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 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,

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.

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