situation persists, polytechnics will be nothing more than second class institutions, and the part they play will be devalued with them. The authors of the pamphlet therefore believe that "in due course federal structures should be developed, each of which should embrace all the institutions of higher education within its area".

The authors of the pamphlet were Professor H. D. Hughes, principal of Ruskin College, Oxford, Caroline Benn, editor of *Comprehensive Education*, Tessa Blackstone, David Downes and Howard Glennerster, lecturers at the London School of Economics, and Stephen Hatch from Brunel University.

LONDON UNIVERSITY

Taking the Strain

by our Education Correspondent

IF the latest projections of student numbers in 1980 prove to be correct, the University of London external degree system will break down. The government and administration of the university will also be severely strained. These fears have prompted the setting up of a joint committee of the university and the Universities Grants Committee to look at the future of the University of London as a federal institution. The committee of inquiry will have sweeping terms of reference, but it will concentrate mainly on the organs of government of the university—the Senate and its standing committees, the convocation and the court—and it will also consider how staff and students can participate in the decision-making process.

The university Senate said last week that since 1962 its policy has been not to increase its external examining commitments, but despite the advent of the Council for National Academic Awards, the number of external degree students has increased by almost 50 per cent during the last eight years, and the external examining resources of the university are already severely strained. The committee of enquiry will therefore look at the relationship between the internal and external degree systems.

Such a committee is not without precedent. In 1963, the Robbins Committee said that the University of London has problems which call for investigation and remedy, and, if those problems could not be resolved internally, they "should be the subject of independent inquiry". The university set up a steering committee to consider the implications of the report, and since then, the Senate says, the academic organization of the university has been completely reshaped. But there are still problems which require outside help, and the University Grants Committee has agreed to cooperate in establishing the committee of inquiry.

WOLFSON FOUNDATION

More Grants to Universities

THE Wolfson Foundation is to make further grants for university research projects likely to benefit British industry. In November 1968, the foundation supported fifteen projects to the tune of about £1 million (*Nature*, **220**, 1165; December 21, 1968) and General A. R. Leakey, the foundation's director, has indicated that a similar sum may be made available at the end of this year. The total value of the grants will, however, depend on the applications received from the universities.

The foundation's last spending spree in the universities attracted more than 150 applicants, and the fifteen chosen for support make an impressive list. It seems that the Wolfson Foundation has not found itself inundated with applications which have been turned down by other grant awarding bodies and, indeed, many academics may even apply to the foundation in preference to the research councils because it places less restriction on the way the grant is spent. Among the projects already being supported are several liaison units between university and industry. For example, the Wolfson Microelectronics Liaison Unit at Edinburgh, the Wolfson Industrial Unit at Southampton and the Wolfson Bioanalytical Centre at the University of Surrey are all hoping to undertake direct consultancy work for industry, the intention being to earn money for research which may have immediate industrial application. Other projects chosen for support also have potential industrial applications; for example, Birmingham is developing a high-speed press driven by combustion of hydrocarbon fuels and the University of Wales Institute of Science and Technology is setting up a centre for the technology of soft magnetic materials. Grants which will be awarded this year will probably support similar projects, and applications must be made before July.

INFRARED ASTRONOMY

Latest Light Bucket Ready

by our Astronomy Correspondent

ONE problem facing Professor Jim Ring this week has been how to get a 40-inch infrared telescope out of the cellar of 10 Prince's Gardens, the terrace-house home of the infrared astronomy group at Imperial College, London. The telescope is the latest step in a progression which people are hoping will lead one day to the building of a 120-inch infrared telescope for the consortium of British universities which have banded together to promote infrared astronomy. But the 40-inch telescope is an Imperial College venture, built on a shoe-string budget of £2,500 and started before the Science Research Council a year ago announced the award of £27,000 to the Imperial College group. This grant is earmarked for a 60-inch telescope, the next step in the path to the 120-inch, now past the design stage and awaiting detailed drawings before the parts go out to tender in April or May.

Infrared telescopes, more properly called flux collectors—light buckets in the language of astronomy—are cheap compared with similar equipment for the visible spectrum because the optics do not have to be so accurate. This leaves the way open for unusual optical systems, and the 40-inch has a novel design even for infrared telescopes. Light is directed on to the 40-inch paraboloid by a glass flat about 60 inches across. Because of the problem of supporting a sheet of glass this size, the flat is made up of a circle of six hexagons with a hole where the seventh hexagon in the pattern ought to be. The paraboloid converges the beam to a focus through the hole, and this is where the detectors will be fixed.

The next step is to transfer the telescope from the basement workshop at Prince's Gardens, where it was

built because of problems of space and floor strength, to the Imperial College out-station at Silwood Park, Ascot. Here it will be used chiefly to test infrared systems, but Professor Ring hopes it will be possible to do some real astronomy through the moist air of Ascot. Although the important wavelengths at 10 microns are badly affected by water vapour, the band at 1 to 3 microns ought to be clearer and Professor Ring wants to record the infrared emission from the Orion Nebula. To get it out of the cellar, the telescope will probably have to be broken down into three components, and the Imperial College group is happy that the transfer will be accomplished safely.

Meanwhile the search for a permanent site for the 60-inch flux collector with the requisite minute amount of water vapour in the atmosphere has narrowed down to the Sierra Nevada Mountains in Spain and, rather pleasantly, Tenerife in the Canaries, where an inversion makes the atmosphere drier than expected for an island site. Testing is to go on at both places for most of the year, when the decision on the site should coincide with the completion of the 60-inch telescope expected by the end of this year. The mirror blank is at present being polished at Grubb Parsons optical works. Compared with an image size of 30″ of arc for the 40-inch telescope, the 60-inch telescope is expected to produce an image of 1″ of arc or so.

What form the 120-inch flux collector is to take—if it is built—is still under discussion, and much revolves around what wavelengths people most want to observe. One school of thought favours adding to the world's arsenal of 60-inch flux collectors before going to bigger instruments. These are questions which will have to be discussed before the British family of flux collectors grows further.

INSTRUMENTS

Microscopic Microanalysis

A POWERFUL new instrument which combines the facilities of an electron microscope and an X-ray microanalyser has been jointly developed by Tube Investment Research Laboratories near Cambridge and AEI Instruments at Harlow. The electron microscope microanalyser (EMMA) can simultaneously magnify and make an X-ray analysis of minute areas of material one tenth the diameter of the smallest objects visible in conventional electron microscopes. There are likely to be many uses for the instrument both in metallurgy, for which it was originally designed, and in biological and pollution research.

The advance which made EMMA possible was the invention of a miniature focusing lens to replace the bulky lens usually used in electron microscopes. The lens allows X-rays emitted at the surface of the specimen to be analysed by a series of spectrometers without interference from the lens. By removing the need to transfer a specimen constantly between a microanalyser and a microscope the new instrument makes possible precise analyses of small regions of the sample which are inaccessible by techniques involving two instruments. The electron beam in EMMA can be focused down to a diameter of about 1000 Å, and samples, which are in the form of thin films, can be magnified up to 160,000 times with a resolution of about 10 Å. The electron microscope is designed to operate at up to 100 keV, and in this range all elements with atomic number greater than about ten can be picked out by the spectrometers.

An interesting series of trials have already been carried out with EMMA. Surface cracks on steel tubing have been analysed and shown to contain particles of aluminium nitride with a diameter of 1500 Å, well below that resolvable in a conventional electron microscope. Certain steels are known to owe their creep resisting properties to plates in the structure, commonly thought to be silicon nitride. Analysis with EMMA revealed that some of the silicon sites were in fact occupied by manganese atoms, the presence of which had been concealed in the simple diffraction pattern.

Asbestos fibres extracted from a human lung have been identified in EMMA as coming from a particular asbestos known as Amosite. By studying these fibres, which are often only 1000 Å thick, it may be possible to find out more about the disease known as asbestosis. In another test, the eyebrow of a chick has been studied. The cells were found to contain more phosphorus and less calcium than did the extra-cellular space, in which there was an excess of calcium. Dust particles collected in the upper atmosphere by an American rocket have also been analysed, and the absence of nickel has precluded the possibility of their being micrometeorites. The tests suggested that the particles probably came from a steel works in Sweden, showing the great potential of the instrument for studying problems associated with pollution.

Sales for the new instrument, which will cost between £35,000 and £45,000, are likely to be at least fifty a year according to AEI. The chief sales problem is expected to be in making people aware of the range of research tasks that can be undertaken with the instrument.

ARCHITECTURE

Prize Universities

THE encouragement given by British universities to good architecture in the past few years is reflected once again in the new crop of Civic Trust Awards. Among the 198 schemes for new buildings, restorations or landscape projects that have been recognized by the trust for the top accolade, an award or for a commendation are twenty-six from universities. The trust says that the challenge of the pace of building programmes to meet the huge expansion in university expansion in the past ten years has been met "dramatically" by the university administrators and academics. Its praise does not all go to the new universities by any means—the Brynmor Jones Library at the University of Hull and the Oliver Lodge Laboratory and Senate House

University of East Anglia.