employment through decreased government spending and the extent to which the government can continue to hold down food prices, subsidize production inputs and support massive agricultural development programmes.

Equally worrying is Indonesia's ability to weather the inevitable bad years produced by new pest and disease outbreaks or poor rainfall. The traditional village welfare institutions based on the sharing of village product and labour are disappearing. The communal village rice stores are now often empty — replaced by more centralized government stores. It remains to be seen whether in the bad years the government can act as efficiently as have the village-based institutions.

The national rice policy of the past decade has been highly successful, but now, with self-sufficiency at hand, the need in the next five-year plan, currently being drafted, is for a broader-based national food strategy. The variety of policy, technical and social questions which this raises are just beginning to be addressed.

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Texas symposium

Astronomy: relativity's relative?

from Virginia Trimble

THE uneasy marriage between general relativity and astronomy, solemnized by the biennial series of Texas Symposia on Relativistic Astrophysics, has endured another two years*, although the parties concerned continue to regard many of each others' concerns with tolerant puzzlement.

The relativists, who were rather badly outnumbered on the programme, have been worrying about such issues as the logical structure of general relativity, ways of improving numerical calculations within it and possible approaches to a quantum theory of gravity that might, someday, be unified with gauge theories of the other forces. S. Deser (Brandeis University) reported progress towards demonstrating that energy, properly defined, is always positive within general relativity, so that real systems are guaranteed to have ground states and stability. The proof is essentially complete both locally and globally for cases with zero cosmological constant, Λ, and for global-positive Λ solutions. The case with negative Λ is still not quite fully understood, but the speaker expressed confidence that it would all turn out all right.

T. Nakamura (Kyoto University) discussed results of numerical solutions for the collapse (in two dimensions) of a rapidly rotating star, in which the matter is properly included but gravitational radiation neglected. Considering the small number of grid points used, the results come impressively close to what we think should be the 'right' answer. Thus, for several different patterns of angular momentum distribution, most of the material collapses only when the ratio of angular momentum to mass is small enough for a stable Kerr black hole eventually to result. Larger ratios always lead to much of the matter being ejected, although the detailed ejection pattern is probably an artefact of the grid pattern, numerical viscosity and so on.

Finally, P. Van Nieuwenhuizen (SUNY, Stony Brook) pointed out some of the pros and cons of supergravity, the extension of general relativity which adds to its gravitational field carried by gravitons a second field, carred by fermions (spin = 3/2) called gravitinos. On the plus side, it has now been demonstrated that supergravity (unlike general relativity) is renormalizable at least for all Feynman diagrams with one or two loops, though there are still some uncertainties at higher levels. A negative aspect is that it is not clear that even the largest ($N = 8$) supersymmetry has enough freedom to include both non-zero cosmological constant (vacuum energy) and all the kinds of fermion field we know exist. The speaker expressed guarded optimism that further significant progress could be expected, perhaps along the lines of multidimensional space.

The astronomers, meanwhile, remain enamoured of telescopes and the objects they reveal. A half-day session addressed large ground-based optical telescopes for the late 1980s and beyond. The University of Texas 300-inch (7.6 m) project, discussed by H. Smith (University of Texas), is the furthest along in funding. It will probably be a thin monolith, with active support and/or honeycomb-style strengthening. The University of California TMT (Ten Meter Telescope, with an actively controlled segmented single mirror) was discussed by J. Nelson (University of California, Berkeley). There is a site reserved on Mauna Kea, Hawaii, and testing of techniques for producing off-axis parabolic mirror segments is well under way. The testing of these very-long-focal-ratio segments is proving unexpectedly difficult. R. Angel (Univerity of Arizona) described some lessons learned in operating the Multi Mirror Telescope, for example, that low thermal inertia is very important for sharp images, and that separately aimed mirrors are really better than a single completely rigid one, as careful aiming can then partially compensate for large-scale atmospheric turbulence. He also showed results of an assortment of techniques for producing thin but very rigid mirrors that might be scaled up to yield either very large or very many reflecting surfaces at reasonable cost. My favourite sandwiched lengths of glass tubing between thin plates, filled the tubes with sand, then gently heated the whole assembly so that the tubes deformed into close-packed hexagonal cylinders of considerably greater strength than round ones.

Among the objects revealed, the star attraction was undoubtedly the 1.57 ms pulsar (see *Nature* **300**, 615; 1982), although by the time of the meeting it was already clear to theorists from Berkeley to Bangalore that the very small period derivative means that the object must be old and is not the answer to experimental relativists' quest for a strong coherent astronomical source of gravitational radiation. One intriguing suggestion (J. Arons, University of California, Berkeley) is that the spinning back up to short period occurred by mass transfer from a relatively low-mass companion, which then liberated the pulsar by shedding more than half its mass in a planetary nebula — now seen as the extended thermal source north of the pulsar.

A potpourri of other objects was also discussed: R. Ekers (VLA Observatory) reported that the point infrared source, IRC16, often identified with the centre of our Galaxy, is in fact displaced about 0.1 pc from the compact radio source at the centre of symmetry of a 1-parsec-diameter three-arm spiral source mapped by the VLA. The radio centre is also the centre of symmetry of the highest gas velocities seen near the middle of our Galaxy, and Ekers suggested that IRC16 may be falling into that centre.

W. Hillebrandt (Max Planck Institute, Munich) discussed recent calculations of the collapse of iron cores of massive stars and concluded that core bounce probably ejects material to make a type II supernova and pulsar only in stars of initial masses 8–10 $M_\odot$ and not in more massive stars, although nuclear burning in the outer layers, rotation and magnetic fields, which are not included correctly in current models, will all tend to favour ejection and so raise the maximum mass capable of it.

Finally, there were superclusters and the voids between them. A. Szalay (University of Budapest) reminded us that adiabatic fluctuations in the early universe should give rise to very large-scale structures ($\gtrsim 150$ Mpc and $10^{15} M_\odot$), and R. Kirshner (University of Michigan) reminded us that such structures and voids are indeed seen in the distribution of luminous galaxies and clusters, and that, according to Lao-Tzu, "Profit comes from what is there; Usefulness from what is not there". □

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