PANEL DISCUSSION

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The Future of Laboratory Astrophysics

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Abstract. A Round Table discussion on the future of Laboratory Astrophysics and the role of IAU Commission B5 was held on the fourth day of the conference to discuss how the IAU Laboratory Astrophysics Commission (B5) can best support the astronomy community and help promote laboratory astrophysics.

Keywords. Astrophysics, Laboratory, IAU Commission, Role, Mandate, Activities, Panel Discussion

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Report on Panel Discussion on The Future of Laboratory Astrophysics and the role of IAU Commission B5.

Panel Members: F. Salama (Moderator), J.-H. Fillion (PCMI), H. Fraser (IAU Commission B5), D. Hudgins (NASA SMD), H. Linnartz (DAN), N. Mason (Europlanet), V. Mennella (INAF), D. Savin (LAD), O. Shalabiea (CU), F. Wang (NAO), N. Watanabe (ILTS)

A Round Table discussion on The Future of Laboratory Astrophysics was held on the fourth day of the conference to discuss the role the IAU Laboratory Astrophysics Commission (B5) plays to support the astronomy community and promote laboratory astrophysics and to initiate a discussion of future activities.

The panel was moderated by the Symposium's Chair (F. Salama) and included representatives of the IAU Laboratory Astrophysics Commission, CB5 (1) (H. Fraser), NASA Space Mission Directorate, SMD (2) (D. Hudgins), the Laboratory Astrophysics Division of the American Astronomical Society, AAS/LAD (3) (D. Savin), the Europlanet Society (4) and the European Astrobiology Institute, EAI (5) (N. Mason), National Program of Physics and Chemistry of the Interstellar Medium, PCMI (6) (J. H. Fillion), the Dutch Astrochemistry Network, DAN (7) (H. Linnartz), the Italian National Institute for Astrophysics, INAF (8) and the European Conference on Laboratory Astrophysics, ECLA (9) (V. Mennella), and national programs from Africa/Middle East/Egypt, SSC/CU (10) (O. Shalabiea), China, NAO (11) (F. Wang) and Japan, ILTS (12) (N. Watanabe).

The central issues discussed during the Round Table focused on four major points:
- The mandate of the Commission.
- The role the Commission plays as a bridge between the laboratory astrophysics and the astronomy communities.

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- The role the Commission plays as a bridge between local/national laboratory astrophysics communities and how it helps facilitate the dialog and the exchange of experiences and approaches between the various laboratory astrophysics communities and networks.
- Answering and discussing pre-filled questions from the participants.

The Round Table discussion lasted 90 minutes. It started with a short opening presentation from the Moderator to define the goals of the round table discussion and introduce the panelists. This was followed by presentations of the panelists who discussed how laboratory astrophysics is organized in their respective countries and the roles and objectives of the various societies and organizations. Examples of national and international collaborative networks were presented. Finally, pre-filled questions from the participants were discussed in a Q&A session.

The questions submitted by the participants were distributed between two broad topics:

- The structure, organization, support of Laboratory Astrophysics (funding, advocacy and promotion of the field, . . .)
- The science priorities in Laboratory Astrophysics (aligning experimental and theoretical efforts with observational and modeling needs, communication (language barriers), outreach, . . .)

The Q&A discussion started with a discussion of the activities that are within the scope/mandate of IAU CB5

Main activities of the Commission:

Meetings and Symposia:

Scientific meetings are among of the most important means by which the IAU pursues its goal of promoting the science of astronomy through international collaboration and, as a result, organizing meetings and symposia are among the main activities of IAU Commissions. IAU Symposia are competitively selected, i.e., there is no systematic mechanism for establishing a regular cycle of symposia. The topics of the proposed symposia traditionally target a broad astronomy audience.

The field of Laboratory Astrophysics is multidisciplinary and is intrinsically suited to address this requirement by bringing the broad astronomy community together with the laboratory astrophysicists in a symposium where the participants will benefit from each other expertise as well as become aware of each other's needs.

In this context, the audience reached a large consensus that the optimized strategy for CB5 would be to alternate the organization of broad-scope symposia every 5–6 years covering the width of laboratory astrophysics disciplines (interstellar, planetary, plasma, nuclear, etc. . . such as in this Symposium IAUS 350 (13)) with the organization of topical Focus Meetings (FMs) to be held every 3 years in coordination with the IAU General Assemblies (GA) that would address specific topic(s) within the scope of the field of laboratory astrophysics (typical examples from the recent past are the Focus Meeting FM12 "Bridging Laboratory Astrophysics and Astronomy" held at the IAU General Assembly in Hawaii in 2015 (14) and Focus Meeting FM10 "Nano Dust in Space and Astrophysics" held at the IAU General Assembly in Vienna in 2018 (15)).

In addition to the full meetings/symposia formats described above, by taking advantage of its pluridisciplinary character, CB5 can hold parallel sessions during the Division days at the IAU General Assemblies (e.g., "Reports Commission B5: Laboratory Astrophysics: from Observations to Interpretation" parallel sessions held at the Division B (Facilities,

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Technologies and Data Science Division) days during the IAU General Assembly in Vienna in 2018 (16)) and/or co-organize or support symposia with other IAU Divisions or Commissions such as with Commission H2 Astrochemistry of Division H Interstellar Matter and Local Universe (e.g., IAUS332 (17)), Division E Sun and Heliosphere, Division F Planetary Systems and Astrobiology (e.g., FM10 (15)). CB5 could also organize meetings with scientific communities beyond the scope of astronomy, e.g., with the physics, chemistry, earth science, engineering communities. . . to promote laboratory astrophysics and improve communication and the exchange of information.

Working Groups:

According to IAU bylaws (18), Working Groups are established by Commissions, with the approval of the Division, to undertake studies of well-defined scientific issues and report to the Commission. Normally IAU Working Groups end after a three-year term unless actively renewed.

CB5 has currently two active Working Groups:

A working group on High-Accuracy Stellar Spectroscopy (19) whose role is to promote the interaction between the fields of theoretical atomic physics, laboratory spectroscopy, and astrophysical observations to generate the high-accuracy atomic and molecular data required for accurate stellar spectroscopy.

A working group on Spectroscopic and Radiative Data for Molecules (20) whose role is to provide a report on the latest experimental and theoretical results on radiative processes, especially at ultraviolet, visible, infrared, and millimeter wavelengths, that provide essential information on molecular abundances and excitation in astronomical environments for the astronomical community in time for distribution at IAU General Assemblies.

The panel discussed the potential role CB5 could play in connection to data (databases, data evaluation and data citation). It was agreed that CB5 could play a key role in this domain by initiating and leading the development of recommendations and guidelines to research groups worldwide for the standardization and the homogenization of databases and data citation.

The audience felt that the best way to address this issue was for CB5 to create a new working group on Databases tasked with the role of coordinating the support for databases in astrophysics and astrochemistry through long-term maintenance of databases

Laboratory Facilities:

The role the commission could play in supporting laboratory facilities was also discussed.

This included initiating a survey of small scale- as well as large scale laboratory facilities available worldwide (similar to the surveys of all telescopes facilities), issuing guidance and recommendations for the merging of laboratory facilities, promoting the establishment of laboratories in developing countries, initiating a discussion within the community of the comparative advantages in the current context of centrally owned/run experimental facilities versus individual facilities.

Communication:

Another topic that was discussed is the key role played by CB5 to improve communication both internally, i.e., within the various elements of the multidisciplinary laboratory astrophysics community (observers, experimentalists and theorists) helping overcome the language barrier between the scientists involved in the various research fields and

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externally, i.e., between the laboratory astrophysics science community and the various research and educational institutions to promote the discipline. For example, suggestions were made for CB5 to work with Astronomy Departments to include Laboratory classes in their curriculum, to contribute and help coordinate discussions within the laboratory astrophysics community on how to prioritize experiments in times of limited budgets, to help promote the support of laboratory astrophysics by large observational facilities, etc. . ..

Acknowledgment

The SOC of IAUS350 thanks the participants for their active participation to the panel discussion. The questions submitted by the participants have been compiled and transmitted to the Organizing Committee of the Commission. The SOC of IAUS350 wishes also to acknowledge the panelists for their contribution to the discussion and E Sciamma-O'Brien for recording the minutes of the panel discussion.

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