

Teaching and outreach in the *Aula d'Astronomia* of the *Universitat de València*: a lab for studying the heavens

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Abstract

The *Aula d'Astronomia* is a teaching laboratory of the Faculty of Physics, University of Valencia, managed by the *Departament d'Astronomia i Astrofísica*. In it, practices of some astronomical specialities are taught. Therefore, we have a classroom with computers together with four specific telescopes installed on the terrace (a solar one, a reflector with CCD, an apochromatic refractor and a radiotelescope). Apart from the academic aspect, the *Aula d'Astronomia* has been widely used for outreach activities through various educational programs such as visits from elementary and high schools, the open day *Conèixer la Universitat* visits, the activities of the Week of Science, and public astronomy observation nights as the *Nits de divendres, nits d'estels*. Finally, we should emphasize its use in important ephemerides such as the transit of Venus in 2004, the solar eclipse of 2005, or the open day activities of IYA2009. Located in the building Jeroni Muñoz at the Burjassot-Paterna Campus, since its inauguration in 1997, about 15 000 people have used its facilities to attend classes, outreach lectures or make day and night observations.

1 Introduction

The *Aula d'Astronomia* is a teaching laboratory of the Faculty of Physics, University of Valencia, managed by the *Departament d'Astronomia i Astrofísica*. Practical and instrumental matters of astronomy are taught there.

The *Aula d'Astronomia* is located in the last floor of the building of research Jeroni Muñoz in the Campus of Burjassot-Paterna of the University of Valencia. This building is dedicated to the Valencian astronomer Jeroni Muñoz who was correspondent of Tycho Brahe and a professor of the university in the 16th century.

The origin of the lab dates back to the end of the eighties of the 20th century. In



Figure 1: View of the *Aula d'Astronomia* with the 5 m dome, where the apochromatic 7'' telescope is seen beside the 3 m radiotelescope. Courtesy of Enric Marco.

1988, a group of professors of Theoretical Physics, under the leadership of José María Ibáñez, launch the Laboratory of Astrophysics that was assembled in the terrace of the building D of the Faculty of Physics. The instruments were an 8'' telescope Schmidt-Cassegrain, some binoculars, and a 90 mm telescope refractor.

But the final impulse for the *Aula d'Astronomia* was made in 1997 when the lab obtained an appropriate place in the last floor of the research building Jeroni Muñoz. There, a classroom and a 5 meter dome were constructed. The promoter of the construction was the dean of the Faculty of Mathematics José Luis Valdés.

The *Aula d'Astronomia* is an urban observatory located in a densely populated area near Valencia. In spite of the fact that its main goal is the teaching of Astronomy, when it is not in use, it has been available for outreach activities.

2 Structure and instrumentation

The astronomy lab is composed of two parts: a classroom, with networked computers where students analyse collected images and data, and an observation station located in the terrace with telescopes. There, two domes harbor the main instrumentation. Inside the first one, with 5 m in diameter, we can find an all purpose apochromatic 7'' telescope. In the second one, with 2.3 m in diameter, a reflecting 12'' LX200 telescope is found. Apart from these classical instrumentations, a radioantenna of 3 m in diameter allows to observe the Universe in the 21 cm wavelength, and finally, a vertical solar telescope can cast the solar disk and spectra into the classroom.

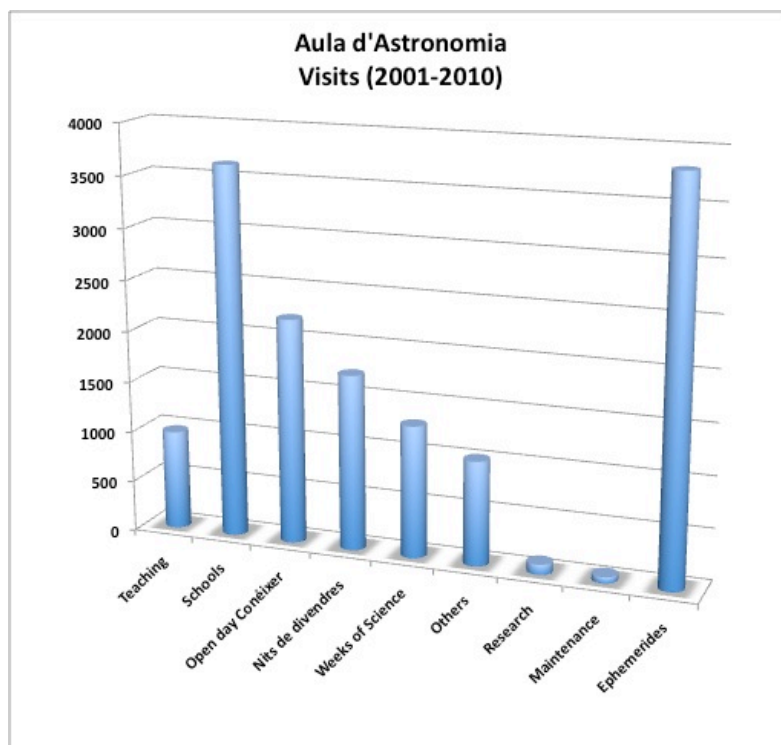


Figure 2: Number of visitors to the *Aula d'Astronomia* since 2001 from teaching courses and different outreach programs.

3 Teaching courses

The facilities of the *Aula d'Astronomia* are mainly dedicated to train our students in the basic skills of practical astronomy. In the mathematics studies, and mostly in the physics degree, the basic courses of foundations of astronomy and astrophysics and the more specialized observational techniques of astrophysics are the sources of the majority of our students. Imaging and reduction data techniques applied to different astronomical objects are the main duties of our students. Other courses, like spherical astronomy, are also partially taught in the *Aula*. Their students use telescopes and CCD instrumentations for studying and computing asteroid orbits. There is also a cosmology and space exploration course for the journalism studies. Some of their practice activities are taught in the facilities of the *Aula d'Astronomia*.

Finally, the astrolab gives also assistance to the geology subject in the biology degree. A lecture on cratering in the solar system and a night observation to explore the moon surface are given every year to students.

4 Outreach programs

As teaching courses do not completely fill the time capacity of our astrolab, this is the reason why, since 2001, the days without students can be used for outreach activities. There are several educational programs:

- 1.- Visits from elementary and high schools.
- 2.- Open day *Conèixer la universitat* visits.
- 3.- Weeks of science of the University of Valencia.
- 4.- Public astronomy observation nights (*Nits de divendres, nits d'estels*).
- 5.- Other activities (*Nau gran, nau dels estudiants*, teacher training courses).

Apart from those programs, in the *Aula d'Astronomia* big events like eclipse and transit observations have also been organized. In these cases, the number of visitors and media coverage have also been important.

The outreach activities done at our astrolab are made known to schools by the different institutions of the University: *Càtedra de Divulgació de la Ciència* and the *Centre d'Assessorament i Dinamització dels Estudiants* (CADE), student counselling and promotion center, principally. It is also important to mention that CADE periodically send a booklet, with all the outreach activities to elementary and high schools, from where teachers can know the possibility to visit the *Aula* with their students.

It is also important to note that numerous schools repeat their participation in the outreach activities every year, as their teachers consider that it is an interesting educative complement.

Finally, the web page of the *Aula d'Astronomia* gives full information about the activities a school can do there.

For the general public, the information about astronomy observation nights (*Nits de divendres, nits d'estels*) usually comes out at the main web page of the University. Let us point out that this way to disseminate information is good enough because the free places to apply are filled in only a couple of days.

4.1 *Nits de divendres, nits d'estels*

This is a joint project between the *Departament d'Astronomia i Astrofísica* and the *Observatori Astronòmic* of the *Universitat de València*. It is a public astronomy observation night program running since 2001 with a very big success. It is, by far, the most known outreach program of the *Aula d'Astronomia*. Every year the demand always exceeds the offer.

This outreach activity consists of sessions held on Friday nights, twice a month, running from January to July (12 sessions). Usually, the visit begins at sunset at 18:00 in early winter, but at 21:30 in late summer. The maximum capacity of the activity is a group of 20 people.

Each session consists of:

1. An introductory talk 30 to 45 minutes long about the constellations, their mythology, and the visible planets.
2. Explanation of the sky, the position of the planets and constellations, and light pollution problems.
3. Observation of the visible planets and the Moon, using the apochromatic 7" telescope.

All the visitors get a booklet with information about the constellations and planets. The conductors of these activities are, since its beginning, the authors of this paper.

5 Research

Although the *Aula d'Astronomia* is a lab located in a populated area with a high level of light pollution, some basic research could be done. An asteroid observing program is running since 2001 in this observatory with an assigned number SAO J99. More than 500 observations have been published since then in the Minor Planet Circulars of the Minor Planet Center, Smithsonian Astrophysical Observatory (SAO). This program is usually used as a complement for spherical astronomy students.

Some educational research studies have also been done. [1] have shown how to detect the Earth precession and have estimated the duration of a precession cycle using the observational equipment of our astrolab. [2] have measured the speed of light in a similar way as it was done by Rømer in 1677. Following the occultations of Io during some months using our apochromatic 7" telescope, they achieved a result of $299\,792\,458\text{ m s}^{-1}$, quite approximate to the accepted value. These papers confirm the possibility to use modest equipment to carry out easy and valuable astronomical experiences by high school and university first course science students. Also they strongly support the pedagogical utility of such a facility as the *Aula d'Astronomia*.

6 IYA2009 activities

The *Aula d'Astronomia* was widely used in the IYA2009 activities last year. From 2-5 April 2009 during the "100 hours of astronomy" an open day session, some day and night observations and the "Around the world in 80 telescopes" webcast were held.

The measurement of Earth radius, in the same way as Eratosthenes did in the third century BC, was also performed by two groups of students in our astrolab, as also did more than 600 schools all over Spain.

But the main open day during 2009 took place on Sunday 25th October when more than 200 people came to see the astrolab facilities in a visit arranged by the social external activity program of *Metro Valencia*.



Figure 3: View of the *Aula d'Astronomia* during the annular solar eclipse of 3rd October 2005. Courtesy of Rafael López Machí.

7 Ephemerides

The most important events of popular astronomy are solar and lunar eclipses, transits and occultations. A big effort has been done to observe the last important astronomical ephemerides in our astrolab and open our facilities to the general public and media.

The transit of Venus on 8th June 2004 was our first important event, but the annular solar eclipse on the 3rd October 2005 was a complete success, not only because the sky was quite free of clouds and the covering of the solar disk by the Moon was well observed but also because more than 3000 people participate in the observation.

Other events like the partial solar eclipse on 29th March 2006 and the occultation of Venus by the Moon on the 1st December 2008 were also observed. The observations of these astronomical events are important as outreach activities for their great impact in the media.

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