

US and Japan to cooperate in fusion and high energy physics

A BROAD programme for collaborative research in a number of areas of energy science has been agreed in principle by the United States and Japan. The programme, which will include fusion research and high energy physics, is expected to involve expenditure of about \$1,000 million by the two countries over the next ten years.

The main areas of collaboration were agreed during a visit to Japan in September by Dr James Schlesinger, Energy Secretary, and Dr John Deutch, head of the Department of Energy's office of energy research. The details were worked out in a series of meetings held in Washington last week; and it is hoped that an agreement will be signed within four months.

The two main items in the programme are research into magnetic fusion, and into liquefaction of coal. In addition, the two sides have agreed to cooperate in solar photovoltaics, geothermal energy, and high energy physics.

As far as fusion is concerned, the main focus of Japanese interest will be the General Atomic Company's large Doublet III programme in San Diego, to which the Japanese are expected to contribute about \$50 million.

In addition, the two sides have agreed to set up a joint research institute for fusion research. The Japanese end of the institute will probably be in Nagoya; no decision has been reached on a US site, with Massachusetts Institute of Technology and the University of California at Los Angeles being possible contenders.

In return for being allowed to participate in the fusion programme, the Japanese have agreed to contribute 25% of the costs of a \$700 million coal conversion demonstration plant planned for construction by Gulf Oil in West Virginia. The German government has already agreed to contribute a further 25%.

As for high energy physics, the two sides have in principle agreed on joint research and development into accelerator and particle detection technology and the joint construction and use of new facilities. It has been suggested for example that the Japanese may contribute to enhancing the 400 × 400 GeV intersecting storage accelerator (ISABELLE) at the Brookhaven Laboratory on Long Island. In the longer term, many US physicists are hoping that it may be possible to obtain joint funding for the next generation of particle accelerators. **David Dickson**

Home insulation may increase radiation hazard

SCIENTISTS at the University of California's Lawrence Berkeley Laboratories have suggested that the reduced ventilation in private houses resulting from conservation measures may pose a potential health hazard, by increasing exposure to low levels of the radioactive gas radon.

Radon-222 is produced as part of the decay chain of uranium-238. Both the gas and its short-lived decay "daughters"—in particular the alpha-emitters polonium 218 and 214—are present in the natural environment and are a recognised source of background radiation. Furthermore radon's precursor, radium-226, is a trace element contained in most rocks and soil; and indoor radon sources therefore include many building materials.

The health hazard is caused principally by radon's daughters, which can attach themselves to airborne particles and if inhaled, can lodge in the lung and emit short-range alpha radiation. In recent years, the hazardous aspects of high-level radon exposure have been dramatically highlighted by the high incidence of lung cancer among uranium miners. And only recently the federal government has been taking steps to minimise public exposure to the radon emitted by uranium mill tailings.

Six scientists at the Lawrence Berkeley Laboratory's energy and environment division have now suggested that, if medical data from the uranium miners is extrapolated backwards—and assuming a no-threshold, linear dose-response relationship at low levels of exposure—the decreased ventilation in private homes achieved in the interests of energy conservation could theoretically lead to an extra 20 to 200 annual deaths per million population from lung cancer.

New Spanish Constitution leaves science policy open

THE Spanish Parliament has just voted by a large majority (more than 90%) for the second democratic Constitution of this century. On 6 December the Spanish people are called to vote the text in a referendum. The main political forces, from extreme left to neofrancoists, will campaign for its approval.

Science is mentioned twice in the first part of the new Constitution. Article 20 recognises "the right to literary, artistic, scientific and technical production and creation" and article 44 says that "the public powers will promote science and technical and scientific re-

The scientists point out that despite recent interest in the effects of radon exposure in both Sweden and the UK, there is still little detailed knowledge about the effects of low level exposures over long periods of time, and that any conclusions are highly speculative. "We are not issuing a warning, but merely calling attention to a possibility that should be watched and studied", says Dr Craig Hollowell, one of the scientists concerned.

Despite this, a report produced by the scientists states that: "It is likely that some increased lung cancer risk would result from increased radon exposures; hence it is desirable not to allow radon concentrations to rise significantly".

In the long term, the scientists suggest that it may be necessary to include radon exposure levels in building standards. In the short term, they suggest a number of measures—such as sealing walls and floors, or coupling mechanical ventilation with heat exchangers—to reduce radon exposure.

The scientists have applied to the Department of Energy for further funds to carry out a more detailed investigation of the potential hazards—a request which has fallen between the department's environmental health and conservation responsibilities.

Some money has already been granted to study the radon emission of building materials. A complementary proposal for studying the health effects is being considered by the department's office of energy research. No one is yet prepared to admit that increased radon exposure does pose a health hazard, however small; but with growing concern about the long-term effects of low level radiation, no one is yet prepared to dismiss the hypothesis as unfounded. **David Dickson**

search for the benefit of general interest".

The mention of research in the articles dealing with the organisation of the State may be of greatest significance for scientists. One of the central constitutional problems has been the formation of autonomous governments in different parts of Spain. Article 148 lists the matters transferable to autonomous communities and it includes "the promotion of culture and research". However "the promotion and general coordination of technical and scientific research" can be found in the list of matters reserved

for central government. Nevertheless anything is possible because article 150 says that the central government may transfer or delegate to autonomous communities matters attributed to it.

The reason why the organisation of research is mentioned in the Constitution comes from the present unequal distribution of research centres in Spain. The question is left open because some people think that if control over research is given to autonomous governments research would be more

balanced and related to the needs of different areas; others fear that it could be more difficult for a smaller community to build an appropriate system of financing research and that co-ordination may not be easy.

Parliament will have to make a decision on these issues within the next few months. From a practical point of view it is very important that decisions are made quickly as the present provisional situation in science makes work very difficult. For instance

one of the main sources of research funds (FNDICT) may disappear next year and laboratories have not yet received the credits corresponding to applications made in 1977.

What remains to be seen is if political decisions will be taken soon enough to prevent the closing of certain laboratories and if the problems are treated with sufficient imagination to achieve an adequate structure for research.

Pedro Puigdoménech

Sweden's new government wrestles with nuclear power

NUCLEAR power has finally proved to be the undoing of Sweden's first non-socialist coalition government in 44 years. Former Prime Minister Torbjörn Fälldin handed his resignation to the Speaker on 5 October.

The government fell because some members of Fälldin's Centre Party opposed the coalition's decision on the loading of two reactors: Ringhals 3 and Forsmark 1. Under the Stipulation Law, the reactor owners could be given permission to load only after they had secured an acceptable reprocessing contract. They also had to show how and where the highly-radioactive waste resulting from reprocessing could be finally stored. Judging the application by these criteria, the government found "that the preconditions for consent are deficient in one respect. The application cannot therefore be approved".

The government went on to say that in order for the application to meet the conditions laid down for secure final storage, there should be test drilling to "show the existence of a sufficiently large rock formation of appropriate depth" with the qualities already prescribed by the nuclear industry's Nuclear Fuel Safety (KBS) project*. If the applicants found rock they considered suitable and applied again, the government would ask the Nuclear Power Inspectorate to judge the application. If the Inspectorate approved it, the government would give permission for the reactors to be loaded.

This agreement was immediately interpreted by the Press as a 'soft yes' to the loading, as it was assumed that the test drilling was a mere formality which would quickly produce the required rock. The Centre Party was criticised for yet another capitulation: although anti-nuclear, it had made several compromises on the issue during the government's term. How much influence these attacks had is uncertain, but, at the insistence of former Energy Minister Olof Johansson and other members of the Centre Party, Fälldin demanded that his coalition partners should agree to a referendum

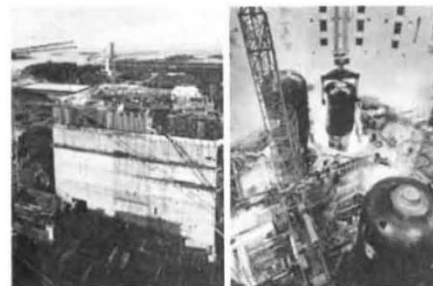
on the issue. They refused, and the government fell.

After much speculation, a minority Liberal party government was sworn in on 18 October. The new Energy Minister, Carl Tham, favours nuclear energy, but his statements since becoming Minister have been cautious.

Tham has said that the investments already made in nuclear reactors should not be wasted, and that those already in operation or being constructed should be used if security demands can be met. This would mean drawing the nuclear line at eleven reactors. He also wants to tighten up security on all energy forms. The new government will, he says, follow the old one's agreement on the Ringhals 3 and Forsmark 1 reactors.

Since the government's fall, debate has raged over the extra drilling requirements. Will they prove to be a simple formality, or was this a subtle way of delaying the two reactors perhaps for years? Engineer Lars Bertil Nilsson, chief of the KBS project, is confident that suitable rock will be found quickly. "There are certainly many places in Sweden where the rock is suitable", he says. "According to the government's statement, we simply have to find one of them. We don't need to choose any particular place now for final storage: that's a long-term business and will need to take a lot of other things into account besides the rock itself: buildings, transport, public opinion, etc. All we have to do now is to show that suitable rock exists. It is our judgement that we need only drill four new holes at Finnsjön, near Forsmark, and three new ones at Karlshamn. The drilling has just begun and will be finished by the end of the year. Then we'll put our report together and make a new application to the government in 1979."

His optimism is not shared by various researchers and some of the geologists actually doing the drilling. They have claimed that reliable results cannot be expected before two to ten years.



Forsmark 1 and Ringhals 3 under construction.

Meanwhile, the Nuclear Power Inspectorate is preparing itself for the new application. According to Dr Thomas Johansson, Vice-Chairman of the Inspectorate's Board, an expert panel of geologists is being set up to review the application. Before it is presented, however, the board is asking the panel to discuss guidelines for its evaluation. The panel should list the qualities that the nuclear power industry has said suitable rock should have; discuss possible measuring techniques that could be used to claim that the rock actually has the required characteristics; and decide what constitutes "showing" that the rock is suitable. "None of the geologists on the panel is involved in the drilling", says Dr Johansson. "The intention is to have a completely independent review."

What, then, of the future? "I am rather pessimistic", says anti-nuclear activist Björn Gillberg. "The Centre Party committed suicide when it passed the Stipulation Law. Whether or not we want nuclear energy should be decided on very broad grounds: social, political, psychological, environmental, international. To reduce it to the technical handling of waste, as the Law does, simply turned out to be a trap. The Centre Party didn't realise it had set a trap for itself until it was too late. They're nice guys, but they're naive. I can see the [pro-nuclear] Social Democrats winning next year's elections." Wendy Barnaby

*The first KBS report, against which the Ringhals 3 application was judged, is called "Handling of Spent Nuclear Fuel and Final Storage of Vitrified High Level Reprocessing Waste". It is available from KBS, Brahegatan, S-102 40 Stockholm.