



International Astronomical Union
Union Astronomique Internationale

POST MEETING REPORT FORM

Deadline for Submission: within 1 month after the meeting

For Symposia the following documents should be attached:

- (i) Final scientific program, list of invited review speakers and session chairs;
- (ii) Summary of the scientific highlights of the meeting (1 page, to be published on the IAU website);
- (iii) List of participants, including their distribution by country and gender (double bar chart);
- (iv) List of recipients of IAU grants, stating the amount received, country and gender;
- (v) An Executive Summary of the Meeting (1-2 pages) to be published on the IAU website.

For Symposia the Post Meeting Report should be sent to the AGS.

1. Meeting Number: IAUS 330

2. Meeting Title: Astrometry and Astrophysics in the Gaia sky

3. Coordinating Division: Division A (the symposium was supported by 4 divisions and 10 commissions)

4. Dedication of meeting (if any): Dr. François Mignard

5. Location (city, country): Nice, France

6. Dates of meeting: 24-28th April 2017

7. Number of participants: 276

8. List of represented countries: Australia, Armenia, Belgium, Brazil, Canada, Chile, China, Czech Republic, Denmark, France, Germany, Greece, Hungary, India, Indonesia, Italy, Japan, Lithuania, Macedonia, Mexico, Netherlands, Poland, Portugal, Russia, Spain, Serbia, South Africa, Sweden, Switzerland, Taiwan, Turkey, Ukraine, United Kingdom, United States.

9. Report submitted by: Alejandra Recio-Blanco

10. Date and place: 10 June 2017

11. Signature of SOC Chairperson:

A handwritten signature in black ink, appearing to read 'Alejandra', followed by a horizontal line.

I) Final scientific program, list of invited review speakers and session chairs.

Please, see attached document for the detailed programme.

Invited speakers:

Carlos Allende Prieto (Spain)
James Binney (United Kingdom)
Angela Bragaglia (Italy)
Anthony Brown (The Netherlands)
Corinne Charbonnel (Switzerland)
Martin Groenewegen (Belgium)
Sergei Klioner (Germany)
Lennart Lindegren (Sweden)
Ivan Minchev (Germany)
Marc Pinsonneault (United States)
Giampaolo Piotto (Italy)
Timo Prusti (ESA, The Netherlands)
Nuno Santos (Portugal)
Bruno Sicardy (France)
Rosemary Wyse (United States)
Norbert Zacharias (United States)

Session Chairs

Susan Steward (United States)
Amina Helmi (The Netherlands)
Esward B. Reddy (India)
Naoteru Gouda (Japan)
Brigitta Nordstrom (Denmark)
Marco Delbo (France)
Angela Bragaglia (Italy)
Timo Prusti (ESA, The Netherlands)
Alejandra Recio-Blanco (France)

II) Summary of the scientific highlights of the meeting

The symposium was a clear illustration of the impact of the ESA Gaia mission on the international astronomical community, since its first data release. It was organized around five plenary sessions: The Gaia sky, Astrometry and Fundamental Physics, Galactic Archaeology, Solar System and Exoplanets, Stellar physics. Many interdisciplinary questions were treated and, the exchanges between the different communities have been a great success.

Regarding the Gaia sky session, the status of the Gaia mission, the main characteristics of the first Gaia data release, and the planned content of the second data release, were presented by the Gaia Project Scientist, the head of the Gaia Data Processing and Analysis Consortium (DPAC) and different DPAC members, responsible of the data releases. This has allowed an exchange on different technical and scientific points (like the errors treatment, for instance). The Gaia mission was also put in the historical perspective of the previous Hipparcos mission.

The Astrometry and Fundamental Physics session has analysed the Gaia astrometric data in the general context of other ground based surveys, including VLBI, QSO catalogues, Pan-STARRS, etc... This has also been examined through the perspective of different astrophysical objects (like evolved stars, active galactic nuclei or Milky Way satellites) and different wavelength domains (optical vs. radio, for instance). Moreover, the challenges of Fundamental Physics in the Gaia astrometry context have been presented. Among them, i) the tests of General Relativity (e.g. light

deflection, gravitational field of the Solar System and of remote objects, observations of special objects like compact binaries, etc...), and ii) gravitational waves challenges. In particular, local tests of gravitation with Solar System objects have been extensively treated.

In the Galactic Archaeology sessions, multiple observational results, based on the first Gaia DR1 have been presented. Among them, the analysis of Galactic stellar clusters and associations, the Milky Way spiral arm system, the Magellanic Clouds nature, the temporal evolution of the Galactic disc chemo-dynamical characteristics, the disc star formation history, the studies of the close stellar encounters of the Sun, the Galactic warp signal, and the identification of hypervelocity stars candidates. This has been complemented by different analysis focussed on Milky Way modeling and numerical simulations in a cosmological context. The interplay between models/simulations and data in the Gaia era, has been extensively treated. Finally, the Gaia DR1 selection function has also been analysed.

In the Stellar Physics sessions, different observational constraints on white dwarfs, red clump stars, S-type stars, variable stars (including cepheids) and low mass star formation, have been presented. In addition, the context of stellar evolution models (equations, prescriptions for macroscopic MHD processes, instabilities, modeling uncertainties,...) has been presented. In particular, the challenge of stellar age estimation has been discussed in detail, a crucial stellar property for Galactic Archaeology studies.

The Solar System and Exoplanets session has extensively treated the prospects on different asteroid studies (masses, shapes, orbit determinations...), the predictions of stellar occultations, and more specifically, the Gaia impact on our knowledge of the Chariklo's ring system.

Finally, the symposium has also hosted a practical presentation of the ESA Gaia archive facility and a dedicated poster session that led to award five “Best Poster” prizes.

In summary, the symposium scientific highlights have shown the strong impact of the Gaia mission over various astronomical topics, already since the first data release. In addition, it has allowed fruitful exchanges from the different scientific communities (different topics, various geographical origins, different generations...), fostering collaborations and paving the way to the scientific exploitation of the future and more extended Gaia data releases.

III) List of participants, including their distribution by country and gender

See corresponding attached excel document.

IV) List of recipients of IAU grants, stating the amount received, country and gender

See corresponding attached pdf document.

V) Executive summary

Astrometry has historically been fundamental to all the fields of astronomy, driving many revolutionary scientific results. Kepler's laws, deduced after analysing the observations of Tycho Brahe, are an outstanding example of this. Four centuries later, the ESA Gaia mission is astrometrically, photometrically and spectroscopically surveying the full sky since July 2014. This survey will be complete to magnitude 20 for the astrometry and photometry and to magnitude 16 for the spectroscopy (~1 billion and ~150 millions sources expected, respectively). The Gaia astrometry allows stellar distance and age estimations with unprecedented accuracy, and with the complement of radial velocities, it will provide the full kinematic information of the targets. Moreover, the photometric and spectroscopic data will be used to classify objects and astrophysically characterize stars.

The International Astronomical Union Symposium 330 has been the occasion to review the first 2.5 years of the Gaia activities and to present and discuss the first scientific results derived from the Gaia first Data Release (GDR1), seven months after its delivery in September, 2016. The

most significant illustration of the Gaia high impact is probably the large involvement of the international astronomical community in this symposium: 276 participants from 35 different countries were present in Nice for this one-week symposium. Already from its first data release, Gaia is therefore undoubtedly changing not only our understanding of the Galaxy and its planetary and stellar components, but also our way of working.

On one hand, the significant increase in the precision of the astrometric measurements is sharpening our view of the Milky Way, but also of the physical processes involved in the stellar and galactic evolution. This implies an enhanced synergy between different communities (astrometry, stellar and galactic physics), and a refinement of the models and simulations that are now better constrained thanks to Gaia data.

On the other hand, the increasing number of available data has a clear impact on the analysis approaches that have to be adopted by the astronomical community, imposing robust statistical treatments, opening the path to unsupervised classification techniques and, generally, enriching our knowledge of the detailed physics in play on the studied astronomical objects (the Milky Way, the stars, the Solar System objects...). Moreover, from the point of view of the models and simulations, the increasing number of constraints even for low probability processes or rare objects is already acting as the catalyst of a new era in our understanding of the Galaxy, its stars and the Solar System.

In summary, the extremely important improvement in the astrometric precision and in the number of studied objects will lead to a turnover comparable to the impact of the telescope invention about four centuries ago. The IAU Symposium 330 has confirmed the start of that announced Gaia revolution.

Finally, it has to be pointed out that this IAU Symposium 330 has also been an unique occasion of preparing the international astronomical community to the arrival of the second Gaia data release, planned for April 2018.