

manifesto spokesman, and CACT took other advice about the composition of the panels of referees.

One curious feature of the grant-making process is that the director of CACT, Professor Marcos Rico, demanded that nobody who was applying for a grant should serve on a review panel. The manifesto group complains that no scientist worth his salt would not be applying after a year without a research grant. The head of one of the panels has since written to one unsuccessful applicant (who with a similar proposal won DM265,000 from the Volkswagen Foundation) to say that a lottery would have been equally fair.

On the other side, the Ministry for Universities and Research claims that the



Seara — handing out

manifesto group is the naive political tool of the far Right, which wants to unseat the minister, Luis Gonzalez Seara, for his attempt to reduce professorial power with a bill now before parliament.

Seara's chief science adviser, sociologist Narciso Pizarro Ponce de la Torre, said at the Strasbourg meeting that his ministry (like Spanish democracy) was new and that the power of the Francoist professors was great, so that change had to be slow. Even so, the ministry is preparing a major policy statement, the "livre blanc", on science for May 1981, together with a three-year plan that would multiply university research tenfold. But, said the manifesto group spokesman, the same has been said before, by three successive ministers: he will not believe it until it happens.

The seriousness of this conflict cannot easily be gauged. Narciso Pizarro accepts that a "more scientific" method has to be found for making the next allocation of grants. He is considering the appointment of international referees to some of the review panels for the next grant allocation in 1983. But he argues that the international community can itself be an inequitable power base for those with access to it, and wants to see a "just" distribution of funds. So does the manifesto group, although its wish that scientific excellence should be rewarded is seen as elitist in a fledgling democracy. The conflict is between the impatient and the gradualists.

**Robert Walgate**

## US radioastronomy

### Thinking big

San Francisco

Following the successful completion and inauguration of the Very Large Array (VLA) telescope in New Mexico last month, US radioastronomers are developing an ambitious scheme that would, in effect, turn the country into a single large radio telescope.

The VLA is designed to study relatively close objects whose distance from the Earth is of the order of thousands of light years. But to study the internal structure of quasars and the nuclei of galaxies the necessary resolution can only be achieved by the use of Very Long Baseline Interferometry (VLBI) in which data from several telescopes are combined to form a single image.

To some extent this can be done by linking existing telescopes, and since 1975 seven US radio telescopes have formed such an array. But there are several disadvantages, including the difficulty of coordinating and correlating data from machines designed and built for different purposes.

The new proposal, which has been developed by scientists from the California Institute of Technology (Caltech) and its Jet Propulsion Laboratory (JPL), is for a transcontinental array of ten 25-metre radio dishes, stretching from Massachusetts to Hawaii and controlled by a single central computer.

Such an array should provide an order of magnitude leap in the important parameters that could be measured compared with the data that can be collected from the present *ad hoc* arrangement. It could be used to provide fine detail radio maps of quasars and galaxy nuclei and also for making precise

### Any encounters, any kind

Voyager 1, now nearing Saturn, is far from innocent of messages to extraterrestrial civilizations (in which respect the article on page 9 is incorrect). Like its partner, Voyager 2, it carries a phonograph disk of copper (for long life) with sound recordings of greetings in 60 languages, a spoken message from Kurt Waldheim, Secretary-General of the United Nations, sounds of the Earth (natural, unnatural and musical) and a list of the members of the pre-election US Congress.

The disk also contains analogue tracks representing 100 photographs of the Earth and a message from President Jimmy Carter referring to "our progress towards a single global civilization" and "our wish to become a member of the galactic community". Voyager 1 was launched before the seizure of the US hostages in Iran.

measurements of the Earth's rotation, even providing information on plate tectonics.

The scientific and the economic feasibility of such a transcontinental array has now been demonstrated in a Caltech study which concludes that for extragalactic astronomy VLBI is the only tool available for detailed study of the energy sources in quasars and galaxies.

One feature of the Caltech proposal is that the array would be two-dimensional, with radio dishes as far north as Alaska. This spread will make it possible to cover almost all of the northern sky, in contrast to a Canadian proposal for a similar array with radio dishes essentially on a linear axis from Europe to British Columbia.

Two particular aspects of the array would improve performance compared with the present system. First, being able to locate the individual dishes in an optimal arrangement would make it possible to increase the dynamic range by an order of magnitude. This would allow detailed studies of the shape, size and evolution with time of the jets which are emitted from quasars and galaxy nuclei, in particular the acceleration and deceleration of so-called "knots" which occur within the jets.

The second advantage is that the array would be able to make measurements at frequencies of up to 15–20 GHz, considerably higher than some of the telescopes in the present array can achieve. This will make it possible to look much further down the jets to the surface of the objects from which they are emitted.

Radioastronomers in general are enthusiastic about the proposal for a ground-based array, which has been given top priority for funding in the next decade by the Field Committee responsible for overseeing research priorities in all fields of astronomy.

The main problem, inevitably, will be funding. The Caltech group estimates that the array will cost \$38.8 million, considerably less than other astronomical facilities (VLA, for example, cost \$80 million).

But astronomy, like other fields of basic science, is feeling the pinch. Already the National Science Foundation (NSF) has had to postpone plans for the next telescope on its priority list, a 25-metre dish that had originally been requested for funding in the fiscal year 1981 but failed to survive the budget review process.

There are three other schemes vying for funds. The National Aeronautics and Space Administration (NASA) has been working on plans for an advanced X-ray astronomical telescope, a successor to HEAO 2 and HEAO 3. In addition to the ground-based array, the NSF is already considering proposals for a 10–15-metre optical telescope, including designs that have been submitted by the University of California, the University of Arizona and the University of Texas.

Caltech scientists should have detailed plans ready for potential funding by 1982,

and on such a schedule their array would be in operation by 1984–85. If the 25-metre dish is approved for funding next year, as hoped, there will be no conflict. However, if it is postponed again, then relations between what could become rival projects would be more delicate.

Experience has taught supporters of the ground-based array that any debate over who should run the facility ought to be resolved before the funding battle begins. Many feel that proposals for a mid-west telescope floundered because of inter-university rivalry for control. "We are determined not to make the same mistake again", says one radioastronomer.

David Dickson

## Nuclear protests

### Were Croats first?

With the Madrid Conference about to commence its review of the Helsinki Accords on Security and Cooperation in Europe and the Campaign for Nuclear Disarmament recently revitalized in the United Kingdom it is interesting to look back at what was almost certainly the first ever anti-nuclear protest — that of Dr Ivan Supek, a Yugoslav physicist, in 1944, more than a year before nuclear bombs were dropped on Hiroshima and Nagasaki.

Before the war, Supek had been a pupil of Heisenberg. In 1941, after a visit to

impossible the final victory of progressive forces — a victory which Marxist theory stated was inevitable. Therefore such weapons could not exist.

Supek, however, remained unconvinced, and a few months later published his papers from the congress in the Croatian popular science journal *Priroda* under the titles "Developments in Modern Physics" and "Science and Society".

Although at that time his main fear was of the perverted use that the Nazi regime could make of science (biology as well as physics), his stand against nuclear weapons has never wavered. He has from the beginning been an active participant in the Pugwash movement, and is extremely wary of proposals for peaceful uses of nuclear energy (including research), lest they be perverted to military ends.

Vera Rich

## Research councils

### Geological setback

The Department of the Environment will slash a third from its spending on geological science over the next three years, raising a question mark over the future of the Geological Survey of Great Britain, officials of the UK Natural Environment Research Council (NERC) said last week.

NERC was launching its first annual report since Sir Hermann Bondi took over a month ago as the new chairman of NERC (see *Nature* 5 June, p. 349). Bondi had no influence over the report and was much less concerned than his colleagues: "This report is not in my style", he said. "As you know, I'm an eternal optimist."

Bondi favours the Rothschild "customer-contractor" principle, which the report described as a threat. In 1973 NERC lost control of a third of its budget to government departments, following Lord Rothschild's recommendations for a shake-up in government science spending. At the time, the council warned that many of its projects — such as the Geological Survey — which were dependent on a group of customer departments would be vulnerable to the whim of any one of its customers. "It is of little comfort that this forecast is proving correct" says the report.

A quarter of NERC's £20 million contract research income depends on multi-customer contracts. The Geological Survey itself costs about £4.5 million a year, of which the Department of the Environment currently contributes £1.5 million. The survey was established in 1835, and produces near-surface and deep geological maps of Britain, improving them area by area as techniques develop. Some 180 scientist-years are spent each year on the survey, which involves 10 field units and a number of palaeontologists and chemists, mostly at the Institute of Geological Sciences (IGS).

The survey, UK geologists argue, is a national resource, drawn on regularly in

major civil engineering works, for example. But if the Department of the Environment takes too short a view, the value of the survey will be diluted and ultimately lost. A thorough survey for a "sheet" covering an area of 12 miles by 18 miles takes around 25 scientist-years and 5 to 7 years. "So you can't turn on a tap when you need a survey" said Dr Brian Kelk, who heads NERC's geosciences division. The survey is not purely an academic exercise. Dr Kelk argues that the survey must be developed on a continuous basis. It is not possible to predict exactly which areas are likely to prove important; for instance, the massive construction work carried out for North Sea oil terminals on the west coast of Scotland and the Shetlands would probably have been slowed without the geological maps which may have seemed of only academic interest when they were made in the 1920s.

Other bodies in the "consortium" which has managed the survey since Rothchild are the Department of Energy (contributing 5 per cent), the Department of Industry (also 5 per cent) and NERC (60 per cent, through the science vote of the Department of Education and Science). But the consortium will now collapse, with the Department of the Environment cutting its share to 20 per cent and offering its money piecemeal for particular areas and purposes. A new management structure must thus be found for the survey — and one is being sought actively by the director of the IGS, Dr G. M. Brown, who will present his proposals to NERC in two weeks' time. Dr Brown will also have to cope with other Department of the Environment cuts at IGS, where the department is reducing its spending from £3 million (at 1979 prices) this year to £2 million in 1982–83, out of a total IGS budget of £16 million. Staff recruitment, for one thing, will be reduced to a trickle.

Nevertheless, NERC's total income of £56.6 million in 1979–80 will hold roughly constant in real terms in 1980–81, largely through a slight increase in funds from the Department of Education and Science; but there is another problem over the replacement of the council's two research ships, RRS *Shackleton* and RRS *Discovery*. The *Shackleton* is older, and will probably be retired around 1983. The *Discovery* should remain effective until about 1987, but a new ship must be found to replace her if Britain is to maintain her place in oceanographic research, says NERC. This would cost £18–20 million at present prices, plus equipment: and to have her ready for the 1988 season, the order must be placed in 1984 at the latest. But there is no sign of the necessary money being made available — except perhaps if the ship were used jointly by the Science Research Council's Marine Technology Directorate and NERC.

It is here, perhaps, that Bondi's contacts and experience in the Advisory Board for the Research Councils — which advises on



Supek (left) and comrade, 1944

Heisenberg in Leipzig, he said that, although his main interest at the time was solid-state physics, he was able to make an "informed guess" that the Germans were working on both fission and fusion bombs.

Supek made his fears known in June 1944, at a congress of Croatian "cultural workers" (a term which included scientists) held in the newly liberated town of Topusko. His views did not go unchallenged. Several Marxist participants were doubtful that such weapons could exist at all. Nuclear weapons in Nazi hands, they argued, would render utterly