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# NCAR Scientists Conduct Brazilian Expedition

Boulder, Colo. -- The primary goal of any scientific expedition, of course, is to obtain useful data. But when the expedition produces valuable scientific data and also establishes sound and amicable working relationships between scientists from different countries, it can be called a real success.

This is the view taken by a team of atmospheric chemists from the National Center for Atmospheric Research (NCAR) who recently returned from a very successful expedition on the Amazon River in Brazil. Not only did they obtain useful data from their experiments on the river, but they also fostered a satisfying meeting of minds -- scientific minds -- in an aura of international cooperation.

NCAR scientists John B. Pate, David C. Sheesley, and Arthur F. Wartburg went to Brazil early in April to study atmospheric trace gases and aerosols in the jungle around the Amazon River. They spent two weeks taking air samples in the Ducke Forest Reserve, a scientific research station in the heart of the Amazonian jungle. When analyzed, these samples will help NCAR scientists establish background levels of natural trace gases and aerosols in the tropical atmosphere.

According to Pate, who was field director for the expedition, the cooperation of the Brazilian government contributed greatly to the success of the entire trip. "The Instituto Nacional de Pesquisas da Amazonia (INPA), directed by Dr. Paul Almeida de Machado, was our Brazilian host, and they allowed us access to a part of Brazil that is being preserved in its natural state. The National Research Council of Brazil -- equivalent to the U.S. National Science Foundation -- assigned a scientist, Dr. Luiz R. M. Pitombo, as our host and collaborator."

The scientists arrived in Manaus, Brazil, on April 2 and spent the next several days attending a conference on research in Amazonas Province, where they presented a series of papers on atmospheric chemistry. By the 7th

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they were ready to go to the Ducke Forest Reserve, which is about 20 miles from Manaus in the heart of the Amazon jungle. INPA arranged for the scientists to be transported to the Ducke Reserve, and for the next two weeks they took air samples, analyzed them and recorded the data.

"Life at the Ducke Reserve was very interesting," Pate says. "A steady field-station diet of rice, beans, stew, coffee and bread kept body and soul together, while gallons of insect repellent kept the wildlife at bay. We stayed at Ducke almost continuously except for an occasional quick trip to Manaus for supplies. Insects and other wildlife were a constant hazard. We found a four-inch tarantula spider one morning in one of the bedrooms, and that alone made us cautious. But the advice that we received on a sampling trip from boats on the Rio Negro caused us some concern. We were told that the bushes along the shore were infested with hornets and the river had piranha fish in it. Moreover, we were told, the hornets would attack if the bushes were disturbed by a passing boat. They advised us to take our chances with the man-eating fish rather than risk thousands of hornet stings. At least the fish might not be hungry!"

The NCAR chemists finished their sampling without being faced with this difficult decision, and were ready to leave Ducke Reserve on April 23. They arrived back in the United States early in May.

"The entire trip could be called a real success not only because the data we obtained was valuable," concluded Pate, "but also because we established such a good working relationship with the Brazilian scientists and officials."

Pate, Sheesley and Wartburg are going back to the Ducke Forest Reserve in October to do more sampling during the "dry" season, and at that time they hope to arrange other joint programs and exchange of scientists for the future.

NCAR, which is supported by the National Science Foundation, sponsored the Brazilian sampling expedition. It was part of the NCAR Atmospheric Chemistry Department's effort to study trace gases and aerosols in the atmosphere.

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Trace gases and aerosols are important in many areas of atmospheric research. Some trace gases absorb infrared and ultraviolet radiation, affecting the radiation balance of the atmosphere. Aerosol particles can also absorb or reflect radiation, and they play an important role in the physics of clouds and precipitation as condensation nuclei. Trace gases often can be used as tracers to identify atmospheric motions and rates of exchange.

For several years, the NCAR atmospheric micro and trace chemistry program, under the direction of James P. Lodge, Jr., has been building up a body of data on the life cycles of trace gases and aerosols in the atmosphere. They have identified and measured gases such as ozone, sulfur dioxide, formaldehyde, and various oxides of nitrogen, as well as aerosols such as sulfuric acid, neutralized to a varying extent by ammonia.

NCAR has obtained a great deal of information on the chemical constituents of the atmosphere from all over the world. North American sampling stations have produced data on the mid-temperate zones; Antarctic sampling has yielded data on the polar atmosphere; and stations in Panama and Barbados have provided data on the tropical zone. This information, combined with much more to be gathered over the next few years, will help NCAR scientists establish background levels for many trace gases and aerosols in different parts of the world.

One significant use for these background levels is in measuring air pollution. Many of the atmospheric gases and aerosols that man produces also occur naturally. Unless man knows the concentrations of these substances that occur in nature -- background levels -- he cannot calculate the amounts that are contributed by manmade sources of pollution.

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