



INTERNATIONAL

SPACE SCIENCE INSTITUTE

ISSI

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*It is proposed to create an Institute in Switzerland
at which scientists from many countries can work together
to achieve a deeper understanding
of the results from space missions,
adding value to those results
through multi-disciplinary research
in an atmosphere of international cooperation.*

Issued by the Executive Board of the Association PRO-ISSI:

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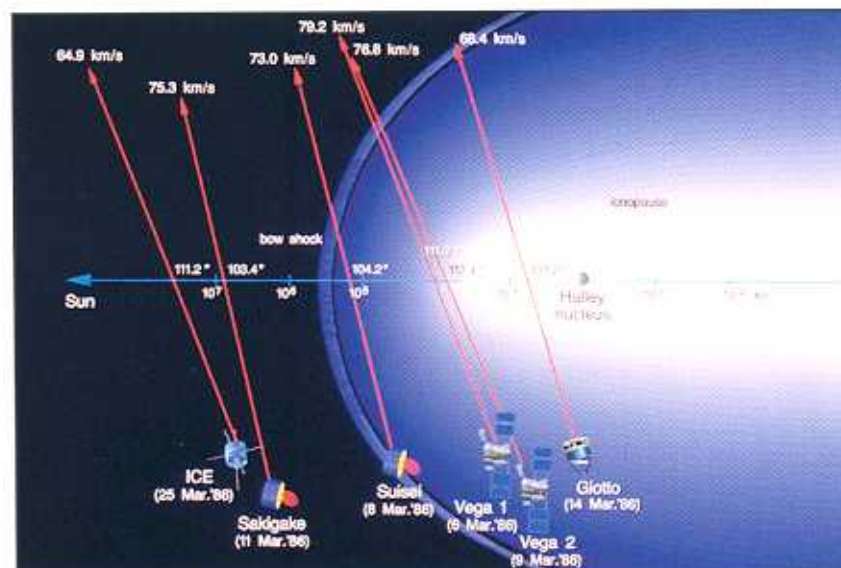
G.A. Tammann, University of Basle



INTERNATIONAL COOPERATION IN SPACE SCIENCE

Space research has progressed, through its many successes, to a point at which international, and even intercontinental, cooperation becomes mandatory. The scientific aims of a modern space project require a broad range of knowhow and experience in science and engineering, as well as sophisticated spacecraft and instrumentation, which is not readily available to a single space agency and its customers. Moreover, some scientific goals require a combination of several spacecraft, thereby surpassing the means of even the larger space agencies.

Indeed, most modern space missions have a strong international component. Recognising this general evolution already in 1982, and going a step further, the European Space Agency (ESA), the Space Research Institute of the Russian Academy of Sciences (IKI), the Institute of Space and Astronautical Sciences (ISAS) of Japan, and the US National Aeronautics and Space Administration (NASA) created the 'Inter-Agency Consultative Group (IACG)', with a mandate to coordinate their missions to Halley's Comet. It successfully coordinated the flights of six space probes to, and remote observations of that comet. In 1986, the IACG delegations agreed to also coordinate their respective missions in the area of Solar Terrestrial Physics, which will eventually involve more than a dozen spacecraft from the four agencies.





THE INTERNATIONAL SPACE SCIENCE INSTITUTE

It is proposed to create an 'International Space Science Institute (ISSI)' – along the lines of an advanced-studies institute – with the aim to further enhance the results of international coordination and collaboration. The Institute will enable space-science experimenters, using different instruments, often flown on different spacecraft in a wide variety of orbits, to pool their data and their knowledge in order to be able to interpret their scientific results in a broader context. Theorists and modellers working at ISSI in direct contact with the experimenters would gain a greater understanding of the potential – and limitations – of the available data, enabling them to identify crucial checks on their theories or models. ISSI is also intended to foster the comparative interpretation of results from space missions with observations from the ground and with laboratory data.

Perhaps the most important aim for ISSI lies in its interdisciplinarity, providing the means to draw as necessary on the methods and arguments of the appropriate branches of physics, astronomy, chemistry and earth sciences. Such access – currently hardly affordable to an individual experimenter's group – is the key to the interpretation of data in the wider scientific context, reaching well beyond the points of view of the individual disciplines. It is in this sense that ISSI would truly be an institute for advanced studies.

Involvement in the development and construction of hardware is beyond the scope of ISSI, nor is it intended to play a significant role in the archiving of data, at least not in the initial phase. ISSI would, however, need access to the relevant archives and data systems at other sites.

ISSI would not infringe on the rights of Principal Investigators and their teams regarding their experiment data. On the contrary, it would be striving to enhance the value of these data in close cooperation with the experimenters.

The idea of creating an International Space Science Institute in Switzerland with the scope outlined in this brochure has been endorsed by the IACG.



Knobbach, 28 September 1994

RESOLUTION BY THE IACG HEADS OF DELEGATION

concerning

THE ESTABLISHMENT OF AN INTERNATIONAL SPACE SCIENCE INSTITUTE

The four IACG Delegation Heads were briefed on the progress made since last year to establish in Switzerland an International Space Science Institute called ISSI. They took note of the brochure provided by the Association PRO-ISSI and reaffirm their support expressed during the last four IACG meetings for the creation of this institute.

The rationale for ISSI and its aims have remained the same ever since this idea was first presented to the IACG in November 1990. In brief they are:

- to provide an environment for direct, face-to-face cooperation of
 - space experimenters of different speciality
 - ground-based observers and experimenters
 - theorists and modellers,

thereby fostering in-depth studies and interdisciplinary interpretations of the new, enormously rich and complex experimental results which are coming in from multi-instrument, multi-spacecraft programmes.

The Delegation Heads take note of the plans of the Association to organise ISSI. They deeply appreciate the decision of the State of Bern to provide the necessary space for ISSI and to make a substantial financial contribution for the initial investments. They were satisfied to learn that the Swiss Federal Government is close to making a decision concerning their contribution to investments, running costs and salaries of staff.

The Heads of Delegation will explore within their agencies how to provide grants in order to maintain (without exchange of funds) an appropriate presence at ISSI, through researchers from their respective communities.

Ryegon Akiba
Prof. R. Akiba
Director General of ISAS

R.M. Bonnet
Dr. R.M. Bonnet
Director of Scientific Programmes,
ESA

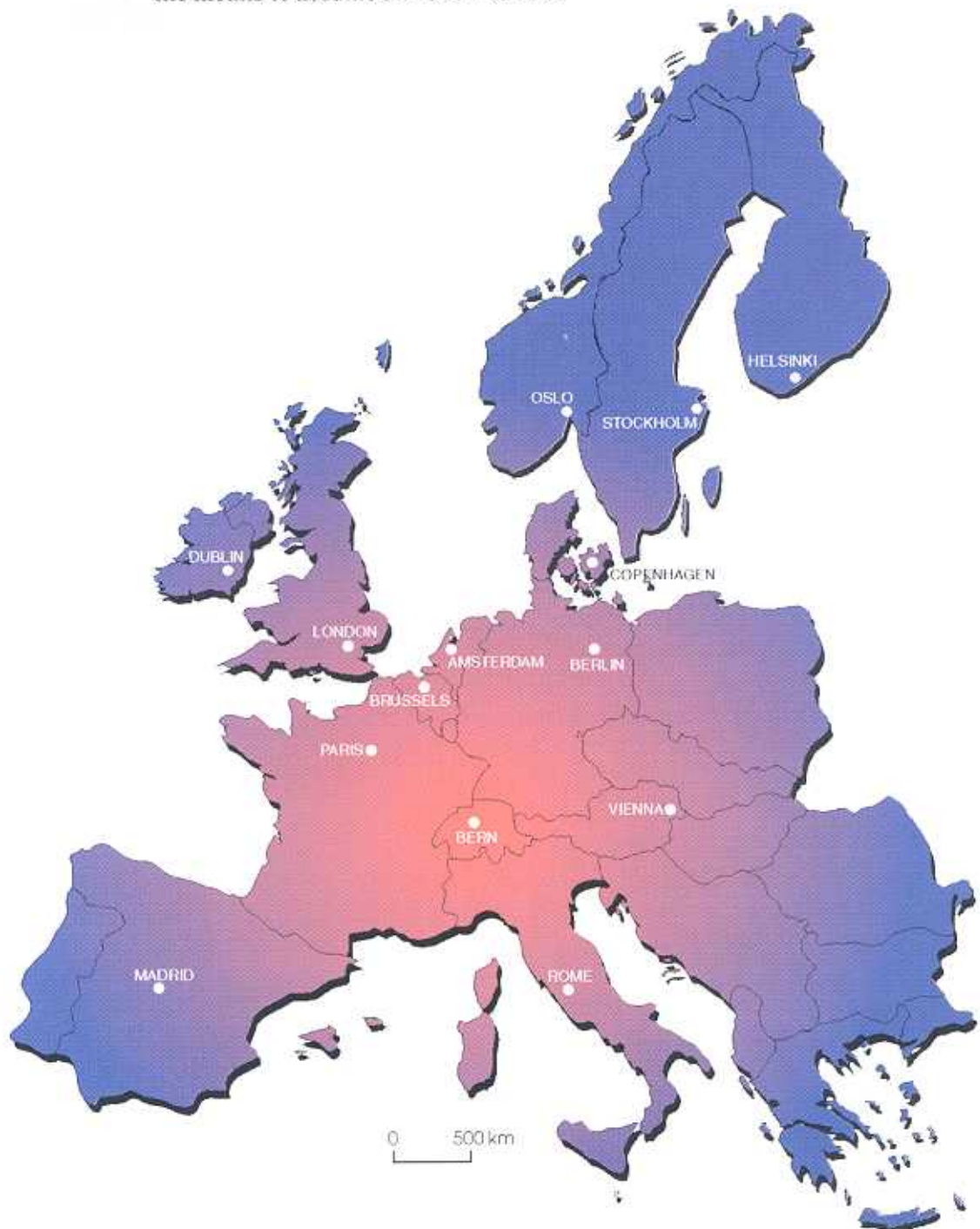
W. Hurlburt
Dr. W. Hurlburt
Associate Administrator for OGS

Prof. V.A. Galeev
Prof. V.A. Galeev
Director of IKI, Russia



WHY IN EUROPE?

There is currently no institute in the ESA member states that plays the role foreseen for ISSI. Other partners in the IACG have large scientific institutes at their disposal, which would, in principle, have the means to assume an ISSI-like role.



In the United States in particular there are, in addition to the large NASA Centres, a number of important institutes, essentially financed by NASA, with aims somewhat similar to those for ISSI, e.g. the Space Telescope Science Institute and the Lunar and Planetary Science Institute.

The past successes of these institutes actually underline the need for creating an institute like ISSI in Europe, to increase Europe's share in the advanced, more interdisciplinary-oriented science resulting from space missions.




Universität Bern

Prof. A. Ludi
Rector

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Scientific research is never limited by borders but reaches beyond earth, beyond the solar system into the vastness of space. The elucidation of the origin and unfolding of the universe has been a challenge to man throughout his existence. Early mythological patterns have been transformed into an increasingly complex arsenal of sophisticated instruments including satellites. Space missions and the evaluation of their data require an intense international collaboration where our Department of Physics has made significant contributions. It is with pride and joy that the University of Bern welcomes the International Space Science Institute.

Bern, June 1994


Prof. A. Ludi, Rector

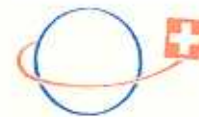


WHY IN SWITZERLAND?

The political authorities, the space-science community, and industry in Switzerland are actively promoting the creation of ISSI which, in addition to bringing a centre of space expertise and excellence into the country, would at the same time bolster public awareness and political support in Switzerland for space activities in general.

Swiss scientists have been heavily involved in the definition and planning of the ESA Science Programme, and they have participated successfully in many international space-science projects. Swiss industry has participated for thirty years in the development of spacecraft, spacecraft instrumentation and launchers, contributing expertise in many areas of high technology.

Last but not least, Switzerland is very centrally located in Europe and has excellent international air and rail connections.



SPACE INDUSTRIES GROUP OF SWITZERLAND

18 August 1994

The Space Industries Group of the Swiss Association of Machinery Manufacturers (VSM) considers space-science programmes to be of fundamental importance for developing technology in industrialised countries. This is in part because scientific space missions are always pushing technology with a view to obtaining measurements of higher quality and greater accuracy. In addition, in most cases scientific space missions are not repeatable and thus demand extremely high reliabilities in order to ensure their successful operation over extended time periods.

The Swiss Space Industries Group is therefore delighted to note that an International Space Science Institute is to be established in Switzerland with the aim of improving the efficient exploitation of the vast amount of precious scientific data that is being returned to Earth each day from space.

H.-P. Schneiter
Chairman

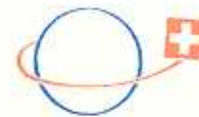


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THE ISSI SCIENCE PROGRAMME

ISSI's science programme would be centred around the space projects in which the four space agencies cooperate. Thus, cooperative scientific projects meeting the criteria spelled out in Section 2 from the fields of Solar-System Science and Astronomy could be pursued by ISSI Fellows and Staff. Sufficient flexibility in terms of personnel must be maintained to allow ISSI to keep abreast of the changes in the international space-science programmes. However, 'quality of science' shall have priority, and so ISSI and its Fellows and Visitors will have considerable freedom in choosing the range of their scientific topics.

Ultimately, ISSI will be judged on whether or not it is fulfilling its true mandate, which is to generate – for relatively low cost – more high-quality science from the projects being conducted by the various space agencies.

Initially, however, research at ISSI would focus on the Solar System sciences, where the need for an institute of the kind proposed here is particularly strong. Virtually all projects in this field are Principal-Investigator (PI) type missions, and thus already to a certain extent interdisciplinary. The sets of experiments flown on such missions produce very different types of data, which have to be interpreted and integrated holistically if mission objectives are to be fully exploited.

Specifically, ISSI's initial programme would include heliospheric and cometary research, solar and space plasma physics, and solar terrestrial relations. Such a programme could begin immediately after ISSI's creation. Analyses of the early data from *Ulysses* and of data from the spacecraft that intercepted Halley's Comet have progressed sufficiently for the broad interdisciplinary studies foreseen to bring added value immediately.



There are already very important links to astronomy in the IASTP Programme: the penetration of interstellar gas and grains into the heliosphere, the shock acceleration processes directly observed in interplanetary space, the relationship between cometary and interstellar chemistry, the implications of the results from the solar atmosphere and seismology for stellar physics and stellar structure, or the information on nucleo-synthesis obtained from chemical and isotopic abundances in comets and galactic cosmic rays. As long as the emphasis on broad questions is maintained, the activities at ISSI will strengthen the link between solar-system studies and astronomy – to the ultimate benefit of both.

Once the work on solar-terrestrial physics was well under way, decisions on the future direction for the programme would need to be taken. The choice of whether to go more towards astronomy or to include planetary – in particular lunar and earth-oriented research – would depend on how the World's space programmes in general develop, and what the role of the IACG in this framework would be.



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ORGANISATION AND FINANCE

It is proposed to organise ISSI as a private institute, run by an Association and supported by several sponsors. The existing 'Association PRO-ISSI' could assume this responsibility, subject to satisfactory provision being made to afford the sponsors adequate influence and monitoring possibilities. However, the primacy of science should be the guide in setting up ISSI. The organisational structure and the various responsibilities foreseen would be as follows:

Governing bodies

The organisational scheme proposed for ISSI is not unlike that of other existing advanced-studies institutes: a Board of Trustees oversees the activities of ISSI. It is supported in this task by an Administrative and Finance Committee, which would supervise the financial and administrative activities of the Institute.

The Association

The Institute would be run by a non-profit-making Association, which would receive the financial contributions from, the Swiss Confederation, the Canton of Bern, and the other sponsors. The Association would provide the Institute with the necessary funds and monitor its operation. The Association supports ISSI in acquiring national and international sponsorship, and in maintaining and strengthening support for the Institute. Following consultation with and confirmation by the Board of Trustees, the Association would also appoint the Directors of ISSI.

The Directorate of ISSI

The ISSI Directorate would be led by up to three Directors. They would be responsible for defining and carrying out a scientific programme of high quality and originality, as well as for the Institute's day-to-day operation.

The Staff

The personnel would consist of a small Staff – six to eight in the initial phase, rising to about twelve after four years – and at least twice as many Fellows. Among the latter, a reasonable balance between junior and more senior visiting scientists would be maintained. The Staff would aid the Directorate in running the Institute, and aid the Fellows in getting started with their work. Scientists among the Staff would be actively involved in scientific research.

An Administrator would be responsible for financial and administrative matters, following guidelines set by the Directorate and the Governing Bodies.

The Fellows

The majority of scientists working at ISSI at any given time would be Fellows; who would be expected to produce substantial scientific output. To enable them to concentrate on this task, ISSI must strive to provide them with optimal working conditions, and the grant-providing agencies must also offer them attractive Fellowships. Special arrangements will be needed in the initial phase to support the granting of fellowships to scientists from Russia and the former Interkosmos countries.

Depending on the scientific task in hand, the tenureships for Fellows would typically be from three months to two years. ISSI would also provide some office space for short-stay visitors, in particular for senior scientists whose cooperation with an ISSI group would enhance their scientific work. The contacts with other experimenters and theorists and the experience gained at ISSI should enable the Fellows to continue with cooperative studies after completion of their tenure in Bern, thereby multiplying ISSI's effect with regard to the in-depth interpretation of the data from future international cooperative programmes.

Fellows would be selected – by a granting agency, with concurrence by the Institute required – on the basis of scientific ability and the significance of the work they propose in the context of ISSI's scientific programme.

Financial Contributions

The Canton of Bern is expected to offer the use of a building, including services, and to contribute to the initial start-up costs.

Negotiations are in progress with the Swiss Government and the European Space Agency to finance the basic operations of the Institute (i.e. staff, investments and running costs). Other agencies or organisations can be expected to contribute to the running costs at a later date.

Space agencies cooperating in the IACG, as well as other national and international agencies, foundations, academies and private companies are encouraged to finance the Fellowships.

Budget

The estimated yearly expenditures (at 1994 prices) for the building, investments, running costs and staff salaries would be 1.6 MECU for an initial period of two to three years, rising to a foreseen ceiling of 2.2 MECU after about four years. (The Fellowships are not included in this estimate).



photo: Eymann AG, Spiez



THE SITE FOR ISSI

The Canton of Bern has recently decided to fund the leasing of a building for ISSI on the city's Hallerstrasse, which is in an ideal location.

A floor area of 700 m² is available to ISSI, consisting primarily of office space and two seminar rooms. For larger meetings, lecture rooms could be made available by the University of Bern during the academic vacation periods. A small specialised library is foreseen at ISSI, while the larger libraries of the University nearby would be available to ISSI personnel.

ISSI would be equipped with PCs and work stations linked to the central computers of the University of Bern, to the Swiss Scientific Computing Centre at Manno (in Ticino), and to Internet.

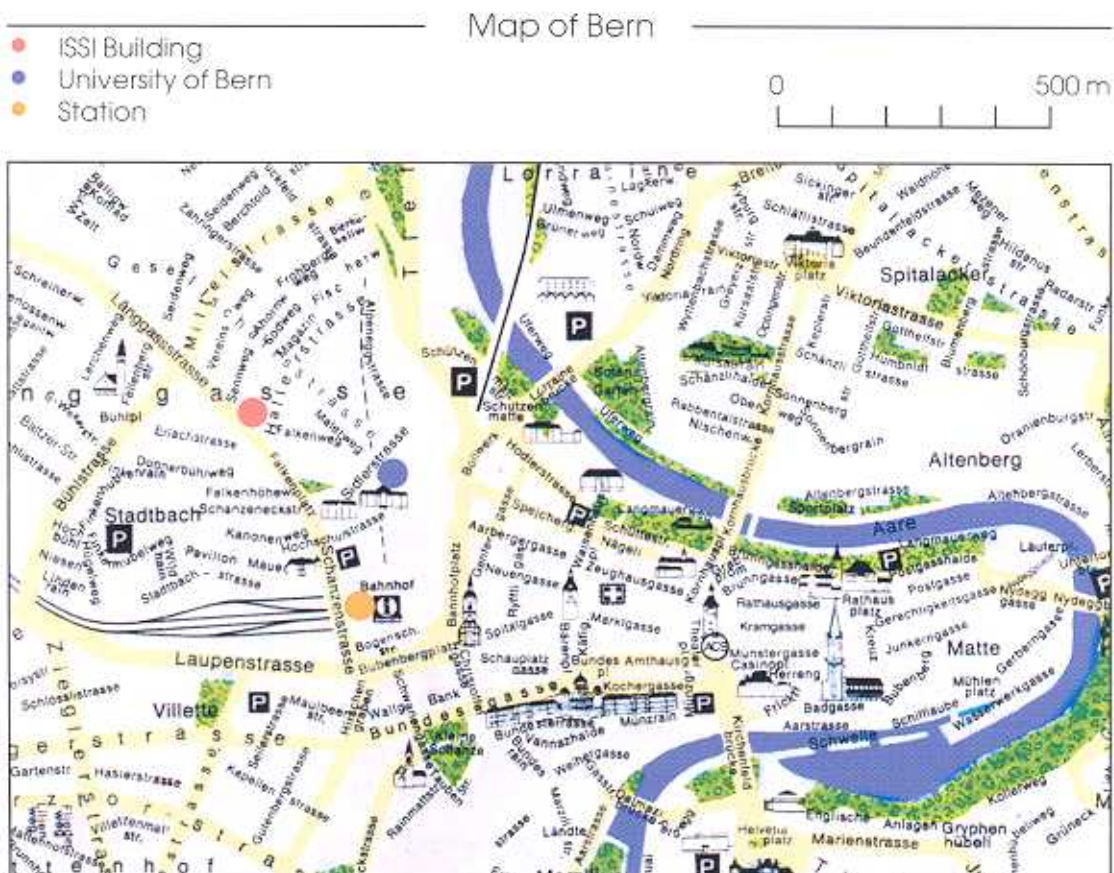
The University of Bern, with its physics, astronomy, mathematics, computer sciences, chemistry and earth-sciences institutes, can be reached on foot in five to ten minutes from the Hallerstrasse. The Institute of Physics in particular, and several of the other institutes also, have considerable experience and an international reputation in the space sciences. Their proximity is an advantage for ISSI in numerous ways (attendance at seminars, libraries, etc.), and especially during the start-up period (administrative advice and support, etc.).





The building that would house ISSI is just ten minutes' walk from the main railway station in Bern, from which there are direct trains to Zurich and Geneva international airports, and to other European cities. The proximity of the railway station and an excellent local public transport system permit easy commuting from a wide choice of residential areas in and around Bern. For instance, it is possible to commute from Neuchatel, in the French-speaking part of Switzerland, or from Spiez in the Bernese Oberland.

The spoken language in Bern is German but, this being the capital of Switzerland, there are many French-speaking people too. English and Italian are also often heard, and there are English, French and German schools in the city.





STARTING-UP ISSI

It is intended that ISSI should open its doors in early 1995. The building will be available in May 1995, but staff could be recruited earlier and essential equipment ordered in advance by making use of some temporary office space that could be put at ISSI's disposal by the University.

For the initial two-year period, a minimum of six to eight staff members will be needed, the full complement of about twelve staff being reached only after four years. At least two Directors should be appointed as early as possible, to give ISSI enough impetus to begin pursuing its mandate.

ISSI could begin active working in May 1995 and, as no major installations are needed, the Institute would become scientifically productive almost immediately.

A decision to proceed with the establishment of ISSI needs to be taken before the end of 1994.