Branching out in chemical systems

THE most improved laboratory in India must be the Indian Institute for Chemical Technology (IICT) at Hyderabad. Ten years ago, as the Hyderabad Regional Laboratory, it was one of the worst. The difference is not so much the change of name, but the arrival as director of Dr A. V. Rama Rao, a vigorous no-nonsense organic chemist of distinction.

But not all traces of the old laboratory have vanished. Indeed, the elaborate pilot plant then constructed to develop a process for the gasification of Hyderabad's peculiarly high-ash coal is still in place, but a little rusted. Rama Rao says that on his arrival in 1985, he insisted that the future of the project should be decided quickly, one way or the other. It took two years to show that the process would not be economic.

Meanwhile, IICT has turned its attention to more tangible projects, one of them a different process for the manufacture of AZT, the drug widely used in the treatment of AIDS. The inspiration of that project was the calculation that the Wellcome Foundation's raw material are *D*-ribose (which costs $200 a kg) and a-thymidine ($800 a kg), but that *D*-xylose, at $20 a kg, could be a source of the thymidine.

IICT has licensed the Indian manufacturer CIPLA to make the resulting AZT in India. Arrangements to manufacture the drug in Thailand and Brazil have also been agreed, although the arrangements stipulate that CIPLA should be free to export to both countries if it can do so more cheaply than the local manufacturers.

Otherwise, IICT is busy with the development of processes for the manufacture of the approved alternatives to the chlorofluorocarbons (CFCs) used as refrigerants and banned by the Montreal Protocol of the ozone-layer convention. Rama Rao says that having developed an economical process for producing the hydrogenated CFCs, he is now locked in argument with the World Bank over the capital cost of a production plant, which he estimates at Rs50 million.

He is annoyed that the fund established to compensate developing countries for their use of alternatives to CFCs, which is administered by the bank, will meet the extra costs of use, but not the capital costs of making them, which would be cheaper in the long run. Gently, he suggests that this is a way of making India a perpetual customer of producers in the West.

For the rest, IICT has a host of other projects to launch onto the market. Rama Rao's own research interest in antitumour agents has been led to processes for the manufacture of materials such as vinblastine and vincristine. Half of India's annual production (50 tonnes) of vitamin B6 by an IICT process is exported. Indeed, Rama Rao claims that the annual value of the drugs being manufactured by processes developed by him and his group amounts to Rs2 billion (say US$65 million). □

Thirty-dish array aiming to see further than VLA

ON the western edge of the Rajasthan Desert, on a site 80 km north of Pune, Indian radioastronomers are building a radiotelescope that will be the most powerful of its kind in the world. If the current pace of construction can be kept up, the metre-wavelength instrument (GMRT) will be ready late next year or early 1995. Will that give India's small but renowned group of radioastronomers a decisive advantage?

Everything will depend on how well the instrument works. But the project has excellent credentials. It is being carried through by the National Centre for Radio-Astrophysics based at the Tata Institute for Fundamental Research in Bombay, and is the brainchild of radioastronomer Govind Swarup, the director of the national centre. The site has been chosen for its freedom from man-made radio noise, which is especially troublesome at comparatively long wavelengths.

In many ways, GMRT compares with the US radiotelescope called the Very Large Array (VLA) in New Mexico. When completed, it will consist of 30 fully steerable parabolic dishes of 45-m diameter spread out along the three arms of a Y-shaped configuration. Four dishes are already in place and a new one is added every two weeks. In terms of resolving power, the array is equivalent to a single gigantic dish 25 km in diameter, Swarup says. The chief difference between GMRT and the VLA is that the latter's dishes are movable on railway tracks as well as steerable.

The decision to build a telescope designed for metre wavelengths is a mark of India's confidence in radioastronomy. One objective is to look for the nebulae in the early Universe from which it is supposed that galaxies were formed. Such objects, consisting predominantly of neutral hydrogen, would have emitted the familar 21-cm wavelength radiation characteristic of hydrogen clouds in nearby galaxies. The expectation is that this radiation will be red-shifted by the expansion of the Universe so that it has an apparent wavelength between 1 and 2 metres, or within the GMRT bandwidth of 30 to 1,500 MHz.

One of the planned 30 dishes.

But Swarup also reckons that the new telescope will be used for searching the radio-sky for pulsating radio stars whose repetitive signals are even more frequent than the recently discovered millisecond pulsars.

The design of the new instrument is distinctively Indian. To save on materials cost, for example, the dishes are made of see-through wire mesh instead of solid metal. The total cost of the entire project is US$15 million and, except for the German bearings, has been entirely fabricated in India. Overseas astronomers will be offered 10 per cent of the observing time.

That echoes Swarup's original hope that the new telescope could have been built as an international project on an equatorial site (not in India) so as to cover both hemispheres of the sky. When functioning, it will more than keep India's radioastronomers busy with observations. (There is also a substantial radiotelescope at Ooty, in South India, and a millimetre-wave telescope at Bangalore.) The project's well-wishers outside India marvel at two of its outstanding features: the small construction cost and the belief that it will be possible to weld such a complicated array of radio-dishes into a finely tuned observational instrument within the next twelve months or so. □