OECD MEGASCIENCE FORUM
WORKING GROUP on REMOVING OBSTACLES to INTERNATIONAL CO-OPERATION

REPORT of the SUB-GROUP on ACCESS to LARGE-SCALE RESEARCH FACILITIES

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EXECUTIVE SUMMARY

The Issue

In a number of scientific fields, experimental research is becoming concentrated at a small number of very large facilities. The conditions that must be satisfied in order to gain access to these facilities are of obvious interest to the scientists who wish to use them, and to their funding agencies. In most cases, the scientific excellence of the proposed work is a primary criterion, but other, non-scientific, conditions are sometimes applied, especially towards researchers from countries that have not contributed to the construction or operation of the facility. Currently, access policies and practices vary widely among scientific disciplines, but there is a broad consensus in the scientific community that the overall situation is satisfactory, i.e., it is usually possible for outstanding researchers, if they have superior proposals, to gain access regardless of nationality or institutional affiliation. This system, while currently viable, is considered by many to be fragile. There is growing concern among scientists and facility administrators that access policies may become more restrictive in the future, with a negative impact on international co-operation, and on the advance of science in general.

Two long-term trends form the basis for concern regarding the future:

- increasing pressures on national science budgets, coupled with increased demand for scientific facilities, could lead to changes in access provisions for foreign scientists, and more emphasis on the recovery of capital and/or operating costs from users;
- further concentration of research at a small number of very large research facilities that are built and operated on a regional or international basis, some of which have built-in access restrictions based on national, regional or institutional affiliation.

The Sub-Group on Access to Large-Scale Research Facilities of the Megascience Forum Working Group on Removing Obstacles to International Co-operation undertook a study of this issue. A survey of current policies and practices was carried out using questionnaires addressed to facility administrators and to scientific associations. This report was then prepared, based on extensive consultations and discussions among government-appointed representatives of twenty one OECD Member countries, plus representatives of the European Commission, the Russian Federation, and Israel.

Findings

Access policies and practices vary widely by scientific discipline, type of facility, and user base. For example, discipline-based facilities (such as high-energy particle accelerators) differ from service-type facilities with a cohesive user community (such as astronomical telescopes or oceanographic vessels) which, in turn, differ from service-type facilities with a diffuse user community (such as neutron and synchrotron radiation sources). Nonetheless there is, in most cases, sufficient

flexibility in the current system to allow very high quality proposals to be accepted, regardless of the national or institutional affiliation of the researchers.

Access policies reflect a desire to balance many priorities. Flexible policies and practices of large-scale facilities with respect to access by foreign or non-member scientists clearly benefit the visiting scientists. The facilities also benefit from the increased pool of talent available to conduct their scientific programs, while the world community benefits through the accelerated pace of scientific progress. In addition, the exchange of people and ideas is a proven mechanism for promoting understanding among nations, economic development, and democratic principles.

On the other hand, access policies and practices are an expression of national policies, which are intended to do more than advance science. They are also meant to promote national interests, and to provide short- and long-term benefits to the public in areas such as employment, education, technological development, health, national security and environmental safety. **Decision makers must balance scientific imperatives with the need to demonstrate tangible returns on national investments.**

Local facility administrators implement the details of access policies at individual installations. It is clear, however, that there are certain shared expectations about the actual utilisation of large-scale facilities. With regard to national facilities (i.e., those that are built and operated by a single nation) the primary expectation is that predominant use of the facility will be made by nationals of the funding country. In practice, other considerations apply; for example, the dominant use of a facility by those who live in its physical proximity, or the custom, observed by many scientists, of not applying for the use of a facility that "belongs" to another country or institution. Such self-censorship also occurs with respect to regional and international facilities. Access practices are usually compatible with a limited degree of openness to outside (e.g., foreign) scientists; indeed, co-operative efforts are normally encouraged as long as they do not, cumulatively, exceed some tacitly understood level.

The situation regarding access to regional or international facilities (i.e., those built and operated on a bi- or multi-lateral basis) is somewhat different. Normally, scientists can utilise the facility in proportion to their government's equity share, but there is considerable variation among scientific fields. For example, access to multinational astronomical observatories usually reflects a percentage ownership of the facility whereas access to particle beams has typically depended on participation in designing and building the experimental detector (rather than a contribution to the accelerator itself).

Scientists have learned to work within the rules (sometimes unwritten) that determine access to the facilities that they need. However, this state of affairs is fragile. The current flexible system functions well and, in addition, governments can make explicit provisions for transnational access, which may involve economic or other considerations. When several facilities exist in a given field, reciprocity and balance among nations allows for productive use of the most appropriate facilities for conducting the best research. Problems can arise, however, when one country

requires long-term use of a facility to which it does not contribute, and when this use becomes a structural feature of its scientific enterprise, and no offsetting arrangements (such as reciprocal facility use) are in place. In such cases, governments have had to undertake concrete steps to facilitate access for scientists.

To support the deliberations of governments, the Megascience Forum has developed the recommendations that follow. Their purpose is to preserve and strengthen the positive aspects of existing access policies and practices, to alert governments to access-related impediments in the future, to facilitate planning for needed facilities, and to maximize the opportunities for fruitful international collaborations between scientists.

Recommendations

1. International access to large-scale scientific research facilities has widespread benefits to science, to scientific facilities, and to the countries that engage in international co-operation. Governments, however, invest in the construction and operation of large-scale research facilities to fulfil multiple policy purposes beyond the advancement of science. Therefore,

Governments and their scientific communities should recognise and understand each other's concerns. In formulating access policies, governments should take into account the intellectual stimulus and scientific benefits that accrue from international co-operation at their facilities. Scientists, in turn, should recognise the needs for host governments to achieve fair burden-sharing and an appropriate return on their scientific investments. All parties should explore opportunities for international collaboration in the construction and operation of large facilities, while preserving the best features of the current system which provides for a reasonable degree of flexibility in assigning access to particularly meritorious research proposals.

2. There is considerable diversity in types of large-scale facilities, and the research communities they serve. Therefore,

Governments should not seek to define a single, fixed set of access policies and practices to be applied at all large research facilities. They should, however, strive for clarity in defining and articulating the policies at existing and planned facilities.

3. Currently, a reasonably equitable system exists which enables much of the scientific community to access the facilities they need, regardless of nationality. This system should be protected and even expanded. Therefore,

Host governments should continue to support arrangements that allow facility managers to assign a small fraction of the use of the facility to particularly meritorious proposals, regardless of the affiliation of the researchers.

Governments should support and utilise multi-national and regional groupings and programs, which have been established to facilitate transnational access to large research facilities.

4. In a world of finite financial and intellectual resources, it is neither feasible nor necessary for every country to construct and operate its own large-scale research facilities in all fields of science. Such facilities are increasingly likely to be established on an international basis in the future. Therefore,

Governments participating in the development of a new large-scale research facility are encouraged to initiate at an early stage of the development process, discussions and planning regarding participation of significant foreign users. Access practices followed at the facility for other foreign users should be consistent with the principle of providing flexibility to facility managers, as noted in Recommendation 3, wherever possible.

When it is anticipated that their national research community will have a significant and consistent need to use a large-scale research facility, governments should consider contributing towards its construction and/or operation. Contributions could be made in several ways, including: cash, in-kind materials and equipment, secondment of scientific and technical staff, and provision of reciprocal access to national facilities.

5. There are a number of access-related evolving issues and issues which could not be studied adequately in the current effort, but which could have a significant impact on the science system and science policies. In the future, the Megascience Forum, or another appropriate international body, should consider undertaking additional work in this area.

SECTION 1: Introduction

In a number of scientific fields, experimental research is becoming concentrated at a small number of very large facilities. The conditions that must be satisfied in order to gain access to these facilities are of obvious interest to the scientists who wish to use them, and to their funding agencies. In most cases, the scientific excellence of the proposed work is a primary criterion, but other, non-scientific, conditions are sometimes applied, especially towards researchers from countries that have not contributed to the construction or operation of the facility. Currently, access policies and practices vary widely among scientific disciplines, but there is a broad consensus in the scientific community that the overall situation is satisfactory, i.e., it is usually possible for outstanding researchers, if they have superior proposals, to gain access regardless of nationality or institutional affiliation. This system, while currently viable, is considered by many to be fragile. There is growing concern among scientists and facility administrators that access policies may become more restrictive in the future, with a negative impact on international co-operation, and on the advance of science in general.

Two long-term trends form the basis for concern regarding the future:

- increasing pressures on national science budgets, coupled with increased demand for scientific facilities, could lead to changes in access provisions for foreign scientists, and more emphasis on the recovery of capital and/or operating costs from users;
- further concentration of research at a small number of very large research facilities that are built and operated on a regional or international basis, some of which have built-in access restrictions based on national, regional or institutional affiliation.

Megascience facilities may be classed as national or multinational (international). In addition, they may be dedicated to one disciplinary scientific domain (e.g., particle physics using high energy accelerators), or be of a service type, providing a venue for experimental work in a wide range of scientific fields (e.g., neutron or synchrotron radiation sources used by physicists, chemists, biologists and materials scientists).

The issue of access, in addition to being of immediate interest to scientists and to facility administrators, is of concern to national science policy officials. Few countries are able to build and operate megascience facilities on their own. In many cases, and particularly in smaller countries, the desire of governments and their domestic scientific communities to participate in a broad range of research activities requires access to a spectrum of large-scale facilities. This is usually feasible through participation in international collaborations, or through the use of national and international facilities that are funded by other governments. Individual scientists are often able to make the necessary arrangements on their own, but in some instances (especially when major, long-term commitments of funds are needed), national authorities must become involved in negotiating, establishing, and overseeing the collaborative research projects.

With the need for additional large facilities in traditional and new scientific disciplines, and with the continuing constrained budgetary environment, governments are very sensitive to the costs of science, and the efficiency of the scientific enterprise. There is a growing concern among some national authorities about the costs of foreign utilisation of facilities, leading to the consideration of the option of charging for such costs, or of promoting various forms of compensation or reciprocity. This is particularly the case whenever another country's access requirements are extensive, and become a structural part of that country's national science strategy.

Since 1992, the OECD Megascience Forum has provided a venue for information exchange and consultation among science policy officials and scientists of the OECD member countries, the European Commission and several observer nations. One of the goals of the Forum is to anticipate, identify, and evaluate potential problems that could impede international co-operative ventures in large science projects and programs. Previous activities of the Megascience Forum identified the issue of conditions of access to large facilities as being of real concern, both to governments and to the scientific community. Despite its increasing visibility, the issue of access to large facilities has not, until now, been the subject of a systematic examination by any intergovernmental body. In January 1996, the Megascience Forum delegates established a Working Group on Removing Obstacles to International Scientific Co-operation, one of whose goals was to examine access concerns. A Sub-Group on Access to Large-Scale Facilities was therefore established, and directed to: (a) survey the current policies and practices across a wide range of scientific disciplines; (b) identify trends and problems; and (c) develop findings and recommendations for consideration by governments as they formulate national and regional policies for existing and future megascience facilities.

Scope, goals and activities of the Sub-Group

The workplan for the Sub-Group on access issues was approved by the Megascience Forum in June 1996. Twenty four Megascience Forum member governments decided to participate in the work. Delegates to the Sub-Group were formally designated by their governments.

Background information was sought from officials of participating governments, from national and international scientific organisations, and from the administrators of national and international facilities (see Appendix). The survey was not designed to obtain a comprehensive inventory of access polices and practices at all large-scale research installations, but rather to cover a limited number of facilities, chosen by government officials, to achieve an understanding of the range of policies and practices that currently exist.

Megascience includes not only large-scale research facilities, but also large-scale distributed research programs (e.g., genome mapping, or research on global climate change). However, the Megascience Forum recognised that the issues relating to access to large-scale research facilities were significantly different from those relating to distributed programs, and of wider interest and concern. Consequently, the Sub Group confined its attention to access policies related to large scale research facilities.

SECTION 2: Current Policies and Practices

Government Perspectives on the Access Issue

The governments of the OECD countries have not promulgated formal written policies regarding access to national and international large-scale facilities. The survey of science funding agencies of member governments drew responses from officials in twelve national governments including the seven governments that have the highest R&D investments among OECD countries. In addition, the members of the Sub-Group (mostly government R&D officials) were able to provide a considerable amount of additional information and insight.

In the replies to the survey, there was substantial (9 out of 12 governments) endorsement of the principle that priority in the use of large scientific instruments should be assigned on the basis of scientific merit, as established by an independent peer review system. None of the responses contradicted this principle. Four of the responses stated explicitly that the nationality of researchers should not be a factor in determining access to facilities. In addition, the government officials expressed strong support for international scientific co-operation in general.

The above views alone, however, do not form a sufficient base from which actual access practices can be derived or understood. In particular, the existing set of large science facilities world-wide does not constitute an integrated research infrastructure that is freely and universally available to the best researchers, regardless of national, regional or institutional affiliation. A deeper and more realistic analysis must take into account the fact that national investments in science and technology are intended to do more than advance science. They are also meant to promote national interests, and to provide short- and long-term benefits to the public in areas such as employment, education, technological development, health, national security, environmental safety, and many others. For example, siting of large scientific facilities is normally a matter of intense discussion between national and regional authorities, as the latter consider that these facilities can provide a stimulus to the local economy. The non-scientific dimensions of science policy-making were not obvious from the survey responses, but became apparent in follow-up contacts and in the Sub-Group discussions.

Science policy officials are accountable not only to scientists, but also to the general public and its elected representatives. Consequently, these policy makers often struggle to balance conflicting principles: scientific imperatives (that favour openness and liberal access policies), and the need to demonstrate tangible returns on national investments.

The Sub-Group's survey revealed an almost universal practice of allowing local facility administrators to establish and implement the details of access policies at individual installations. It is clear, however, that there are certain shared expectations about the rules and principles that govern the actual utilisation of large-scale facilities.

With regard to national facilities (i.e., those that are built and operated by a single nation), the expectation is that predominant use of the facility will be made by nationals of the funding country. In some cases, actual utilisation may be even more narrowly defined by institutional affiliation (for example, to a specific laboratory or university). In practice, unwritten or common-sense considerations govern the realisation of these expectations; for example, the dominant use of a facility by those who live in its physical proximity, or the custom, observed by many scientists, of not applying for the use of a facility that "belongs" to another country or institution. These practices are almost always compatible with a reasonable degree of access by outside (e.g., foreign) scientists; indeed, co-operative efforts are encouraged as long as they do not, cumulatively, exceed a certain level which is normally imprecisely-defined, though tacitly understood.

The situation regarding access to regional or international facilities (i.e., those built and operated on a bi- or multi-lateral basis) is somewhat different. Normally, scientists can utilise the facility in proportion to their government's equity share, although there is considerable variation among scientific fields. For example, access to multinational astronomical observatories usually reflects a percentage ownership of the facility, whereas access to particle beams has typically depended on participation in designing and building the experimental detector (rather than a contribution to the accelerator itself). In many cases where access is limited to nationals from participating states, however, some accommodations are made to allow access by scientists from non-contributing nations. A number of these are described in more detail in this report.

There are also variations in approach that can be linked to the economic status of the individual nations:

Large and affluent nations are characterised by large scientific communities, and the presence of major facilities that are attractive to foreign scientists. Such countries are also able to participate financially in international facilities, and to establish equitable reciprocal arrangements for foreign access at their own national facilities.

Small and affluent nations have world-class (though small) scientific communities, some national installations that are attractive to foreign scientists, and the ability to make significant contributions to international collaborative efforts. Such countries are likely to favour formal participation in regional or international facilities, and may even contribute to foreign facilities in special cases. If officials of these countries allocate funds to such facilities, they may be particularly sensitive to the structural (and no-cost) use of the facilities by non-participating countries.

Small and needy nations have few but often highly-skilled scientists, and virtually no domestic facilities that can attract foreign scientists. They have a marginal ability to contribute tangible resources to international facilities. Such countries need special programs/considerations if their scientists are to have access to major national and international facilities.

Large and currently needy countries with large scientific communities may have national facilities attractive to foreign scientists within a few years, but currently lack the

resources to make significant contributions to international facilities. To use major national and international facilities, scientists from these countries may also need special programs / considerations.

It should be noted that, at present, the net result of all of these considerations and arrangements is an effective collection of large facilities, funded by governments, where it is usually possible for high quality research proposals to be accommodated, regardless of where they come from. The keys to the success of this system are flexibility, reciprocity, enlightened self-interest, a commitment to fairness and burden-sharing, a long record of productive international co-operation, and a desire to promote excellence in scientific research. Often, governments are required to make difficult decisions to maintain this system. For example, contributions to international facilities (which are also used by scientists from non-contributing countries) may require reductions in national programs, including shutting down entire laboratories. As a result, governments are continually monitoring and evaluating the benefits of international scientific co-operation. In some cases this can lead to reductions in national contributions to international facilities, and pressure to obtain outside funding to compensate for the shortfall.

The Perspectives of Facility Administrators

Managers of both national and international large-scale facilities who responded to the survey emphasised the primacy of scientific merit as a criterion for providing access to foreign scientists applying to use their facilities. Other criteria used were: the appropriateness of the proposed experiment to the research focus of the facility; the technical feasibility of conducting the research; the competitiveness of the research with that undertaken by other laboratories; the capability and track record of the research team; the potential for collaboration; and the availability of funds for the facility and group proposing the research project. Additionally, and reflecting government expectations regarding return on their investments, managers of some service-type facilities noted the potential for technological spin-off as a significant criterion in the evaluation of proposals.

Access Practices: National Facilities

Access policies and practices of national facilities are usually defined and implemented by the facility's own administrative bodies, acting on behalf of a funding agency. The resulting practices vary by scientific field, but are frequently open to high-quality foreign proposals. However, most of the research proposals come from the country that owns the facility, and many of the foreign researchers are members of collaborations that are led by researchers from that country.

There are instances of national instruments built and / or operated in collaboration with one or more other countries. In such cases the facility statutes often include provisions that reserve a fixed percentage of utilisation time to researchers from the collaborating countries. For example, the Dutch AGOR accelerator was built by the French nuclear physics institute IPN, which retains a right to a fixed fraction of the beam time. Another

example is the HERA accelerator at DESY in Germany, where five European countries, together with Canada and Israel, having provided selected components, became limited partners in this national facility with rights of access for their scientists.

There are significant cases where access to a large-scale facility, whether national or international, is conditioned by technical constraints. For example, access to oceanographic vessels is strictly limited for practical reasons of space and geographical location. However, reciprocity agreements can be used to exchange research time on board vessels of different nations. Additionally, research time for foreign scientists can be granted in exchange for access to the other country's territorial waters.

Another telling example is high-energy physics, which is evolving towards the use of a limited number of very large detectors that completely use the capacity of the associated accelerator. The detector collaborations may be characterised by access conditions that are separate and different from those of the facility.

When the large-scale facility consists of a dedicated instrument such as JET (European fusion experiment), VIRGO and LIGO (Franco-Italian and U.S. gravity wave detectors), and large neutrino detectors, the issue of external access does not apply, since there is, essentially, only one experiment being performed, with no proposal process in place.

Access Practices: International Facilities

Access to international facilities is frequently limited to the participating countries in proportion to their contribution to construction and operating costs. The nationality of a proposal is often determined by that of the Principal Investigator (PI). Sometimes, small research groups from non-member countries gain access by joining projects led by a member-country PI. However, it should again be stressed that access policies have evolved in different ways in various scientific disciplines, and that policies in high-energy and nuclear physics, for example, have traditionally been different than those in astronomy or in ocean sciences.

For scientific and political reasons, special membership categories are sometimes defined for international facilities, so that scientists from specific non-member countries or regions may obtain access. The net result is that, even at these facilities, there are considerable opportunities for access by researchers from non-member countries. This is the case for many of the large multinational service facilities, such as neutron sources, synchrotron radiation sources, and astronomical observatories.

An illustrative example is the European Synchrotron Radiation Facility (ESRF), where the twelve European participants established a *société civile* in Grenoble under French law. According to its statutes, the invitation to submit proposals is extended to scientists from institutes based in one of the contracting party countries. However, other scientists can obtain access under one of the following conditions:

- their government or institute is a Scientific Associate of ESRF based on a specific agreement;
- they collaborate with scientists based in one of the member countries;

- their proposal is of exceptional scientific or technical quality, in which case the beam time will be granted through the management's contingency quota (which equals five percent of scheduled time).

Scientific Associates of ESRF are non-member countries that agree, through an explicit arrangement, to pay a fixed percentage of the operating costs and initial construction costs. Scientists from Scientific Associate countries are entitled to the same access rights as users from member countries.

In addition, some ESRF beam lines are funded by, and operated for, Collaborating Research Groups (CRGs) from member countries (excluding Associates), which are entitled to two-thirds of the time on their beam line. The remaining one-third is allocated via the general peer review procedure. At present, these CRGs use their beam lines for non-proprietary research, although proprietary work is not, in principle, excluded.

The Grenoble Institut Laue-Langevin (ILL), which operates a neutron source established jointly by France, Germany and the UK, follows similar rules, including CRGs and associate membership.

Similar arrangements are under consideration for some new multinational telescopes in order to provide observing time to astronomers from countries which are not members of the facility. Up to now, the European Southern Observatory (ESO), with eight member countries, has worked without explicit rules. Astronomers from non-member countries are accepted based on scientific criteria, but they are not entitled to financial support from ESO for travel and residence expenses, as are members. The situation may change when the Very Large Telescope (VLT) is commissioned. In the view of some members, this very large investment calls for *juste retour* rules (i.e., an equitable return on investment in terms of access or other benefits), including distinctions between full members and associates.

SECTION 3: Trends and Concerns

Government policy officials, facility administrators and representatives of scientific organisations who responded to the Sub-Group's survey did not indicate a high degree of concern about transnational access barriers. However, current access restrictions may be underestimated because of the practice among some scientists of not submitting proposals for the use of facilities that are identified with another institution or country because they perceive they will have little chance of approval. Rather than indicating the lack of a systemic problem, the ability of facility management to deal with the demands for access is perhaps more indicative of the fact that the research community has come to recognise the limitations and barriers, and either finds ways to deal with them, or finds alternative sites for conducting research.

Although the international scientific community is currently able to live with most access barriers, there are a number of long-term trends that require vigilance and attention by both government officials and the scientific community. One of these is

related to the evolving nature of the scientific enterprise itself. For many years, the matter of access to large facilities was a concern for a very small part of the scientific community, mainly high-energy physicists and astronomers, and the distinction between big and small science was relatively clear cut. Today, however, the use of large neutron sources and synchrotron radiation facilities as research tools in fields such as materials science, biology, earth sciences, and engineering makes it clear that access to large scale facilities is essential for scientific progress in many fields which can still be appropriately regarded as small science, and may also be a factor in the advancement of applied technology.

For the purposes of this report, it is useful to consider two categories of large-scale facilities: discipline-specific facilities, and service-provider facilities. Differences in user characteristics among various types of facilities within these categories illustrate the difficulties involved in attempting to establish a single set of access guidelines for all large-scale facilities.

Large, discipline-specific facilities (e.g., particle accelerators) are the site for dedicated, large-scale, long-term experiments by groups that are often international in character and may consist of 100 or more scientists. Such discipline-specific facilities have always been rare on a global scale. Additionally, users of discipline-specific facilities are typically from a well-defined, coherent, and relatively small community. In many cases, these facilities provided access to all researchers, based solely on scientific merit, technical feasibility, and resource limitations. Because such large discipline-specific facilities were, for many years, almost the only examples of large-scale facilities, their access practices may have come to be tacitly regarded as the norm.

In contrast, service-provider facilities, including synchrotron light sources, neutron beam sources, sky survey satellites, oceanographic platforms, and large astronomy facilities, are the site for small and medium scale experiments of relatively short duration carried out by small groups, frequently with relatively modest ancillary apparatus. Service-provider facilities can be further sub-divided into those used by a reasonably coherent and well-defined scientific community that makes frequent use of the facility (e.g., astronomers and oceanographers), and those with a more diverse user base (e.g., material scientists or biologists) that uses the facility (e.g., a synchrotron radiation source) for research on a relatively infrequent basis.

Looking towards the future, it is not at all certain that either the "free and open" access policies that have traditionally typified large discipline-specific facilities, or the informal and open practices of the traditional “small science” fields that are making increasing use of large-scale service-provider facilities, will carry over into the administrative and financial environment of the latter type of facility. This may be particularly true for international facilities. While some international facilities follow open access practices, many service-provider facilities have formal limitations on the users they will accept, reserving the bulk of their capacity to scientists from contributing countries. The growth in the number of international (as opposed to national) large-scale facilities with their more formal access policies may be part of the reason why portions of the

international scientific community are concerned that access may become increasingly difficult.

Concerns about access to large science facilities are linked in part to the issue of operating expenses. These costs are normally borne by the national authorities that support the facility, with funds usually provided directly to the facility. Experimenters use the facility itself on a no-cost basis, although they must usually pay for their specific experimental expenses (apparatus, expendables, travel, lodging, etc.). There is some indication that this scheme is coming under pressure with regard to both national and foreign researchers. The United Kingdom, in particular, has adopted an experimental system whereby their scientists whose proposals are approved by the Engineering and Physical Sciences Research Council (EPSRC) are awarded vouchers ("tickets") which can be redeemed for beam time at facilities that are operated by the Council for the Central Laboratory of the Research Councils (CCLRC). EPSRC reimburses CCLRC for vouchers received from experimenters. This system is meant to encourage competition between laboratories, and provides for accountability and transparency in how and where research funds are used. Foreign scientists do not receive tickets, and are expected to pay for beam time at CCLRC facilities (although other mutually acceptable arrangements can be negotiated on a case-by-case basis). The international impact of this experimental system is not yet clear, although it is possible to envisage a change in the policies of other governments vis-à-vis researchers from the United Kingdom.

SECTION 4: Options For Facilitating Access

There are a number of options that government officials, scientists and facility operators can use to minimise potential access problems. These include; participating in construction and / or operation of a megascience facility, joining experimental teams led by scientists that are entitled to access, providing special access time allowances for meritorious proposals from less affluent countries, providing reciprocal access provisions to national facilities, participating in multinational access arrangements (such as those of the EU), and where necessary, paying for access.

The construction and / or operation of large science facilities on a regional or international basis, with participating countries sharing capital and operating costs, is not new. There is likely to be more multinational co-operation of this type as the cost, scale, and user base of such facilities grows. To date, decisions on the construction of international facilities have been made on an individual basis, predicated primarily, but not exclusively, on the needs of the scientific communities of the participating countries. Indeed, the Megascience Forum was initially established in part with a view to exchange information and facilitate planning for such facilities when the need for them became evident. Broad international participation in large new facilities on an equitable basis is clearly the most direct way to maintain a focus on scientific merit while limiting future access problems. This is an area where direct government involvement is necessary. An example of a constructive response to a need of this type is the participation of Canada, India, Israel, Japan, Russia, and the United States in the construction of the Large Hadron Collider (LHC) at CERN. In this case, most of the governments of the non-

member countries responded, at least in part, to the anticipate structural use of LHC by their high-energy physics communities.

A common means of gaining access to a foreign facility that has access limitations is to join in experimental groups led by nationals of the facility owners. Access restrictions, when applied on the basis of nationality, often refer to the research team leader, and not other members of the experiment group. Hence, in a number of fields, access can be gained through proper international organisation of the project.

Many facility operators indicate that they retain the flexibility of allocating a small fraction (typically five to ten percent) of access time to particularly worthy experiments which would otherwise not be eligible. On the basis of the survey, this approach is generally viewed favourably by all concerned.

Reciprocity (i.e., offering access to national or international facilities in return for access to a desired foreign facility) as a means of assuring access is a complex matter which is widely practised on an ad hoc basis in many scientific fields. However, opening a facility to foreign users does not automatically mean the offer will be accepted. Consequently, attaining an equitable reciprocal balance between countries or regions is not easy to accomplish, even if desired by all. In addition, consideration of reciprocity includes questions of the time framework (past use versus present or future use) and reciprocity across fields (neutron source time for astronomical observatory time). When reciprocity becomes an issue, government officials may have to become involved in the deliberations. The topic of reciprocity has not been examined in detail in this study.

Buying facility time is common for proprietary research, but is not widely practised as a basis for access for basic research. The European Union, however, has had a very active programme along these lines to assist researchers in its member states to gain access to large scale research facilities in states other than their own.

Successive Framework Programmes for research in the European Union have, since the late 1980's, sponsored new opportunities for research teams to obtain access to major research facilities, regardless of where in the European Community the teams, or the facilities, are located. Annually, approximately 2000 researchers obtain access to over 100 research installations through the Access to Large-Scale Facilities programme, which is part of the European Union's Training and Mobility of Researchers Programme.

To be considered for support under the programme, a facility must provide a world-class service essential for the conduct of top quality research, must be rare in the Community, must have investment or operating costs that are relatively high in relation to those costs in its particular field, and must provide adequate scientific, technical and logistic support to external, and particularly first-time, users.

Community funds are awarded directly to the selected facility operators for them to provide free access to transnational users. Each facility operator is required to publicise widely the opportunities being offered, and to arrange for an independent peer-review of proposals. In effect, the Community buys time on the facilities - typically 5 to 10 percent of the total access to a facility, but not above 20 percent.

SECTION 5: The Policy Role of Governments

The Sub-Group's survey of the current access situation revealed that thus far the international scientific community has adjusted to the system of access policies and practices at large facilities. The trends and concerns described in Section 3 of this report relate to the future. Scientists and government officials thus need to consider the actions they should take during the planning and developmental stages of new megascience facilities, in order to anticipate and minimise potential access difficulties.

The survey revealed that while governments generally endorse policies of free and open access at their national facilities, they leave implementing details either to funding agencies or, more frequently, to the management of the facilities themselves. This "bottom-up" approach is appropriate in view of the variation of access practices by discipline and user group characteristics, as well as the desirability of vesting as much decision-making responsibility as possible with facility management. It remains to be seen whether this system can continue to operate satisfactorily in light of the pressures and trends enumerated earlier.

The creation of any megascience facility is a complex process which involves many participants from the domains of science and public policy. The concept of a new instrument originates among scientists, motivated either by the insufficient capacity of instruments (e.g., neutron sources), by new scientific and technical advances (e.g., free electron lasers) , or by new scientific ideas giving rise to the need for a new instrument (e.g., high-energy particle accelerators). Initially, scientific consultations typically occur at the international level, even if a national facility is the one that is finally proposed.

Governments usually become involved when they are brought in by their scientific community in the late formative stages of planning. The Megascience Forum was created to facilitate consultations and intergovernmental exchange of information in parallel with both international discussions among scientists and discussions between national scientific communities and their funding agencies. The objective is to identify, at an earlier stage than in the past, attractive opportunities for international co-operation, and potential obstacles as well. Final decisions concerning the creation of a new large-scale facility are in the hands of national authorities who must weigh factors in addition to the desirability of the proposed facility as a scientific tool, including national interests, costs, expected returns, and priorities across a range of scientific disciplines. Intergovernmental consultations can provide valuable information for use in such national decision-making processes.

In the case of a prospective international facility, an initial three-step approach is appropriate for national authorities;

- assessment of the needs at the national and international levels, and of the existing and planned facilities which might meet the needs,

- identification of countries that may have an interest in the project, and whose scientists would have a full right of access (based on scientific merit), and

- preliminary discussion among authorities of those countries with a view towards establishing the degree of serious interest, and the type and magnitude of contribution each participating country would make.

The decision of national authorities in these countries about whether to commit themselves to the proposed project will be based on factors similar to those considered in deciding whether to create a new national facility.

Scientific associations may also be involved, sometimes creating *ad hoc* bodies to broaden the international scientific dialogue (one notable example is the International Committee for Future Accelerators, ICFA, a subsidiary body of the International Union of Pure and Applied Physics, IUPAP). International bodies may also play an incubator role, such as that played by the European Science Foundation for the European Synchrotron Radiation Facility (ESRF). As the project progresses, intergovernmental organisations (such as APEC, UNESCO or OECD) may become involved.

If a new large-scale facility is to involve more than one country, the question of access may be explicitly incorporated in the statutes of the new facility, since in many cases each party is given a share of machine use in proportion to its contribution to the construction and operation costs. However, access by non-members is not usually discussed in great detail, and the various formal and informal mechanisms that are known to operate at large facilities are relied on to accommodate such scientists.

SECTION 6: Follow-on Actions

There is an inadequate basis at present to assess the impacts of the evolving access issue on the world's scientific system. However, the potential impact of evolving access regimes warrants periodic monitoring and review by governments and by the scientific community. In addition, the industrial use of megascience facilities raises a number of access issues which are different from those associated with use for purely scientific purposes, and has not been examined by the Megascience Forum Sub-Group. Additional topics of continuing and future interest include:

1. the impact of new approaches to the allocation of megascience resources, such as the UK "ticket" system;
2. the treatment of balance and reciprocity between countries or regions as related to access;
3. access provisions for, and intellectual contributions to, megascience facilities by scientists from developing or newly-emerging countries and other non-OECD countries;
4. the expanding science base utilising megascience facilities, and the potential availability of such facilities in large non-OECD states (China, Russia, India, Brazil);
5. the role and interest of industry relative to the design, construction, funding, and use of megascience facilities;
6. the implications of rapidly-evolving information technology;

7. the treatment of data access at large science facilities;
8. identification of potential indicators for monitoring and assessing international co-operation at large science facilities.

SECTION 7: Findings and Recommendations

Findings

Access policies and practices vary widely by scientific discipline, type of facility, and user base. For example, discipline-based facilities (such as high-energy particle accelerators) differ from service-type facilities with a cohesive user community (such as astronomical telescopes or oceanographic vessels) which, in turn, differ from service-type facilities with a diffuse user community (such as neutron and synchrotron radiation sources). Nonetheless there is, in most cases, sufficient flexibility in the current system to allow very high quality proposals to be accepted, regardless of the national or institutional affiliation of the researchers.

Access policies reflect a desire to balance many priorities. Flexible policies and practices of large-scale facilities with respect to access by foreign or non-member scientists clearly benefit the visiting scientists. The facilities also benefit from the increased pool of talent available to conduct their scientific programs, while the world community benefits through the accelerated pace of scientific progress. In addition, the exchange of people and ideas is a proven mechanism for promoting understanding among nations, economic development, and democratic principles.

On the other hand, access policies and practices are an expression of national policies, which are intended to do more than advance science. They are also meant to promote national interests, and to provide short- and long-term benefits to the public in areas such as employment, education, technological development, health, national security and environmental safety. **Decision makers must balance scientific imperatives with the need to demonstrate tangible returns on national investments.**

Local facility administrators implement the details of access policies at individual installations. It is clear, however, that there are certain shared expectations about the actual utilisation of large-scale facilities. With regard to national facilities (i.e., those that are built and operated by a single nation) the primary expectation is that predominant use of the facility will be made by nationals of the funding country. In practice, other considerations apply; for example, the dominant use of a facility by those who live in its physical proximity, or the custom, observed by many scientists, of not applying for the use of a facility that "belongs" to another country or institution. Such self-censorship also occurs with respect to regional and international facilities. Access practices are usually compatible with a limited degree of openness to outside (e.g., foreign) scientists; indeed, co-operative efforts are normally encouraged as long as they do not, cumulatively, exceed some tacitly understood level.

The situation regarding access to regional or international facilities (i.e., those built and operated on a bi- or multi-lateral basis) is somewhat different. Normally, scientists can utilise the facility in proportion to their government's equity share, but there is considerable variation among scientific fields. For example, access to multinational astronomical observatories usually reflects a percentage ownership of the facility whereas access to particle beams has typically depended on participation in designing and building the experimental detector (rather than a contribution to the accelerator itself).

Scientists have learned to work within the rules (sometimes unwritten) that determine access to the facilities that they need. However, this state of affairs is fragile. The current flexible system functions well and, in addition, governments can make explicit provisions for transnational access, which may involve economic or other considerations. When several facilities exist in a given field, reciprocity and balance among nations allows for productive use of the most appropriate facilities for conducting the best research. Problems can arise, however, when one country requires long-term use of a facility to which it does not contribute, and when this use becomes a structural feature of its scientific enterprise, and no offsetting arrangements (such as reciprocal facility use) are in place. In such cases, governments have had to undertake concrete steps to facilitate access for scientists.

To support the deliberations of governments, the Megascience Forum has developed the recommendations that follow. Their purpose is to preserve and strengthen the positive aspects of existing access policies and practices, to alert governments to access-related impediments in the future, to facilitate planning for needed facilities, and to maximize the opportunities for fruitful international collaborations between scientists.

Recommendations

1. International access to large-scale scientific research facilities has widespread benefits to science, to scientific facilities, and to the countries that engage in international co-operation. Governments, however, invest in the construction and operation of large-scale research facilities to fulfil multiple policy purposes beyond the advancement of science. Therefore,

Governments and their scientific communities should recognise and understand each other's concerns. In formulating access policies, governments should take into account the intellectual stimulus and scientific benefits that accrue from international co-operation at their facilities. Scientists, in turn, should recognise the needs for host governments to achieve fair burden-sharing and an appropriate return on their scientific investments. All parties should explore opportunities for international collaboration in the construction and operation of large facilities, while preserving the best features of the current system which provides for a reasonable degree of flexibility in assigning access to particularly meritorious research proposals.

2. There is considerable diversity in types of large-scale facilities, and the research communities they serve. Therefore,

Governments should not seek to define a single, fixed set of access policies and practices to be applied at all large research facilities. They should, however, strive for clarity in defining and articulating the policies at existing and planned facilities.

3. Currently, a reasonably equitable system exists which enables much of the scientific community to access the facilities they need, regardless of nationality. This system should be protected and even expanded. Therefore,

Host governments should continue to support arrangements that allow facility managers to assign a small fraction of the use of the facility to particularly meritorious proposals, regardless of the affiliation of the researchers.

Governments should support and utilise multi-national and regional groupings and programs, which have been established to facilitate transnational access to large research facilities.

4. In a world of finite financial and intellectual resources, it is neither feasible nor necessary for every country to construct and operate its own large-scale research facilities in all fields of science. Such facilities are increasingly likely to be established on an international basis in the future. Therefore,

Governments participating in the development of a new large-scale research facility are encouraged to initiate at an early stage of the development process, discussions and planning regarding participation of significant foreign users. Access practices followed at the facility for other foreign users should be consistent with the principle of providing flexibility to facility managers, as noted in Recommendation 3, wherever possible.

When it is anticipated that their national research community will have a significant and consistent need to use a large-scale research facility, governments should consider contributing towards its construction and/or operation. Contributions could be made in several ways, including: cash, in-kind materials and equipment, secondment of scientific and technical staff, and provision of reciprocal access to national facilities.

5. There are a number of access-related evolving issues and issues which could not be studied adequately in the current effort, but which could have a significant impact on the science system and science policies. In the future, the Megascience Forum, or another appropriate international body, should consider undertaking additional work in this area.

The OECD Megascience Forum

Working Group on Removing Obstacles to International Megascience Co-operation

Sub-Group on Access to Large-Scale Research Facilities

QUESTIONNAIRE TO FACILITY MANAGEMENT

The OECD Megascience Forum is an inter-governmental organisation whose goal is to allow its 28 member countries to take full advantage of opportunities for international co-operation on large-scale research projects and programmes. In January 1996, the Forum created a Working Group on "Removing Obstacles to International Megascience Co-operation" which has itself created a Sub-Group on "Access to Large-Scale Research Facilities. The Sub-Group's goal is to address, in detail, questions relating to scientific access at such facilities. The Sub-Group will take stock of the current situation, identify significant issues and trends for the future, study the impact of these trends on science and scientists, and develop recommendations to assist the governments of OECD countries in establishing and implementing policies relating to current and future scientific access to large-scale research facilities.

To obtain needed background material for this effort, national authorities and international facilities are being asked to supply information on the policies, practices and experiences that that they have had (or are having) regarding access to facilities. (The detailed workplan of the Sub-Group is attached.)

This questionnaire is addressed to the management of large-scale research facilities, both national and international, and will provide baseline information that will assist the Sub-Group. While we recognise that detailed responses to all questions may not be possible, we would appreciate as full a response as is possible. If your facility consists of a number of sub-facilities, you may prefer to fill out a separate questionnnaire for each one. In the event that a specific question does not apply to your facility, please indicate this with the phrase "Not Applicable".

The information that you provide will be held in the confidence of the Sub-Group. However, following analysis, aggregate information which does not allow for the identification of specific facilities, may be used in the Sub-Group's reports and publications.

QUESTIONNAIRE

1) FACILITY

General Background

a) Please give the full name and address of your facility.

b) What is the status of your facility (e.g., national, federal, privately owned, privately-owned-government-funded, university owned, bi-national, multinational, etc.), the operator, and the governing body?

c) If yours is an international / multinational facility, who are the member countries?

d) When did your facility begin operations, and when was your last major facility upgrade / addition (please describe)? Are any upgrades / additions currently planned (please describe and attach relevant documents)? Have the upgrades / additions been approved for funding?

Financial Background

e) Please give the facility's annual budgets from fiscal year 1990 to the current fiscal year. Please provide a general breakdown of the source of your funding (by government, e.g. national, regional, municipal; by government department or agency; by private sector; other sources).

f) Is the major source of funding to the facility in the form of a direct contribution, a grant, or a membership? If the latter, how is eligibility for membership determined, and how is the membership cost calculated?

g) How many staff does your facility currently employ? Please provide a general breakdown of this group by category (e.g. research scientists, research fellows and research associates, postgraduate students, technical support staff, engineering staff, administrative staff).

h) How many research personnel visit and use your facility in the course of a year? Please provide a breakdown for visiting research personnel by country of research institution.

Research Background

i) What are the research foci of your facility?

j) What experimental facilities are available to users? What percentage of these facilities is currently being used by scientists who are conducting basic research (as opposed, for example, to technical monitoring, or studies on future upgrades of the

facilities)? Are some of the facilities reserved for specific categories of research (e.g., defence research)?

k) What fraction of the facility's full potential capacity is being utilised? Do you anticipate this fraction changing in the near future? If so, please provide details.

l) Do scientists typically use your experimental facilities on an individual basis, or as members of experimental groups? If the latter, is there a typical group size?

2) THE PROCESSING OF RESEARCH PROPOSALS

a) How many research proposals are received each year by your facility and, typically, what percentage are approved? What percentage of approved proposals involve multi-year commitments?

b) Are research proposals solicited by the facility, or its associated research teams? If so, please describe this process and how do 'calls for proposal' outline eligibility?

c) Does the facility have a formal research proposal selection committee? If so, please describe its membership, its mandate, its reporting relationship to the facility management. Please describe the review cycle for proposals.

d) Are there selection processes that exist outside your facility, perhaps in other agencies, that help rank, fund or otherwise establish the priority of proposals? If so, please describe.

e) What criteria are used to evaluate research proposals (please rank, if appropriate): scientific merit; scientific 'fit' with the ongoing work of the facility; potential for scientific collaboration; potential for cross-institutional collaboration; budgetary constraints of the facility; availability of research support for scientists or groups of scientists; national scientific, technological or other policy priority areas; nationality of researchers; other (please describe).

f) Are proposals submitted by the facility's own staff subject to the same criteria and evaluation process as proposals from outside applicants?

g) Is preference given to individual researchers or research teams with a particular university affiliation, or with particular laboratory affiliations? If so, please describe the process.

h) Are researchers from the private sector encouraged to lead or participate in research activities at the facility? If so, do any special conditions apply?

i) Are scientific users required to contribute to the operating costs of the facility? If so, please provide information on how the operating costs are defined, and how

each user's contribution is computed. (Please provide as much detail as possible, or send copies of the relevant documentation.)

j) Is access to your facility determined by the contributions, grants or memberships paid by countries or institutions? Is there an explicit quota system for accepting proposals, based on country of research institution of applicants?

k) For the purposes of accessing your facility, does the nationality of a research team leader define the nationality of the team? Or is team membership and access to your facility determined on an individual researcher basis?

l) Are there any special provisions for considering research proposals by researchers from developing countries?

3) ADMINISTRATIVE AND OTHER ISSUES

a) What are the rules and procedures that govern access to the raw data that is generated at your facility?

b) Has the access policy of your facility been reviewed or amended since 1990? If so, why was the policy changed? Please describe the changes.

c) To what extent do factors such as national science policy, science budgets, and science priorities affect the mandate and the access policy of your facility?

4) ADDITIONAL INFORMATION REQUESTED

a) Please provide any additional information that you feel would help in understanding the access policy of your facility.

b) We would appreciate your views on the relative importance of the factors that ultimately determine your ability to make your facilities available to researchers. These factors might include: size and quality of the facilities, the facility's budget, research funding at the national or international level, competition from other researchers, access restrictions based on nationality, and others. Please discuss the relative importance of these factors as they currently apply, and please identify the trends (positive and/or negative) that may affect your facility in the future.

c) Please provide the name and contact information of an individual who may be contacted if further information is needed.

d) Is there is a formal Users' Group at your facility? You may wish to ask the Users' Group to provide its views on the access policy of your facility. Should the Users' Group wish to provide comments, they are encouraged to do so, either through your response to this questionnaire, or directly to the Sub-Group.

The members of the Megascience Forum Sub-Group on Access to Large-Scale Research Facilities greatly appreciate the co-operation of those people responding to this request for information. In the event that you require more information, or would like clarification on any of the above questions, please contact one of the following:

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November 27, 1996

(Chief Officer,
International Scientific Organization
- see list on Page 9)

Dear Prof. ...,

In connection with the work of the OECD Megascience Forum, I am writing to ask for your assistance in gathering information regarding access by scientists to large-scale research facilities.

The OECD Megascience Forum is an inter-governmental organisation whose goal is to allow its 28 member countries to take full advantage of opportunities for international co-operation on large science projects and programmes. The Science Ministers of the OECD member countries met in September 1995, and directed the Forum to establish working groups to address key issues and problems (including broad policy questions) that are common to megaprojects. Accordingly, the Forum established Working Groups for inter-governmental consultations in the following areas: high-intensity neutron sources, nuclear physics, biological information systems, and removing obstacles to international co-operation.

One of the most important cross-cutting policy questions concerns the rules that govern the access by scientists to large-scale research facilities. At a time when research priorities are shifting within nations, and research budgets are under increasing strain, some governments are moving towards (or have already moved to) a concept of “cost recovery” in the use of such facilities. The full implications of this trend for the advancement of science, and the development of international scientific co-operation, are not fully understood.

In January 1996, the Megascience Forum created a Working Group on Removing Obstacles to International Megascience Co-operation. This group established a Sub-Group on access to large-scale research facilities (another Sub-Group is looking at administrative and legislative barriers to international co-operation). The access Sub-Group will take stock of current policies and practices, identify significant issues and trends for the future, study the impact of these trends on science and scientists, and develop recommendations to assist the governments of OECD countries in establishing and implementing policies relating to current and future scientific access to national and international large-scale research facilities. For your information, the workplan of the Sub-Group is attached.

To obtain baseline information for its study, the Sub-Group has developed a detailed questionnaire which has been distributed to the managers of selected national and international research facilities. Science policy officials have also been asked to provide information on national policies, and the factors that may affect these policies in the future. In addition, the Sub-Group is soliciting the views of the research communities which are most directly impacted by access policies (a preliminary list of organisations to be surveyed is attached). We would therefore be most grateful if you could provide, on behalf of your organisation, responses to the following questions:

a. Does your organisation have a formal position regarding scientific access to large-scale research facilities? Has the issue been the subject of a special study by your organisation? (If so, please provide copies of the relevant documents)

b. Are there trends in access policies that are of concern to you? Please specify or give examples.

c. Has your organisation been consulted for your views on this issue by government officials? Do you feel that the views of the organisation are being taken into account by policy-making bodies?

You are invited to supplement your responses by providing any other information that could assist the Sub-Group in its work. We would be grateful if you would send your responses to the above address, not later than **December 20, 1996**. If this deadline is inconvenient, please contact the Forum secretariat to arrange a mutually agreeable schedule.

On behalf of the Sub-Group, let me thank you in advance for your assistance in providing this much-needed information. We appreciate the effort involved, but your contributions will be important to the work of the Sub-Group on Access to Large-Scale Research Facilities, as it moves towards its objectives.

If you need additional information or assistance, please do not hesitate to contact one of the following persons:

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Yours sincerely,

Pardeep Ahluwalia
Chair, OECD Sub-Group on
Access to Large-Scale Research Facilities

International Large-Scale Facilities

Anglo Australian Telescope / Anglo-Australian Observatory (AAT)
Isaac Newton Group Telescopes
Joint Institute for Very Long Baseline Interferometry in Europe (JIVE)
Institut Laue Langevin (ILL)
European Laboratory for Particle Physics (CERN)
European Synchrotron Radiation Facility (ESRF)
European Southern Observatory (ESO)
European Incoherent Scatter Scientific Association (EISCAT)
Instituto de Astrofisica de Canarias (IAS / IAC)
Joint Institute for Nuclear Research (JINR)
Joint European Torus (JET)
Hubble Space Telescope / Space Telescope Institute (HST / STI)
European Molecular Biology Laboratory (EMBL)

International Scientific Organisations

International Union of Pure and Applied Chemistry
The European Physical Society
The European Synchrotron Radiation Society
Fonds Wetenschappelijk Onderzoek
Swedish Physical Society
Maxlab Nuclear Physics User Society
Users of the Manne Siegbahn Laboratory
Instituto Nazionale di Fisica Nucleare
Canadian Institute for Synchrotron Radiation
American Association for the Advancement of Science
Nuclear Physics European Collaboration Committee
International Council of Scientific Union
International Union of Pure and Applied Physics
International Union of Crystallography
Italian National Institute for the Chemistry of Materials
European Union of Physics Research Organisations (EUPRO)
Lund Maxlab Nuclear Physics User Group
The Users' Organisation at ESRF
The American Physical Society
International Union for Pure and Applied Biophysics (IUPAB)
International Astronomical Union

National Large-Scale Facilities

Australia	Australia Telescope National Facility (ATNF)
Belgium	Interuniversitaire Micro-Electronica Centrum vzw (IMEC)
	Centre de Recherches du Cyclotron (CRC)
Canada	TRI-University Meson Facility (TRIUMF)
	Canadian Institute for Synchrotron Radiation (CISR)
Denmark	Risø National Laboratory (RISØ)
France	Grand Accélerateur National d'Ions Lourds (GANIL)
	Laboratoire Léon Brillouin (ORPHEE)
	Laboratoire pour l'Utilisation du Rayonnement Electromagnétique (LURE)
Germany	Deutsches Elektronen-Synchrotron (DESY)
	Berliner Elektronenspeicherring-Gesellschaft für Synchrotron (BESSY)
	Hahn-Meitner-Institut Berlin Gmbh (HMI)
Italy	Sinctrotrone Trieste Società Consortille per Azioni (ELETTRA)
	Gran Sasso Undergound Laboratory (LNGS)
	European Laboratory for Non-linear Spectroscopy (LENS)
	Instituto Nazionale di Fisica Nucleare (INFN)
Japan	SPring-8
	Spring-8 User Society
	KEK B-Factory
Korea	Hi-flux Advanced Neutron Application Reserach Reactor (HANARO)
Netherlands	Foundation of Research of Matter (FOM)
	SON
	Amsterdam High Field Facility
	Superconducting Cyclotron (AGOR)
	Free Eletron Laser for Infrared Experiments (FELIX)
	Nijmegen High Field Magnetic Laboratory (HFML)
Norway	Arctic Lidar Observatory for Middle Atmospheric Resarch (ALOMAR)
	Halden Reactor Project
Poland	Warsaw University Heavy Ion Laboratory
	Warsaw High Pressure Research Center
	Torun VLBI Radiotelescope Station

(Continued)

Sweden	National Electron Accelerator Laboratory for Nuclear Physics and Synchrotron Radiation Research (MAX-Lab)
UK	ISIS Pulsed Neutron Facility (ISIS)
	Synchrotron Radiation Source (SRS)
	UK Infra-Red Telescope (UKIRT)
US	Relativistic Heavy Ion Collider (RHIC)
	Alternating Gradient Synchrotron (AGS)
	High flux Beam Reactor (HFBR)
	National Synchrotron Light Source (NSLS)
	Fermi National Accelerator Laboratory (Fermilab)
	Cold Neutron Research Facility (CNRF)
	Stanford Linear Accelerator Center (SLAC)
	National Institute of Standards and Technology (NIST)