

Early in 2016, the IAU Division J, Galaxies and Cosmology, organized a questionnaire targeting its division members with the aim to better understand the community perspective on the role of the IAU, and identify how Division J can better reflect the opinions of its membership. The questionnaire was hosted by Google:

https://docs.google.com/forms/d/1HQ1h_RQdaUXI8ut1XvmZLasZ1IkNgJ3FAfwLB6Nd0BA/viewform

and regarded aspects of the IAU in general (Part 1), and Division J in particular (Part 2). Answers were generally given as ratings of importance (e.g., from 1="not important" to 5 or 6 as "extremely important"). The questionnaire response took place from 13 January to 12 February 2016, and was initiated via an email to the entire Division J member list. Below we give an overview of the numerical results, followed by a summary of the opinions voiced by Division J members on various aspects of the query (given in text boxes rather than numerical multiple choice).

611 members (of 3179 total), or roughly 19% of Division J, answered the questionnaire. The respondents of the questionnaire remain anonymous; Division J did not trace, nor is able to trace, the specific identity of the participants.

1 Overview of results for the role of the IAU

The first part of the questionnaire was focused on the role of the IAU, in particular on the strategic part that the IAU plays in promoting astronomy and organizing educational activities for young astronomers and outreach to the general public. Fig. 1 shows the results for the importance of various roles of the IAU. Almost 40% of the respondents considered public outreach as the most important role for the IAU (right panel), while the second most important role was considered (by ~30%) to be promoting astronomy and fostering astronomy in developing countries. Minorities and gender inequality, together with advice to junior-career astronomers and/or the attraction of new astronomers, was considered less important.

There were also three questions in the first part of the questionnaire focused on the IAU's strategic plan for "Astronomy for Development", the IAU Office for Astronomy Outreach (OAO), and the International School for Young Astronomers (ISYA). Each of these has a specific website (see Appendix for details). The results for these more focused questions are shown in Fig. 2. Before the importance rating, the questionnaire also asked how many respondents knew about these initiatives prior to the questionnaire: less than half the responding Division J members knew about either the Astronomy for Development strategic plan or the ISYA (44% and 47%, respectively), but 63% already were informed about the OAO. Although the latter is encouraging, the relatively small fraction of our Division that knew about these very important IAU initiatives before the Questionnaire implies that perhaps more publicity is required.

The third aspect of the role of the IAU was focused on IAU publications, namely to assess which publications were used the most. IAU Publications consist primarily of the Information Bulletin and the Proceedings of the IAU General Assemblies, together with other scientific meetings sponsored by the IAU. The series of IAU Symposia, IAU Colloquia, the IAU Transactions (Vol. A and B), and the Highlights of Astronomy are published by the IAU Publisher, Cambridge University Press. The results are shown graphically in Fig. 3, where the various available IAU publications are plotted horizontally, together with the fraction of respondents who used them. At least one answer (including "None") was required, but it was possible to indicate more than one.

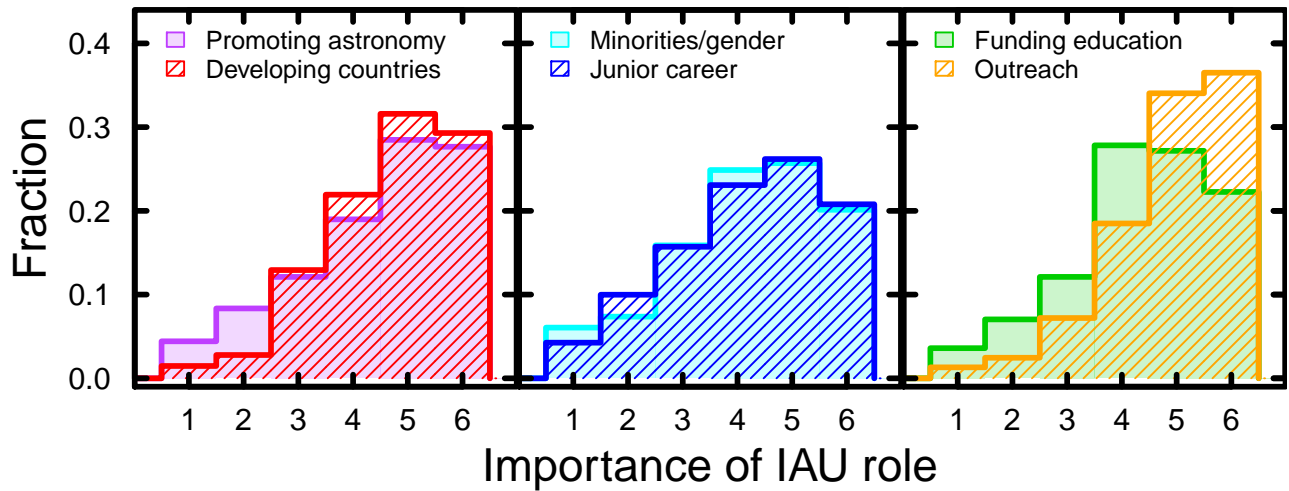


Figure 1: Fraction of participants rating the various roles of the IAU from 1 (unimportant) to 6 (extremely important). The specific questions are as follows: (left panel) promoting astronomy among scientists (purple solid histogram), and fostering astronomy in developing countries (hatched red); (middle panel) promoting minorities and gender equality (cyan solid), providing guidance for junior-career astronomers and attracting new ones (hatched blue); (right panel) funding educational initiatives for young astronomers (green solid), promoting public outreach and communication (orange hatched).

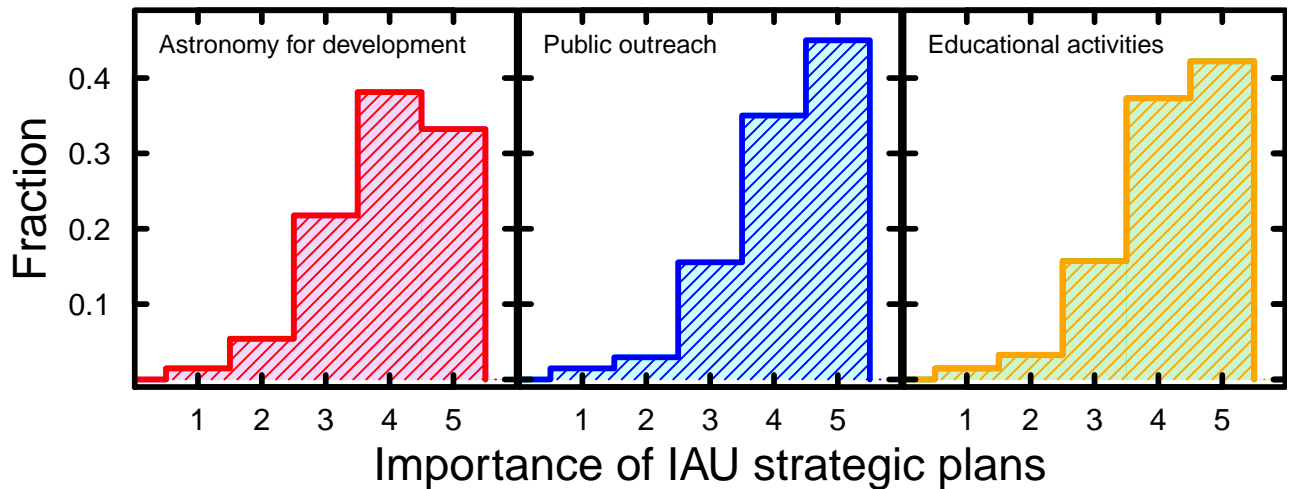


Figure 2: Fraction of participants rating the focus of the IAU from 1 (unimportant) to 6 (extremely important) for the strategic plan of “Astronomy for development (left panel), public outreach and communication (middle), and the IYSA (right).

The IAU Symposia Proceedings are used for their research by ~80% of the Division J respondents. Highlights of Astronomy, Information Bulletins, and Proceedings of Regional Meetings are used by ~30%, the GA Newsletters by ~20%, and the remaining publications by 12–14%. It is possible that a cost analysis be conducted for the latter, although it is also conceivable that some of these are not related to research but rather IAU administration (e.g., Transactions).

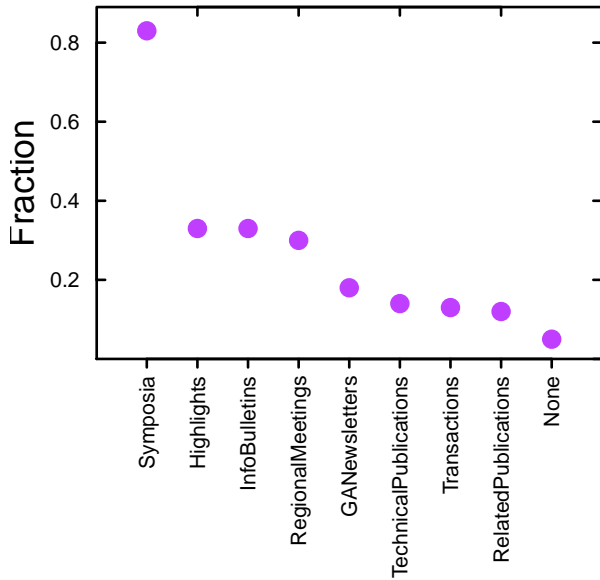


Figure 3: Fraction of participants who used the publications plotted along the abscissa. These are listed on the IAU website and include Symposia, Highlights of Astronomy, Information Bulletins, Proceedings of Regional Meetings, General Assembly Newsletters, technical publications, IAU Transactions, and related (unspecified) publications.

2 Overview of results for Division J

The second part of the questionnaire regarded only Division J, with the aim of better incorporating input from the community for the Division’s Science Objectives and for the importance of interacting with IAU Commissions and other divisions. Specific science topics were rated in importance (with a maximum of 5 as most important) as shown in Fig. 4. Topics included:

- ★ the physical origins and evolution of the Universe, and the nature of large-scale structure
- ★ the physics of dark matter and dark energy (overlap with Division D)
- ★ formation and assembly of galaxy clusters
- ★ the structure and evolution of the intergalactic medium
- ★ galaxy formation and evolution through the study of the internal structures and properties of galaxies beyond the Local Universe in terms of stellar populations, kinematics, star-formation histories and metal content
- ★ galaxy formation and evolution through the study of the dust and gas content and kinematics in galaxies (overlap with Division H)

The single-most important topic was considered by $\gtrsim 55\%$ of the respondents to be physical origins and evolution of the Universe, together with large-scale structure. The second topic, considered most important by $\sim 50\%$ of the participants, was more detailed studies of galaxy formation and evolution through the study of galaxies’ properties outside the Local Universe. Dark matter and dark energy were considered by $\gtrsim 40\%$ of the respondents to be extremely important, while the remaining topics were given, on average, a slightly lower rating. Additional topics, suggested by participants, will be discussed in Sect. 3. This information will be extremely important for the composition of the Scientific Objectives that will appear soon on the Division J website.

Our Division hosts two Commissions (C.J1 Galaxy Spectral Energy Distributions, C.J2 Intergalactic medium), and shares one (Supermassive Black Holes, Feedback and Galaxy Evolution) with Division D. Division J also has common interests with Division H (Interstellar Matter and the Local Universe) and with other Divisions. The Questionnaire’s last topic of inquiry was thus threefold: to establish the relative importance of enhancing interaction with Commissions hosted by our Division; enhancing

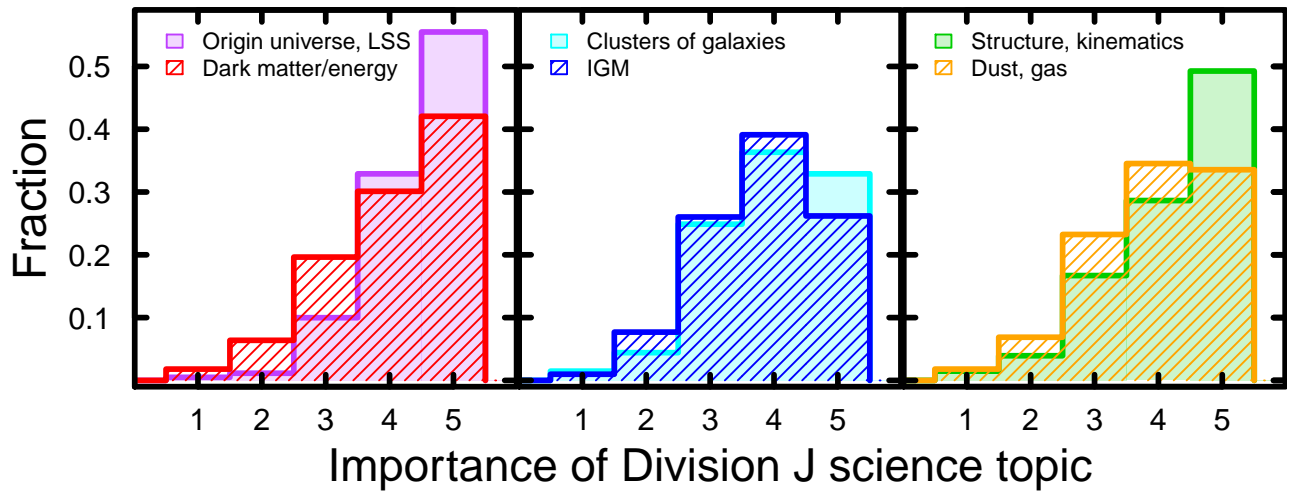


Figure 4: Fraction of participants rating the various science topics for Division J from 1 (unimportant) to 6 (extremely important). These include: (left panel) physical origins and evolution of the Universe, and the nature of large-scale structure (LSS), physics of dark matter and dark energy; (middle panel) formation and assembly of clusters of galaxies, structure and evolution of the intergalactic medium (IGM); (right panel) galaxy formation and evolution through the study of internal structures and properties of galaxies beyond the Local Universe, galaxy formation and evolution through the study of dust and gas content and kinematics.

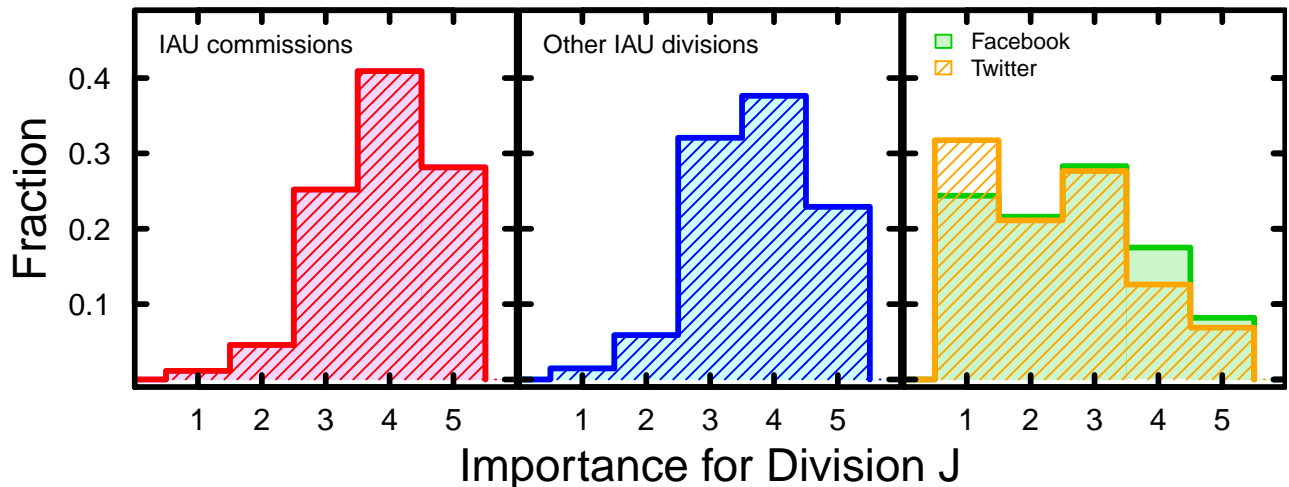


Figure 5: Left panel: fraction of participants rating the importance of enhancing interaction with Commissions from 1 (unimportant) to 6 (extremely important); middle panel: fraction of participants rating the importance of enhancing interaction with other divisions; right panel: fraction of participants rating the importance of social media including Facebook and Twitter.

interaction with other Divisions; and the importance of social media including Facebook and Twitter. Fig. 5 shows the results. While enhancing interactions with Commissions and other Divisions was considered important by $\sim 40\%$ of the respondents, neither was considered to be of the very highest priority (see left and middle panels of Fig. 5). The importance of social media (right panel) is apparently considered marginal. This was the only topic where the “least important” rating was favored; 30% of the respondents are of the opinion that social media are “not important” and only $\lesssim 10\%$ thought that social media are “extremely important”.

3 Summary of suggestions input as text

A number of commenters were positive about IAU's efforts in public outreach. Perhaps these efforts could be expanded or updated, particularly in countries with more limited resources. There were several suggestions for the Division to run a Facebook page or something similar, perhaps limited to members. One suggested hosting interviews on a website.

A few commenters believe that the IAU should be more involved in professional ethics, providing guidelines and best practices, for example to promote respectful interactions at conferences. One writer suggested IAU seek to make the astronomical profession more "family friendly".

The poll requested criticism of the IAU, and some was received. Some doubts were expressed about the purposes of the various IAU Divisions. The organization was criticized as being somewhat "artificial" and sometimes redundant. For example one respondent wrote: "There is little need for the IAU to coordinate science activity. Its purpose should be to promote astronomy, provide a definitive source of astronomical information, and define nomenclature and standards where required. This could be achieved with barely any activity at division level at all." One writer criticized the "mostly unnecessary bureaucratic hierarchy." Another suggested that the IAU "revisit the rationale for commissions and which commissions are useful to have."

One respondent wrote: "Astronomy needs stronger interaction between those working on special topics." Another advocated: "Promoting a new approach to conferences, with less talks and more debate on key questions in the field(s)." Some suggested closer working links with other organizations such as AAS and COSPAR, and possibly government officials.

Finally, a writer pointed out that polling IAU members is not an efficient way to find out what its deficiencies are as perceived by astronomers who have not chosen to join it. One respondent said that "one issue is that not all countries are as open regarding IAU membership as the United States."