

member of NFR, South Africa, for Astronomy from 1996–2000. During this period he encouraged black people to participate in astronomy programmes.

Second, Prof Okeke and the late Bob Stobie were instrumental in the planning and sitting of the South African Large Telescope (SALT) in Southland, South Africa, and trained a number of PhDs using facilities in South Africa. He is currently serving as the Director of Nigeria's National Space Research and Development Agency (NASRDA) Centre for Basic Space Science (Astronomy and Atmospheric Sciences), as well as a member of the Technical Advisory Board of NASRDA. Prof Okeke was given a letter of commendation by the United Nations during one of UN's meetings in Tokyo 2007, for his tremendous role in the development of astronomy in Africa, and he is still a single point contact for astronomy in Nigeria.

Apart from the above, Prof Okeke works extremely hard to make the study of physics and astronomy easy and interesting in West Africa. He has written over fifteen textbooks in physics and astronomy at both tertiary and higher school levels. These books are today, the most popular books in Nigeria and some other parts of West Africa.

Prof Okeke has published extensively in various areas of space science, and his final ambition is to complete the construction of a 25 metre radio telescope which he intends to operate with over twenty former PhD students whom he produced in collaboration with various research groups around the world.

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## **NASE ASTRONOMY COURSES IN SOUTH AMERICA**

The mission of the IAU in world astronomy development is to stimulate the application of astronomy in all its forms as a benefit to society and human kind.

The IAU, through its commissions, has projects which involve: public understanding, school education, university education, research training, and research infrastructure.

It is crucial to act in the curricula of children and teenagers, before the university and research periods. If the pupils have a positive contact with astronomy, maybe they will decide to be astronomers. But it is very difficult to choose to study something which is not known to them. Astronomy should be more present in the school. It is necessary to educate teachers in astronomy topics. In general, there is astronomy in school curricula, but if teachers do not introduce observing possibilities this will limit their astronomy lessons to book contents in a very theoretical way. All schools in all the countries in the world have an 'astronomy lab': the outdoor grounds/fields of the school. The teachers with enough instruction can use it. It is necessary to promote astronomy among primary and secondary school teachers.

In August 2009, C46's NASE (Network for Astronomy School Education) was born at the IAU General Assembly in Rio de Janeiro (Chair, Rosa M Ros, Spain); Vice-chair, Beatriz García, Argentina). The main goal of this new Program Group of C46 is to promote astronomy at secondary and primary schools in all countries, with a special interest in developing countries. The first objective is to create a basic course in astronomy, and teach this course in the language that teachers normally use, with the aid of a group of IAU C46 members and teachers. A small group of three members of NASE would visit a country and teach the course in cooperation with any IAU members in the country, and any teachers there interested in astronomy. The teachers and astronomers in the country that cooperate with the NASE members will have created a new NASE working group, and they will have to repeat the course at least once per year. Of course they are invited to cooperate with NASE in relation to other courses and in the creation of materials in order to increase their knowledge. The Local NASE group should be born in cooperation with local institutions: Ministry of Education, Universities, and/or Observatories interested in cooperation with NASE.

It is necessary to create a set of complementary materials for the teachers that participate in the basic course to introduce them to ideas to continue and increase their activities during the academic course with their students.

### The course (for teachers)

The basic course will be the same in all the countries, with changes in the presentation related to the latitude and longitude. The topics appear in Table 1 and the timetable in Table 2. The course can be seen in detail at the website of NASE (<http://www.iau.org/education/commission46/nase>).

Table 1 Authors of lectures and workshops of the NASE Basic Course

Lectures	Solar System	Magda Stavinsky (Romania)
	Stellar Evolution	John Percy (Canada)
	History of Astronomy	Jay Pasachoff (USA)
	Cosmology	Julieta Fierro (Mexico)
Workshops	Local horizons and Sundials	Rosa M. Ros (Spain)
	Stellar, solar, and lunar demonstrators	Rosa M. Ros (Spain)
	Earth-Moon-Sun System: Phases & Eclipses	Rosa M. Ros (Spain)
	Planets and exoplanets	Rosa M. Ros (Spain)
	Solar Spectrum and Sunspots	Alexandre Costa (Portugal), Beatriz García (Argentina), Ricardo Moreno (Spain)
	The life of stars	Alexandre Costa (Portugal), Beatriz García (Argentina),
	Astronomy outside the visible	Beatriz García (Argentina), Ricardo Moreno (Spain)
	The Universe's Expansion	Ricardo Moreno (Spain)
	Young astronomer briefcase	Rosa M. Ros (Spain)

The duration of the course is 4 days. The activities are distributed among

- lectures giving information about special topics in astronomy
- working groups for discussion of the situation of astronomy in the country
- methodology for teaching astronomy
- workshops for practical activities.

The workshops constitute the most important part in the course. Our aim is to promote learning by doing, and workshops are specially designed for this. The idea is that students, helped by their teachers, produce some observations using devices made by themselves or by the use of simple objects and instruments (for instance a photographic camera or a 'remote control') applied to astronomy. The course is also complemented with day and night observations, with and without telescopes, poster sessions in order to give some participants the time to display their expertise, a visit to an astronomical/archeo-astronomical site, and a final evaluation session.

The astronomical visit is to show the participants that astronomy is possible in the middle of a city. In some cases we can visit a building oriented according to astronomical principles, or note the structure of a city oriented in the same way, or visit an old site and to recognise the astronomy of old cultures in the area. Of course, participants are invited to try to discover astronomical sites in their towns and to study them with their students.

All the activities, except the workshops, are taught to the full group. The workshops are taught to small groups. This is the best method to enable a teacher to understand how to do it. Also we can divide into groups of primary and secondary school teachers in order to approach in a more appropriate way the different methodologies needed.

The first time that a workshop is taught to the teachers, the instructor is a member of NASE who visited the country, but with the support of the members of the local NASE group that will be the

responsible instructor in the second session. In the second workshop, the NASE visitor is present too, but it is only for support if it is necessary. This method had been used in all the visits this year and it was very useful. Of course the local instructors know that with enough time, a month before, the contents of the activities, they will have enough time to prepare.

The first year that NASE implemented the basic course, three members of NASE visited the country. In subsequent years the number will decrease, and finally the local members will work alone, but they will receive occasional visits from a NASE member in order to reinforce the cooperation.

The materials had been prepared by members of the NASE group and experienced teachers in astronomy. In Table 1 appears the full list. At present the contents are in Spanish and English, but in future we plan to translate into other languages. If it is not possible to translate into the mother tongue, we will translate into a very well-known language accessible to them.

### The complementary materials

For our activities in South America, Spanish is an excellent option. There are more than 150 papers, for secondary and primary schools, including: activities, simulations, interactive projects, games, tales, videos, observations, pictures, articles, etc., all that teachers and students can need. The materials are listed in the two panels below, the first for primary schools (4-10 years old), and the second for secondary schools (11-18 years old). These have been developed in cooperation with the UNAW Universe Awareness initiative which involves C46 too.

**Website Complementary Materials: Explora el Universo – UNAW - NASE**

<ul style="list-style-type: none"> <li>• <b>ACTIVIDADES</b></li> <li>- <b>INSTRUMENTOS</b> <ul style="list-style-type: none"> <li>• Cámara oscura</li> <li>• Mini planetario</li> <li>• Planetario económico</li> <li>• Telescopio: fundamentos</li> <li>• Telescopio: construcción elemental</li> </ul> </li> <li>- <b>MODELOS</b> <ul style="list-style-type: none"> <li>• Bóveda celeste con sombras</li> <li>• Cita de dedo</li> <li>• Culeta más caliente</li> <li>• Culetas fáciles</li> <li>• Culetas para mayores</li> <li>• Modelo de sol</li> <li>• Modelo tierra-luna-sol</li> </ul> </li> <li>- <b>OBSERVACIÓN</b> <ul style="list-style-type: none"> <li>• Calendario meteorológico</li> <li>• Como localizar constelaciones</li> <li>• Como organizar una observación</li> <li>• Constelaciones con acetato</li> <li>• Descubrir las sombras</li> <li>• Eraticiones</li> <li>• La brújula</li> <li>• Luna con prismáticos</li> <li>• Manchas del sol</li> <li>• Orientarse con un reloj de guñera</li> <li>• Puestas de sol</li> </ul> </li> <li>- <b>SISTEMA SOLAR</b> <ul style="list-style-type: none"> <li>• Anillos de Saturno</li> <li>• Buscador de Micro meteoritos</li> <li>• Superficies de planetas</li> <li>• Viaje emocional al sistema solar</li> <li>• Viaje virtual al espacio exterior</li> <li>• Sistema solar en pequeño</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>ACTIVIDADES</b></li> <li>- <b>TIERRA LUNA</b> <ul style="list-style-type: none"> <li>• Actividades eclipse de luna</li> <li>• Fases de luna</li> <li>• Luna: fases y eclipses</li> <li>• Tierra paralela</li> <li>• Modelo tierra-luna-sol</li> <li>• UNIVERSO</li> <li>• Colores del sol</li> <li>• Constelación de Orión</li> <li>• Construyendo galaxias espirales</li> <li>• Espéculos en todas partes</li> <li>• Modelo de agujero negro</li> </ul> </li> <li>• <b>ADIVINANZAS</b> <ul style="list-style-type: none"> <li>- Diez Adivinanzas</li> </ul> </li> <li>• <b>ANIMACIONES</b> <ul style="list-style-type: none"> <li>- Entendiendo el sol de medianoche</li> <li>- La Antártida</li> <li>- Viaje con la NASA</li> </ul> </li> <li>• <b>ARTÍCULOS</b> <ul style="list-style-type: none"> <li>- Agujeros negros</li> <li>- Humboldt y los ovnis</li> <li>- Astronomía y los niños</li> <li>- Historia de la dentada ficción</li> <li>- Diario de Pedro Duque</li> <li>- 400 años del mundo moderno</li> </ul> </li> <li>• <b>CUENTOS</b> <ul style="list-style-type: none"> <li>- Cuentos de estrellas</li> <li>- Como crear cuentos</li> <li>- Otros cuentos</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>JUEGOS</b></li> <li>- A la caza de la sombra</li> <li>- Baraja de cartas de familias astronómicas</li> <li>- Colorear los planetas</li> <li>- Constelación con velas</li> <li>- Dominó galáctico</li> <li>- Estaciones del año</li> <li>- Juego de los planetas</li> <li>- Juego "memory" del universo</li> <li>- Jugando con el sistema solar</li> <li>- Móvil del sistema solar</li> <li>- Paisajes astronómicos</li> <li>- País del sistema solar</li> <li>- Sistema solar con plastilina</li> <li>- Sistema solar en el patio del cole</li> <li>- Toma de decisiones de astronauta</li> <li>- Viaje al sol</li> <li>• <b>SIMULACIONES</b> <ul style="list-style-type: none"> <li>- Observaciones del sol durante un día</li> <li>- Explicación del movimiento solar diurno</li> <li>- Simulación Luna 1</li> <li>- Simulación Luna 2</li> <li>- Simulación Tierra</li> </ul> </li> <li>• <b>VIDEOS</b> <ul style="list-style-type: none"> <li>- Galaxia</li> <li>- Universo</li> <li>- Eclipse de Luna</li> <li>- Rotación de la Luna</li> <li>- Fases y perspectiva orbital de la Luna</li> <li>- Batallas de Júpiter</li> <li>- Luna Gota</li> </ul> </li> </ul>
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A page with complementary material will be developed in English in a few months, in cooperation with other institutions.

### The courses organised in 2010

In 2010, the actuation area has been South America. We organised several courses in July and in October. The members of NASE who visited the countries were Beatriz García, Ricardo Moreno and Rosa M Ros all of them from Spanish speaking countries, and they can teach and exchange opinions with all the participants in this language.

The first course took place in Barranquilla, Colombia, 6-9 July, in cooperation with the Atlantic Department of Education, and the 'Eridano' Astronomy Association. Fifty-one teachers participated, and it created a 'WG NASE Atlántico-Colombia' with seven members. These members participated as instructors in the course together with NASE members.



Students in Columbia making a model showing the relative sizes of the Sun and planets

The second course was in Managua, Nicaragua, 11-15 July, in cooperation with the Universidad Autónoma Nacional de Managua, and the Observatory of Managua. The 'WG NASE Nicaragua' has been created with six members who worked as instructors in the 2010 course, and they will be responsible for organizing courses in future summers. The full number of participants in the course was fifty six from all the different parts of Nicaragua. There were secondary and primary school teachers and professors from education faculties in the university.



Students in Nicaragua performing the Bunsen grease spot experiment to compare the luminosity of two light sources

Then same month, from the 17<sup>th</sup> to the 20<sup>th</sup>, the last course took place in Lima, Perú, in cooperation with the Universidad Nacional Mayor de San Marcos, and in particular with the Facultad de Educación and the Facultad de Ciencias Físicas. We created the 'WG NASE Perú' with five members who cooperated with the NASE foreign members, and taught the astronomy course to thirty primary and secondary school teachers.



At an archaeological site near Lima (Perú)

At present we are preparing two courses in Argentina. In this case the courses will be organized in two different cities, one for primary school teachers in Cañada de Gómez, and another for secondary school teachers in Rosario. Both courses will take place 12-17 October 2010.

Every year the lectures, workshops, and observation are the same (of course adapted to the latitude of the place and to the peculiarity of the country). The required materials are on a website in the language of the country.

Every participant receives the Proceedings (details of all the activities) in hard copy plus a CD with PowerPoint presentations and the digital material that they need, in the language of the country.

Table 2: Timetable of NASE Basic Course

	1st day	2nd day	3rd day	4th day
<b>0900-1000</b>	Lecture 1	Lecture 2	Lecture 3	Lecture 4
<b>1000-1100</b>	Workshop 1	Working Group 1	Working Group 2	Working Group 3
<b>1100-1130</b>	break	break	break	break
<b>1130-1300</b>	Workshop 2		Workshop 5	Workshop 8
<b>1300-1400</b>	lunch	lunch	lunch	lunch
<b>1400-1530</b>	Workshop 3	Astronomical visit	Workshop 6	Workshop 9
<b>1530-1700</b>	Workshop 4		Workshop 7	Evaluation
	dinner	dinner	dinner	dinner
<b>1830-2030</b>		Observation 1	Observation 2	

### The plans for 2011

According to the IAU decanal plan, we are to considerer eight regions.

- Region 1: North America
- Region 2: Latin America
- Region 3: Europe
- Region 4 Middle East and North Africa
- Region 5: Sub-Saharan Africa
- Region 6 Central Asia
- Region 7: Far East and South-East Asia
- Region 8: Oceania (including Australia and New Zealand)

In regions 1, 3 and 8, there are several important associations which organise astronomy courses for teachers. For instance in Europe, the EAAE (European Association for Astronomy Education) organized several courses in cooperation with several IAU C46 members in Madrid, Spain (November 2009), and in Varna, Bulgaria (September 2010). These regions are not in the focus of NASE at present.

The first courses organised by NASE were in region 2 in 2009 as already described. Our plans are to organise courses in 2010 in Africa, regions 4 and 5, in accord with budget constraints. In 2012 we are planning to organise courses in Asia, regions 6 and 7.

We invite Comm. 46 members interested to cooperate with the NASE PG

[Rosa M Ros](#)

(for contact details see Organizing Committee of Commission 46)