there may be many countries in which working physicists are not adequately represented by national societies. Because of the great differences of size among the national societies—the British Institute of Physics and Physical Society, as it calls itself, is the largest—subscriptions will be paid on a non-linear scale by means of which a member society will pay an amount which is roughly inversely proportional to the square root of its size. As yet, there are no plans for launching a series of European physics journals (although there will be a newsletter fairly soon), but a sub-committee is hard at work on this part of the problem. The pattern of meetings and exchanges which the society hopes to stimulate will become clearer when there has been time to work out subject groupings under the umbrella of the federation, and there should be some progress to this end at the Geneva meeting. It will be a great surprise if Professor G. Bernadini, who has provided much of the impetus for the European Physical Society during the past two years, does not emerge in a prominent position among the officers.

NAVAL ARCHITECTURE

Brunel's Great Britain

A CAMPAIGN was opened last week for funds to refloat the *Great Britain*, one of the three major ships designed by Brunel. The object is to tow her back from the Falkland Islands to the Bristol shipyard where she was launched in 1843. The *Great Britain* was the first ocean-going iron ship and the first to be driven by propeller.

Since the late 1880s, the *Great Britain* has been moored in the Falkland Islands, and now lies rusting on a sand-bank in Sparrow Cove, near Port Stanley. Attention was drawn to the ship's historic and engineering importance by Dr Euan Corlett, a practising naval architect, in a letter to *The Times* last year, and has led to the setting up of a committee for the retrieval and restoration of the ship. The costs of making minor repairs to the hulk and towing her some 7,000 miles are estimated at £150,000. Back in place at the

Jefferies Dock in Bristol, the substantial cost of restoration is expected to be defrayed by volunteer labour.

The first of Brunel's ships, the *Great Western*, was paddle-driven and built of wood. The *Great Britain*, besides its iron construction and propellers, incorporated revolutionary features such as the bolted rudder post which relieved pressure on the rudder and is standard design in most modern vessels. Brunel's third ship, the *Great Eastern*, had a double skin, a feature which other designers ignored until the sinking of the *Titanic* some fifty years later.

The history of the *Great Britain* was closely linked with that of the British Empire. The ship was the fore-runner of the iron merchant vessels and battleships

which in the latter half of the nineteenth century gave Britain her mercantile and naval supremacy. Brunel intended the ship to carry passengers of the Great Western Railway, of which he was a director, to New York, but the *Great Britain* made only a few transatlantic voyages before running aground in Dundrum Bay in Ireland. Brunel managed to refloat the ship, which for the next 20 years carried emigrants to Australia. She was withdrawn from this service to be used as a troopship in the Crimean War and during the Indian Mutiny.

The interior of the *Great Britain*

In 1875, the *Great Britain*'s engines were removed and she was converted to sail, plying between Liverpool and San Francisco until put out of service by a fire near the Falkland Islands. Her final duty was to serve as a floating warehouse. Despite the ship's age, her structure is still sound enough to survive the journey back to Britain, should the necessary funds be raised.

DISEASE

Leprosy at Bay

by our Social Medicine Correspondent

MORE than five hundred people from seventy countries are attending the ninth International Leprosy Congress at Imperial College in London this week. The last conference was held five years ago in Rio de Janeiro. Among the topics to be discussed are the clinical and neurological aspects of leprosy, and its chemotherapy. But the subject which has advanced the most rapidly in recent years and which is likely to be the highlight of the congress is the successful experimental transmission of the disease to animals.

Failure to grow and propagate the bacterium (*Mycobacterium leprae*) in non-human tissues has, until recently, been one of the chief setbacks in the fight against leprosy. The significance of the developments in transmission is that the susceptibility of the organism to chemotherapeutic agents can in future be studied without endangering human life. Though effective chemotherapeutic agents are obviously desirable—and

Dapsone (diaminodiphenylsulphone) is the most effective so far—the ultimate aim must be the development of a safe vaccine to be used as a preventive rather than a cure. Here again, the successful propagation of the bacterium in animals is probably an important step forward in this direction, but it may be some time before the aim is fully realized. In the meantime there is a possibility that leprosy may respond to BCG vaccine for the prevention of tuberculosis, but this has not been established beyond all doubt.

ASTRONOMY

Bright Future for Infrared

from our Astronomy Correspondent

ALTHOUGH the prediction of what is likely to happen in astronomy in the future is a hazardous undertaking just now, it seems increasingly obvious in astronomical circles that infrared astronomy is going to be an important field of investigation during the next few years. The subject has so far been neglected chiefly because of problems with detectors but also because it promised comparatively little. The enthusiasm throughout astronomy has now, however, led astronomers to believe that important discoveries are just as likely to be made in this new branch as in any other. Progress with infrared devices has given the subject substance.

There is a wealth of problems to be tackled. One of the successes of infrared astronomy so far has been the detection of what seem to be very cool stars—strong emitters in the infrared but weak at visible wavelengths—which probably represent stars and planetary systems in the early stages of formation. The quasar problem has also received its fair share of attention from infrared astronomers, who have found that quasars are brighter in the infrared than their visible spectra might tend to suggest. So far the significance of this observation to the underlying mechanism of quasars is not understood.

In Britain, much of the progress in infrared astronomy is likely to come from a group now being set up at Imperial College, London, by Professor J. Ring. A proportion of the group is planning to continue Professor Ring's studies at the University of Hull on phenomena near the Earth, Balmer line emission from the night sky and the zodiacal light, but new infrared telescopes and spectrometers are taking shape as well.

One interesting development has been the introduction by Fellgett of a technique known as multiplex spectrometry, which makes possible the delineation of the infrared spectrum of faint astronomical objects in spite of the low sensitivity of infrared detectors. The essence of multiplex spectrometry, as used by the group at Imperial College, is a Michelson interferometer in which one of the mirrors is moving, thus imparting a sinusoidal modulation to the emergent light. The point is that the modulation is different for each spectral element, and the signals from the many spectral elements are recorded by the detector with no further dispersion. The spectrum can then be re-constituted from the modulation pattern on the record, so that the technique is analogous to the multiplexing of telephone conversations. Apart from the advantage of making efficient use of the detector, the size of the aperture is not limited to the same extent as it is in a conventional spectrometer.

Infrared astronomy is best carried out at high altitudes. Except for a few narrow ranges of wavelengths, water vapour in the atmosphere absorbs a large proportion of the infrared radiation and emission by the atmosphere itself also matters. This has led to the introduction of instruments which automatically compare the signal from the astronomical object under observation with the signal from an adjacent region of the sky. The group at Imperial College is at present using a site high in the Italian Alps at Testa Grigia, but it is looking out for other more suitable locations.

SCIENCE POLICY

No Best Seller

It is hard to see a best selling future for the recent report on United States science policy produced by Unesco (*National Science Policies of the USA*, Unesco, \$3.5; 21s.). For one thing the Unesco report contains less information than that produced by the Organization for Economic Cooperation and Development (OECD) earlier this year. For another, the Unesco document seems content merely to define the important issues of American science policy without paying much attention to how they could or should be tackled. The stimulus of the OECD examiners at least made the OECD report something more than a colourless collection of statistics, even if the burden of their questions went unanswered.

The director of the US Office of Science and Technology, Dr D. F. Hornig, has remarked that there is no such thing as a national science policy which can be isolated from the other policies of government. The OECD report bluntly observes that the total expenditure related to external challenge of one form or another accounts for more than 80 per cent of US government spending on research and development. The Unesco report, which bears no name on its title page but has apparently been compiled by the US National Science Foundation (NSF), is somewhat less forthright on this issue, although a section on the history of science policy in the United States describes the stimulus to government interest presented by the Second World War and the launching of the first Russian satellite in 1957.

A principal feature of science policy in the United States is the division of responsibility for research funding between the various mission oriented agencies, the role of the National Science Foundation being to support the areas of basic research which it considers have been poorly done by. The Unesco report points out that the task of deciding how and where this compensation should be made is a matter of considerable importance, but in view of its authorship it is not surprising that the report avoids discussion of the case for strengthening the role of the NSF.

The report discusses the "internal" brain drain of the United States, but has little to say about the external brain drain, a subject of primary interest to the other members of Unesco. The Korean Institute of Science and Technology was established jointly by the United States and Korea with the specific intention of encouraging Korean scientists to work in their own country; it would be interesting to know how successful this experiment has been and whether it is likely to be repeated.