A new research institute for Sri Lanka

THE Institute of Fundamental Studies in Colombo, Sri Lanka, was formally inaugurated by President J. R. Jayawardane, on 2 December 1982. The inaugural ceremony also marked the beginning of a ten-day seminar on 'Fundamental studies: present attitudes and future prospects'. Among the participants were some 30 delegates from Sri Lanka and abroad.

The idea of the institute was mooted as a partial solution to the brain drain problem in Sri Lanka. Like India, Sri Lanka became free from British rule in the late 1940's early in 1948. Like India, it eventually changed from a dominion status to a republic. And like India, it has maintained a parliamentary democracy.

The similarity, however, ends when we consider indigenous growth of science and technology. In India, after independence, the Nehru-Bhabha-Bhatnagar triangle led to the creation of the Department of Atomic Energy and the Council of Scientific and Industrial Research. And research institutions and laboratories proliferated under these umbrellas as well as outside. The Indian Space Research Organisation, Indian Institute of Technologies, Indian Council of Medical Research, Indian Council of Agricultural Research, University Grants Commission are other governmental organisations funnelling money into science and technology. By contrast, there was hardly any move in Sri Lanka in these areas. If India, with so much input into science and technology, complains of brain-drain, it is small wonder that the problem is felt even more acutely in Sri Lanka.

The Institute of Fundamental Studies (IFS) will hopefully provide or generate a congenial environment for research to attract local talent. The IFS has two models on which to pattern itself. The first is that of the Tata Institute of Fundamental Research TIFR at Bombay, which grew to its present form out of purely indigenous talent. The second is that of Abdus Salam's International Centre for Theoretical Physics (ICTP) at Trieste in Italy which derives support from UNESCO and serves mainly the interests of developing nations.

The IFS would like to choose the TIFR as its first model. if the TIFR has grown to its present stature, it had Dr. Homi Bhabha, an experienced scientist of international standing, who stayed back in India, and nurtured and built up the organisation. But none of the distinguished Sri Lankan scientists settled abroad could be persuaded to devote all *their* time to set the IFS on its feet. The major force behind the institute and its director, Chandra Wickramasinghe, holds a chair of applied mathematics and astronomy at Cardiff, UK, and would devote only a part of the time of the institute. It is also not clear whether the IFS could be sustained with a core membership of Sri Lankan scientists drawn from the local universities. Inevitably, therefore, the institute has moved towards the second model and has received support from UNESCO and UNIDO (United Nations Industrial Development Organization). Perhaps when it gathers sufficient momentum, a shift to the TIFR pattern may become possible.

The inaugural seminar was, therefore, funded by the international agencies with a view to identifying some areas of fundamental studies which could be undertaken by the IFS. The spectrum of areas covered was very wide and certainly not limited to sciences. Besides such scientific fields as astronomy and astrophysics, astrobiology, computer sciences and meteorology, it also included religion, philosophy, architecture and history of science.

The highlight of the seminar was the debate on the Hoyle-Wickramasinghe hypothesis of the cosmic origin of life (see box on p.9). Considerable interest was also generated by the science fiction writer Arthur C. Clarke's talk on "War and peace in the space age". In a thought-provoking review of the role of reconnaissance satellites, Mr. Clarke pointed out that the arms race between the two superpowers had now extended to space. The man who successfully predicted the use of geostationary satellites for communications long before the dawn of space technology, recalled another of his predictions made in the 1930s, which unfortunately has come true only in its negative aspect—that man would develop nuclear power to such an extent that it will be possible as well as necessary for him to abandon the Earth.

In astronomy, there were review talks by Larry Peterson on the prospects of gamma-ray astronomy; Phil Solomon spoke on the state of research on the giant molecular clouds where stars are believed to be forming; Arnold Wolfendale talked on the origin of cosmic rays and Fred Hoyle on how elements are synthesised in stars.

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The new Japanese observations of the near-infrared cosmic background reported by Satio Hayakawa reveal a surprisingly high component at around a micron wavelength. The energy estimated is comparable to the energy in the cosmic microwave background. If confirmed, these observations pose a serious threat to the standard relic interpretation of the microwave background.

There were also historical reviews of sciences. Sadnek Kopal argued that the incidence of genius had not kept pace with the rise of human population. He asked why were there no theoreticians of the calibre of Newton, Gauss and Poincare in these days of population explosion and scientific growth? The Sri Lankan expatriate Mr. Eliezer

Proof that life has cosmic origin?

SINCE 1978, Fred Hoyle and Chandra Wickramasinghe have been arguing that life is not (and has not been) limited to Earth. In the first issue of the Memoirs of IFS their ideas have been discussed at length. The evidence in support has been classified in nine categories. A (Atmosphere), B (Bacteria and Micro-organisms), C (Comets), D (Diseases), E (Evolution), I (Interstellar grains), M (Meteorites), O (Origin of life) and P (Planets). It was the evidence under categories I and M that led to a hot debate at the IFS seminar.

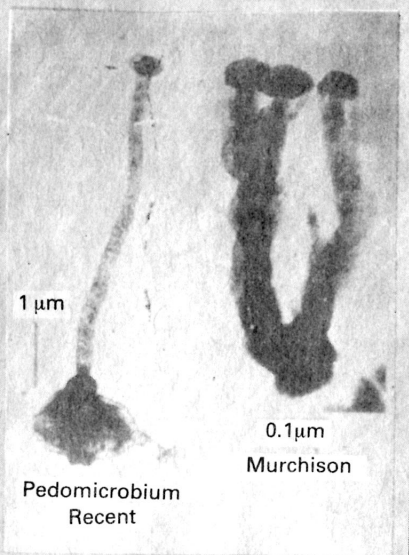
In May 1981, D. A. Allen and D. T. Wickramasinghe (brother of Chandra Wickramasinghe) reported a curious intensity spectrum of an infrared astronomical source GC-IRS7 (*Nature* **294**, 239) shown in Fig. 1. The dips in intensity are supposed to be due to interstellar absorption. The usual procedure that a theoretician adopts is to suppose the interstellar material to be in the form of grains of dust made of certain chemical material and then to compute a theoretical curve. If the curve fits the data reasonably well the assumed composition of interstellar grain is considered to be approximately right. We see two such curves in Fig. 1, of which the solid curve fits the data remarkably well while the dashed curve gives a poor fit.

Hoyle and Wickramasinghe (HW) point out that the dashed curve is due to prebiotic polymers commonly assumed to be present in interstellar space and is the best possible curve available if the grains are made of non-living chemical compounds. The solid curve is that produced by *E. coli* bacteria heated to 350°C. So the interstellar space contain bacteria.

The chemists argue that probably other plausible non-living alternatives might fit better than the dashed curve. However, so far they have failed to produce a viable alternative. Critics of the bacteria theory also argue that bacteria in space would not survive the X-rays and γ-rays flowing there. This is a debatable point since HW argue that the bacterial cross-sections are small enough and their ice shields strong enough to ensure their survival.

The meteoritic data was presented by H. D. Pflug from Germany. Pflug's technique consists of dissolving the great bulk of the minerals present in a thin section of the meteorite in such a way that the insolubile carbonaceous residue settles on a piece of film. The residue is then examined (without disturbing it from outside) by a transmission electron microscope. Examination can also be made by a laser Raman probe, by an ultra-violet probe and by a mass spectrometer, thus achieving a resolution spot of diameter 1mm.

The probe techniques are supporting evidence. However, the main thrust of Pflug's approach is based on morphological comparisons of the electron microscope pictures, as is done by palaeonotologists. Fig. 2 shows a comparison of the residue in Murchison meteorite *(right)* with a micro-organism of the present day.



If Pflug's interpretation that meteorites carry micro-organisms is accepted it has many implications. First it shows the existence of life outside terrestrial environment. Second, since the meteorite may be as old as the Earth (4.6×10^9 years) the existence of life that long ago is inconsistent with the standard Oparin-Haldane theory of the origin of life on the Earth (which began much later).

Proponents of the standard theory like Cyril Ponnamperuma therefore challenge Pflug's findings largely on the grounds that what he sees is contamination and not the original component of the meteorite. At Colombo the debate on this issue was inconclusive and it appears that further evidence is needed to convince the sceptics. Gustaf Arrhenius also cautioned against mistaking artefacts for the real thing. Some of Pflug's pictures show double walls as would be seen in a fossilised cell. Is it? Could the double walls appear from the imperfect optics of the microscope? Pflug rules out this possibility—but, again, the sceptics would need more evidence to be convinced.

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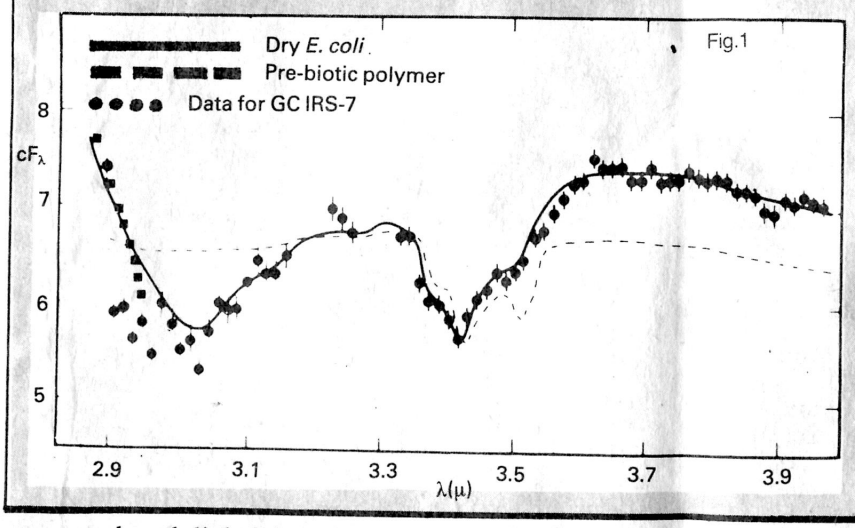

Fig.1

presented a delightful review of the interaction of mathematics with science. This author described the important role played by astronomy in fundamental studies, scientific or otherwise.

Inputs from Sri Lankan scientists included a light-hearted but thoughtful assessment of the Darwinian and Neo—Darwinian theories of evolution by Prof. Hilary Guesz of the University of Peradeniya, a review of genetic engineering by Prof. Ramaswamy of the University of Jaffna and the survey by Dr. S. Gnanalingam of the Ceylon Institute of Scientific and Industrial Research, on how important upper atmospheric research was carried out in Sri Lanka on a shoe-string budget. Prof. Mailvaganam, Emeritus Professor, University of Colombo, discussed his ideas on the parallelism between Hindu philosophy and modern science while Venerable Dickwela Priyananda Thero pointed out that some words in sacred Buddhist texts reveal modern scientific meanings. An interesting talk on the engineering principles behind the ancient stupas found in Sti Lanka was given by Mr. Roland Satva of the Sri Lanka Central Cultural Fund.

It is hard to summarise adequately the interesting as well as diverse fare presented at the seminar. The diversity was inevitable since the scope of 'fundamental studies' was not specified beforehand. It is clear, however, that some specialisation is called for if the new institute is to make significant contribution in the near future. And this is the important policy issue which the Board of Governors of the IFS have to settle fairly soon.

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