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International Schools for Young Astronomers (ISYA): a programme of the International Astronomical Union

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Abstract. This paper outlines the main features of the International Schools for Young Astronomers (ISYA), a programme developed by the International Astronomical Union (IAU) in 1967. The main goal of this programme is to support astronomy in developing countries by organizing a school lasting 3 weeks for students with typically a M.Sc. degree. The context in which the ISYA were developed has changed drastically over the past 10 years. We have moved from a time when access to any large telescope was difficult and mainly organized on a national basis, to the situation nowadays where data archives are established at the same time that any major telescope, ground-based or in space, is built, and these archives are accessible from everywhere. The concept of the virtual observatory reinforces this access. However, the rapid development of information and communications technologies and the increasing penetration of internet have not yet removed all barriers to data access. The role of the ISYA is addressed in this context.

Keywords. IAU Programme: International Schools for Young Astronomers (ISYA).

1. Introduction

The programme *International Schools for Young Astronomers,* hereafter named ISYA, was developed by the International Astronomical Union (IAU) in 1967 under the auspices of IAU Commission 46 *Astronomy Education & Development*. We first describe the creation of this Commission in 1964 and the ISYA programme in 1967. Then we present the objectives and the organization of these Schools from 1967 to 1990. The context in which the ISYA was created has changed over the past ten years, mainly due to the information technology and communications revolution. We depict this evolution from 1992 to 2006. An assessment of the impact of the ISYA is given and the conclusion addresses the new horizon for this IAU programme.

2. IAU XIIth General Assembly in 1964

2.1. *Creation of Commission 46 on The Teaching of Astronomy*

During the XIIth IAU General Assembly, helded at Hamburg in 1964, one of the Special Meetings organized was on *The Teaching of Astronomy* (Transactions of the IAU, vol. XIIB, page 629, 1964). In the preliminary report published, M. Minnaert concluded the discussion (Transactions of the IAU, vol. XIIB, page 648, 1964) with two proposals. The first of proposal was that: "The Members of the International Astronomical Union, present at the Hamburg meeting on the Teaching of Astronomy, strongly recommend to the Executive Committee to organize a Commission of the Union on this subject."

This Commission was created as a Commission of the Executive Committee, with E. Schatzman being the first President for the period 1964–1967.

2.2. *Summer Schools for Young Astronomers*

During the same meeting, V. Kourganoff expressed his views on the "International cooperation in the domain of astronomy teaching, including the training of the astronomers" (Transactions of the IAU, vol. XIIB, page 637, 1964). As a follow up of this discussion a meeting was organized in July 1965 in Nice (France) to discuss the creation of an International School for Young Astronomers, its organization and its funding. The aim of such a School would be to give to young astronomers an intensive training in astronomy and astrophysics during a 3-month period, rather similar to the one that could be given in a university over a longer period. The students would then spend one year in an astronomical institution to receive more practical and theoretical training (Transactions of the IAU, vol. XIIIA, page XCV, 1967). A questionnaire was sent to many institutions around the world on their potential level of involvement in this project in terms of the proposed 3-month school or 1-year training programme. More than 20 supportive replies were received. At that date already 6 Schools were foreseen. The first IAU Summer School took place in Manchester (UK) in 1967 with funding by UNESCO. The General Secretary of the School was J. Kleczek; he was appointed by the IAU Executive Committee.

3. The first Summer Schools for Young Astronomers

3.1. *1967 in Manchester: the first Summer School for Young Astronomers*

During the XIIIth IAU General Assembly in 1967, in Prague, J. Kleczek reported on the first Summer School for Young Astronomers organized at Manchester University (UK) over a period of six and a half weeks (Transactions of the IAU, vol. XIIIB, page 229, 1967). Twelve students participated in this School (India: 3, Egypt: 2, Portugal: 1, USA: 1, Romania: 1, Czechoslovakia: 1, Poland:2 and Netherlands: 1). The infrastructure was offered by the host country of the School. The advantage of having a few well prepared students joining these Summer Schools for the benefit of the other students was emphasized. This remark has always remained valid. For one or two young astronomers, these early Schools were followed up by a stay of one year at another institution.

3.2. *From 1967 to 1970: four Summer Schools for Young Astronomers*

With the financial support of UNESCO, the IAU and the host countries, four International Schools for Young Astronomers were organized consecutively: Manchester (UK) in 1967, as already mentioned, then Arcetri (Italy) in 1968, Hyderabad (India) in 1969 and Córdoba (Argentina) in 1970. Reports on these early ISYA can be found in the Transactions of the IAU (vol. XIVA, page 563, 1970 and vol. XVA, page 719, 1973). The respective durations of these Schools were: 6.5 weeks, 8.5 weeks and 8 weeks for the last two. Their numbers of participants were, respectively, 12, 10, 23 and 21. The UNESCO Department of Environmental Sciences had allocated funds to the IAU for the organization of these Schools.

The comments by J. Kleczek are reproduced here from the relevant IAU Transactions (vol. XIVA, page 563, 1970):

> *"In organizing the schools in Manchester and Arcetri young astronomers from various countries were bought to an observatory to work with local lecturers and instruments. At Hyderabad, on the contrary, a new scheme was tried, namely to bring foreign lecturers and experienced research workers to an Observatory which, with newly acquired telescopes, is developing its astronomical research programmes.*

The scheme was effective and it has the advantage that the experienced astronomers can help the host Institute to plan future research programs."

This scheme became the rule for the future ISYA and constitutes one of its defining characteristics.

4. From the 1st ISYA in 1967 to the 18th in 1990

After such a promising beginning the ISYA became a regular programme of Commission 46. The prescription to organize an ISYA was clearly defined in the *IAU Transactions* vol. XVA, page 718, 1973).

> The Commission propose to organize each year an ISYA of about 8 weeks duration for promising young scientists from developing countries and institutions.
> The purpose of these schools is to give a concentrated expert instruction and training in special topics of modern astronomy to a number of selected young astronomers or physicists with or without a graduated degree who otherwise would not have such opportunities available to them.
>
> The schools would be organized on a regional basis. They would be held at a suitably equipped Observatory in a location of good atmospheric conditions, thus allowing ample time for the practical training of the students at the telescope. The most convenient period of time for holding a school would be fixed by the host institution.
>
> The teaching staff would be supplied mainly by the host Observatory, but some outstanding specialists from other countries would be invited to teach a course during a limited period of time. The number of participating students would depend on the available teaching facilities (astronomical instruments, assistants and teaching staff).
>
> The activity of the schools would consist of regular lectures, practical training, seminars informal discussions and study hours.

Not all the above requirements could be fulfilled. Unfortunately, in 1971 the UNESCO funding stopped. In view of the importance and usefulness of the ISYA, the IAU Executive Committee decided to allocate funding which would allow the organization of one ISYA during the triennium 1970–1973, with preference for holding the School in a developing country. The Schools therefore continued with IAU support alone, but as the available IAU funding was much less than previously obtained from UNESCO, the number of participants, the number of teachers and the duration of the Schools were drastically reduced by half compared to the earlier ISYA.

Table 1 lists the 18 ISYA organized up until 1990. The relevant information was taken from the IAU Transactions. This provides information, when available, on the total number of participants (first figure in the last column), the number of foreigners (f) and the number of different nationalities (n). The ISYA in Argentina was on the theme *Physics of Solar Plasmas, the Sun and Interplanetary Medium and Solar Energy*; it consisted in fact of three parallel schools and it was also funded by the Argentinian Commission Nacional de Estudios Geoheliofisicos. From 1979 until 1990 the ISYA received partial financial support from the UNESCO via ICSU.

Table 1. List of the ISYA from 1967 to 1990

No	Date	Location	Duration (weeks)	Participants
1	1967 March	U.K., Manchester	6.5	12 (12f, 8n)
2	1968 June-July	Italy, Arcetri	8.5	10 (10f, 7n)
3	1969	India, Hyderabad	8	23 (5f, 5n)
4	1970 Oct-Nov	Argentina, Córdoba	8	21 (5n)
5	1973 July-Aug	Indonesia, Lembang	4	8 (3f, 4n)
6	1974 May	Argentina, San Miguel	4	60 (21f, 7n)
7	1975 Sept	Greece, Athens/Thera	4	74 (35f, 16n)
8	1977 Nov	Brazil, Rio	4	29
9	1978 Aug	Nigeria, Nsukka	3	28
10	1979 Sept	Spain, Tenerife	2	36 (7n)
11	1980 Sept-Oct	Yugoslavia, Hvar	3	25
12	1981 Aug-Sept	Egypt, Cairo	3	28 (9n)
13	1983 May-June	Indonesia, Lembang	3	21 (5n)
14	1986 Aug	China, Beijing	3	52 (6n)
15	1986 Sept	Portugal, Espinho	3	30 (19f, 7n)
16	1989 Aug	Cuba, Havana	2	55 (23f, 6n)
17	1990 May-June	Malaysia, Kuala Lumpur and Melaka	2.5	27 (11f)
18	1990 Sept	Morocco, Marrakesh	2.5	53

5. Objectives and organization of the ISYA

An ISYA is always oriented towards developing countries and takes place in these countries. Nevertheless, an ISYA takes place in countries and universities with a reasonably long-term interest in astronomy to sustain further development. During an ISYA there is no donation of research equipment, such as telescopes, for example.

The main goals are:

- to broaden the point of view of the students – a young astronomer should not only stick to a single, very specialized, branch of astronomical research;
- to fight against the isolation of the "lonely astronomer";
- to initiate collaboration on a larger geographical scale.

An ISYA is organized through an agreement signed between the IAU and a host university, and this is often linked to a development project, such as the establishment of a new astronomy department, the installation of a new telescope, etc.

The main financial conditions are as follows:

- the IAU pays for the travel of the faculty members and all the participants
- the host country pays for the stay of the faculty members and all the participants and provides the facilities for the school.

The duration of an ISYA is currently 3 weeks, which is the minimum time needed for the participants to become accustomed to speaking and debating in English and in public. The lecturers are asked to stay as long as possible in order for the participants feel at ease to communicate with them.

Normally, there are 8–10 lecturers, of which 3–4 come from the host institution and 4–5 are visiting foreign faculty members. The topics covered during an ISYA are chosen by the host institution in close collaboration with the Chairperson of the IAU ISYA programme.

The number of students who can participate in an ISYA depends mainly upon financial considerations. There are about 30 to 45 participants from, on average, 10 different

Table 2. List of the ISYA from 1992

No	Date	Location	Duration (weeks)	Participants
19	1992 Aug	China, Beijing and Xinglong Observatory	3	30 (17f, 12n, 9w)
20	1994 Jan	India, Pune	3	35 (25f, 13n, 11w)
21	1994 Sept	Egypt, Cairo and Kottamia Observatory	3	41 (12f, 13n, 10w)
22	1995 July	Brazil, Belo Horizonte and Serra Piedade	3	38 (19f, 11n, 15w)
23	1997 July	Iran, Zanjan	3	38 (14f, 8n, 12w)
24	1999 Aug	Romania, Bucharest	3	41 (18f, 9n, 22w)
25	2001 Jan	ChiangMai, Thailand	3	36 (17f, 9n, 6w)
26	2002 Aug	Casleo, Argentina	3	28 (14f, 9n, 10w)
27	2004 July	Al Akhawayn, Morocco	3	29 (18f, 13n, 9w)
28	2005 July-Aug	INAOE, Mexico	3	46 (20f, 10n, 18w)

countries in the same geographical area. The participants' background is typically that of a M.Sc. degree, but it ranges from fresh graduates to more experienced PhD students.

During an ISYA there are lectures as well as practical computer-oriented activities – both are considered equally important. Participants also give talks: for most of the students it is the first time that they have the opportunity to give a talk on their research, in English, in public and in front of foreign specialists.

An ISYA can be characterized by a large collage of astronomical and cultural backgrounds among the participants and the lecturers, which makes it so rich and fruitful.

6. From the 19th ISYA in 1992 to the 28th ISYA in 2005

Table 2 lists of the last ten ISYA. This provides information on the number of foreigners (f), the number of different nationalities (n) and of the number of women (w). From 1992 to 1997, Don Wentzel (USA) and Michèle Gerbaldi (France) were, respectively, the General Secretary and the Assistant General Secretary for these Schools and since then Michèle Gerbaldi (France) and Ed Guinan (USA) have been the Chairperson and the Vice-Chairperson, respectively, for this Programme Group of Commission 46.

The ISYA were still financially supported by the UNESCO (through ICSU) up until 2000. The ISYA in Argentina in 2002 took place during an economic crisis in that country. Nevertheless this ISYA was organized thanks to significant financial support given by UNESCO-Paris and the IAU. Subsequent ISYA were funded only by the IAU.

7. From 1992: a new context for the ISYA and their evolution

We are entering into a *computerized world*. Large astronomical databases now organized routinely by the space agencies and by all the major ground-based observatories. The first database to be so organized and accessible by anybody without restriction was the International Ultraviolet Explorer (IUE) Archive, created by the European Space Agency (ESA). This is the corner stone of a new context characterized by:

- the fast development of observational databases
- web access to publications in electronic form.

It should be noted that web access does not necessary imply easy access to on-line catalogues such as those at the CDS (Centre de Données Astronomiques de Strasbourg) or to the software needed for relevant data analysis.

Since 1995 the practical activities developed during the ISYA have been increasingly computer-oriented, to query the relevant databases and to develop the awareness of the participants towards the concept of "database mining" in order to overcome the general perception in a developing countries that *research in astronomy is not possible without access to a large telescope.*

The organization of any ISYA requires:
- computers and internet access;
- a large bandwidth (i.e. fast) link to query the databases
- access to electronic publications.

These points imply that an ISYA cannot be organized in a location that is too remote: hence a university or a national observatory is becoming the rule. However, we still have to face the long standing problem of the cost of the access to recent publications, whether in print or electronic form. This question has no solution on a short-term basis. What is lacking, very often, is the large Internet bandwidth and fast speed.

It should be mentioned that there are more and more "summer schools" organized by various institutions but they usually differ from ISYA in the following significant ways (which are important if we consider the goals of the ISYA):
- shorter in duration (one to two-weeks);
- more specialized towards doctoral students or recent postdocs;
- only national in some cases;
- students not fully funded.

Nowadays we also have to face to the greater mobility of students and their demand for mobility in their training years. This is integrated into the ISYA programme by having lecturers from Institutions which offer M.Sc. or PhD programmes.

The consequences of such evolution are that an ISYA cannot take place in a location that is too isolated. The last 3 ISYA were respectively organized
- in 2002 at El Leoncito (San Juan), the Argentinian National Observatory, which has excellent communication facilities as well as offering the possibility to do observations; with a 2-m telescope,
- in 2004 at Al Akhawayn University (Ifrane, Morocco), where the computing facilities were highly appreciated;
- in 2005 at INAOE in Mexico, the leading country in Central America for astronomical research where various programmes M.Sc. and/or PhD are offered in several Mexican universities.

8. Impact of the ISYA programme

We do not repeat here the detailed analysis done by D. Wentzel in 1996. We simply quote the key points which are addressed by an ISYA.

8.1. *What do the students get out of an ISYA?*

- a much broader perspective on astronomy and how science works;
- practice in asking penetrating and challenging questions;
- lecture materials and reference addresses;
- (professional) friendships;
- practice in spoken English;

Fig. 1 displays the home countries of the participants of the 28th ISYA in Mexico, at INAOE, showing how a regional network will be created, among the participants.

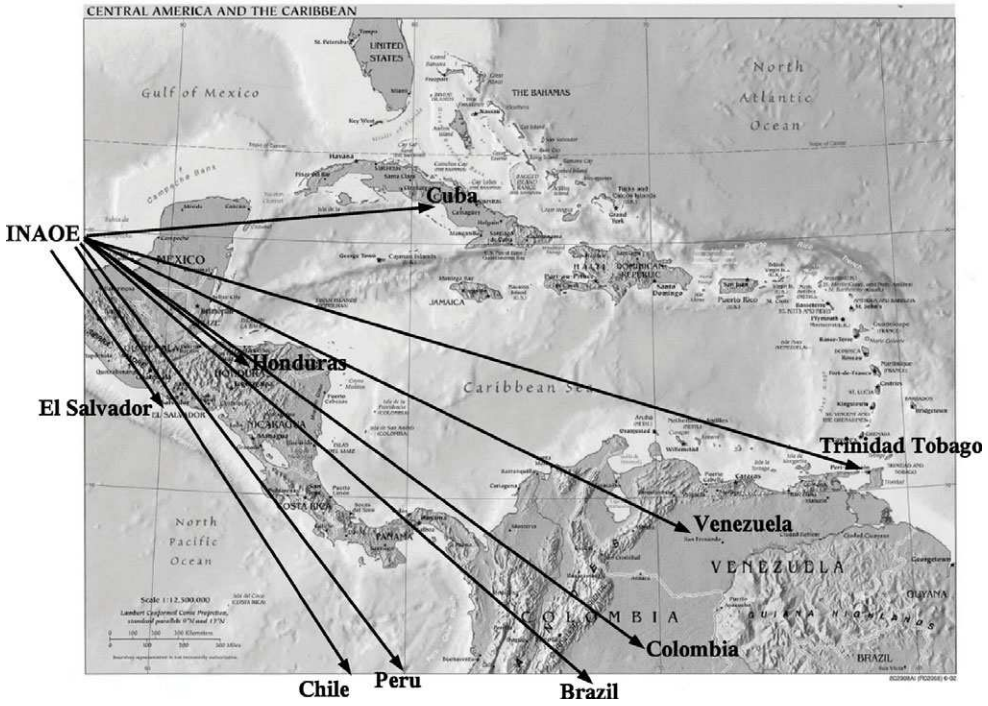

Figure 1. Location of the foreign participants at the 28th ISYA at INAOE (Mexico). (Map from PCL collection, by courtesy of the university of Texas libraries, Austin, USA)

8.2. *What does the host institution get out of an ISYA?*

- recognition
- starting a group of astronomy students
- broadening the training of astronomy students and young researchers in the host country
- exposure for the host institution and its development projects

The long-term impact of the ISYA is measured through evaluations of each ISYA done 3 to 4 years later through a questionnaire by e-mail, with a reply rate of 30% to 40%. Without a doubt, the ISYA are worthwhile for the participants and the ISYA have benefited astronomy as a whole. We quote one of many the comments received from students: *"We learned not only useful astrophysics, but also had the chance to interact with some of the more advanced researchers in the field."*

9. New horizon and conclusion

Today the *lonely astronomer* is also the one who is not associated with an international project. The development of the concept of the virtual observatory (VO) will induce, even more, the decentralization of research and will allow individuals to develop their expertise and competence in the international research arena. The objective of the ISYA is to introduce more young researchers into the international domain, but without cutting them from off their roots by, among other, offering them the possibility to start their network of scientific contacts in the context of their own national environments.

To participate in an ISYA is a critical moment in a student's life:
- a crucial cross-roads: research career or not ?
- the right time to do her/his astronomical check-up.

To become a scientist is not an easy task and to participate in an ISYA is one way to contribute to this goal. It allows students to become more confident to discuss their ideas with others, outline research projects, and build international relationships.

Acknowledgements

It should be emphasized that no ISYA could take place without all the faculty members who participate, giving so freely their time and energy to make a success of these Schools. It is my great pleasure to acknowledge the IAU Executive Committee members and more especially the IAU General Secretaries who have supported this programme over the years. Ed Guinan, Vice-Chairperson of the ISYA programme, is warmly thanked for his help as well as for the friendly atmosphere during those years in which we worked together on this programme.

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