

periodicities (19, 23, 41,100 x 10<sup>3</sup> years), as proposed by Milankovitch. But the theory says nothing about variations on shorter time scales. J.-C. Duplessy (CNRS, Gif-sur-Yvette) reported that recent work has revealed much more abrupt climatic changes. These develop within a few decades and are superimposed on the Milankovitch-type variations. The main physical factor responsible for the rapid variations seems to be the hydrological cycle driving the surface salinity/density of the North Atlantic Ocean. Rapid climatic changes arose during ice ages because massive iceberg discharges occurred in response to disequilibrium of the ice-sheet. They resulted in major injections of freshwater into the ocean. However, climatic variations of great amplitude also seem to have occurred during the ice ages, suggesting that iceberg discharge is not the only factor perturbing ocean circulation and the salinity of the surface of the North Atlantic. The mechanisms involved in such changes must be understood in order to evaluate the magnitude of climatic change resulting from the enhanced greenhouse forcing arising from man's activities.

### Energy Use: Learning Process

B. Dessus (CNRS, France) argued that many people believe that today's approaches to energy development are leading down blind alleys. If current trends continue, a critical point will be reached 50 to 100 years from now, with the simultaneous depletion of resources (especially oil) and a rise in the level of pollution (greenhouse gases and high-level radioactive waste). The idea is spreading that a choice must be made between development and protection of the environment.

The very basis of this reasoning which must be changed. Work carried out over the past few years has shown that exploiting science and technology to master energy efficiency is not only indispensable to avoid the deadlock mentioned above but is also a major component of development. It has also been shown that economic aspects are no longer an obstacle since the investment required to improve energy efficiency, and to use renewable energy at the level necessary for the hoped for development, is not larger than the investment required to produce additional energy based on current trends. The main obstacles are fundamentally institutional and human. A changeover from one method of energy management to another requires the organization of an immense transition. It implies the undertaking of a collective learning process affecting government policy, energy production, land-use, and financial systems. One has to build up an action programme which brings international resources to this huge learning process.

### Cost

European Cooperation in the field of Scientific and Technical Research – is a framework for coordinating national research on a European level. COST was set up in 1971 and national organizations, institutes, universities, and industries in non-COST countries, and especially from central and eastern European, have participated since 1981 if there is a justified mutual interest. Flexible, *à la carte* "COST actions" consist of basic and pre-competitive research as well as activities of public utility. European Union (EU) institutions play an important role, but in contrast to EU programmes, COST collaboration does not require an agreed overall research policy. It focuses instead on specific themes for which there is particular interest. There are 115 COST actions, each managed by a committee. Only the "Application of Ion Beam Analysis" action involves physics directly.

## Knowledge, and Nothing but Knowledge

**Huub Eggen of the Foundation for Fundamental Research (FOM) reports on several recent assessments of science policy in The Netherlands.**

Knowledge is the key word in Dutch science and technology policy at the moment. In 1994, the Dutch organization for applied science research (TNO) issued its third Strategic Plan, called "Putting Knowledge to Work". In May 1995, the Netherlands Organisation for Scientific Research (NWO) issued its policy document for the period 1996-2001, entitled "Knowledge Enriches", and one month later the ministries of economic affairs; education, science and culture; and agriculture, environment and fisheries published a joint policy paper called "Knowledge in Action". All these documents state that knowledge and a healthy knowledge infrastructure are of the utmost importance for the Dutch economy and for Dutch society in general. After all, apart from natural gas and a fertile soil there are no natural resources in The Netherlands other than brains. According to this view, The Netherlands have to concentrate on innovation in knowledge and technology. On the basis of several recent studies, the level of Dutch scientific research and the international visibility of its research are satisfactory.

People in industry and government are worried, however, about Dutch industry's relatively meagre level of advanced technology and ability to innovate. That is what everybody is focussing on. The TNO states that knowledge has to be translated into advanced products for the market; this will lead to, amongst other things, more jobs. TNO sees as a major role for itself the transfer of knowledge to medium- and small-scale companies. NWO stresses that science's greatest influence on generating new innovative power comes from interdisciplinary and multidisciplinary research. So the organization wants to actively pursue this kind of research. A high quality of research remains, however, the key criterion for funding by NWO. The government document focuses on the need to stimulate industrial activities with a high knowledge content. The ministers propose to establish a small number of top research institutes as centres of excellence to bring providers and users of knowledge closer together and to stimulate the use of essential enabling technologies.

### Sources of information

- TNO has available an English version of its strategy document, called "Strategy Document, Abridged Version". It can be ordered from the TNO Corporate Communications Department, which can be reached through TNO's WWW server at <http://www.tno.nl/home/index.html>
- The NWO policy document is available in English (entitled "Knowledge enriches"). More information on NWO is available from [news@nwo.nl](mailto:news@nwo.nl) or via WWW at <http://www.nwo.nl/>
- The government policy document is available in English (it is called "Knowledge in Action") and can be reached through the WWW server of the Ministry of Economic Affairs at <http://www.minez.nl/> under the heading "Technologie".