the AEC money ran out, the accelerator has been kept going on a limited scale on money gleaned from foundations and on a few small contracts, and in that time the machine has been altered from a proton accelerator to a heavy ion machine in an attempt to cash in on some of the largest now being devoted to cancer research.

The National Cancer Institute turned down the grant application chiefly on the basis that the Princeton Particle Accelerator lacks sufficient in-house medical expertise to ensure cooperation from the medical community. But Dr Milton White, Director of the PPA, said last week that such a judgment is premature since well-known cancer therapists will not be attracted to the machine until the cancer institute puts up the money to enable it to undertake cancer research. The loss of a grant from the National Cancer Institute also spiked the chances of getting a grant from the National Science Foundation, which had promised to put up some money if the pitch to the cancer institute was successful.

Asked last week what would now become of the machine and its parts, Dr White said that it would be turned off carefully so that it could be revived if funds became available. Otherwise, most of the instruments and magnets are "really just junk" because they are specifically geared to that machine. The nineteen remaining members of staff (the machine had a staff of 350 in its heyday) will also be looking for jobs, although one or two may be slotted into other posts at Princeton.

With the present concentration on cancer research and the much publicized efforts to direct science and technology to solving pressing national problems, the chances of securing money to turn the PPA into a cancer research tool seem good. In the event, however, it has finally become an expensive sacrifice to the 200 GeV machine, which started operation at Batavia recently.

RESEARCH SPENDING

The Numbers Game

by our Washington Correspondent

THE latest contribution of the National Science Foundation to the continuing debate about the relationships between science and the economy was published last week. A set of statistics detailing trends in expenditures on research and development during the past two decades, the report*, according to its introduction, says that for 1972, "moderate R & D growth, shared by all sectors of the economy, is foreseen". Total expenditures on research and development are expected to reach $28,000 million—an increase of 4 per cent compared with figures for 1971—with federal expenditures on defence and space research and on civilian research set for increases of 2 per cent and 6 per cent respectively.

If inflation is taken into account, however, these increases look distinctly less rosy. Implied in the figures contained in the report, although not made explicit, is that inflation will increase costs by 3 per cent in 1972 so that, in real terms, what the report calls a "moderate increase" boils down to 1 per cent. Moreover, the report shows that research and development are continuing to take a declining share of the Gross National Product—expenditures for 1972 are expected to amount to 2.5 per cent of the estimated GNP, down from 2.6 per cent last year and 3.0 per cent in the heady days of the early 1960s.

As for manpower, the report gives details of the absolute decline in the numbers of scientists and engineers in research and development jobs during the past few years, but makes no predictions for 1972. In 1971, for example, there were 6 per cent fewer jobs available in industrial laboratories than there were in 1970, and 3.5 per cent of scientists and engineers previously employed in research and development were out of work last year. Much of the reason for the decline in employment prospects is, of course, the drop in expenditure on space research since 1968—the report shows that total expenditure on defence and space research declined by 7 per cent between 1968 and 1972 while federal expenditure on civilian research and development has increased by 30 per cent over the past three years.

Among the other statistics included in the report are:

- Expenditure on basic research in the United States is expected to amount to $4,100 million in 1972—an increase of 2 per cent, or a decline of 1 per cent in real terms.
- Applied research is expected to soak up $6,400 million this year (5 per cent more than last year), leaving $17,400 million for development. The trend over the past few years has seen basic research taking a steadily increasing share of the total expenditure on research and development, while the proportion spent on development has been declining.
- Between 1967 and 1969, expenditures on research and development in the United States increased by an average of 5 per cent a year, while in Canada they increased by 9 per cent, in West Germany by 16 per cent and in Japan by 33 per cent.

**National Patterns of R & D Resources*, NSF 72-300, US Government Printing Office, Washington DC 20402; $0.50.

Short Notes

Branscomb to leave NBS

THE National Bureau of Standards may not be one of the most prominent agencies of the federal government, but its size and influence have been growing steadily during the past few years under the directorship of Dr Lewis M. Branscomb, NBS director since 1969. Last week, however, Dr Branscomb announced that he has accepted a new job as chief scientist for the International Business Machines Corp (IBM), and that he will be leaving the bureau of standards. He had been widely tipped for various federal scientific posts in recent years, including director of the National Science Foundation.

Radiation Standards

THE Supreme Court two weeks ago denied individual states the right to set standards for discharge of radioactive wastes from nuclear power plants that are more stringent than those set by the Atomic Energy Commission. By a vote of five to two, the court denied the State of Minnesota a full hearing on its claim that federal laws which seek uniform standards for radioactive emissions do not necessarily pre-empt the state's own environmental laws.

The court ruling, which was brief and unsigned, was regarded by environmentalists as an important issue because they have often charged in the past that the AEC suffers from a conflict of interest between its regulatory and promotional functions. Environmental groups maintain that the Atomic Energy Commission has in the past been lax in setting standards for discharges, and that the states set more stringent requirements because they have no vested interest in the promotion of nuclear power.

All-share Shuttle

THE decision to use a solid fuelled disposable booster for the proposed space shuttle effectively limits the number of possible launch sites to Cape Kennedy and Vandenberg Air Force Base in California. Last week, the National Aeronautics and Space Administration announced that both have been chosen, thereby confounding speculations that Cape Kennedy would get a monopoly of the shuttle launches, and putting the Department of Defense for the first time in the business of direct operational support of manned space flight. Cape Kennedy will be developed first at an estimated cost of $150 million, while Vandenberg may not come into operation until the early 1980s. The Department of Defense will bear the costs of converting Vandenberg.