

## **Hluchy receives NSF grant for Adirondack environmental research**

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Dr. Michele Hluchy, professor of geology and environmental studies and chair of the Division of Geology and Environmental Studies, along with two Alfred University juniors, will spend three-four weeks late this spring, doing field work in the Adirondack Mountains of New York that could demonstrate the effectiveness of the U.S. Clean Air Act of 1970 and the Clean Air Amendments of 1990 in reducing the impacts of acid precipitation. The work is made possible by a nearly \$1 million, four-year National Science Foundation grant that Hluchy and three Colgate University professors - Tim McCay, assistant professor of biology; Randy Fuller, professor of biology; and Rich April, professor of geology - received. The grant is one of only four new awards of its type given nation-wide by the NSF in 2005. It is one of the largest National Science Foundation grants received by Alfred University and the largest ever obtained by Colgate University. Acid precipitation results from emissions released during the burning of fossil fuels. In the northeastern U.S., many of these emissions come from coal-fired power plants in the Midwest. The airborne emissions are carried by the prevailing winds, which blow from west to east, and as they rise over the mountains, they are incorporated into rain and snow that condense in the cooling air masses. The sulfur dioxide released by the burning of coal becomes sulfuric acid, and the nitrogen oxide released during petroleum combustion becomes nitric acid. As the clouds become saturated, they release the moisture in the form of rain, snow or fog. The Adirondack region receives some of the most acidic precipitation in the United States. The sulfuric and nitric acids in the precipitation combine with base cations in soil and water. Base cations are positively charged ions of alkali or alkaline earth metals, such as sodium, potassium, calcium and magnesium, which naturally buffer acids in the soils and are used as nutrients by plants and animals. The AU-Colgate team will specifically be looking at levels of calcium and how its availability in soils and surface waters affects organisms, Hluchy explained. The Adirondack Mountains, protected by strict state legislation that limits development, provide an ideal testing grounds, noted Hluchy. "We remove many of the effects of humans development" on the ecosystem. She said they "specifically tried to choose lakes that are untouched by development and that fit our scientific requirements." She's also excited by the prospect of an interdisciplinary research project, one that brings together geologists, geochemists and biologists to examine an environmental issue. As her colleague, Prof. McCay explained, "There is growing evidence that chemistry of surface water is responding to the Clean Air Act Amendments of 1990. However, we know less about the chemistry of forest soils and virtually nothing about biological responses and potential recovery. We are excited to link chemical changes to biological responses." "We will have students involved in all phases of the research," said Hluchy, who anticipates working with at least eight AU students over the next four years on both field work - collection of samples - and laboratory analysis of those samples. They will be looking at soil chemistry and mineralogy, litter decomposition, soil invertebrates, and small mammals (those that eat insects) in the forests, and bacteria, algae and invertebrates in the streams to determine how they are affected by calcium availability in the ecosystem. For Hluchy, the project offers some rare opportunities, personally and professionally. Hluchy has earned a reputation on the AU campus as a strong advocate of undergraduate research, giving students the opportunity to apply the knowledge they acquire in the classroom. Her commitment to undergraduate research stems from what she gained from her undergraduate research experiences, undertaken as a student at Colgate, working with her mentor, Rich April, on one of the first studies measuring the effects of acid precipitation on soils in the Adirondacks. Samples will be collected at 20 sites, said Hluchy, and while they will try to "get as close as possible" to the sample sites that Hluchy and April used approximately 25 years ago, "we only had maps then, not global positioning systems." Still, the opportunity to re-evaluate the sites she and April studied a quarter of a century ago, when the Clean Air Act was fairly recent, is a rare opportunity for a scientist, said Hluchy. "We know acid rain still exists," she said. "The Clean Air Act and its amendments may have decreased the amounts of acid in the precipitation, but it is still present. The real questions are 'Are the ecosystems recovering? And if so, how fast is the recovery occurring?'" This year, beginning in mid-May and continuing for three or four weeks, Hluchy and her students, juniors Skylar Pais of Trout Run, PA, and Martha Buckwalter of Alfred Station, NY, will be collecting samples that they will bring back to AU to analyze during the remainder of the summer and the coming school year. Hluchy anticipates that not only will Pais and Buckwalter be contributing to the overall research effort, but they will also be developing their own independent research projects that complement the larger one. All students will be involved in all aspects of the project, so her geology and environmental science students, for example, will also be collecting biological data, and biology students from Colgate will help with the geological studies. During the fall of

this year, and again in fall 2007, AU's "Environmental Biogeochemistry" course and Colgate's "Interdisciplinary Investigations in Environmental Issues" course will be linked. Groups of students will work on small research projects together, collect data in the Adirondacks and have an end-of-the-semester colloquium to present their results. There will be regular bimonthly meetings of the four faculty members and their undergraduate students to discuss the progress of the research and to work on publications. The grant also includes an outreach component for area kindergarten-12th grade teachers, designed to involve them in the research and introduce them to the scientific process, beginning in 2006 and continuing for three years.