

Report of Activities  
28th International School for Young Astronomers  
Itziar Aretxaga (28th ISYA Chair Organizer)  
1st of October 2005

**Introduction**

The International School for Young Astronomers (ISYA) is an initiative of the International Astronomical Union (IAU) to reinforce and promote the development of professional astronomy in communities around the world. The ISYA places a special emphasis on students located in areas that do not have the benefit of a local research institute that teaches most of the sub-disciplines of astronomy. The ISYA combats isolation by bringing together these students and providing them with contacts among the professional astronomers in their own country or in neighbouring countries.

The Instituto Nacional de Astrofísica, Óptica y Electrónica (INAOE) sent a letter of intent in May 2003 to the IAU Executive Committee expressing its interest in organizing the school during the summer of 2005. INAOE's interests in hosting an ISYA were to offer a top-level series of introductory lectures to its own students and to the ISYA students, to promote the institute as an attractive place to enrol in Graduate School for Mexican as well as for other American students, and to increase the awareness of the Latin American and Caribbean communities about their major astronomy projects, such as the Large Millimeter Telescope (LMT, <http://www.lmtgtm.org>).

The IAU Executive Committee selected INAOE to host its 28th ISYA school between the 25th July and the 12th August 2005. The IAU agreed to provide transportation to students and professors, and INAOE agreed to host the school in its Tonantzintla campus and to cover accommodation and catering expenses for the school. In addition to the IAU and INAOE, the 28th ISYA school was also supported by the Instituto de Astronomía de la Universidad Nacional Autónoma de México (IA-UNAM), which offered its housing on the adjacent UNAM campus, and the support and staff for the 1m telescope that was used during the school by the students.

We expected to receive about 100 applications to attend this school from graduate and final-year undergraduate students in the Americas, and especially from Latin American and the Caribbean countries, out of which we

could select the best 30. The school was aimed to cover a wide range of topics in theoretical and observational astronomy, from Planetology to Cosmology, through lecture courses, and practical laboratories on observational techniques and data mining, which were also supported with observations using the on-campus 1m telescope, and a visit to the LMT and other on-campus facilities . All these activities were to be led and supervised by our international team of professors.

### **Announcement of the 28th ISYA**

An announcement was made to the international community to encourage students to submit applications to the school. The means of announcing the school ranged from traditionally air-mailed letters and posters to Latin American and Caribbean research and educational institutions, to e-mails to the national representatives of the IAU, astronomy associations and individuals, and the posting of a public web-page (<http://www.inaoep.mx/~isya28>) linked by the IAU, INAOE and UNAM servers. A web-link to this page was also included in the International Astronomy Meeting List of the Canadian Astronomy Data Center.

The ISYA web page was monitored with a web analysis tool. From the 4th May 2004, the date of the page posting, to the 31st January 2005, the deadline for reception of applications by potential students, the 28th ISYA web page received 5735 hits, and its application form 2340. The break-down of the hits by country is listed in Table 1. A quick look at this table shows that the school was widely noticed by the Latin American and Caribbean communities with developed or developing astronomy research groups, but it was ignored by countries with no record of astronomy research groups or individuals. All the American countries listed in the table were targeted by air-mail or e-mail, with the exception of the USA and Canada.

We also note that the ISYA page was hit by individuals in non-American countries, especially in developed countries, but also in countries with developing astronomy groups or with no record of astronomy research group (Bulgaria, Egypt, Slovakia, Thailand, Algeria, Romania, Malasya, Kuwait, Saudi Arabia, Jordan, Nepal, Mongolia, Nigeria, ...).

### **Student Selection**

Applications to attend the school were received through the school web-

Table 1: Number of hits and percentage of hits received by the 28th ISYA page, and by the application form. Countries in the American continent are listed individually, and non-American countries are grouped by continent.

Origin	<i>N</i>	%	<i>N</i>	%
Mexico	1976	34.5	620	26.5
USA	592	10.3	210	9.0
Argentina	393	6.9	285	12.2
Brazil	380	6.6	310	12.9
Chile	149	2.6	101	4.3
Venezuela	101	1.8	79	3.4
Colombia	69	1.2	51	2.2
Peru	62	1.1	50	2.1
Uruguay	53	0.9	25	1.1
Canada	50	0.9	11	0.5
Trinidad & Tobago	17	0.3	16	0.7
Nicaragua	17	0.3	11	0.5
El Salvador	14	0.2	33	1.4
Cuba	14	0.2	12	0.5
Ecuador	13	0.2	8	0.3
Costa Rica	5	0.1	2	0.1
Guatemala	5	0.1	4	0.2
Puerto Rico	4	0.1	0	0.0
Bolivia	4	0.1	0	0.0
Panama	2	0.0	1	0.0
Europe	1204	21.0	300	12.8
Asia	388	6.8	163	7.0
Africa	51	0.9	18	0.8
Oceania	44	0.8	4	0.2
Unknown	127	2.2	35	1.5

Table 2: Number of received ( $N_r$ ) and accepted ( $N_a$ ) applications by country, and corresponding percentages.

Country	$N_r$	%	$N_a$	%
Mexico	43	27.9	29	59.1
Brazil	27	17.5	3	6.1
Argentina	23	14.9	0	0.0
Chile	10	6.5	3	6.1
Venezuela	5	3.2	3	6.1
Peru	5	3.2	2	4.1
Cuba	3	1.9	2	4.1
Trinidad & T.	3	1.9	3	6.1
Colombia	3	1.9	2	4.1
El Salvador	3	1.9	1	2.0
USA	3	1.9	0	0.0
Honduras	2	1.3	1	2.0
Ecuador	2	1.3	0	0.0
Nicaragua	2	1.3	0	0.0
Asia	7	4.5	0	0.0
Europe	6	3.9	0	0.0
Africa	1	0.1	0	0.0

page, which was designed to create an electronic database that collected the applications and letters of reference of the candidates. The final number of applications received by the school was a total of 154.

The student selection committee was integrated by Michèle Gerbaldi (Chair of the ISYA Programme) and Itziar Aretxaga (28th ISYA Chair Organizer). The selection criteria were based on the track record and commitment of the students to follow a career in astronomy and on the guidelines of the ISYA Programme to favor students in isolated locations within America. Students with completed BSc degrees were also favored over undergraduate students, but a few students that were in the final stages of graduation were also selected, especially in the cases when they were conducting a final research project for graduation and also had strong recommendation letters. The selection committee reserved a quota for IA-UNAM students, the 28th ISYA

Table 3: Number of received ( $N_r$ ) and accepted ( $N_a$ ) applications from Mexican institutions

Institute	$N_r$	$N_a$
INAOE	18	18
IA-UNAM (CU)	10	4
IA-UNAM (Ensenada)	5	3
U. Guanajuato	3	2
U. Sonora	2	1
CRyA-UNAM	1	1
U. Guadalajara	1	0
Tec. Monterrey	1	0
U. Veracruzana	1	0
U. Zacatecas	1	0

co-organizing institute, which did not fulfill the isolation selection criteria. All INAOE students were accepted without selection, as the housing constraint did not apply to them, and all of them were inscribed in a MSc or PhD programme. The number of INAOE students did not impact the total number of non-INAOE students that the school could accommodate (30).

The total number of accepted students was 49, out of which we had 3 drop-outs, 2 from INAOE and 1 from IA-UNAM (CU, Mexico City), as these students could not finally attend the whole school due to last minute professional or personal commitments. The oversubscription of the school was thus a factor of  $\sim 4.4$  (excluding INAOE applications).

Table 2 lists the number of applications and successful applications by country of inscription of the candidate students, and the corresponding percentages of applications and selected students. Table 3 lists the number of applications and successful applications for those students coming from Mexican institutions. In the appendix, we list the names of the individual students and their host institutes and countries.

The gender split in the population of students was 40% female and 60% male.

Apart from the official students of the school, the auditorium and lectures was also open to non-inscribed INAOE students and staff. There were about

5 additional astronomy and instrumentation students that regularly attended the lectures as external students.

### **Organizing Committee and Support Technicians**

The organization of the 28th ISYA was possible thanks to the devoted Local Organizing Committee chaired by Itziar Aretxaga (INAOE), which also included Alberto Carramiñana (INAOE - Head of the Astrophysics Dept.), Esperanza Carrasco (INAOE), José Franco (IA-UNAM – Director), José Guichard (INAOE – General Director) and Francisco Soto (INAOE – Research and Teaching Director). The LOC secured the local funding, and planned and supervised the running of the school.

The organization could not have been possible without a hard-working team of technicians, secretaries and support personnel, which included:

- Rosario Sánchez, INAOE, secretary of the 28th ISYA
- Carmen Meza, INAOE, secretary (visas)
- Ángeles López, INAOE, computing support technician (linux)
- Gustavo Hernández, INAOE, computing support technician (windows)
- Miguel Martínez, INAOE, Head of the Computing Support Dept. (networking)
- Nacho Pani, IA-UNAM, 1m OAN telescope operator
- Gabriela López, INAOE, graphical design (general)
- Germán Santos, INAOE, graphical design (posters)
- Gorgonio Cerón, INAOE, Head of Logistics, with 3 of his team members (catering/acoustics/photography).
- Héctor López, INAOE, computing support technician (application database)
- César Arteaga, UMass/LMTO (LMT visits)
- Guadalupe Rivera, INAOE, Head of Public Relations (outreach, cultural programme)

### **Professors and Lecture Plan**

The topics covered by the ISYA school were wide in scope, because our intention was to complete the general astronomy education of the students we targeted. The topics, which ranged from the discovery of extra-solar planetary systems to the latest results in the studies of the Cosmic Microwave Background, were current and the lectures were given to the highest intro-

ductory level, and employed both theoretical and observational approaches. The selected topics were aimed at stimulating the students to consider competitive projects that will exploit the future Mexican access to world-class optical/IR/mm facilities. Special emphasis was given to astronomy laboratories, where the students acquired practical experience in solving the problems they were set.

The titles of the individual lectures courses, names of the professors and their assigned lecture/laboratory hours are detailed in the following list:

- “*Theory of Galactic Star Formation*”, Susana Lizano, Centro de Radioastronomía y Astrofísica (UNAM), Mexico, lecture course of 4.5 hours.
- “*Stellar Atmospheres: from Observations to Theoretical Challenges*”, Michèle Gerbaldi, Institut d’Astrophysique de Paris, France, lecture course of 3 hours.
- “*Extrasolar Planets: Properties and Future Possibilities*”, Edward Guinan, University of Villanova, USA, lecture course of 4.5 hours.
- “*Supernovae: from Stellar Evolution to Cosmology*”, Massimo Turatto, Osservatorio di Padova, Italy, lecture course of 7.5 hours.
- “*Feedback and Hydrodynamics of the Interstellar Medium*”, Guillermo Tenorio-Tagle, INAOE, Mexico, lecture course of 6 hours.
- “*The Universe According to Optically-Selected Galaxies*”, Rafael Guzmán, University of Florida, USA, lecture course of 6 hours.
- “*The Hidden Universe Revealed at mm Wavelengths*”, David Hughes, INAOE, Mexico, lecture course of 6 hours.
- “*The Chemical History of the Universe*”, Manuel Peimbert, IA-UNAM, Mexico, lecture course of 7.5 hours.
- “*Groups and Clusters of Galaxies*”, Claudia Mendes de Oliveira, Universidade de São Paulo, Brazil, lecture course of 4.5 hours.
- “*Cosmology and Large Scale Structure*”, Enrique Gaztañaga, Institut d’Estudis Espacials de Catalunya, Spain, lecture course of 6 hours.

- “*Astronomical Databases and Virtual Observatories: Surfing the Tsunami of Data*”, Rodolfo Barbá, Universidad de La Serena, Chile, laboratory of 13 hours.
- “*Optical/IR Observational Techniques*”, Elena Terlevich & Vahram Chavushyan, INAOE, Mexico, laboratory of 15.5 hours to the general audience plus two observing runs per student of about 6 hours total.
- “*Millimeter-Wavelength Observational Techniques*”, William Wall & David Hughes, INAOE, Mexico, laboratory of 11 hours.

We note that Enrique Gaztañaga was not originally announced as one of the lecturers, but he kindly agreed to replace at short notice Renée Kraan-Korteweg (Univ. de Guanajuato, Mexico, later moved to Univ. Cape Town, South Africa), who was going to lecture on “Extragalactic Large-Scale Structures and the Zone of Avoidance”. Renée could not attend the ISYA due to a sudden medical emergency.

Please note that the “Optical/IR Observational Techniques” Lab included observations at the 1m OAN telescope every night, Monday to Friday during the 3 weeks of the school. Each student had a one-night run to practice surface photometry observations, and one to practice spectroscopic observations. The students were divided into sub-groups of 5 to 7 students for each run. The heavy teaching load for this lab was shared by the ISYA professor Vahram Chavushyan with two of the advanced students of the 28th ISYA, both in their final year, Olga Vega and Abelardo Mercado (INAOE), who acted as assistants.

One more assistant to the faculty, Julia Arias (La Plata, Argentina), who attended the school with her partner, volunteered to help in all the Observational and Database Labs.

All lectures were given at the INAOE “Auditorio Docente” lecture hall, and the laboratories were conducted in two purpose conditioned rooms in the INAOE “Salón Docente” and “Salón de Juntas”, and in the 1m telescope of the Observatorio Astronómico Nacional operated by UNAM in Tonantzintla. The laboratory rooms contained 20 PCs to conduct the practical exercises. All lectures were delivered in English, and the notes of the courses were made available to the students through a password protected section in the web-page of the school. Electronic copies of all lectures were provided to the

students on a CD at the end of the school.

### **Other Academic Activities**

Apart from this intensive academic program, the school also organized visits to the LMT site, guided by three of the LMT Observatory personnel (David Hughes, LMT Project Scientist; Alberto Carramiñana, LMT Facilities Coordinator; and César Arteaga, UMASS/LMT Site Engineer). Tours of the INAOE laboratories and telescopes were also provided by INAOE staff (Esperanza Carrasco, Astronomer, and Guadalupe Rivera, Public Relations). These visits were repeated once per week to accommodate the rotation of 3 groups of students/professors to tour each of the facilities.

Although the ISYA was not designed to be a research conference, poster panels were available for the students to present a summary of their research projects. From the 35 posters presented at the school (see the complete list at <http://www.inaoep.mx/~isya28>), 8 posters were selected for oral presentations during two special poster sessions. The selection of the posters was made by the ISYA students (4 posters) and by the professors and organizers of the school (4 additional posters). The quality of the posters and of the presentations was recognised to be very high.

We also held a workshop on “Job and Graduate School Applications”, led by Edward Guinan, and assisted by some of the professors and organizers. This workshop was aimed at guiding the students on how to prepare competitive applications. The volunteering professors reviewed sample applications and CVs made available by the interested students of the ISYA.

Several students also received instruction by the INAOE computing staff on how to update their home institute PCs with current astronomy software. Three of the students coming from institutes with very limited low-speed internet connections received CDs with those software packages that would be most useful (linux, IRAF, AIPS, IDL demo, ...) and detailed instructions for their installation.

### **Cultural Activities**

Apart from the academic school activities, the participants also had the opportunity to experience the archeological, artistic and scientific environment of the central valleys of Mexico through a series of cultural visits and events.

The school organized a series of 6 public talks, 2 of which were on cultural aspects of Mexico and 4 on Astronomy from a cultural, political, archeological or historical point of view. One of the public lectures was by Julieta Fierro on how to best popularize astronomy, which was widely attended by the general-public within the State of Puebla despite it being announced as an English talk. You can see the details of the cultural programme, list of speakers and topics at <http://www.inaoep.mx/~isya28>.

The school also projected 3 movies and documentaries filmed by Mexican directors, as part of our display of Mexican culture.

During the weekends visits were made to the surrounding cultural and archeological sites of the State of Puebla and Oaxaca, including the ancient astronomical observatory of Monte Albán.

### **School Outcome**

A full photograph documentation of the school is available in the photo gallery on the 28th ISYA web page (<http://www.inaoep.mx/~isya28>).

The students were clearly enthusiastic about the learning opportunities they were given, and the contacts they established with the lecturers and their fellow students. A great atmosphere of comradeship permeated throughout the school. Although English was the official language of the ISYA, the majority of students were Spanish-speaking. The Hispanic ISYA students however observed the policy to speak English to ensure that their fellow students from Brazil and Trinidad & Tobago in particular were not excluded from both casual conversations and more formal discussions.

The school was a success from the organizers' point of view:

- INAOE offered a series of first-class introductory lectures to its own students.
- Many Mexican students from other institutes attended the school and benefited from the high-quality lectures and the opportunity to get to know INAOE, often for the first time.
- We also promoted the institute as an attractive place to enroll in graduate school for Mexican as well as for other American students. INAOE advertised a studentship for foreign students at the same time as the ISYA was announced, and this was filled by a Canadian student, who

attended the school as an external student, and was thrilled by the dynamics of the school and the working environment at INAOE. Other ISYA students, who had not applied for the INAOE studentship this year, expressed interest in applying for MSc/PhD positions at INAOE in the future, if more studentships were available.

- We raised the awareness of the Large Millimeter Telescope (LMT) within the Latin American and Caribbean communities. The students showed a high degree of interest in the LMT project and their related lectures and laboratories, some even inquiring about the possibilities for them and their countries to use or contribute to the telescope.
- We furthermore raised the awareness of the Mexican population about astronomy, the ISYAs, and INAOE, as articles on the opening of the ISYA and goals of the school appeared in the national and local newspapers, radio, TV and the internet publications of INAOE and CONA-CyT (Consejo Nacional de Ciencia y Tecnología, Mexico). A total of three interviews with Michèle Gerbaldi, Itziar Aretxaga and/or a selection of the students were also recorded and broadcasted by national radio and TV channels.

Apart from INAOE's grant, four other studentships were advertised during the school (U. Florida and IEEC-Spain) by the professors of the 28th ISYA, and suitable candidates were identified among the attending ISYA students. Furthermore a Cuban student was interviewed by academic staff from Univ. Guanajuato to enter their graduate school during the 28th ISYA.

The school was organized within the approved budget, both for local and travel expenses.

The organizers regard this school as an extremely successful event, fulfilling the expectations of the hosting institute, the lecturers, the students, and the IAU.

This report has been thoroughly discussed with Michèle Gerbaldi, who endorses its content.

**Appendix:** List of the 28h ISYA official students that completed the school.

1. Denzil Ali, Univ. of the West Indies, Trinidad & Tobago.
2. Mercedes Andrade Velázquez, IA-UNAM (Mexico City), Mexico.
3. Natalia Asari, Univ. Fed. Santa Catarina, Brazil.
4. Juan Manuel Atienzo, Univ. Sonora, Mexico.
5. Martha Bello Ramírez, INAOE, Mexico.
6. Georgina Benítez de la Mora, IA-UNAM (Ensenada), Mexico.
7. Mónica Blanco Cárdenas, IA-UNAM (Ensenada), Mexico.
8. Jourdain Cornwall, Univ. of the West Indies, Trinidad & Tobago.
9. Antonio Dalmau Cam, Univ. Nac. Ingeniería, Peru.
10. Felipe de Oliveira Alves, Univ. Fed. Minas Gerais, Brazil.
11. Gloria Delgado Inglada, INAOE, Mexico.
12. Juan José Downes W., CIDA, Venezuela.
13. Hugo Jair Escalante Balderas, INAOE, Mexico.
14. Nahiely Flores Fajardo, IA-UNAM (Mexico City), Mexico.
15. Javier Andrés Fuentes Lettura, Univ. La Serena, Chile.
16. Roberto Galván Madrid, CRyA-UNAM (Morelia), Mexico.
17. Rafael Gámez Díaz, Inst. de Geof. y Astronomía, Cuba.
18. Joannes Hernández Águila, INAOE, Mexico.
19. Izbeth Hernández López, INAOE, Mexico.
20. Juan Manuel Islas, Univ. Guanajuato, Mexico.

21. Yari Juárez López, INAOE, Mexico.
22. Maritza Arlene Lara López, INAOE, Mexico.
23. Jonathan Francisco León Tavares, INAOE, Mexico.
24. Jesús López Hernández , INAOE, Mexico.
25. Jose Manuel López Rodríguez, IA-UNAM (Ensenada), Mexico.
26. Juan Rafael Martínez Galarza, Univ. Nac. Colombia.
27. Cecilia Elena Mateu Jiménez, CIDA, Venezuela.
28. Abelardo Mercado, INAOE, Mexico.
29. Faviola Molina, Univ. Los Andes, Venezuela.
30. Juan Carlos Muñoz Cuartas, Univ. Antioquia, Colombia.
31. Norman Palma, Univ. Nac. Aut. de Honduras.
32. Ángel Pastrana, INAOE, Mexico.
33. Ilse Plauchu, Univ. Guanajuato, Mexico.
34. Luis Ramírez Garduño, INAOE, Mexico.
35. Hayden Rampadarath, Univ. of West Indies, Trinidad & Tobago.
36. Isabel Tatiana Rodríguez Esrand, Inst. de Geof. y Astronomía, Cuba.
37. Ary Rodríguez González, INAOE, Mexico.
38. Fabián Rosales, INAOE, Mexico.
39. Roberto Saito, Univ, Fed. Santa Catarina, Brazil.
40. Brisa Terezón, Univ. Don Bosco, El Salvador.
41. Janet Torrealba, IA-UNAM (Mexico City), Mexico.
42. Juan Pablo Torres Papaqui, INAOE, Mexico.

43. Olga Vega Casanova, INAOE, Mexico.
44. Víctor Daniel Vera Cervantes, Univ. Nac. Met. San Marcos, Peru.
45. Daniela Villegas, Pontificia Univ. Católica, Chile.
46. Hugo Andrés Zeballos Pinto, Univ. La Serena, Chile.