humans, such as over-harvesting of species, biological invasions of exotic species, and introduction of ozone-depleting chemicals. All together these and other changes are leading to two major events -- global climate change, which we cannot clearly demonstrate yet and cannot predict locally with much certainty, and a loss of biological diversity, which is becoming increasingly evident and is truly an irreversible loss. Leading all of this change is the ever-growing human population.

Simple reversals of the changes we face are nonexistent. We can limit the amount of change we cause, but the crucial first step to setting some limits is for scientists to get active in communicating what they know rather than focussing on uncertainty. Dr. Vitousek insisted that we know a lot, and this knowledge can be used by society today to make decisions that will determine how much global change occurs. His message was that we all should actively seek out colleagues who have confidence in their knowledge and ability to effect a change, form partnerships with these people, and work actively to make a difference in the future of the world.

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