

which use liquid hydrogen as ballast—controlled evaporation could turn ballast into lift. Flights lasting several days over the polar caps (and especially in the Antarctic, where national boundaries create no problem) come high on the list, as does the need for developing instruments for balloon flights which can yield information about the momentum, charge and directional distribution of cosmic ray particles which is comparable with that obtained from ground-based equipment. For the rest, where cosmic ray studies are concerned, the panel would like to see an all-round development of present work.

Throughout the panel's report, there is a constant repetition of the need for mobile facilities for the measurement of cosmic ray neutron flux, the measurement of geomagnetic disturbances and the recording of some kinds of solar phenomena. It seems to be acknowledged that the handling of geomagnetic data is a special problem, and the panel suggests that a world-wide communication link based on a COMSAT circuit would be sensible (but there is no estimate of cost). There is, the report says, a great need for the development of programmes which will continuously monitor whistler signals received at very low frequency.

The panel has several expensive proposals for the better study of the ionosphere, the chief of which is the building in the northern United States (at the edge of the magnetic shell  $L=4$ ) of a transmitter-receiver capable of exploiting incoherent scatter techniques in the study of the motion of plasma in the ionosphere. The cost of this proposal is said to be potentially comparable with that of the Arecibo station in Puerto Rico. The panel also asks that there should be a smaller station in the auroral zone, and suggests that this might be established by moving the incoherent scatter equipment now at Palo Alto to College, Alaska. The panel is clearly anxious that the stations at Jicamarca (Peru), Millstone and Arecibo will be kept on tight budgets, especially now that the last of the three is due to be moved from the Advanced Research Projects Agency to the National Science Foundation. The financial position of these three stations seems also to concern those who would make simultaneous optical and radio measurements of the atmosphere from stations on the ground, but the panel also urges that there should be more detailed laboratory studies of important processes in aeronomy.

To the extent that the panel's report will help agencies such as the National Science Foundation to work out a strategy for solar-terrestrial physics, the report will be valuable. Inevitably, however, it is bound to seem like wishful thinking or even special pleading so long as it lacks a detailed costing. This deficiency is no doubt one of the inevitable features of reports prepared in the splendid isolation of Aspen, Colorado.

## GEOLOGY

### Applied Mapping

WITH an eye on the practical applications of its services, the Institute of Geological Sciences has been putting its surveying and mapping work to good use despite difficulties in recruiting staff and in re-siting numerous offices. One economically important project mentioned in the institute's recently published annual report on 1968 (HMSO, £1.2; 1969) is a comprehensive

survey of the Humberside area with a view to the optimum development of its industries, services and amenities. The field unit is revising the six-inch mapping of the area, a new marine geophysics unit has made its first ship-borne survey in the estuary and the hydrogeological department is studying the underground resources of the entire Humber drainage basin.

The engineering geology unit has played its part with a geotechnical study of the area of the new town of Milton Keynes, and maps and tables showing the variation of physical properties over the area will be ready within the next few months. This seems to have been helpful in planning the drainage for the town although too late to influence any of the major planning decisions. The institute is, however, involved right from the earliest stages of planning with all road projects costing more than a million pounds, by agreement with the Ministry of Transport.

In its programme for shallow geological mapping of the sea bed of the continental shelf, the institute hopes to encourage commercial firms to carry out more detailed deep surveys in areas which seem likely to have mineral deposits. The institute publishes these maps in a new IGS report series, and it has so far surveyed the North Irish Sea, the sea of the Hebrides and Minch, the Clyde and the Firth of Forth. One deep reflexion seismic survey was commissioned in Cardigan Bay, a deep sedimentary basin of potential interest to oil companies.

The radiogeological department, under a £250,000 contract from the United Kingdom Atomic Energy Authority, is examining two areas in North Scotland and the Midlands for uranium deposits. The results have not yet been fully analysed, but at least four areas have been identified where the radioactivity can be attributed to uranium and one where there is thorium. Hydrogeochemical reconnaissance seems to be an effective prospecting technique in this environment. A new twelve-inch mass spectrometer in the isotope geology unit is being used mainly for geochronological work using K-Ar, Rb-Sr and U-Pb dating techniques. An interesting development has been work on stable isotope ratios. The institute hopes, for instance, to set up a new unit to study the relationship between  $O^{16}/O^{18}$  ratios and the temperatures of formation of rocks and mineral deposits and is also interested in examining sulphur and hydrogen isotopes which may give information about the fluid inclusions in rocks and minerals.

## LINNEAN SOCIETY

### Successful Appeal

by our Botany Correspondent

FIFTEEN months after it was launched, the appeal for development of the rooms of the Linnean Society in London has drawn gifts and promises of more, totalling £69,000. So successful has it been that the first phase of alterations at Burlington House is already under way. The new strongroom is complete and only has to dry out before the collections of plants, shells, insects and fishes, made by Linnaeus in the eighteenth century, can be moved in from the wooden cabinets they have occupied since the society moved into its rooms in 1857.

The latest piece of good news for the organizers of the appeal came just before Christmas when they heard

that the Swedish Government had approved a grant of 100,000 Swedish crowns (about £8,000) towards the provision of suitable premises for the collections. Linnaeus was of course a Swede, and the impetus for the gift seems to have come from the Royal Swedish Academy of Sciences at the instigation of Professor S. O. Horstadius, a foreign member of the Linnean Society. Other gifts from Sweden have come from HM the King, the University of Uppsala and the Swedish Match Co., as well as the Academy of Sciences.

The most generous single British donations have come from the Royal Society (£4,970) and from the Drapers Company (£5,000) towards the cost of a new council room as a memorial to the late Sir Frederick Stern, former master of the company and treasurer of the society. In its report on the appeal the society notes that the response of industry and commerce has been reasonable in view of the present financial climate and the rather specialized nature of the appeal. BP and ICI were the most generous donors, giving £1,000 and £500 respectively. Many scientific societies have also contributed, and the Linnean Society hopes that some of them will be able to make use of the modernized rooms for their meetings.

The work already completed or under way in the basement, which as well as the strongroom includes the provision of new cloakrooms and heating and ventilation systems, will cost about £42,000. Further plans have been drawn up for improvements to the library and lecture room and the provision of a council room and offices. This work, due to begin soon, will cost more than £30,000, and so the appeal is by no means closed. If sufficient funds are available there are a few more improvements, particularly to the library, which the society would like to see effected.

The library of the Linnean Society has considerable historical interest, because it is founded on the libraries of Linnæus himself and J. E. Smith, the wealthy friend of Sir Joseph Banks, who bought the collections and books for £1,088 5s from Linnæus's family in 1783. The Linnean Society was formed five years later, meeting at the Marlborough Coffee House in London, with Smith as one of the seven founder members. After Smith's death in 1828 the society bought the collections and books from his executors, and has had them ever since.

#### CARNEGIE OBSERVATORIES

### Rechristening Mount Wilson

THE Mount Wilson and Palomar Observatories in California are in future to be known jointly as the Hale Observatories. This was announced recently by the Carnegie Institution of Washington and the California Institute of Technology. The immediate benefit of the change will be that innocents will not in future fall into the trap of calling Palomar Mountain Mount Palomar, but it is also intended that there should be a new method of planning work at the observatories, which will separately be known by their old and separate names. The director of the observatories will remain Dr Horace W. Babcock, but the new arrangements specify that there should always be a director from one of the observatories and an associate director from the other. In fact, Dr J. Beverly Oke has been appointed associate director of the Hale Observatories. The allotment of observing time will

be entrusted to an observatory committee of eight people.

The permanent staff of the observatories is now more than 120 strong and includes nineteen astronomers, many of whom are also members of the faculty at the California Institute of Technology. The naming of the observatories after George Ellery Hale is of course appropriate—Hale founded not merely the Mount Wilson and Palomar Observatories but also those at Kenwood and Yerkes. Although experienced people say that seeing conditions at Mount Wilson have never been as good as in the years during the war when Los Angeles was blacked out, the two observatories remain remarkably usable. The 200-inch Hale telescope on Palomar Mountain, for example, had 238 complete nights of seeing in 1968 and 62 nights when it could be used for part of the time.

#### LONDON

### Preventing a Flood

by our Planning Correspondent

WHILE the British Government has not yet firmly committed itself to the form or the location of a barrage or barrier across the River Thames as a defence against a tidal flood, it has agreed that London and Lower Thames-side must be protected in some form, although it does not regard the likelihood of a serious flood with quite the same alarm as does the Greater London Council. Nevertheless, the Minister of Housing and Local Government, Mr Greenwood, did say in a written parliamentary answer on January 20 that no time should be lost in completing the further studies called for in a report on various defence systems which the GLC has just submitted to the minister, and that the government and the responsible authorities "will then decide as a matter of urgency on the nature and siting of the defences required".

The GLC report to which the minister referred contains the council's preliminary conclusions from a detailed study into what it believes to be the growing threat of a flood caused by a combination of circumstances—the sinking of the south-east at the rate of about a foot a century; the increasing height of the tides in the Thames (about 3 feet a century at London Bridge) compared with the general sea level; the reclamation of low lying land alongside the river over the centuries which has stopped the build-up of silt; and the channelling of the river through the building of flood walls which has raised the general level of water. A high spring tide, a "surge" of moving water from the North Atlantic, an adverse wind, heavy rainfall and drainage off the land could, in the council's opinion, cause a disastrous flood.

The council has worked on the basis of providing protection against a high water level six feet above the levels reached by the Thames in the floods of 1953, taking into account the sinking of the land, the increase in tidal range and so on. This new high water level, the council says, would put the risk of flooding at about 1 in 10,000 in 1980, about 1 in 6,000 in 2010 and about 1 in 4,000 in 2030. At present, 55 square miles of London, with a population of 1,200,000 people, are below this new level. Walls an extra six feet high along the river banks would, however, be unacceptable from the amenity point of view in most parts of London. The council has therefore looked into other ways of