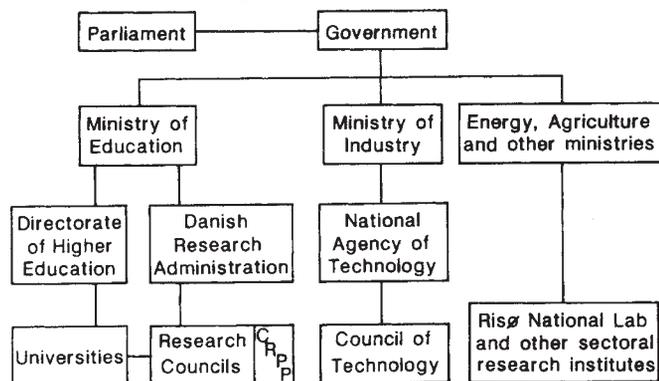


## Organization

# Looking to science for a solution

THE high quality for which Danish products are known — be they sofas, ships or synthetic enzymes — is also reflected in Denmark's science. University administrators are quick to point out that the country has won more than its 'share' of Nobel prizes (eight all told), remarkable for a country with a population of only five million.

Denmark's success is all the more noteworthy for its meagre research and



development expenditure, which at 1.1 per cent of gross domestic product (GDP), is less than half of the R&D investment in West Germany, Great Britain, and Sweden.

Part of the reason for this is that Denmark's industrial base is tiny, and what industry there is depends almost exclusively on imported technology (Novo Industries and Bang and Olufsen, the stereo manufacturer, are notable exceptions). As one senior science administrator puts it, "we Danes have always been known as good merchants, and that's what we still are. But perhaps we are good enough".

The Danish balance of payments is in a ruinous state; Denmark has the highest foreign debt per capita of any country in the world, as well as the highest taxes. Cutting costs at home is politically impossible — a rise in unemployment would surely bring down the fragile minority government.

So the politicians are looking to science for the answer, channelling much of their spending directly into the universities, (see table) and only a small proportion through the research councils. Some other government programmes — biotechnology is the current example, with an annual budget of DKr 125 million a year for the next four years — are funded directly through the Ministry of Education. Also, each ministry has its own sectoral institute(s) for basic and applied research.

Provisions for key programmes are administered by the Council for Research Policy and Planning and the Council of Technology, the six councils — Natural

Sciences, Medical Sciences, Technical Sciences, Agriculture and Veterinary Sciences, Social Sciences, and Humanities and by some *ad hoc* mission-orientated committees. The role of the six research councils should not be underestimated. They provide critical support for key programmes that might otherwise go begging. The decisions of the research councils are final, and cannot be questioned even by the Minister of Education himself. The

research councils will advise the government on the distribution of funds to the biotechnology programme and also a new materials sciences programme, when it begins.

Though the leaders of the research councils sometimes complain that insufficient university funding forces them to provide "band-aids" for some projects, these same leaders are blessed with flexibility almost unheard of within the universities. It is the bane of researchers in Danish universities that the amount of money given to a faculty is determined by teaching load. Exceptions for certain institutions — the Dansk Rumforsknings Institut (DRI), the Danish Space Research Institute, administered directly by the Ministry of Education, or the Niels Bohr Institute, a part of Copenhagen University — have allowed them to thrive, while in many other areas institutions have sunk danger-

ously close to mediocrity.

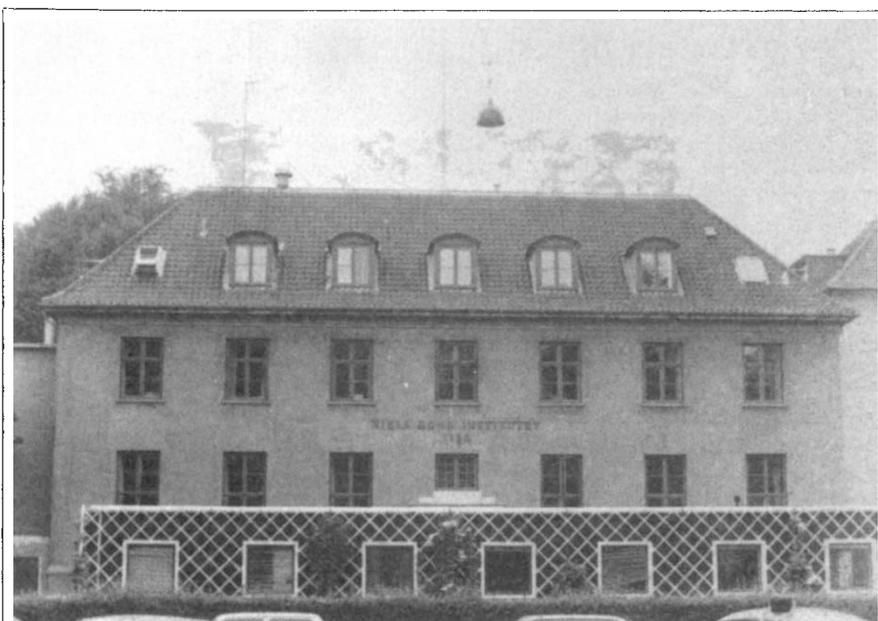
A small amount of the research carried out by private enterprise takes place in the twenty independent non-profit institutes set up in post-war years by the Akademiet for de tekniske Videnskaber (ATV) or Danish Academy of Technical Sciences. ATV was founded in 1937 to serve the needs of private industry. Only 20 per cent of the DKr 350 million budget for the ATV Institutes (which include a bio-tech-

### Distribution of 1987 R&D money

Organization	million DKr
Research councils	200
Ministries of Education and Industry special programmes	750
Nordic and European participation	200
Universities	1,600
Medical science	500
Other public sector	200
Business enterprise	4,250
Non-profit	50
<b>Total</b>	<b>7,750</b>

nical institute, a maritime institute, and the international agency for <sup>14</sup>C) comes from the Ministry of Industry; the bulk comes from outside contracts.

The rest of Denmark's private research is carried out by companies such as Novo Industries and the construction and high-technology firm Haldor Topsoe. Smaller firms, which predominate in Denmark, do hardly any research. The government is contemplating changes in the tax law to encourage more private R&D, but critics charge that this would only help twenty companies. Some suggest giving the tax breaks to the shareholders in smaller companies that do research as a more effective way to broaden the industrial R&D base. □



The cramped quarters of the Niels Bohr Institute, near the centre of Copenhagen. Founded in the 1920s, the institute is now looking for a lifeline to keep it going as explained on page 329.