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Spreading astrobiology

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Abstract

From the moment of its creation, a basic guideline for the *Centro de Astrobiología* has been that scientific outreach and communication are inseparable tasks of research work. This objective of the Center is assumed by all of its staff by informing the public in general and the scientific and educational community in particular of the *Centro de Astrobiología* research program and results. Since astrobiology is an emerging science, it is also a key objective to contribute to the dissemination of this new knowledge, its theoretical assumptions, and its main lines of work. In this communication we present the activity of the Outreach Unit of the *Centro de Astrobiología* as an example of the spread of knowledge in a multidisciplinary science.

1 Introduction

Astrobiology is a young science, interdisciplinary in nature, whose purpose is to seek answers to some of the many unknowns related to the life (Fig. 1):

- What is life?
- How did life arise on Earth?
- Is there or has there been life elsewhere in the Universe?
- Is there a relationship between the evolution of the Universe and the evolution of life?

In summary, life as a result of the evolution of the Universe.

2 *Centro de Astrobiología*

The *Centro de Astrobiología* (CAB) is an interdisciplinary research center with the key objetive of studing the emergence of life elsewhere in the Universe. It was created as a Joint

Figure 1: Can life emerge elsewhere in the Universe?

Figure 2: The building of CAB in the INTA campus.

Center between the *Instituto Nacional de Técnica Aeroespacial* (INTA) and the *Consejo Superior de Investigaciones Científicas* (CSIC) and since its creation in 2000 is a full Associate Member of the NASA Astrobiology Institute (NAI).

The center is located close to Madrid in the INTA campus (Fig. 2). Over an area of nearly seven thousand square meters, there are nine laboratories, a greenhouse, three robotic telescopes, a radiotelescope, a library, an auditorium, and some support units (adminstration, management, outreach, and computers).

The scientific profile of CAB staff is very heterogeneous with astrophysicists, engineers, mathematicians, biologists, chemists, physicists, geologists, virologists, and ecologists. The center is organized in four Departments: Astrophysics, Molecular Evolution, Planetology and Habitability, and Instrumentation. Each one has some scientific active lines that cover the interstellar medium, brown dwarf, and exoplanets; prebiotic chemistry molecular evolution and ecology; geology and planetary atmospheres; environments as habitats of astrobiological interest; and the development of missions to explore the Solar System.

3 Scientific outreach at CAB

The CAB is designed with an outreach vocation by its own requirements. However, astrobiology is in a period of consolidation and definition and, therefore, is more difficult to communicate and with fewer specialists than other established sciences. The staff at the

Center dedicated to outreach tasks is minimal, because it is intended that an important part of the outreach work of the CAB (attention to visitors, stands at fairs, etc) is carried out by the researchers themselves. This model has drawbacks, such as availability, or the necessary expertise that the media attention required, but a great advantage: the strong involvement of research staff, participating at all levels, giving an extra quality to this service.

This quality is enhanced by the development of astrobiology, which provides very suggestive items for popular science, as it touches issues such as space exploration, genomics, etc, which have proven their appeal to all audiences. The national and international reputation of the CAB and its scientific staff, the situation of quasi-exclusivity in Spain of this type of research and, finally, the association with the NAI help with this task.

The scientific communication at CAB has the following goals:

I Share the objectives and results of the research program of the CAB.

II Dissemination of astrobiology knowledge in general, its scientific foundations and research lines, and generating news.

III Enhance the reputation and image of the CAB.

IV Achieve greater integration with the scientific and academic.

V Expand and improve the activities and services outside the Center, making them more attractive to potential recipients.

VI Increase the participation of researchers in the dissemination and communication activities of the institution.

VII Optimize relationships with their counterparts from other institutions.

And the activities in which they participate are:

- Visitors and media attention.
- Design, installation and care of stands in fairs and exhibitions.
- Maintain and update web page.
- Development and dissemination of information material.
- Care and maintenance of library service.
- Collection and management of information related to the external activities of the members of the CAB such as publications, conferences, courses, etc.
- Relationship to other units and equivalent bodies.

Figure 3: The CAB has participated in some scientific fairs.

4 Activities in 2009

During the past year, the main activity in this area has been, as in previous years, the CAB guided tours program for schools, which occupy every Friday and extends over the entire academic year. In 2009, 49 schools have attended with a total of 1 550 students and 74 teachers. Also, 31 institutional or professional groups has visited the CAB. For all this visits, a large number of researchers and laboratories have been involved.

As for fairs and exhibitions (Fig. 3) the CAB has participated in 2009 in the following, either independently, or as part of the delegation of CSIC:

- Exhibition of Aviation and Aerospace Sector of the Community of Madrid (6–24 May).
- VII Science Fair of Seville (14–16 May).
- IX Science Week of Castilla-La Mancha (9–13 November).
- IX Week of Science and Technology in the Region of Murcia (5–8 November).
- IX Science Week of the Community of Madrid (9–22 November).

In the latter case, CAB organize directly four activities with the participation of more than 300 people:

- At the CAB headquarters:
  - Two open days.
  - Two workshops for radioastronomy.
- At the *Museo Nacional de Ciencias Naturales*, in collaboration with the CSIC and the Society of Friends of the Museum:
  - Three conferences with the main topic of “Darwin and astrobiology”.
  - A remote astronomical observation on line.

5 PARTNeR

The PARTNeR (see [1]) project (the Spanish acronym of "Academic Project with the Radio Telescope of NASA at Robledo") is an outreach long-term project in the field of Radio Astronomy (Fig. 4). Its main goal is to promote the knowledge of Astronomy, and Radio Astronomy in particular, among secondary schools and universities. Its main didactic instrument is one of the antennas (DSS-61) of the NASA's Madrid Deep Space Communications Complex, located in Robledo de Chavela.

PARTNeR is an educational program that allows high school teachers and students to control a 34 meter radio telescope and conduct radio astronomical observations via the internet. Teachers take a training course and learning activities are also given to them. PARTNeR is an inquiry-based approach to science education. Students can join in three research programs: variability in quasars, radio-bursts in microquasars and mapping of radio sources.

PARTNeR program activities in 2009 were:

- 13 radio astronomy observations, involving 240 students and 28 teachers.
- 89 workshops on astronomy to 3,016 students in the Visitor Center of the Monitoring Station at Robledo de Chavela.
- Teacher Training Course, 2 sessions for 13 teachers.
- Bachelor Project (remote radio astronomical observations at the University Miguel Hernndez at Elche, Alicante).
- "Science Fiction, science or fiction?" program with students at St. Louis University in Madrid.
- "A journey through the solar system" astronomical activities in Rivas-Vaciamadrid for a group of 100 students.
- "Astronomy for all" in the XI Antoniorrobles Cultural Week in Robledo de Chavela.
- "Radio astronomy and radio telescopes" to AstroHenares (association of amateur astronomers from Alcalá de Henares).

6 Robotic telescopes divulgative program

The key objectives of the robotic telescopes of CAB (RTCAB) are the identification of new exoplanets and especially the characterization of the known exoplanets by observing photometric and systematic monitoring of their transits (Fig. 4). These telescopes, equipped with advanced technology, optimized control programs, and optical and technical characteristics adequate for this purpose, are ideal to make the observations that are required to carry out these programs (see [3]). But, in addition of scientific objectives, RTCAB intends to be a

Figure 4: The Radio-telescope of PARTNeR at Robledo de Chavela (*left*) and the robotic telescope in the Calar Alto Observatory (*right*).

fundamental piece of teaching practice Astronomy as a way of understanding the Universe around us.

In order to introduce astrobiology to the public, visits to the CAB and its robotic telescopes are organised. There is a program of visits that include astronomical observations. The observation sessions, lasting between two and three hours, consist of a guided visit to the installation, a talk about robotic telescopes and their use and finally the night observation that will include the viewing of several astronomical objects visible that night like globular clusters, planetary nebulae, hydrogen nebulae, galaxies and bodies of the Solar System.

The planned program of astronomy sessions (see [2]) is only an example of a much more ambitious project that includes a program of direct observations and a complete educative project with practical sessions in the classroom. By means of this program students will be able to make remote observations on subjects of general astrophysics that they themselves have prepared and requested. After the observations, they will have to analyse and report their results, receiving support and advice from the scientific staff of the CAB.

References

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