IU3. Committee on Space Research (COSPAR)

Report 2016 to the IUPAP

Mandate

The Committee on Space Research (COSPAR) was established by the International Council for Science (ICSU) in 1958, at the beginning of the space age, as an interdisciplinary scientific organization with the focus on the progress of all kinds of research carried out with the use of space means (including balloons).

COSPAR's guiding vision is to expand the knowledge frontier of space. COSPAR is doing very well in pursuit of its prime mission: service to the international space science community with a view to fostering a vigorous international research effort, conducted without impediments from geopolitical tensions or differences. COSPAR achieves its objectives through the organization of biennial Scientific Assemblies, Capacity Building workshops and various meetings, publications and other means.

COSPAR's membership encompasses 45 National Scientific Institutions and 13 International Scientific Unions. From the point of view of IUPAP, COSPAR is a highly physics based organization. Most of the scientists present have a background in the discipline either as Physicists or Applied Physicists. Sensor technology and indeed spacecraft performance (pointing, positioning, thermal response, stability etc.) all rely heavily on physics as an underlying discipline. Much of the physics addressed by COSPAR is Earth sciences (including effectively all the disciplines of geophysics undertaken by remote means), astrophysics, planetary physics, space plasma physics, as well as life, material and fundamental science in space.

COSPAR is a very effective body in bringing together practitioners in the various disciplines of space research and from a large number of countries. Its Scientific Assemblies provide an excellent forum for scientists to describe current activities, to learn about other space science programs, and to engage in cooperation with international colleagues. The Assemblies permit space scientists to learn about activities relating to both their own area of specialty and to those from other overlapping disciplines.

COSPAR recently approved a Strategy Statement that describes the activities in pursuit of its mission, to be of service to both developing and developed space programs. COSPAR which is the only pan-national organization devoted to discussing the broad spectrum of space research activities, is expected to continue to play a useful role in defining and coordinating the direction of space research in the future. In a world where space activities have been dominated by a few large countries or regions, COSPAR's role is particularly relevant for countries with intermediate and small programs to develop their interests and plans.

For more details see COSPAR's renewed web site: https://cosparhq.cnes.fr

Scientific Assemblies

COSPAR held its most recent (40th) Scientific Assembly in Moscow, Russia on 2–10 August 2014. A total of about 2000 full participants, 121 students as well as exhibitors and press representatives participated in this Assembly. The Assembly included 117 core scientific events, covering all branches of space research. The scientific program was structured in oral and dedicated poster sessions. The successful morning interdisciplinary lectures were continued

The Inauguration of the Assembly began with a Scientific Round Table, entitled 'Exoplanet Exploration and the Future of Space Propulsion'. It was followed by opening addresses including that of Giovanni Bignami, the outgoing President of COSPAR, and the awards ceremony. The 2014 COSPAR Space Science Award went to David J. McComas and to Jean-Loup Puget, and the COSPAR International Cooperation Medal to Carlë McGetchin Pieters. A number of other awards, some joint with other Academies of Sciences or space agencies, were also bestowed. For the fourth time awards for outstanding papers of young scientists were conferred.

The public had the opportunity to attend two lectures on 'The Role of Basic Science and Space Research in the M.V. Lomonosov Moscow State University' and on 'Extreme State of Matter on the Earth and in Space', as well as the exhibition with displays from space agencies, industry and publishing companies.

The term of office for many COSPAR Officers, including the President, came to an end in 2014. Lennard A. Fisk, long-term Chair of COSPAR's Scientific Advisory Committee, was elected as new President for a 4-year period, A.Jayaraman and J. Wu as Vice-Presidents.

Preparations for the 2016 (41st) COSPAR Scientific Assembly are in full swing (https://www.cospar-assembly.org/); it will be held in Istanbul, Turkey on 30 July–7 August. The 42th Assembly will take place in Pasadena, California, USA on 14-22 July 2018.

Recent activities

COSPAR continues to sponsor the development of scientific 'roadmaps' providing independent scientific advice in support of planning, research and development of space programs. Three reports addressing different scientific topics, have been published: *'Toward a Global Space Exploration Program: A Stepping Stone Approach'*, ***'Future of Space Astronomy: a Global Roadmap for the Coming Decades' and 'Understanding Space Weather to Shield Society'***. The roadmap on *'Integrated Earth System Science in the GEO 2015-2025 Era'* is nearing completion. It should, as did the earlier roadmaps, have an important impact on several major planning efforts, including, for example, the next US Decadal Survey in Earth Science.

The prime goal of the Committee's Panel on Capacity Building has been to develop workshops for young researchers in developing countries that can be held in several areas of the world in order to extract most benefit from them. This program of Capacity Building is highly successful and expanding. For example, during one of the workshops a new transient magnetar, the ninth of its class,

was identified by a team of young astronomers led by a Chinese PhD student. The annual frequency of the workshops could also be increased. In 2014 three workshops took place, in Indonesia (*Matching Oceanographic Problems of the Indonesian Seas to the Right Data Sets and Models*), in Russia (*Satellite Remote Sensing, Water Cycle and Climate Change*) and in Mexico (*Advanced School on X-ray Astrophysics - Data Analysis of the XMM-Newton, Chandra, and Suzaku Missions*). In late 2015 three further workshops were organized, in Brazil (*Planetary Missions Data Analysis*), in Vietnam (*Earth Observation of Transboundary Water Resources*) and in Thailand (*International Reference Ionosphere (IRI) 2015 Workshop, Improved Accuracy in the Equatorial Region and Progress toward a Real-time IRI Model*). In April 2016 a workshop on '*Crystallography for Space Sciences*' will be held in Mexico. It is worth noting that the IRI and Crystallography workshops extend the scope of the Capacity Building workshops to two topics covered by COSPAR but never addressed in this series of meeting, with the latter bringing in a new International Scientific Union partner, the International Union on Crystallography (IUCr).

In light of the success of the Capacity Building workshops the follow-on fellowship program has been firmly implemented. It enables young scientists who have been participants in one of these workshops to build on skills gained at the workshop. The program provides for visits of 2 – 4 weeks for the purpose of carrying out joint research at laboratories (now about 20) which collaborate with COSPAR in this program.

To date International Scientific Union partners in COSPAR's Capacity Building program include the IAU, URSI, IUGG/IAGA, ISPRS and IUCr. In addition, ESA, the UN, WMO and national scientific entities, including in some cases space agencies, were co-sponsors and financial supporters. Efforts are continuing to promote improved coordination and cooperation among various international and intergovernmental organizations that have their own capacity building programs in space science and technology. COSPAR welcomes other partners and topics in an effort to cover all disciplines represented in COSPAR.
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Possible ways for IUPAP to be involved in COSPAR activities in the near-term future are: award nominations and nomination of officers, proposals for and/or co-sponsorship of future Capacity Building workshops, co-sponsorship of future Scientific Assemblies with a modest contribution to the grants program which provides partial support to young scientists and those from developing or economies in transition countries.

COSPAR Symposia complement the Scientific Assemblies and will generally be held in countries with small to medium-size space infrastructures. They focus on multidisciplinary topics not fully covered so far and are held in the years between Assemblies in a different part of the world. The first COSPAR Symposium on 'Planetary Systems of our Sun and other Stars, and the Future of Space

Astronomy' took place in Thailand in November 2013.The second Symposium on 'Water and Life in the Universe' was held in Brazil in November 2015 (**www.cosparbrazil2015.org**). Twice as many abstracts were submitted compared with the first Symposium. With the attendance of the leaders of many major space agencies, the Symposium offered an opportunity to further their international cooperation. The Symposium was again be preceded by a co-located Capacity Building workshop. The call for proposals for the third COSPAR Symposium was recently issued, and in all likelihood the next event in this series will take place in South Korea in September 2017.

COSPAR continues to sponsor and co-sponsor scientific meetings throughout the world and to participate actively in major international gatherings such as the Scientific Conference 'Our Common Future under Climate Change' held in Paris in July 2015 in preparation for the UN Climate Change Conference.

COSPAR is also an important partner in a study on Planetary Protection, selected for funding by the European Commission. This is a particular important issue for COSPAR and its Planetary Protection Panel which has the responsibility under the UN Outer Space Treaty to set the policies for planetary protection.

Publications

COSPAR maintains various means of communication with the international space research community. COSPAR's website has been renewed; its address is given above. *Advances in Space Research* (ASR) is the flagship for the COSPAR community. The journal is open to all relevant submissions and fully refereed. Covering all areas of space research, its editorial structure has been correspondingly adapted. COSPAR's new journal *'Life Sciences in Space Research'* (LSSR) publishes high quality original research in the field and will have its contents available in PubMed. *Space Research Today* (SRT) is a key tool in communication of information within the COSPAR community. This information bulletin provides COSPAR Associates and others with articles on current topics in space research by practitioners in the field, regular information on meetings, COSPAR and space-related news and other topics of interest to the community. It is issued three times a year.

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