

Part 4. The IAU and its history

Serving Astronomy: the Aim of the IAU

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Abstract. The IAU was founded in 1919 “to facilitate the relations between astronomers of different countries where international co-operation is necessary or useful” and “to promote the study of astronomy in all its departments”. These aims have led the IAU throughout the century of its existence, but the way it has tried to fulfil them has changed. We have tried to trace the changing role of the IAU in the international astronomical community through the twentieth century and into the twenty-first. The IAU has striven – occasionally struggled – to protect international scientific cooperation across the deep political divides that characterized the 20th century, while maintaining an important function in the context of the rapidly evolving science itself and the changing fabric of institutions involved in astronomy. We especially argue how the emphasis of the IAU’s activities has shifted from the first aim – facilitating collaboration by organizing meetings and defining common standards – to the second aim: promoting astronomy by outreach and development programs.

Keywords. History of astronomy, Sociology of astronomy. Scientific internationalism

1. Introduction

The IAU was founded in 1919 “to facilitate the relations between astronomers of different countries where international co-operation is necessary or useful” and “to promote the study of astronomy in all its departments”. These aims have led the IAU throughout the century of its existence, but they were formulated rather generally. The Union was not founded to coordinate a specific project, such as the *Carte du Ciel*, or to solve a concrete problem, such as its predecessor, the *International Union for Cooperation in Solar Research*, had done by standardizing stellar classification (DeVorkin 1981). One could say that the IAU was founded as a solution which still had to find its problems.

In this paper, we will analyse how the way in which the IAU has tried to fulfil its aims has changed. Especially in the last decades – say from the turn of the twenty-first century – the emphasis of its activities has shifted from the first aim to the second. Or, put in another way: the IAU has changed from providing a platform for scientific discussions to playing a more active role itself.

Instead of just asking, apart from ‘*what is the IAU for?*’, we will also discuss the closely related question ‘*who is the IAU for?*’ The answer has changed in the course of the Union’s century of existence. In its first period, one could describe the IAU as a parliament, consisting of representatives of national astronomical communities, who met to discuss issues of mutual interest. Today, the IAU aims to include the entire research community, not divided along national lines, and with increasing attention for the inclusion of more women as well as young researchers. The IAU’s representational functions are now mostly aimed at the outside world: the Union is acting as the representative

of the global astronomical community. Its audience is no longer just astronomers, but the entire world population, from policy makers to school-age children. This is a fundamental change in the way the IAU is serving astronomy – in an organization otherwise characterized by great continuity.

2. The first half-century

In Blaauw's impressive book on the history of the IAU in the first fifty years, the dominant theme of the first two decades is the issue of membership (Blaauw 1994). The IAU was founded as part of a group of international scientific organizations by the victors of the First World War, and explicitly excluded the former central powers, including the scientific superpower Germany. This issue was not resolved until after the Second World War (Blaauw 1994). But despite the interwar political controversies, the General Assemblies quickly became the main international meetings in astronomy.

Providing a regular platform for international discussions was the main way in which the IAU '*facilitated the relations between astronomers of different countries*'. This has remained the IAU's core activity throughout its existence. When triennial General Assemblies were not enough to keep up, Symposia were introduced. Their transactions are a testimony of front-line astronomical research in the past seventy years.

Most of the actual discussions were organized by active commissions. In the beginning, a list of 32 topics was drafted, reflecting the initial ideas of the founders of '*where international co-operation is necessary or useful*'. In many cases, the necessity of cooperating was indeed clear, including for example on lunar nomenclature or variable stars. The IAU also sponsored essential services such as the *Bureau International de l'Heure* and the *Central Bureau for Astronomical Telegrams*. The biggest cooperative project in astronomy at the time, the *Carte du Ciel*, was included in the IAU as Commission 23.

Not all topics were suitable for institutionalized cooperation, however. The members of Commission 1, on General Relativity, decided in 1925 that "*collective enterprises cannot, at the present moment, improve progress in the field of General Relativity*"; progress in this field was to be made by individual researchers (Fowler 1925, p. 13). In this case, international co-operation was neither necessary nor useful; the commission was terminated.

After the Second World War, one field emerged in which international cooperation was clearly necessary and useful. New front-line telescopes would be out of reach for individual institutions. In the hard post-war years, nobody could compete with the giant American telescopes, especially with the new 200-inch Hale telescope at Palomar Observatory. The IAU recognized this, and founded Commission 39: 'International Observatories', presided over by the Director of Harvard College Observatory, Harlow Shapley. The goal was for the IAU to organize common international telescopes, to be shared by the entire global astronomical community.

Pooling resources to build large telescopes indeed became common practice, but this became managed by dedicated organizations created for the purpose, such as ESO, and later space agencies such as NASA and ESA. Ad-hoc co-operations were also founded to build telescopes on favourable sites in, for example, Chile, Hawaii or the Canary Islands, where international 'telescope parks' were established in the course of the twentieth century. Commission 39 never played a role in this, however; it was terminated in 1955.

The IAU has tried several times more to find a meaningful role regarding new international research infrastructures, but it remained difficult; several commissions and working groups struggled with their missions. For example in 1994, a working group on '*Future Large Scale Facilities in Astronomy*' was founded, which was active for a while, but ten years later reported that activities in this field were '*becoming inherently international without external IAU-led promotion*' (IB 96, p. 10). Actual planning, funding and design

are discussed at other dedicated forums such as ASTRONET, where funding institutions and government representatives were included. As General Secretary Patrick Wayman put it: “*Seldom do IAU Commissions actually guide the procedures adopted in cooperative programmes, but a forum exists where the problems and desiderata can be discussed and the results presented, with a wide range of interested persons being able to take part.*” (GA 1982, p. 2)

Providing a forum may seem a rather modest, even passive, ambition – indeed it amounted to ‘facilitating’ rather than ‘promoting’ international cooperation. But in the turbulent twentieth century, creating a neutral platform for international exchanges was no mean feat. After a difficult start, from 1945 the IAU could organize truly international meetings with global participation, despite the Cold War and other conflicts. There were exceptions and incidents, most notably the cancelling of the Leningrad GA in 1951 and the withdrawal of China from 1959–82, but the mere existence of the IAU was undoubtedly a great good for the development of international astronomy.

For this reason, it was crucial that the IAU was seen as thoroughly neutral and apolitical. This was not always easy – in some cases, remaining silent was as difficult as speaking out, for example when astronomers were persecuted by their own governments. The IAU has always exercised great caution, generally, if not always, opting for silence rather than risking political involvement.

3. The members of the IAU

The IAU was founded as an inter-national organization, in the sense that its members represented different countries. These were (and are) often referred to as ‘member countries’, even though, as a non-governmental organization, it cannot have nations as members. Officially, its ‘adherent bodies’ were national scientific organisations such as Academies of Science, which could nominate representatives to the Union and its commissions. Debates about which countries could (and would) be represented dominated the first two decades of the Union’s history; after that all countries were eligible.

In practice, the General Secretary maintained an address list of all the national representatives, treating them as individual members of the Union. This individual membership was formalized in 1931, when individual members were given the right to vote in the General Assembly, apparently without much discussion. From then on, the IAU was the only scientific Union with individual members. They had to be nominated by the national adherent bodies, and accepted by the Executive Committee of the IAU. They did not have to pay any fees, and membership was for life. This is still how it works today. But there was one difference: initially, members were expected to contribute actively to one or more commissions. Commission members could also be recruited from non-member countries, thereby adding to the individual membership of the Union.

This meant that all IAU members were expected to have significant scientific expertise, and be willing to devote time to IAU issues. Membership brought not only rights, but also duties. It was clearly not for all astronomers. The selectiveness of membership was further reinforced by the fact that the commissions were supposed to be small, ideally having no more than 12 members (Blaauw 1994, p. 53). They were intended as active working groups, not as communities of researchers with shared interests. In other words: they were supposed to serve the astronomical community, not to include it. There was generally more worry about commissions and meetings being too large than too small.

Because of the limited number of member countries, and the selective nature of membership, the membership consisted mostly of senior professional astronomers from Western countries. The overwhelming majority was male; women in higher academic positions were rare. Among the small number of women were prominent names, however, and several were active in multiple commissions. In 1938, Cecilia Payne-Gaposchkin

was the only female official, as president of a subcommittee of Commission 25 (Stellar Photometry).

4. Controlling growth

The ideal of a small Union with only active members proved to be untenable. Already in 1946, Otto Struve wondered if the end of the Second World War might be a good moment to get rid of inactive members and even entire inactive commissions. Interestingly, Harlow Shapley objected, on the ground that some ‘*dead wood*’ on the committees ‘*is part of the diplomatic interchange*’ (Blaauw 1994, p. 138). These ideas represented contrasting views on the importance of membership. Struve’s proposals were not adopted, but he had clearly touched upon a sensitive issue: discussions about the size and functioning of the commissions would last well into the 21st century (Blaauw 1994; Andersen *et al.* 2019, IAU Archives).

In 1948 it was stipulated that members of the national committees of IAU member states would not automatically be members of the Union itself, in order ‘*not to unduly increase the membership of the Union*’ (Blaauw 1994, p. 172). The growth of the Union could not be controlled, however. In 1957, ‘general membership’ was introduced: from now on, one could be a member of the Union without belonging to any commission. The idea was that the Union could keep growing even while commissions remained small. When this also did not work, a different change was introduced in 1961: all commissions got an organizing committee, with a president and a vice-president. The idea was to make it possible to have larger commissions, without the risk that inactive members would slow down the work. Commission membership remained selective, however. All members were supposed to have ‘*the ability to contribute*’ to research on the topic, and they had to be confirmed by the Executive Committee.† Moreover, the number of commissions that one could be member of was limited.

The size of the General Assemblies also expanded rapidly. This could be interpreted as a sign of their importance and appeal, but not everybody was happy about it. Apart from the logistical challenges, the question was whether such meetings, with so many different sessions, could still be efficient. It became practically impossible to maintain an overview of what was going on in neighbouring fields. Besides, would it be possible to maintain the informal spirit of cooperation? IAU president Oort, who had attended all GAs since Rome 1922(!), confessed feeling uneasy about this at the opening of the GA in Berkeley in 1961: “*We must not run the risk that by an unwieldy size of our meetings the possibility of forming close ties and friendships is lost, or that some of our best astronomers refrain from attending because of disappointment about the too large meetings.*” (GA 1961, p. 19) His ideal apparently was to have intense exchanges between selected researchers, not to have gatherings of the whole research community (this ideal also explains why the social programme of the conferences was so important).

Apart from the size, there was also a lot of discussion about the content of the General Assemblies – too many presented papers, too many business meetings, and too little time for real discussions. In any case, triannual meetings of two weeks were not nearly enough to keep up with scientific developments after the Second World War. The IAU could easily have lost its scientific relevance to other, more frequent conferences. It did not, however, because the IAU kept cutting-edge scientific discussions ‘on board’ by establishing standard formats for smaller meetings: symposia and colloquia. Especially symposia, first organized in 1949 (though the official no. 1 was in 1953), became the prime scientific meetings. Interestingly, participation was by invitation only, a principle that was sometimes questioned, but never changed. Again, quality was valued over quantity.

† The debates are described in more detail by (Blaauw 1994); the documents are in (Arch 6).

All symposia and colloquia organized under the auspices of the IAU had to be approved by the Executive Committee, in part to limit their total cost to the Union, but also to ensure quality – and thereby enhance the authority and prestige of the IAU label. Because this was another function of the IAU: granting a seal of quality. On a different level, IAU-membership has helped astronomical communities in some countries to obtain political support for astronomy.†

When a former, present and future General Secretary presented revised statutes and by-laws in 2003, they stated that the ‘*underlying philosophy [of the old rules] was to control rather than to promote action*’ (IB 94, p. 32). That was a strong but fair assessment. Throughout the twentieth century, a lot of time and ink was devoted to controlling the growth of the Union. IAU membership, commission membership, and symposium proposals all required approval via complex procedures, which were explained in an ‘Astronomer’s Handbook’ in 1967. Members were also regularly informed of the procedures via the Information Bulletins.

5. New Roles

In 1946, the IAU founded Commission 38 ‘Exchange of Astronomers’, to support international exchanges of young astronomers, who otherwise could not afford international travel in the difficult postwar years. It was supported by UNESCO. About 70 exchanges were supported over the next ten years, including one between Jean-Claude Pecker and Cornelis de Jager, both future IAU General Secretaries. Later, the commission also tried to organize exchanges of lectures and professors, but those programmes struggled to find enough candidates (IB 45, for example).

In 1967, the same Pecker, by now one of the most active IAU-members, discussed the aims of the IAU in an advice to the Executive Committee. To the two aims mentioned in the statutes, he added two other ones: ‘*maintain[ing] the unity of astronomy against all kinds of centrifugal forces*’ and ‘*protecting astronomy against anything that might put limits to its development*’.‡

‘*Protecting astronomy*’ became an issue with the rise of radio astronomy, which required protection of certain radio bandwidths to prevent interference with observations. Some high-profile Cold War projects also threatened to interfere with observations. The IAU issued formal protests. Later, light and space pollution became recurrent issues. These were clear cases in which international astronomy needed an authoritative, unified voice.

Speaking with one voice was easy in the case of light and radio interference, but the unity of astronomy was not always self-evident, as Pecker’s other aim suggests. He referred to ‘*centrifugal forces*’, by which he probably meant fields of astronomy that threatened to develop into independent (sub-)disciplines. In the early years of radio astronomy, after 1945, it had not been immediately clear that this field belonged in the IAU, for example. Many of its pioneers were not astronomers but physicists and engineers, and many technological issues were debated in URSI (Sullivan 2009). Later, with the rise of space research, solar physics and solar system research became increasingly independent fields, with their own organizations and journals (Hufbauer 1989). The division of labour between the IAU and, for example, the International Union of Geodesy and Geophysics or COSPAR was also not clear-cut. Pecker suggested that the IAU statutes should include a proper definition of ‘astronomy’.

† This was for example mentioned in B. Hidayat in an interview by D. DeVorkin, 1971, *Oral History Project*, American Institute of Physics; see <https://www.aip.org/history-programs/niels-bohr-library/oral-histories/31248>; see also the interview with J. Bergeron in Andersen *et al.* 2019.

‡ J.C. Pecker to EC, 22 September 1967, IAU Archives (old part) II.14.D.10.

Because of the emergence of radio astronomy and space research, and the rapid development of optical and electronic technology, the astronomical community of the 1960s was different from the community that had founded the IAU half a century earlier. It was bigger and more diverse – that is, more diverse in terms of research topics and professional background, including physicists and engineers besides astronomers. The geographical diversity of the members also grew as more nations joined, but much slower; the Western countries remained dominant, with the United States providing about one quarter of all individual members (DeVorkin 1999, 98). The gender diversity hardly changed, with the fraction of women well below 10%.

There was little attention for issues of diversity at the time. They were hardly ever discussed, except perhaps in terms of the participation of young astronomers in IAU meetings. Various attempts to organize special activities for junior researchers failed, however. In 1970, the Executive Committee seemed ready to give up: “*The problem of young astronomers is largely exaggerated, as seen from the vain efforts of the Executive Committee to arrange special meetings for them during the General Assembly.*” (Arch 1A, Officer’s meeting 27-10-1970). Indeed, up to the 1990s many young astronomers kept regarding the IAU as an organization of and for senior scholars.†

One initiative to reach young astronomers was a great success, however: the *International Schools for Young Astronomers*, which were organized from 1967. The ISYAs were especially intended for talented graduate students from developing nations. The first ones were held in Britain (12 students) and Italy, but the next ones were organized in India, Argentina and Indonesia, with guest lecturers and researchers from all over the world. The number of participants varied, but it could sometimes be over 50. The annual ISYAs have been enormously important for young scholars from all over the world (Gerbaldi 2007, 2011).

The ISYA were supervised by Commission 46 Teaching of Astronomy, which had been founded in 1964. It also aimed to stimulate astronomy education at the high school level, for example by collecting educational material.

6. Promoting and representing astronomy

The exchange programmes and the *International Schools for Young Astronomers* signalled a new interpretation of the IAU’s task. Henceforth, the Union saw a task for itself in actively supporting individual astronomers. The ISYAs also demonstrated that the IAU gradually started to look beyond the traditional strongholds of astronomy in Europe and North America (the regional meetings that were started from the 1970s also promoted astronomy in other continents). Commission 46 gave a new meaning to the aim of ‘promoting astronomy’. Its involvement in ‘protecting astronomy’ meant that the IAU sometimes acted as the voice of international astronomy. These activities started during the Cold War years. Initially, these activities remained relatively small, however. From the turn of the century, they moved to central stage, becoming the main mission of the IAU in the twenty-first century.

The IAU started to adopt a more public role in the 1990s: in part by design, in part because it was forced to do so by unexpected developments. The planned activities included new educational activities such as the *Teaching Astronomy for Development* training programme, and more active involvement in fighting against light and space pollution. This latter activity led to increased involvement in the UN Committee on the *Peaceful Uses of Outer Space* (UNCOPUOS), in which the IAU obtained formal observer status in 1995. This was also the main international venue for discussing the hazards of Near Earth Objects, an issue that increasingly received attention after the end of the

† This is mentioned in several of the interviews in Andersen *et al.* (2019).

Cold War. A media scare in 1998, caused by a press release from the Minor Planet Center on the potential impact of 1997-XF11, put the issue on the top of the public and political agenda, however. The IAU, taken by surprise, started to develop a policy regarding NEOs, not least including a media policy.

In the same year 1998, the IAU also got caught up in another media storm, about the status of Pluto, which was regarded as a minor planet rather than a ‘real’ planet by some.† Again, the IAU was taken by surprise, to the point that General Secretary Johannes Andersen felt obliged to issue a press statement, saying that the planetary status of Pluto was not under discussion.

These issues forced the IAU to speak out in public, which did not come naturally to an organization that had always valued its neutrality. Even positive media attention had not always been seen as a good thing, as is illustrated by the note that General Secretary Luboš Perek sent to the Executive Committee shortly before the GA in Brighton in 1970: “Dear Colleague, Although none of us is very enthusiastic about newspapermen, some degree of publicity is unavoidable”.‡

One could say that the IAU embraced public attention in two stages, again one planned and one precipitated by external forces. From the turn of the century, the outreach and education activities were intensified. In 2000, the various activities in this field were reorganized into a renewed Commission 46, but the main impetus came from another direction: IAU-president Franco Pacini’s initiative to organize an *International Year of Astronomy* in 2009. Coordinated by a central working group located at ESO, the IYA developed into the largest outreach project ever (Russo and Christensen 2010). At the initiative of George Miley, the success of the IYA was translated into the Strategic Plan for 2010–2020, which put outreach and development at the centre of the Union in the next decade. Since then, the IAU has opened three dedicated professional offices: *Astronomy for Development* (South Africa, 2011), *Outreach* (Japan 2012), and *Young Astronomers* (Norway, 2015). An office for Astronomy Education is being planned.

While the preparations for the IYA were still in progress, the IAU suddenly found itself as the subject of more media attention than any outreach activity could mobilize: the Great Pluto Controversy of 2006. After the 1998 Pluto incident, public attention was expected, but its intensity still took many by surprise – as did the intensity of the discussion among the attendants of the General Assembly in Prague. It was a major turning point for the Union. Many people who had never heard of the IAU before, now came to know it as the organization that had ‘demoted’ Pluto.

In the IYA, the IAU could represent astronomy on its own terms. The public attention was organized; the IAU could control its message. In the Pluto ‘affair’, the inner workings of the Union itself were publicly criticized. This made a deep impression. The more recent public naming campaigns for exoplanets can be seen as a direct result of this (Arch 35). The Union tried to regain the initiative by embracing public participation (albeit to a point, of course). One of the traditional scientific core tasks of the IAU, coordinating nomenclature, was now also connected to public outreach.

The IAU also fully embraced growth. In 2003 the last remnant of the effort to limit growth was abolished: from now on, one could be member of more than three commissions (this was later changed: one could be member of an unlimited number of divisions, not commissions). More importantly, the outreach and development activities were now explicitly connected to growth. Supporting countries to full IAU membership was the ideal. The number of national members kept growing, to 73 in 2018.

† Much has been written about the Pluto debates of 1998 and 2006. A good, concise overview is presented by Dick (2013).

‡ L. Perek to EC, 6 March 1970, IAU Archives (old part) I.14b.F.

Efforts to stimulate diversity among the membership also gradually increased. The underrepresentation of women in the IAU became a topic of explicit discussion from the 1990s. It was discussed at the GA in 1988, where 200 astronomers signed the ‘*Baltimore Declaration*’ which called for a scientific culture in which both men and women can thrive, but in 1991, a proposed discussion at the GA in Buenos Aires was still judged ‘*too political*’.[†] At later GAs, meetings on the role of women in astronomy became a standard part of the programme, however. Several incidents in 1991–92 triggered a more structural debate (Arch 34). For example, women were underrepresented in invited lectures, even compared to the percentage of membership. Thus only two of the 15 invited discourses at General Assemblies from 1973 to 1991 had been delivered by a woman (Vera Rubin and Alla Masevitch in 1985, the latter being a last-minute replacement for Roald Sagdeev).

The percentage of women among the members grew slowly but steadily, from just above 10% in 1993 to 17% in 2018. They were above-average active, however: at General Assemblies, the percentage of female participants (though not of presenters) is routinely about 30%, and the representation among officials is also significantly higher (Cesarsky 2010; Débarbat 2004). Similarly, young researchers are now more actively approached, for example with ‘young astronomer lunches’ at General Assemblies. In 1993, only 28% of the members were less than 45 years old; almost 40% were between 45 and 55 (IB 70). Since then, dedicated meetings have become common. In 2018, a new category of ‘junior members’ was introduced, with 350 junior members joining the Union.

7. Conclusion

In 2012, IAU President Robert Williams wrote that “*The IAU is going through a period of transition, from an organization that historically has maintained a largely internal focus emphasizing meetings and events for its members, to one that is becoming more involved in education and outreach to the general public.*” (GA 2012, p. 1) Indeed, the Union has changed more in the past two decades than in any period before. The answers to two simple but fundamental questions, ‘*what is the IAU for*’ and ‘*who is the IAU for*’, have changed.

The IAU retained all its previous roles, but a new role demanded most of the attention. At the foundation of the IAU in 1919, one of the two aims of the Union was stated to be *to promote the study of astronomy in all its departments*. In the 21st century, this aim got a whole new dimension. From now on, the IAU presented itself as the global representative of astronomy, both within the scientific community and among a wider public. This is reconfirmed in the ambitious second Strategic Plan (which also calls for a renewed effort to give the IAU a role in coordinating new large facilities).

During the first half of its existence, the IAU members acted as representatives of a wider community. Today, the IAU aims to include the entire community, including those who are just starting their careers. With nearly 12 500 members in 2018, the IAU includes most senior professional astronomers in the world. The GA in 2018 added 350 junior members and 850 ordinary members to that number. The number of member countries is expected to keep rising, aided by the various development programs. There are still more countries outside than in the IAU.

With over three thousand participants – a sizable share of the global astronomical community – the General Assemblies are still the main astronomical conferences. Since 2000, there have been GAs in all continents except Africa, which will host the GA in 2024. In the meantime, the symposium series – the ‘scientific flagship’ of the IAU – is as active as ever. You are reading the transactions of the 349th one.

[†] Interviews with J. Bergeron and D. McNally in Andersen *et al.* (2019).

8. Discussion

DÉBARBAT: You have not mentioned that in 1994, in the GA in the Netherlands, a special session was organized by Commission 41 History of Astronomy concerning 75 years of the IAU, and all Presidents and General Secretaries being present at the IAU GA had been invited.

BANEKE: Indeed – that was then Blaauw’s book was presented. As far as I know, no proceedings were published, but many past Presidents and General Secretaries have published brief reminiscences in the Information Bulletin no. 104 (2009) and no. 100 (2007) respectively. Those and similar publications are very useful sources for our book.

MONTMERLE: If you want to understand the changes in the IAU and especially its commissions, you have to take the growth of the membership into account. It is very important to realize how many more members there were, and how big the commissions grew over time, from a handful of members to hundreds per commission.

BANEKE: Certainly. But the growth had different backgrounds. After 1945, the number of members grew because of the growth of the discipline, with the start of radio astronomy, space research, etc. After a few decades, the growth slowed down a bit, and from the end of the twentieth century it accelerated again. That is in part because the astronomical community was still growing, but I think it was also because of the changing ideas about who within that community should become a member.

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