Large Space Telescope

Year's delay in prospect

Washington

THE Large Space Telescope has encountered technical problems that could delay its launch, scheduled for early 1985, by as much as a year. According to sources close to the project, National Aeronautics and Space Administration (NASA) administrator James Beggs has launched an investigation into the problems that will take two months to complete.

A spokesman for the Marshall Space Flight Center in Huntsville, Alabama, Tim Tyson, said that two kinds of problems have arisen. First, there were delays in installing the mirror into its supporting ring in a strain-free condition. Since the telescope is to be in orbit for many years, it is vital that the mirror is not subjected to possibly deforming stresses.

There are also problems with the precision guidance systems that are to orient the mirror while the telescope is moving in orbit. NASA says that Perkin Elmer Corporation, which is assembling the space telescope, has met the technical requirements but that there are "systematic" delays nonetheless.

The space telescope project has already been in trouble with Congress because of excess costs. If the launch is delayed, further overruns are inevitable, in spite of NASA's promises to the contrary.

In recent weeks, those working on the project are said to have been instructed not to talk publicly about the problems until NASA headquarters completes its investigation. Headquarters is evidently anx-

The configuration of the Large Space Telescope.

ious that rumours of difficulties should not reach Congress before it has made its own investigation.

One casualty of a launch delay could be the plan at the Jet Propulsion Laboratory to use the space telescope to examine Uranus so as to direct the Voyager spacecraft, which approaches the planet in January 1986.

Deborah Shapley

UK science museums

Merger afoot in Kensington

PLANS for a merger between two much-respected London museums look set to go ahead shortly. The British Museum (Natural History) (BM (NH)) and the Geological Museum of the Institute of Geological Sciences (IGS), which occupy adjacent sites in South Kensington, will become one if Sir Keith Joseph, Secretary of State for Education and Science, agrees.

IGS is supported by the National Environment Research Council (NERC), now under considerable financial pressure, and there is much concern that NERC has not been providing adequate support for the museum's educational exhibits given its primary commitment to research. NERC's chairman, Sir Hermann Bondi, denies, however, that the merger is part of a cost-cutting exercise.

The initial impetus for a changed relationship between NERC and the Geological Museum was, according to Sir Hermann, the transfer (still in progress) of the IGS research base from the South Kensington site to Keyworth in Nottinghamshire. It is expected that most of the scientific collections will move to Keyworth, while educational collections — such as its valuable gemstones — will be sold or loaned to BM(NH).

The move is unpopular with IGS staff,

who feel that Keyworth is too remote from London to be a suitable site for what should be a valuable national resource of expertise. But the museum staff who will stay are starting to realize that their educational collections might be better cared for by BM(NH).

Will science education benefit from the merger? The answer is almost certainly yes. BM(NH) already has substantial geological collections (which would complement those of the Geological Museum) and has about 100 geologists on its staff. A plan has already been made to set up a special committee between the IGS and the Natural History Museum to arrange for loans of specimens and to ensure continued access to IGS expertise in such areas as plate tectonics and sedimentology. BM(NH) has also recently appointed as a trustee Sir Frederick Stewart, formerly Regius Professor of Geology at the University of Edinburgh. The main opponent of the change, the Science Museum (also in South Kensington), does not have resident geological expertise. Under the new proposals, BM(NH) — which allocates around 20 per cent of its funds to public display — will be able to set up a truly impressive display covering all of the life sciences.

Tim Beardsley

High-energy physics

Oiling wheels of research

Washington

HIGH-ENERGY physicists, locked in debate on what the next generation of big particle accelerators should look like and who should foot the bill, have not previously suggested that the next machines should also hunt for oil — until last week, that is.

On 22 February, Sheldon ("Shelly") Glashow, the Harvard physicist, presented a plan he has been developing for two years with Robert Wilson, the builder of the Fermilab accelerator, for a 10 terra-electron volt (TeV) proton-antiproton accelerator that will not only put the United States in the forefront of world physics but also shoot a neutrino beam through the Earth to search for oil and heavy metals. They also propose floating their accelerator out to sea to produce a scan of the Earth's interior rather in the way computer-assisted tomography (CAT) produces scans of the human body.

Appropriately, Glashow revealed his oil-hunting accelerator — which others have nicknamed the "Oilatron" — at Texas A & M University before an audience of 300 physicists, petroleum people from Houston and Dallas and interested laymen. Reactions ranged from enthusiasm to disbelief.

Glashow has been wooed by Texas A & M, which frankly seeks to have a Nobel laureate on its faculty. But he has as yet received no formal offer, although he and his wife have been house-hunting and rumours of his possible salary put it at \$250,000 a year. The university is very rich, having access to the income from a permanent fund of some \$1,700 million based on oil revenues (see *Nature* 300, 674; 1982).

The Oilatron is part of Texas A & M's ambition to become the site of the next large accelerator built in the United States. University officials are now talking with the state of Texas about this machine, which they refer to as the "Texatron". The plan is that both the university and the state could put up part of the cost, thus making the project attractive to the federal government.

Meanwhile, Texas A & M seeks to build a 1 TeV electron-positron colliding linear accelerator along the lines now being studied at the Stanford Linear Accelerator Center, says Peter McIntyre, associate professor of physics at Texas, who went there from Fermilab and Harvard. He hopes the university will make these proposals public in "about a month".

If these ambitious plans materialize (the 10 TeV accelerator would cost at least \$800 million), Texas A & M, which is better known for its marching bands than for physics, will become a world centre. "Texas has big plans for itself. If it is willing to put its money where its mouth is,

it should be taken seriously", says Glashow.

Glashow says he has been working in secret on his project for two years with Robert Wilson and two physicists at the European Centre for Nuclear Physics (CERN), Robert Ch�pak and Alvaro Derujula. They are planning to publish their plan soon. In his lecture, Glashow outlined three kinds of applications. The 10 TeV accelerator would have a circumference of 100 miles. In the search for oil,

code-named GENIUS (for Geological Exploration by Neutrino-Induced Underground Sound), the proton beam would be used to generate neutrinos in a tunnel approximately four miles long directed at the Earth. If, for example, the neutrino beam were pointed down at a 4.5° angle, it would cut a chord through the Earth's subsurface 1,000 km long and 20 km deep at its deepest point. Glashow says that the *in situ* acoustic pulses from a well-directed neutrino beam would be more sensitive indicators of geological structure than ground-based explosions.

The potential of high-precision oil exploration was apparently held out to the petroleum experts who attended last

week's lecture. McIntyre explained to some of them afterwards that "the industry might not have to drill a dry hole again". Heavy hydrocarbons have a much larger expansion coefficient than either water-bearing or dry rock, Glashow explained, so the signal arriving at the surface could indicate clearly whether oil lay in the underground region.

A second application Glashow described is GEMINI, for Geological Exploration with Muons Induced by Neutrino Interactions. This would involve siting ordinary mobile particle detectors where the beam emerges from the Earth. Variations of the accompanying flux of muons are said to be potential indicators of dense ore bodies along the neutrino track.

The third application would in effect be a CAT scan of the Earth's interior — potentially as exciting to geophysicists as its methods would be exotic.

Glashow and Wilson propose putting a 10 TeV accelerator out to sea. The neutrino snout would be pointed down to direct the beam through the centre of the Earth. Neutrino-counters could be located on ships at the antipode where the beam emerged.

Professor Richard Wilson of Harvard University, who is not associated with the proposal, termed it "not completely ridiculous". It's the sort of thing only the oil companies can afford", he said.

Frank Press, the geophysicist who is also president of the National Academy of Sciences, said the proposals would need lots of study and research to determine their practicality — a view Glashow shares. But they might be exciting because "there are two guys, a Nobel prize winner and the world's greatest accelerator builder, going into a new area. That's bound to be interesting."

Deborah Shapley

Polish education

War of attrition

POLISH universities and schools are being used to cripple the young ideologically and morally, General Wojciech Jaruzelski told a party meeting this week. Although, he said, the majority of intellectuals "feel bound to socialism", in some milieus of the intellectual one may still observe "obviously hostile, adventurist and destructive activity", against which "consistent" administrative measures must be maintained.

To some extent, the general's remarks may have been related to the forthcoming trials of the five scholars who acted as "advisers" to Solidarity, three of whom had previously been closely associated with the clandestine "flying university" of the late 1970s. Although the flying university in its old form has not been revived, the underground Solidarity press contains numerous allusions to "alternatives" to the state educational system, in which teachers and lecturers holding official posts may well be participating. From time to time, cases of passive resistance groups organized by academics are reported in the official media, such as the "Fighting Solidarity" group in Wrocław, founded by the mathematician Kornel Morawiecki.

According to underground Solidarity sources, scholars who are suspected of knowing about the composition of these groups and who have refused to pass on this knowledge to the security authorities have been threatened with loss of tenure and loss of bonuses, and have found it impossible to travel to conferences abroad.

For the most part, however, university resistance remains passive. A large number of the rectors elected under the democratic procedures of 1980-81 were replaced during the "verification" process last year — a process which apparently is not yet over, since General Jaruzelski spoke of a "more thorough" phase to take place in the second quarter of this year.

The students, too, seem to have adopted a lower profile — even before Cardinal Glemp's warning to them last week that political activities could jeopardize the forthcoming papal visit. The second anniversary of the founding of the now-illegal Independent Students' Union (NZS) on 17 February apparently passed off peacefully, with only one major protest march, in Kraków, which the police managed to disperse without use of force.

Perhaps the main threat to the universities in the immediate future is not political discontent but the proposed closures next year of intake into 56 higher education courses, and the across-the-board cutback of admissions, which, according to a recent conference of university rectors and party secretaries, is necessary if the standard of education is to be improved, and university courses brought into line with the needs of the economy.

Vera Rich

"Genesis", a structurist portrait by Geoffrey I. Lilley depicting the structure of benzotriazole. Work by Lilley is on view in this year's National Society Exhibition which opened at the Mall Galleries of the Federation of British Artists on 23 February.