

## US acid rain

# Academy finds causal connection

*Washington*

WITH a fine sense of timing, the National Academy of Sciences last week released the latest of its contributions to the study of acid rain. The academy's study\*, which provides the most conclusive evidence likely to be available for some time that emissions of sulphur dioxide from power stations acidify lakes and kill fish, comes the week before Canadian Prime Minister Brian Mulroney arrives in Washington for a summit meeting with President Reagan. Acid rain is at the top of the agenda.

The academy's study, chaired by James Gibson of Colorado State University, looks at time trends and regional variations in anthropogenic sulphur dioxide and nitrogen oxide emissions over the United States, reexamining original data to ensure consistency where necessary, and relates these to effects in the atmosphere and on the ground. It concludes, on the basis of consistency in the association and demonstration of intermediate steps, that in eastern North America a causal relationship exists between sulphur dioxide emissions and presence of sulphate aerosol, reduced visibility and wet deposition of sulphate. Regional changes in sulphate in streams are consistent with these changes, and so is acidification of lakes (assessed over time by diatom remains). Because "the observed acidification cannot be explained by other known disturbances . . . acid deposition is the most probable causal agent".

The clearest instances of environmental effects of acid rain were found in the Adirondack lakes of New York, although there were marked variations in the sensitivity of different lakes. Gibson characterized the results last week as establishing a "very significant linkage" between emissions and acidification. Furthermore, fish populations appear to decline concurrently with acidification. But geographically widespread reductions in tree-ring width and increased mortality of red spruce in the eastern United States, occurring concurrently with climatic anomalies and with high rates of acid deposition, could both be laid unambiguously at the door of acid rain. Members of the academy's committee said last week that the causes of tree mortality should be the next major acid rain research project. Because of poor time-trend data, few conclusions could be reached about nitrogen oxides.

Environmental groups, which have long been convinced of the damage caused by sulphur dioxide, saw the study as further confirmation of what they already knew; the basic hypothesis that sulphur dioxide emissions have caused acidification of lakes has been accepted by several academy and other studies since 1981. The

weight of the study would seem to lie in its demonstration that such effects are large in relation to natural processes and dominate them statistically. But however elegant and persuasive, it is unlikely to persuade the Reagan administration to accept immediate measures to reduce US emissions, which have begun to rise again and which under present policies are likely to go on rising until at least 2010, according to projections by the Environmental Protection Agency.

Fears about the federal budget deficit, which have reached a new pitch because of

unfavourable reaction on Capitol Hill to President Reagan's budget proposals for 1987, make large federal expenditures on control technologies difficult to contemplate, despite the apparent emergence of a new bipartisan consensus favouring control measures in Congress. The discussion with Mulroney this week is likely instead to focus on the recent recommendation of two US/Canadian special envoys that \$5,000 million be spent on demonstration projects to develop cheaper ways of burning coal cleanly. The sum currently proposed for this purpose in the United States in fiscal year 1987 is \$400 million.

**Tim Beardsley**

\*Acid deposition: long-term trends, National Academy Press, 1986.

## Soviet spacecraft

# Space station takes X-ray satellite

A JOINT Soviet/West European study of X rays in space, originally planned for a Salyut-type spacecraft, will now be carried out aboard the new Mir space station, according to unofficial reports from Moscow. This could cause some rethinking of the project, if, as the Soviet media suggest, Mir, after a running-in period, will be permanently manned. For, in order to ensure the accurate pointing which the experiments demand, it was originally planned to carry out the study during a period when the host station was unmanned.

The joint project, known to the Soviet side as "Rentgen" and to the West Europeans as HEXE (High Energy X-ray Experiment), was originally scheduled for April 1986, but there was some delay in the construction of the instruments. Two pieces of apparatus, designed and made by the Max Planck Institute for extraterrestrial physics at Garching (West Germany), have already been delivered to Moscow, but are apparently still causing problems. The software for the project is also still being worked out, and it now seems doubtful that the August launch date can be met.

The Soviet space planners have not yet said when Mir is likely to be ready for full occupation (cosmonauts Leonid Kizim and Vladimir Solov'ev are at present activating the life-support systems and preparing it for habitation). Some 30 cosmonauts are believed to be in training for service aboard Mir, most of whom will be involved in research and "technological production". (The operation of the station itself will be virtually automatic.) Whether there will be any intervals between "shifts" in which HEXE could be deployed as first planned is doubtful.

The HEXE experiments, designed by teams from the Universities of Utrecht, Birmingham and Tübingen and from the European Space Agency, as well as from the Max Planck Institute, are intended to

study the X-ray stars of the Galaxy, the remnants of supernovae and the nuclei of other galaxies. This will require extremely accurate pointing and minimal perturbation of the station during the experiments. Hence the original stipulation that Salyut should be in its unmanned mode. The greater mass of Mir might, however, make it possible to attain the accuracy needed of HEXE, even if one or two people were on board the station. **Vera Rich**

## German gigaflops

*Hamburg*

THE West German government is to support a project for building a huge super-computer designed around more than a thousand microprocessors. This was announced last week by Heinz Riesenhuber, the federal minister for research and technology, who said that Krupp Atlas Elektronik GmbH of Bremen and Stollmann GmbH of Hamburg will be joining with the existing Gesellschaft für mathematische Datenverarbeitung (GMD) with the intention of completing the prototype of the new computer by the end of 1988.

Riesenhuber's ministry, BMFT, has already appropriated DM27 million for the project, which will be carried out by a newly formed company based in Bonn. The total cost is estimated at DM130 million. The designers are aiming at a machine capable of 1,000 million operations a second, known as one gigaflop. Much of the incentive for the development has come from GMD, which has had some success in the development of programs and programming languages for computers based on parallel architecture.

The new machine will probably be used for the simulation of large-scale phenomena, among which Riesenhuber mentioned combustion processes and wind-tunnel experiments. **Jürgen Neffe**