cent growth rate had been maintained since 1967. Declining budgets would result in whole areas of physics being abandoned, the committee found, and similarly static budgets would seriously undermine US capabilities because the holding operation described above would be made permanent, and insufficient regard could be paid to future generations of physicists. As for the intermediate funding level—"typically involving a 6.5 per cent growth rate", the report suggests—part II of the report, to be published later, outlines the effects on each subfield of physics.

The committee does not attempt to come up with a recommendation of what level of funding should be maintained during the 1970s, a decision which the report says "does not reflect unwillingness to face the difficulties inherent in any such attempt. Rather, it reflects the conclusion that it is impossible for any group such as the Physics Survey Committee to develop either adequately complete information or the insight to make such a detailed attempt meaningful." Nevertheless, the likely consequences of various funding levels on elementary particle physics and nuclear physics—two branches that are dominated by expensive new facilities, but which account for about half the total physics expenditure in the US —are useful guides.

In each of these fields, new large facilities are about to begin full operation—the Los Alamos Meson Facility (LAMF) in nuclear physics and the National Accelerator Laboratory (NAL) in elementary particle physics. The committee report points out that financial stringencies in each of these two fields have caused other facilities to be shut down, and unless large increases for operating costs are provided very soon, even more painful decisions must be made. LAMF, for example, requires $7 million for operations in 1973, but only $1.5 million has been provided. Similarly, NAL will require an extra $20 million in 1973, but the entire budget for elementary particle physics has been increased by only $10 million. The committee suggests that "if the additional funds are provided entirely at the expense of the operating budgets of the remaining facilities, the net effect on them will be drastic indeed. It is difficult to see how the ZGS and the Bevatron could survive; such a loss of two of the nation's four proton accelerator facilities would severely damage the national effort in elementary particle physics". The Administration's answer is to budget for an operating level in the NAL of 70 per cent capacity (see *Nature*, **236**, 52; 1972), a situation which, of course, reduces the return on the investment in the machine.

As for physics manpower, the committee has done its own study, and comes up with some bleak conclusions. The dislocation that resulted from budgetary cutbacks just as the universities were producing PhDs at a peak rate is likely to continue, at least until the mid-1970s. Based on the number of graduate students at present in the PhD pipeline, the committee estimates that some 7,000 PhD physicists will be produced between 1970 and 1975, and that this could result in a surplus of between 2,300 and 4,200. Beyond 1975, however, if the economy improves, and if the downward trend in enrolments continues, "overproduction of PhDs may not be a problem", the report suggests.

To help alleviate the unemployment situation in the meantime, the committee recommends that departmental research groups should "replace a significant fraction of their graduate student complement with post-doctoral research associates". The committee also flies a kite by suggesting that "federal agencies should develop, for at least the immediate future, research funding mechanisms and appropriate criteria that would permit selected physics faculty members and colleges or smaller universities to engage in research without training graduate students".

Finally, the committee has some words to say about the federal government's mechanisms for supporting physics. Reiterated several times is the committee's belief that the strength of US physics owes much to the existence of a multiplicity of funding agencies, and the committee observes that "although we must view the diminishing funding levels of the past few years with the greatest concern, we cannot seriously fault the mechanism by which they have been allocated". The committee, in fact, argues that mission oriented agencies should strengthen their research programmes, and agencies such as the departments of Transportation and HEW should support more physics. On the other hand, however, the committee believes that the National Science Foundation should have its budget for basic science increased, so that it can act better as a flywheel to damp down oscillations in the budgets of other mission oriented agencies, and to help it to carry out its mission of ensuring the health of basic science in the US.

ASTRONOMY

Fourth Time Lucky?

by our Washington Correspondent

OAO-C, the fourth and most complex satellite in NASA's series of orbiting astronomical observatories, is scheduled for launch next week. The satellite, which will carry experimental packages from Princeton University and University College, London, is an improved version of OAO-B, which failed to go into orbit in November 1970. So far, only one satellite in the series, OAO-2, which was launched in 1968, has been an unqualified success—the first OAO failed after three days in orbit because of a fault in the power system.

The chief experiment aboard OAO-C is the 82-centimetre Princeton telescope which will be able to view stars down to sixth magnitude in ultra-violet light. The telescope will be used to study interstellar absorption of hydrogen, oxygen, carbon, silicon and other elements in interstellar gas and to investigate ultra violet radiation between 930 and 3,000 Ångstroms emitted from young hot stars.

The London University experiment, which is being directed by Professor R. L. F. Boyd, consists of three small X-ray telescopes. It will complement the work of NASA's Uhuru satellite by searching for new X-ray sources and mapping more precisely other known sources.

The satellite will be renamed Copernicus if launch is successful, to commemorate the 500th anniversary of the Polish astronomer's birth.

Short Note

Budgets cleared, face veto

CONGRESS has finally agreed upon the budgets for the National Science Foundation, NASA and the National Institutes of Health for fiscal year 1973 (which started on July 1). Final appropriations for the National Science Foundation totalled $626 million (including $7 million in foreign currency), $28.4 million less than the administration requested. NASA has been voted $3,310 million, nearly $100 million less than the Administration requested. The National Institutes of Health, however, have fared much better—Congress had added some $213 million to the budget request, bringing the appropriations for the research institutes to $1,794 million compared with $1,476 million voted last year. The budgets now go to President Nixon for signature, but it seems very likely that he will veto the funds appropriated for NIH since they are contained in a bill which adds more than $1,700 million to the administration's budget request for the departments of HEW and Labor. Nixon has recently made several public statements about fiscal responsibility, and Eliott Richardson, Secretary of HEW, said after passage of the appropriations bill that a Presidential veto is likely. The amount added to the HEW bill is, however, almost identical to the cut made by the Senate in the Military appropriations bill.