

Danish Space Research Institute

Focus on the basic research



Gigantic black holes is one of the phenomenas DSRI participates in investigation of. Photo: ESA

Danish Space Research Institute (DSRI) is, in spite of many well-known space research institutes in Denmark, regarded as the flagship in Danish space research. With many years of contribution to the research activities within X and gamma radiation of astrophysics, and through these programmes having achieved an enormous expertise within these fields, DSRI has during recent years increased the coverage of several new areas. The planet's magnetic field, the heliosphere's physics, and the magnetic characteristics of materials at Mars form the basis for future activities within the institute. Participating in projects such as the Russian Spectrum RG mission, large ESA programmes like INTEGRAL and PLANCK and not least the participation in the Danish national Ørsted programme, the DSRI is solidly placed as one of the leading institutions within space research in Europe.

“We have several extremely competent research institutions in Denmark, says Eigel Friis-Christensen, Managing Director at DSRI, and the Danish Space Research Institute is one of them. As a sector research institute below the Ministry of Research and Information Technology our main task is to carry out space research, and at the same time, be a Danish centre of knowledge regarding instrumentation and technology with regards to investigation and use of space”.



Eigel Friis-Christensen, Managing Director at DSRI from 1997

“The fact that two Danish proposals are chosen as candidates to ESA's future Earth Observation missions shows that Denmark is in the forefront within some fields. The two proposals are based on experiences and technology from the Ørsted satellite, and also demonstrate that the national programmes can form the basis for a broader international co-operation within the space segment. To have cutting edge technology within special fields, means that one will be an attractive partner in large international projects” continues Friis-Christensen.

DSRI was established in 1966 and during the first years of the existence the activities at DSRI were directed towards cosmic ray research and magnetosphere physics. A principal division of the Danish space research into satellite/rocket-based and

ground-based experiments was confirmed by the decision of a governmental committee established in 1979. The final recommendation of the committee also led to the decision to transfer the space related instrumentation work, including the development of magnetometers for sounding rockets and satellites, to DSRI.

During the following years the scientific focus of the DSRI activities moved towards X-ray astronomy. Compared to the size and available resources of the institute, DSRI embarked on a very large project; the delivery of crucial parts of the largest instrument, SODART (Soviet-Danish X-ray telescope) of the Russian SPECTRUM RG mission. The resources needed for the Danish contribution to this ambitious project, combined with a decrease in basic funding for the institute in the beginning of the nineties, forced the board of the institute to concentrate the activity on astrophysics and hence abandon the activities in plasma physics.

Thus, in 1995 a new Board recommended to the ministry that additional funding should be made available to allow DSRI to initiate activities in solar system physics. This would make it possible to establish a broader base for the Danish space research activities in this field and thus provide the opportunity for a more adequate science benefit from the Danish contribution to ESA's Science Programme that includes astrophysics as well as solar system physics.

An organisation in evolution

With the change of directorship in 1997, where Eigil Friis-Christensen was appointed as the new director, new plans for the institutes were launched and a new strategic plan was finally implemented in October 1998.

The strategic plan was built upon the three formulated objectives of DSRI:

- To contribute to an increased understanding of the universe, including our solar system.
- To contribute to the understanding of the physics of our own planet earth and in particular how the planet, as a system, interacts with the forces that are in effect in the solar system.
- To contribute to the acquisition of increased competence of Danish instrumentation and technology associated with space.

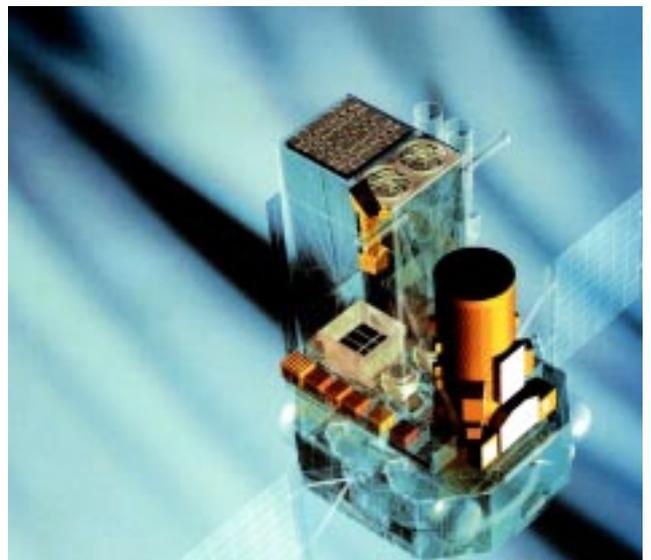
In view of the rather limited size and resources of the institute the necessity of selecting a few scientific key areas was realised. It was also recognised that in order to be successful in the international market there had to be a strong connection between these science areas and the instrument development. Finally, it was realised that it was necessary to take full advantage of the Danish scientific expertise, also at other institutes, and that visibility in the public is a requirement for obtaining public support.

An immediate consequence of the new strategic plan, but not quite realised at the time of formulation, was the decision to reduce the work on the SODART experiment for the Russian SRG satellite. The launch date for satellite was pushed further and further into the future as time went on. A decision was taken to finish all the flight hardware according to plans, but to stop all work on the software development and other operational aspects, until a reliable launch date could be provided.

Apart from these considerations it was also discussed how the existing solar system research efforts in Denmark could benefit from the allocation of additional resources to this field. All these considerations, along with a wish to establish a reasonably strong coherency within DSRI, led to a strategy comprising an effort in three distinct, but interconnected, areas:

- Magnetic fields around planets (including earth) and in the interplanetary space.
- The physics of the heliosphere, particularly the relationship between the solar- surface- processes, and the electrodynamic properties of the environment of planets.
- Magnetic properties of the surface of Mars.

The interdisciplinary aspect is obvious in the selection of these three areas. Due to the relatively limited resources it is believed that space science in Denmark may have the largest international impact on interdisciplinary research topics where the interaction between scientists from different fields is more important than an intense and resource demanding effort in a limited area. In addition to this, all the topics are connected by their dependence on high quality measurements of the magnetic field. Thus, these research areas can fully benefit from the long and extensive efforts in space magnetometer development at DSRI. This has resulted in world leadership in high precision space magnetometry, illustrated by the success of the Ørsted satellite and the inclusion of Danish instruments on board the Argentine/US satellite, SAC-C, and the German CHAMP satellite.



Integral, one of the space research programmes DSRI is very strong engaged in.
Figure: ESA.

The future's organisation

The development of all societies, not only the Danish, is determined by the ability to increase the quality of research, education, and innovation. This is acknowledged and worded in the overall national strategic and political objectives, and thus forms the basis for the selection of means through which the DSRI mission is sought realised.

Research is a major catalyst in such a realisation. Space research is technically demanding and thus creates the challenges, which form the best basis possible for innovation. Increased co-ordination and co-operation between the universities, research institutions, and the industry is necessary for a realisation of above mission. The creation of the necessary basis for the conduction of high-quality space research and the obtaining of the optimal outcome in the form of education and innovation requires the establishment of a new organisation. This organisation must ensure:

- Exploitation of the results from the space programmes of ESA
- Accomplishment of local competence through which Denmark can influence the space programmes of ESA
- The accomplishment of national projects, with specific emphasis on Danish areas of competence
- Increase the understanding of the Danish population for the need for space research and space activities.

In Denmark, DSRI was established with the purpose of ensuring a Danish scientific follow-up on ESA's science and to this date DSRI is the only Danish institution for which the main purpose is to conduct space research. Thus, the present scope of

DSRI will naturally be included in the mandate for the new organisation.

In addition to the mandatory programme, Denmark participates in a number of optional, time-limited programmes within ESA. The exploitation of the above is varied out by various institutions and corporations, and the Danish financial contributions to these programmes will naturally reflect the extent of the national efforts made hereto, contributed by the relevant utilising institutions in Denmark. Thus, an overall prioritising of the Danish contribution to the optional programmes will imply the existence of a permanent forum for the co-ordination of said institutes' contributions and point-of-view.

Paying close attention to the above said considerations, DSRI's proposal for a new organisation structure, a Danish Centre for Space Research (DCSR) includes four main elements:

- An extension of the Board to represent the major Danish space activities.
- A basic research effort that corresponds with the mandatory science programme of ESA.
- Four professional forums with Danish and international experts, who altogether cover the Danish participation in the optional programmes of ESA.
- A small national satellite programme.

The Board for the organisation will be appointed by the Ministry of Research and Information Technology and should represent all major types of Danish space activities and be responsible for the overall prioritising of the distribution of the total Danish funding allocated for space activities. ■

The Danish space organisation.

All Danish space activities are co-ordinated by the Ministry of Research and Information Technology through the Office for International Relations. The office take care of Danish interests in a raw of international research organisations like ESA (space research), ESO (astronomy), CERN (particle physics) and EMBL (molecular biology) in addition to the European research and development programmes EURECA and Cost. The office is also responsible for the Nordic North-Atlantic research co-operation and for some EU research programmes.

To give advice for the ministry the Public Research Committee for Space is established. The committee shall give the Minister of Research and Information Technology independent and qualified advice within the space area. The advice is going to cover both the Danish policy within the area and Danish participation in national and international research activities, including ESA. The committee has representatives from a number of ministries and boards, the industry and DSRI.

If you will read more: “rummet.dk”

Visibility in the society should be one of the main tasks for all who depend on public interest, both to ensure the financing, and not least, to ensure supply of high educated personnel to force the development forward. For the high technology field that space research is, fulfilling of the last point will also form the basis for political goodwill and with that, goodwill with allotment of public funds.

For the space research field in Denmark, some of the information activity is solved with a contract between DSRI and the Ministry of Research and Information Technology to develop, edit and maintain a web site on space research, technology and applications. This web site, called “rummet.dk”, is a Danish popular science site containing various types of information about space, but with particular focus on projects with Danish participation. The main target group is A-Level students in elementary school and high-school freshmen. Besides, the purpose is to increase the interest within space physics, space research and space technology. The site contains more than 500 pages with articles on space research and - technology, with a Q&A service, quizzes, online data, video-clips etc. There is a special section on news with a subscription opportunity. DSRI collaborates with other research institutes, private companies’ etc. to produce the input to the site.

The number of pages downloaded from “rummet.dk” since the release on the Internet on October 1998 shows a steadily increasing use since the launch. In addition, some well defined tops in the interest is detected in connection with the launch of the Ørsted satellite the first quarter of 1999 and the landing of the Mars Polar Lander late in 1999.

“rummet.dk” has also a “questions-and-answers page” that have been synchronised with the similar page from Dansk Naturvidenskabsfestival (Danish Natural Science Festival), called “spørg naturvidenskaben” (“ask the natural science”). Five persons from DSRI are members of the answering panel.



Illustration: DSRI