

Annual Report Division B: Facilities, Technologies And Data Science

Dr. Michael Burton, Division B VP, has kindly agreed to act as ad interim” secretary of the Division B since the GA in Honolulu.

**According with the Resolutions adopted during the GA in Honolulu The Division B Steering Committee and Commissions has been finalized as follows:**

**Steering Committee**

Pietro Ubertini	President
Michael G. Burton	Vice President
Simon F. Portegies Zwart; D. Bisikalo	Comm. B1 P; VP: Computational Astrophysics
Michael W. Wise; A. Schroeder	Comm. B2 P; VP: Data and Documentation
Eric D. Feigelson; P. Shastri	Comm. B3 P; VP: Astroinformatics and Astrostatistics
Gabriele Giovannini; A. Beasley	Comm. B4 P; VP: Radio Astronomy
Farid Salama (Helen Fraser)	Comm. B5 P; VP: Laboratory Astrophysics
Saul J. Adelman; A.M. Magalhaes)	Comm. B6 P; VP: Astronomical Photometry and Polarim.
Richard F. Green; C. Walker	Comm. B7 P; VP: Protection of Existing and Potential Observatory Sites (Parent DivC)
David Richard Silva	Advisor - Past President
Ana I. Gomez de Castro	Member
Peter Joseph Quinn	Member
Lisa Storrie-Lombardi	Member
Wenwu TIAN	Member

More info are available at:

[https://www.iau.org/science/scientific\\_bodies/divisions/B/info/](https://www.iau.org/science/scientific_bodies/divisions/B/info/)

and News at

[https://www.iau.org/science/scientific\\_bodies/divisions/B/info/news/](https://www.iau.org/science/scientific_bodies/divisions/B/info/news/)

After the establishment of the Division B by the IAU EC a long-standing activity was started to implement the new structure, governance, including approval of Commissions, Working Groups, inter-Division and inter-Commission WGs etc. Stable relationship and fruitful interaction has been achieved with EC, other DPs and SCs.

A total of 4 Commission and WG, 3 Division WG, 3 inter-Commission WGs, and 1 inter-Division WG were approved

[https://www.iau.org/science/scientific\\_bodies/working\\_groups/](https://www.iau.org/science/scientific_bodies/working_groups/)

Commission B1 activity: Computational Astrophysics

There have been several new initiatives for organizing computational astrophysics conferences throughout the world, and these meetings have attracted many astronomers and computer scientists. The instrumentation has only marginally improved, with an upgrade of the Swiss Piz Daint supercomputer as highlight. We expect more from next year's new infrastructure. A new web page for the commission B1 Computational Astrophysics is in preparation, and we expect it to belaunch in the next month.

### Commission B2 activity: Data and Documentation

Over the reporting period, IAU Commission B2 has undertaken several organizational activities in support of its core mission. In collaboration with Commissions C1 and C2, we have established the inter-commission working group on Data Driven Astronomy Education and Public Outreach (DAEPO). This working group is chaired by Commission B2 organizing committee member Dr. Chenzhou Cui. Similarly, we have contributed to the creation of two new working groups under the auspices of inter-division Commission J1 on a standardized sample of galaxy SEDs data and models (WG1) and interfaces to SED databases (WG2). Commission B2 organizing committee member Dr. Anja Schroeder is currently co-chair of Commission J1 WG2. Finally, members of Commission B2 have been instrumental in the successful proposal for IAU Symposia for 2017 on Time-Domain Astronomy to be held in Stellenbosch (South Africa) [on November 13-17](#). Like its predecessor, IAU S285, this meeting will focus on the relationships between types of variability and the knowledge which can be derived from and through them. Commission B2 organizing committee members Dr. R. Elizabeth M. Griffin and Dr. Rob Seaman have been some of the prime organizers for this symposium through their participation in the new working group on Time-Domain Astronomy, now a Division WG.

In addition to these organizational activities, several of the Commission B2 working groups have continued to pursue their ongoing activities. Commission B2 WG1 on Designations, chaired by Dr. Marion Schmitz, has continued to clarify existing astronomical nomenclature to help astronomers avoid potential problems when designating their sources. The most important function of WG1 Designations during 2016 was overseeing the IAU Registry for Acronyms<sup>1</sup> sponsored by the Centre de Données Astronomiques de Strasbourg (CDS). The Clearing House screens the submissions for accuracy and conformity to the IAU Recommendations for Nomenclature<sup>2</sup>. From its beginning in 1997 through May 2017, there have been 342 submissions and 291 acceptances. Commission B2 has also started the organization of a new working group focused on Virtual Astronomy and Data Centres. This new WG chaired by Dr. Mark Allen, will participate in the bi-annual International Virtual Observatory Alliance (IVOA) meetings, and the annual Astronomical Data Analysis and Software Systems (ADASS) conferences. These venues provide the working environment for the development of interoperability standards for astronomical data and services, and for the sharing of results and best practices. The working group activities are aimed at providing a link between these (IVOA and ADASS) communities and the IAU, so that major results and status of these efforts may be reported at IAU general assemblies.

### Commission B3 activity: Astroinformatics and Astrostatistics

During 2015-18, Commission B President (Eric Feigelson) played a number of roles related to Commission B3. He served on the leadership councils of the International Astostatistics Association, American Astronomical Society Working Group on Astroinformatics and Astrostatistics, and the Large Synoptic Survey Telescopes Informatics and Statistics Science Collaboration. He is the inaugural Statistical Scientific Editor of the American Astronomical Society Journals, co-edits the on-line Astrostatistics and Astroinformatics Portal, and serves on the NASA Task Force on Big Data. Comm B3 Organizing Committee member Alan Heavens

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<sup>1</sup> See the website <http://cdsweb.u-strasbg.fr/cgi-bin/DicForm>.

<sup>2</sup> See <http://cdsweb.u-strasbg.fr/iau-spec.html>.

organized annual Data Analysis Workshops at the Imperial Centre for Inference and Cosmology, and was co-chair of the 2016 Statistical Challenges in 21st Century Cosmology conference that followed IAU Symposium #306 with the same name.

#### Commission B4 activity: Radio Astronomy

The year 2016 has been characterized by:

A) major advances in radio surveys, which are playing an increasingly important role in radio astronomy. A short non complete list could include: 1) the ALMA survey of Hubble Ultra Deep Field Universe which revealed a previously unknown abundance of star-forming gas; 2) the completed Galactic and Extragalactic All-sky MWA survey (GLEAM); 3) the GMRT 150 MHz all-sky radio survey with 1/2 million radio sources; 4) the LOFAR Two-meter Sky Survey (LoTSS); 5) the Sky Survey for the enhanced VLA in the 2-4 GHz band (VLASS).

B) a large improvement in the scientific instrumentation available. First light has been detected from the new receivers installed at the ALMA antennas in Band 5; the call for 1-mm Very Long Baseline Interferometry (VLBI) proposals to use phased ALMA at Band 6 in Cycle 4, have been released in collaboration with the Event Horizon Telescope Consortium (EHTC); first light was detected from the world's largest single-aperture radio telescope (FAST); first light radio image of MeerKAT array in South Africa has revealed the existence of many distant radio galaxies.

C) Particular attention was given to the discovery of Gravitation Waves. After the first detection of gravitational waves (GW) radio telescopes all over the world are collaborating with LIGO/VIRGO in an effort to promptly react to any alert, and evaluate strategies to plan adequate observations. Moreover, Radio Pulsar Timing Arrays over the world continue to make progress toward detecting nHz GWs, complementing the work by LIGO and Virgo.

More details at:

[https://www.iau.org/science/scientific\\_bodies/commissions/B4/](https://www.iau.org/science/scientific_bodies/commissions/B4/)

The Commission B4 Working Group on Historic Radio Astronomy has continued to assemble historical material and to maintain an on-going bibliography of publications on the history of radio astronomy. In 2016 three Symposia were held:

1) in honor of Ron Ekers on "Innovation and Discovery in Radio Astronomy" covered many aspects in the history of radio astronomy

<http://www.atnf.csiro.au/research/conferences/2016/IDRA16/program.html>

2) in memory of the 100th birthday anniversary of I. S. Shklovsky

<http://shklovsky100.asc.rssi.ru/index.php/en>

3) for Bruce Slee's 70 years of contributions to radio astronomy.

<http://www.caastro.org/event/2016-slee>

For more details see: [https://www.iau.org/science/scientific\\_bodies/working\\_groups/266/](https://www.iau.org/science/scientific_bodies/working_groups/266/)

#### Commission B5 activity: Laboratory Astrophysics

The various activities and discussions of the Commission B5 for the most part take place through email consultation among the OC. The Commission communicates with its members through the IAU mass mailing system (e.g., to inform the members of the Commission about meetings and

conferences of interest, announcements of interest such as International research agreements and job opportunities).

The first Working Group (WG) of the Commission, WG on High-Accuracy Stellar Spectroscopy, was initiated by Paul Barklem and launched in February 2016.

The WG on High-Accuracy Stellar Spectroscopy promotes high-accuracy atomic and molecular data required for accurate stellar spectroscopy and is chaired by Paul Barklem with four supporting members from Commission B5: S. Nahar, J. Pickering, N. Przybilla and T. Ryabchikova.

Commission B5 has endorsed a proposal for a Symposium entitled: "Laboratory Astrophysics: from Observations to Interpretation" and a proposal for a Focus Meeting at IAU 2018. The President of CB5 (Salama) is a member of the SOC of IAU S332, Astrochemistry VII – Through the Cosmos from Galaxies to Planets, organized by the Astrochemistry Commission (CH2) to be held in Chili in March 2017.

The President of CB5 (Salama) is a member of the SOC for the proposed Focus Meeting "Nano Dust in Space and Astrophysics" for IAU 2018 GA by Commission E3, Solar Impact Throughout the Heliosphere.

For more details see: [https://www.iau.org/science/scientific\\_bodies/commissions/B5/](https://www.iau.org/science/scientific_bodies/commissions/B5/)

#### Commission B6 activity: Astronomical Photometry and Polarimetry

Results from many automated photometric telescopes continue to become available. Astrometry and Astrophysics in the GAIA Sky (IAUS 330), April 24-28, 2017 was the most recent meeting to review the now first 2.5 years of Gaia activities and to present and discuss the first scientific results derived from the first GAIA data release.

The polarization community is looking forward to their largest meeting, Astropol 2019 in Hiroshima, Japan. The recent workshop 'Cosmic Polarimetry from Micro to Macro Scales', Feb 17-18, 2017, covered essentially all spectral regions, with a balanced program of theory, observational results and instrumentation development.

J. Allyn Smith and collaborators are continuing an effort to characterize DA white dwarfs to use as absolute flux calibrators, currently concentrating on the Dark Energy Survey footprint. Abhijit Saha and collaborators are continuing their semi-parallel effort to develop faint DA standards using HST, also for large survey calibration. Stubbs and collaborators continue development of new flat fielding techniques to support the Large Synoptic Survey Telescope project.

#### Commission B7 activity: Inter-Division B-C Commission Protection of Existing and Potential Observatory Sites

The Commission through its Working Group structure is focusing on four major objectives:

- \* Defining a set of IAU endorsed standards for astronomy-friendly outdoor lighting and the associated policies to gain compliance.
- \* Supporting the efforts of getting UN-level endorsements for World Heritage status and COPUOS declaration in favor of site protection for ground-based optical/IR and radio observing assets. The WH efforts are starting with Chile; COPUOS will highlight facilities critical for supporting space missions.
- \* Engaging our professional colleagues widely in promoting dark/quiet sky protection, with the Commission providing supporting materials and links on a website.
- \* A strong education and public outreach effort, with dark/quiet skies issues tied to sustainability,

and building on the IYL heritage, through the joint WG with Division C.

*Division WGs activity:*

WG UV Astronomy

Organization of the symposium "Ultraviolet Sky Surveys. The needs and the means". To be held in Tel-Aviv in July 10-14 2017.

<http://www.astro.tau.ac.il/events/uss/>

Presentation of the status and planning for UV astronomy in the 2017 Spring Symposium organized by the Space Telescope Institute on "Life cycle of metals throughout the Universe. Celebrating 50 year of UV astronomy"

<http://www.cvent.com/events/2017-spring-symposium-lifecycle-of-metals-throughout-the-universe-celebrating-50-years-of-uv-astronomy/event-summary-a43f66111bd744cf8622a55464396448.aspx>

Organization of the Special Session "Ultraviolet Astronomy and the Quest for the Origin of Life" to be held during COSPAR Assembly 2018 and the finalization of the web site:

<http://www.gnuva.net>

Division B and E: Working Group on Coordination of Synoptic Observations of the Sun:

The main activities have been in the following area:

Activity related to preservation and digitization of records of past solar activity.

Activity related to support continuation/funding for synoptic programs threatened by budget cuts.

Activity related to verification of existing sunspot number time series and developing a unified sunspot time series.

Activity related to improving access to modern and historical data.

Promoting the broadening international participation in WG activities.

Presentations on activities of this WG were made at "Synoptic ground-based solar observations for Space Weather, Nice, 19-20/10/2016"

Inter-Commission B2-C1-C2 WG Data Driven Astronomy Education and Public Outreach (DAEPO)

With a new item appearing on the IAU Working Groups webpage, the new approved IAU Inter-Commission B2-C1-C2 WG Data Driven Astronomy Education and Public Outreach (DAEPO) was launched officially.

This inter-commission working group is hosted at the IAU Division B (Facilities, Technologies and Data Science) Commission B2 (Data and Documentation), and organized jointly with Commission C1 (Astronomy Education and Development), Commission C2 (Communicating Astronomy with the Public), Office of Astronomy for Development (OAD), Office for Astronomy Outreach (OAO) and several other non IAU communities, for example International Virtual Observatory Alliance (IVOA) Education Interest Group, American Astronomical Society (AAS) Worldwide Telescope Advisory Board, International Planetarium Society, Zooniverse project. The WG consists of 16 founding members, including 9 members and 7 associate members.

With the development of many mega-science astronomical projects, for example CTA, DESI, EUCLID, FAST, GAIA, JWST, LAMOST, LSST, SDSS, SKA, and large scale simulations, astronomy has become a Big Data science. Astronomical data is not only necessary resource for scientific research, but also very valuable resource for education and public outreach (EPO), especially in the era of Internet and Cloud Computing. Maximizing the values of astronomical data in education and public outreach is the mission of the WG. The working group has the major objectives to: 1) Act as a forum to discuss the value of astronomy data in EPO, the advantages and benefits of data driven EPO, and the challenges facing to data driven EPO; 2) Provide guidelines, curriculums, data resources, tools, and e-infrastructure for data driven EPO; 3) Provide best practices of data driven EPO.

More information about the Working Group is available at: <http://daepo.china-vo.org>

#### Working Group on Information Professionals

Members of the Working Group continue to meet formally and informally at scientific and librarian meetings to discuss topics of interest to both parties. We are working to identify new members for the Working Group particularly from the scientific side. The group is drafting a position statement to be presented at an upcoming meeting.

More details at:

<http://hea-www.harvard.edu/IAUinfoproWG>

#### Bilateral and international conferences relevant to Division B held in China.

The Square Kilometer Array (SKA) workshop on Science Data Processing (SDP), High Performance Computing (HPC) and big data on May 11-13, 2016 at the Shanghai Astronomical Observatory. Ministry of Science and Technology of China (MOST) and the SKA Office organized the conference. This conference created conversations, dialogues and exchanges between the worldwide SDP, HPC scientists and researchers who are interested or worked for the SKA project.

Dr. Wenwu Tian is involved into China SKA Science project supported by the MOST".