

Space science

Packaging irresistible instruments

SPACE science is one area where Denmark has obtained a firm grasp on its niche. "Our philosophy", says Niels Lund of the Danish Space Research Institute, DRI, "is to develop instruments for space science to the point where they're irresistible to those launching satellites". The most prolific launcher of the day — the Soviet Union — has found that Danish offer alluring in two cases of late: an all-sky monitor for hard X rays, due to be launched in November 1988, and a sensitive 8-metre X-ray telescope scheduled for launch in 1992.

Founded in its present form in 1966, the year Denmark joined the European Space Agency (ESA), DRI grew out of a programme of ionospheric research at the DTH (Danish Technical University). Crucial to its development was the insistence of its first director, Bernard Peters, that DRI should have technicians and engineers on the permanent staff so that it could produce its own space hardware. That way, DRI's director is free to make commitments to long-term international programmes. Without this freedom, "we wouldn't be on the [1992] Soviet satellite," says the current director, Herb Schnopper.

DRI is unusual in Denmark in being an institute commissioned to do research full-time, but with academic standards just as high as those in the universities. Schnopper compares it to the Smithsonian Astrophysical Observatory or the Woods Hole Marine Biological Laboratory in the United States. There are very few students at DRI, however, primarily because there is no funding for them, and this may eventually cause problems for the institute with its overseer, the Minister of Education.

The all-sky monitor, called WATCH (wide-angle telescope for cosmic hard X rays), was originally due to be launched on an ESA satellite on the US space shuttle in early 1988. The grounding of the shuttle pushed the scheduled launch back to 1991 at the earliest, so when the opportunity arose to launch WATCH with the French satellite GRANAT on a Soviet rocket in 1988, Lund was overjoyed.

There will be four WATCH instruments, along with six other devices from France and the Soviet Union, on the GRANAT mission. True to its name, WATCH will observe the whole sky for bursts of hard X rays, localize the bursts to within a fraction of a degree, and alert the on-board X-ray telescopes. WATCH will also be trained on known bright X-ray sources and will monitor their flux continuously — the project's "bread and butter", according to Schnopper.

Meanwhile, the Soviets are busy designing a spacecraft with a new type of

unfolding mechanism to accommodate DRI's 8-metre telescope, known as Spectrum X-Gamma. One reason that the DRI proposal succeeded with the Soviet space research institute IKI is that the mission is a balanced collaboration. The Soviets "don't just want to be the bus driver", says Schnopper.

Spectrum X-Gamma will operate over a broad energy range (from 100 eV to 2 keV) for a large number of different classes of sources. In particular, it is meant to examine the spectra of very distant active galactic nuclei and clusters of galaxies. It will be the largest X-ray astronomy mission to date when it is launched in 1992.

Despite its resounding success in attracting international collaborators, DRI seems unlikely to be given a larger slice of

the government's research pie. In fact, if a new government proposal is adopted, DRI will be forced to compete with other sectoral research institutes (those non-university institutions which are under the jurisdiction of the various ministries) for up to one-third of its budget. Although DRI would certainly hold its own in such a competition, Schnopper fears for his autonomy in signing up for more long-term projects.

Peder Olesen Larsen, director of the Danish Forskningssekretariatet (Danish Research Administration) and second only to the Minister of Education in Danish science administration, acknowledges that "success breeds success" in Danish astrophysics, and, all other things being equal, he recognizes that DRI would have a tendency to draw in ever-increasing funds based on its merits. But, he says, "we cannot allow it to grow too large if it doesn't have a closer connection to Danish production". □

Research Academy

Doctorates on the double

THE Danish government has become convinced that the key to its future is a guaranteed supply of brain power. So, in a forward-looking move, it last year created the Forskerakademiet (Research Academy) in Århus. The short-term goal of this experimental institution is to increase the number of doctoral degrees granted in Denmark from 180 per year to 360 or more by 1990.

There were several other goals in mind, according to the Academy's dynamic director, Lauritz Holm-Nielsen, who is a former Natural Sciences Research Council chairman. The idea was not only to fund more graduate students, but also to get them through the system faster (ideally in three years). The increased supply would in turn encourage sectoral research institutes to hire only people with doctorates. Also, the Academy is funding graduate students who do theses at the sectoral institutes themselves and in private industry, in order to bring these organizations closer to the academic world. And finally, it is trying to bring more coherence to a very uneven system of graduate education in the universities.

At first, the Academy evoked a typical Danish response — suspicion. "The universities were afraid that part of their competence was being taken away", says Holm-Nielsen, "and that the Academy would become some sort of super-university". Once the initial distrust was overcome, he adds, the universities all accepted the Academy and even welcomed it.

They discovered that Academy fellowships were flexible and could be granted in whatever faculty they were needed. Previously, graduate education was almost

exclusively supported by university budgets. This money was tied to the individual faculties and left the universities with scant manoeuvrability.

Sectoral institutes, too, have responded positively to the Academy. They are beginning to seek applicants with doctorates to fill their openings, which, says Ove Nathan, rector of Copenhagen University and a member of the Academy's



On trial: Lauritz Holm-Nielsen has five years to make a success of the Research Academy.

steering committee, will raise their standards and "those that refuse will be earmarked as impossible people".

Remarkably enough, the Academy is managing to accomplish all this on a relatively small budget — increasing from DKr 14 million in 1987 to DKr 150 million in 1992, when its five-year trial period ends. The low price-tag should help the Academy succeed, and success may make another government goal — to double the Danish investment in R&D in relation to GDP over the next ten years — a bit less unrealistic. □