Astrophysics, and How to Attract Young People into Physics

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Bringing Science into Schools through Astronomy. Project ASTRO, Tucson.

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Abstract:

We report our experience in bringing science into US and French classrooms. We participated in the US scientific educational program Project ASTRO. It is based on a partnership between a school teacher and an astronomer. They together design and realize simple and interesting scientific activities for the children to learn and enjoy science. We present four hands-on activities we realized in a 4th-grade class (10 yr-old kids) in Tucson (USA) in 2002-2003. Among the covered topics were: the Solar System, the Sun (helioseismology) and the Galaxies. We also present a similar experience done in two classrooms in 2005, in Châtenay-Malabry (France) in partnership with an amateur astronomy association (Aphélie), and discuss future activities. This is a pleasant and rewarding activity, extremely well appreciated by the children and the school teachers. It furthermore promotes already at a young age the excitement of science, and provides concrete examples of the scientific methodology.

1 Introduction

Many astrophysicists worldwide have experienced the joy of talking about the physical Universe and their fascinating work to the public, in conferences or in schools. They might have then felt the enthusiasm and the great demand from children, their teachers and parents to talk about science. The scientific education, an important cornerstone in modern societies, faces, nevertheless, several difficulties in practice despite national requirements for science classes. The difficulties to teach science in schools (for students younger than 17) are sometimes related to the teachers' lack of confidence in their own expertise. Science might appear complex, too conceptual and not enough concrete to some teachers and students. The lack of motivation might also be an issue. There is thus a clear need to bring science in the classroom, so that more teachers and students can enjoy it. We describe our involvement in different educational programs in the USA and in France to promote science among teachers and students.

2 Project ASTRO, Tucson

Project ASTRO[1] was developed in 1994 by the Astronomical Society of the Pacific. The goal of this program is to improve science education in the classroom from the first year of

[1]http://www.astrosociety.org/education/astro/project_astro.html

elementary school to the last year of high school (6 to 17 yr-old). Project ASTRO is based on a partnership between a teacher and an astronomer. The astronomer commits to visiting the teacher's classroom at least four times during the school year. The main focus of Project ASTRO is hands-on activities related to astronomy that put students in the position of acting like scientists. Each year about 1000 partnerships bring science through astronomy to ∼100,000 students over 12 project ASTRO sites across the USA.

We were part of Project ASTRO in Tucson[2] during the 2002-2003 school year. We were paired with a 4th grade teacher (10 yr-old kids) at the Sewell Elementary School in Tucson (Arizona, USA). The topics of the activities were chosen in consultation with the teacher. We designed ourselves these activities, but extensively used existing material from the book[3] "The Universe at your fingertips", and were inspired by some NASA Education web sites. We decided to focus on a few simple concepts only in each one-hour visit. The typical visit starts with an introductory 10-minute slide show, and is followed by 40 minutes of hands-on activity. The last 10 minutes are used for a debriefing and questions. We put online[4] all our material.

• First visit: "Who is an astronomer"
Our first visit to the classroom is dedicated to talk about who an astronomer is and what an astronomer does. We first ask the children to draw what they think an astronomer is, and then we use the drawings to address the misconceptions they might have about this special job. It is a good opportunity to mention that an astronomer, thus a scientist, is not always an old man! We also tell the students that an astronomer does not work every night by looking the sky with the eyes on a telescope. We introduce them to the concept that observation, careful analysis, modeling, theory and simulation complement each other and are required to address a scientific question.

• Second visit: "The Solar System"
The goal of this activity is to learn the different planets of our Solar System and the relative sizes of the planets. Each kid makes a sphere of the proper diameter with clay. We then put together this clay Solar System, describe each Planet's average temperature and emphasize the diversity of planet sizes (Fig. 1). We also explore the physical differences between gaseous vs telluric planets, and discuss the differences between the Planets, the Sun and the stars.

• Third visit: "The Music of the Sun"
This activity, dealing with the Sun and helioseismology, illustrates that we can get informations about the interior of an object by "listening" to it. The students have to probe three "mystery boxes". We ask them to shake each box to study its content. They estimate if the content is light or heavy, composed of small or large pieces, in small or large number. They write their observations in a table. We put rice, small rocks, and a tennis ball in each box, respectively. We then explain that helioseismology uses the Sun's vibrations (like music) to probe its interior. This activity shows that it is possible to talk about complex subjects in a simple way (Fig. 2). The last part is an illustration of the Doppler shift (also used in helioseismology): listening to the sound emitted by an object allows one to determine if it is moving or not. We use a bell for this purpose. We first introduce them to the bell's sound when it is still, but also when it is rapidly spinning – the beating effect is then easily heard. Then the students close their eyes, and we ask them to guess, while listening the sound, if the bell is spinning or not.

[2]http://www.noao.edu/education/astro/ It is managed in Tucson by the Education and Outreach department of the NOAO (National Optical Astronomy Observatory).

[3]http://www.astrosociety.org/education/astro/astropubs/astropubs.html

[4]http://lully.as.arizona.edu/∼hdole/vulgarisation/ProjectAstro200203/

Figure 1: Solar System activity: comparison of the Planet's sizes.

Figure 2: Helioseismology activity: probing the mystery boxes.

Figure 3: Galaxy activity: classifying the galaxies in the Hubble Deep Field.

• **Fourth visit: "The Galaxies"**
The goal of this activity is to have the children realize the diversity of the galaxies and their incredible quantity. Using images of the famous Hubble Deep Field, the students sort the bright sources in the images by shape and color. They separate foreground stars from far-away galaxies, and get to realize that the galaxies have various shapes and colors, mainly due to their different content and evolution stage (Fig. 3). Then, on a small image cell, they have to count the galaxies. With the appropriate provided number to multiply with, they have an estimate (lower limit) of the number of visible galaxies in the universe. Classifying the galaxies was a success, but the counting part proved to be too complicated for this level, since orders of magnitude and powers of ten are not well understood.

3 Our Other Experiences in France

There are many other ways to bring science into schools. As members of the amateur astronomy association Aphélie[5] (near Paris, France), we are used to receiving lots of requests from schools to come and talk about astronomy. In May 2005, we visited two classrooms[6] in two of Châtenay-Malabry's schools located in socially disfavored areas. The level is CE2 and CM2 (8 and 10 yr-old, respectively). We wanted to apply the concept of a Project ASTRO visit. We choose to try "**the Venus topography box**" activity from the Project ASTRO book[3], in agreement with the teachers. The goal is to show how scientists get information about the surface of a planet hidden by a thick atmosphere (this could also apply to Titan). After an overview of the Solar System, we tell the children that ESA wants to send a spacecraft to Venus and needs their help to choose the best landing site. The surface is modeled inside a shoe box, hidden

[5]http://www.astrosurf.com/aphelie
[6]http://lully.as.arizona.edu/~hdole/vulgarisation/ecoles/

Figure 4: Venus topography box activity: probing the hidden surface.

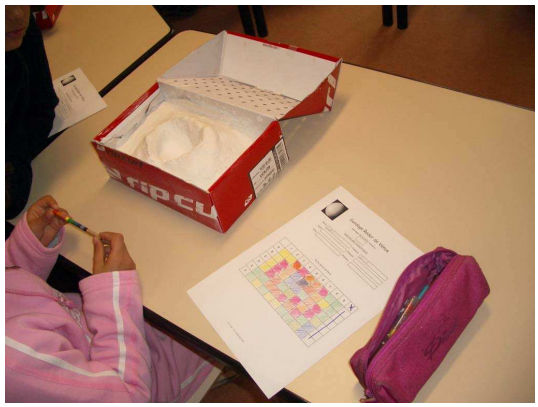

Figure 5: Venus topography box activity: at the end, comparing the measurements (color map) and the real Planet surface model.

by a cover. By probing the holes with a color-encoded stick, the students draw a topographic map of the modeled Venus surface (Fig. 4 & 5). Fig. 5 shows the model crater (top left) and the beautiful result, the crater appearing in pink-orange in the topographic map (lower right). We then asked each student to present in front of the class their best landing site, if any. This activity is very interesting because it deals with different concepts: variety in the Solar System, thick atmospheres, remote information gathering (e.g radar technique), contour map. During this activity the students really act like scientists by getting the data, and then analyzing, interpreting and presenting them.

4 Conclusion

Some professional astrophysical institutions are also involved in bringing science into the classrooms through specific educational programs for the teachers, like the Observatoire de Paris[7] (dedicated workshops, summer schools, observations, ...) or the Université Paris Sud 11. There are also many successful programs like "la main à la pâte[8]", Hands-On-Universe[8], or the CLEA[8], among others.

Finally, we want to emphasize that visiting schools, discussing with the teachers, interacting with the students, and designing such educational projects is a rewarding, interesting and very useful activity. Astronomy is a very efficient way to teach science. Furthermore this is less time-consuming that one might think. We warmly recommend that our colleagues try to be involved in such activities, on their own or by joining an existing program in their country.

Acknowledgments

Thanks to Connie Walker (NOAO), Project ASTRO (ASP), Pam Williams (Sewell Elementary), GONG/National Solar Observatory, MIPS/Steward Observatory/University of Arizona. We also warmly thank Marc Bottineau (for the 15 boxes !) and the Aphélie members involved in this activity, Fabrice Krot and the Maison des Sciences de Châtenay-Malabry, as well as Sébastien Vilain-Derouen (école élémentaire T. Masaryk) and Claude Mallet (école élémentaire L. De Vinci).

[7] http://www.obspm.fr/∼webufe

[8] http://www.lamap.fr/ – http://www.handsonuniverse.org/ and http://fhou.cicrp.jussieu.fr/ – http://www.ac-nice.fr/clea/

Educational Projects at ESO

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Abstract:

ESO's public outreach activities comprise communication and media activities, educational projects and targeted events, addressing well-defined audiences. In 2004, one major activity stands out both in terms of visibility and in covering all of the above areas: the Venus Transit 2004 Public Science Discovery Programme. This very successful programme comprised the development of an extensive set of teaching materials for schools, a web-based information and reporting system, observational activities on the day of the transit as well as a video contest and a final event in Paris in November.

1 Introduction

In order to understand the latest reports on new and exciting discoveries, put them into context and then, hopefully, continue to support research, it is essential that the public has some basic scientific knowledge. It is therefore quite alarming to discover for example that only about a third of US adults are aware and accept the idea that "the universe began with a huge explosion" (NSB, 2000; quoted by Miller, 2004). As worrying is the fact that the same study reveals that only half of US adults know that the Earth rotates around the Sun once in a year. And the situation does not look better in Europe since a comparative study with Britain in 1988 found this ratio to be only one third (Miller, 2004). At a time when science is becoming more and more ubiquitous in our modern society, more and more affecting our daily lives, such reports cannot but raise a lot of concern. This appears even more critical in the framework of the *Lisbon strategy* devised by the leaders of the European Union in order to make Europe a knowledge-based society by 2010. This goal can only be achieved if the new generations become more and more scientifically literate and if science can attract many students, who will become the much needed scientists of tomorrow.

At the same time, however, that there is a well-documented and widespread public interest in science there is a clear disinterest in science learning! The ROSE survey has, for example, shown that to the question "*I would like to have as much science as possible in school*", the answer, in European countries (but also in Japan), was clearly not very encouraging (Schreiner & Sjoeberg, 2004). This is complemented by a worrisome decline in science teachers. Between 1993 and 1998, the number of new science teachers in the UK fell from 553 to 181 per year. And this is just one example.

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2 An ensemble of activities

There is thus no doubt that a dedicated effort to improve science education in Europe's primary and secondary schools is crucially important. The subject of Astronomy and Astrophysics plays an increasingly important role therein. Indeed, this particular field of basic science is very attractive to young people and its interdisciplinary dimension makes it an ideal tool to address many topics in schools. ESO, the European Organisation for Astronomical Research in the Southern Hemisphere, has since many years undertaken, often in association with other European organisations, to address these issues. ESO has for example played a most fundamental role in the setting-up of the European Association for Astronomy Education (EAAE), a network of teachers, and has since more than a decade successfully participated to the calls of the European Commission for the Science Weeks. Initial programmes were often collaborations with the EAAE, as well as with CERN and ESA, while in the last years, most educational programmes, except for the more astronomically oriented Venus Transit 2004, were performed in the framework of EIROforum, a partnership of seven of Europe's major intergovernmental research organisations (CERN, EFDA, EMBL, ESA, ESO, ESRF, and ILL), that was created in 2002. One of these programmes is the very successful *"Physics on Stage"* concept that is directed towards science teachers and pupils in Europe's secondary schools. The project seeks to improve the quality of teaching and to find new ways of stimulating pupils to take an interest in science. It aims to facilitate the exchange of good practice and innovative ideas among Europe's science teachers and to provide a forum for a broad debate among educators, administrators and policy-makers about the key problems in science education. The "Physics on Stage" programmes have now been extended to encompass all sciences and are organised through the EIROforum partnership in the *"Science on Stage"* festivals, the first one being organised at CERN in November 2005, the next one in Grenoble in Spring 2007.

The "Physics on Stage" and "Science on Stage" are by far not the only educational projects done by ESO. Many projects were done in collaboration with the EAAE - thereby ensuring that the programmes are most suited to teachers - and are presented further in this volume (see F. Wagner's contribution). To make things more formal, in 2001 it was decided to set up an Educational Office within ESO. One of its first task was to conduct a survey of the specific needs for astronomy education in Europe's high-schools (Bacher, 2002). Another was to publish, in collaboration with ESA, four comprehensive astronomy exercises that allow high-schools students to gain exciting hands-on experience in astronomy by making realistic calculations based on data obtained by the Very Large Telescope and the Hubble Space Telescope. Two more exercises - on measuring the acceleration of the Universe based on supernovae data and on Trans-Neptunian Objects - are in preparation. ESO also recently embarked upon another ambitious teaching project, in connection with the intercontinental ALMA observatory. The new project, the "ALMA Interdisciplinary Teaching Project", aims at developing and producing ALMA-related educational material at the secondary level. A brainstorming meeting with teachers and scientists took place to specify the format and the content. A list of 30 key topics was established, with teachers volunteering to work on most of them. It is planned to have a useful version of the Educational toolkit ready by the end of the summer of 2006.

3 The VT-2004 Science Discovery Programme

The Venus Transit 2004 (VT-2004) programme is another successful programme established through a major organisational effort by ESO, in collaboration with the EAAE, the Institut de Mécanique Céleste et de Calcul des Ephémérides (IMCCE) and the Observatoire de Paris in

France, as well as the Astronomical Institute of the Academy of Sciences of the Czech Republic. It profited from substantial support of the European Commission within the framework of the European Science and Technology Week. The main idea of this highly innovative, educational programme was to take advantage of this extraordinary and rare celestial event to expose the wide public – in a well-considered, interactive and exciting way – to a number of fundamental issues at the crucial interface between society and basic science.

The programme established wide international networks of individuals, including school teachers and their students, amateur astronomers and interested laypeople, as well as educational institutions like astronomical observatories, planetaria, science centres, etc. It went to great lengths to encourage real-time measurements from which one of the most fundamental astronomical parameters could be determined, the distance from the Earth to the Sun. In order to promote the Venus transit and provide information about the opportunities for participation in the various countries and geographical regions, VT-2004 "National Nodes" were established in many places and as such constituted the main contact points for the media in the corresponding countries and regions. VT-2004 moreover promoted web-encounters and international collaboration throughout Europe as well as in Africa and Asia, stimulating visual and photographic observations of this rare celestial event, with related debates via the Internet. During the preparatory phase, highly useful meetings were held between the organisers and school teachers (Luxembourg, January 2004), media representatives (Germany, March 2004), and amateur astronomers (Czech Republic, May 2004), respectively, which greatly contributed to the shaping of the various activities so that they optimally responded to the expectations and needs of different communities.

On the day of the transit itself, the best images available, via dedicated links to the foremost observatories and from numerous websites set up by observers in many different countries, were selected and displayed at the 'VT-2004 Central Display' page with live comments by a team of professional astronomers in the 'VT-2004 Control Room' at the ESO headquarters in Garching. Judging from the number of registered hits, there is no doubt that the VT-2004 web site may be qualified as resoundingly successful. During the 8-hour interval around the transit period, there were no less than 55 million hits on the VT-2004 website and 1.75 terabytes of data were delivered. This would have brought most servers to their knees, but thanks to foresight and good preparation, the VT-2004 website with its hundreds of *Akamai* mirrors did not suffer the fate of several other sites – including some by major organisations – which collapsed under the load, as was reported in the news. In fact, at the moment of the transit, the VT-2004 website received almost exactly as many hits as the official website of the Athens Olympic Games and it was one of the 6000 most visited websites worldwide.

As a unique aspect of the VT-2004 programme, and never before attempted on this scale, the 'VT-2004 Observing Campaign' was launched with the goal of a real-time measurement of the Astronomical Unit. This sub-programme was carefully organized to re-enact the historical determination of the AU by means of accurate timings of the four moments of contact between Venus' black circle and the border of the solar disc. The preparations paid off and this complex project generally went very well. A large number of groups of observers registered in the months and days before the transit; by the stipulated deadline on July 10, 2004, no less than 4509 contact timings had been received from 1549 registered observing teams. While most of these were located in Europe where the observing conditions were particularly good, there were also data from teams on all other continents except Antarctica. Following extensive analysis of this large material by staff members of the Institut de Mécanique Céleste et de Calcul des Ephémérides, the final result of the VT-2004 Observing Campaign to determine the distance from the Earth to the Sun was published in late 2004: 1 Astronomical Unit = 149 608 708 ±

11 835 km, i.e., only 10 838 km larger than the 'true' value!

In addition to the many activities around the Venus Transit itself, the organisers also aimed at evaluating in gross terms the sociological impact of such a very rare astronomical event and the way it was perceived in different countries. This programme indeed provided a rare field test for the execution of large-scale public activities relating to a particular, scientific event with strong operational constraints (including the requirement to act in real-time as the scientific event progresses). The organisers were therefore keen to gather valuable experience for possible future continent-wide activities involving the same mechanisms and carried out under similar conditions. A thorough post-event evaluation was therefore incorporated as an important element of the VT-2004 programme. Thus, on November 5-7, 2004, a follow-up conference took place at the French Ministry of Research in Paris, entitled the *'Venus Transit Experience'*. It brought together more than 150 persons closely connected to the VT-2004 programme in various functions, as organisers, specialists, educators, students, observers, participants, etc. The major goal was to sum up the vast experience gained through this exceptional public science discovery programme and to evaluate its many components and overall public impact. On the second day of the conference, detailed reports about the circumstances and impact of the Venus transit were given by experts operating in different surroundings, e.g. in primary and secondary schools, at the media and among amateur astronomers. National Committees from about 25 countries, either orally or by posters, documented comprehensively the individual approaches taken in different regions and cultural environments and reported many useful 'lessons learned' within the unique VT-2004 pilot project. These presentations clearly demonstrated the eminent success of the entire effort but also served to identify some technical and organisational shortcomings – as was to be expected in a complex and ambitious pilot project like this. However, the overall impression was thoroughly positive and much experience has been gained that will become extremely useful for any future projects of this kind. Most of the presentations given at this conference are now available on the web at: `www.vt-2004.org/FinalEvent/`.

While the Venus transit is now over, the VT-2004 programme is still very much alive on the Web. From the outset of the project, and given its all-European dimension, it was decided that the Internet would be the main vector of interaction, with a central website at `http://www.vt-2004.org`. Altogether, there are about 20,000 web pages and over 2.6 GB – not counting the numerous comprehensive National Nodes web sites in many languages – which offer insights into the many interesting facets of this celestial phenomenon and which will remain a rich source of information and stimulation for years to come. Faithful to its high goals, the trailblazing VT-2004 programme successfully developed into a true encounter between Science and Society and will most certainly serve as a most effective and useful guide for future projects, thereby helping addressing the issues raised at the beginning of this article.

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A network dedicated to sciences dissemination: Scité

Marie Botman and the Scité network

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Abstract:

The activities of the network Scité are destined for the schools and the general public and include laboratories visits, training periods, seminars, conferences, adult courses specially designed for teachers, etc. Since 2002, collaborations between universities and enterprises are enhanced and developed to bring to light the variety of jobs linked to science and the multi-disciplinary process leading to industrial application of scientific findings. Activities will include, enterprises visits preparation of CD and video support presenting "passionate" jobs, and the set up of interactive workshops for students. Systematic relations and interactions with scientific as well as global media are established and formalised. Activities enhancing such interactions include the development of media-universities interface assuring the quality and the adequacy of scientific information transfer and vulgarisation. Based on the wide expertise accumulated through recent projects, Scité Network develop innovative activities involving a wide range of actors: universities, enterprises, media, schools, general public

1 Introduction

Since 2000, French-speaking Belgian universities mobilized themselves for the dissemination of sciences through the creation of specific units. Their main objective was to be more efficient. Various activities for science dissemination were indeed already organised by several associations and institutions, including the universities. In order to valorise existing initiatives while stimulating projects at a higher level, the deans of the 5 faculties of sciences decided to create a network gathering the groups existing in each university: "Atoutsciences" (FUNDP, Namur), "ScienceInfuse" (UCL, Louvain-la-Neuve), "Inforsciences" (ULB, Bruxelles), "Réjouisciences" (ULg, Liège) and the "Centre de Didactique des Sciences" (UMH, Mons). This network is known as "Scité, catalyseur des sciences" (Scité, catalyst for sciences):

- Sci for Science,
- "Cité "is the french for "City", because science dissemination makes part of the citizenship expected from universities,
- "Catalyseur", because the network acts as a catalyst for sciences dissemination.

The constitution of such a network was made possible thanks to the financial support of:

- the French community government that launched the "Printemps des sciences",

- the Région wallonne (DGTRE) supporting directly the activities of the network.

2 Printemps des sciences

This scientific vulgarization event is a week for sciences in spring, organised each year, around a single theme : water (2001), energy (2002), communication (2003), measurement (2004). It addresses a wide range of target people:

- children of nursery and primary schools, because it is a mistake to believe that children are unable to acquire scientific knowledge. Allowing them to approach scientific subjects in a realistic way, should help the development of the scientific approach.
- teenagers of the secondary schools, who remain however a specific public.
- teachers, who can, through the event, have access to scientific demonstrations that are not available at school.
- all adults (we all are laymen in the front of nowadays whole sciences) during the week-end.
- professors of high schools, for discussions about scientific dissemination, vulgarization, popularization methods.

The event is organised at the level of the whole Belgian French community. Locally, each university organises independent activities in collaboration with actors close to its own activities.

3 Common projects

In order to provide both a better perception of sciences for teachers, general public and journalists, and a concrete approach of scientific professions amongst the youth, the network organises two other main common projects: "Sciences au quotidien" (sciences for everyday life) that presents most useful aspects of science for daily life, while creating the need of a scientific approach. A class studies a daily life object, in collaboration with scientists of the university and relevant companies; visits of high technology companies.

4 Working in a network

It is important to notice that the constitution of the network allows each university to keep its own identity (accounting for previous activities and expertise), while organizing common activities. In order to set up an effective and efficient network, it appeared necessary to:

- account for constraints and opportunities in each institution,
- share experiences,
- set up common projects,
- maintain dialogue.

Such a network enables then to develop both a "proximity science" and a structured approach within the French community. This kind of collaboration could also be extended at the European level.

5 Conclusions

The network Scité fits perfectly within the thematic "sciences and society". Indeed it focuses on the development of new activities of scientific vulgarisation while reinforcing and creating links between all producers and consumers of scientific information (universities, schools, enterprises, media, general public). Through the activities of vulgarisation, sciences and technology will become more accessible to all, thereby responding to the main bottleneck on the way to a European knowledge-based society. However, reaching such a goal implies necessarily the development of a European network working in synergy with local, regional and national initiatives. The network wish to develop such a horizontal integration and partnership at all levels. This colloborations will largely contribute to trigger a major momentum to give access to the knowledge-based society to all European citizens.

Imagine all the students... living zero-G

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Abstract:

Microgravity and spatial activities appear as very attractive topics for many pupils. In order to convert this naive curiosity into a real interest in physical sciences, we offer our students the opportunity to experience zero-g environment. We propose them to take part to one of the Student Parabolic Flight Campaigns organized by ESA. This begins with finding an experiment to be conducted in microgravity environment and ends up with the results analysis in the lab. Between both steps, they build their own experimental rack, take part to international meetings preparing the flights, give some hypothesis on the future observations... and verify them in zero-g !

1 Introduction

For many years, the interest for students into experimental sciences, and particularly physics, has been continuously decreasing. Different reasons can be proposed for that, one being that a large part of the physical community uses computers for 'virtual experiments' rather than real experimentation. Another reason may also come from the fact that most of the physical lectures are theoretical ones and, therefore, students are not familiar with experimental works. While students are able to discuss theoretical concepts they are generally unable to describe an experiment allowing to evidence them.

Thinking that physics, as every exact science, needs high-level experimentations in order to progress, we now proposed our student to performed an experiment by themselves during their last year in physics at University of Liège. The idea is to ask the student, by groups of four, to propose an experiment to be performed in one the department labs. In this paper, we report the issue proposed at GRASP (Group for Research and Applications in Statistical Physics). The particularity of our laboratory is to help students in performing their experiment in a microgravity environment (realized on board of an aircraft). We have indeed noticed that the possibility of feeling zero-G is a very attractive and motivating perspective for pupils. Here-below, we expose the different steps to be followed in order to flight. This includes looking for an experiment, passing selective tests from ESA, preparing the experimental rack, performing the experiment on board and, eventually, coming back to the lab for results analysis. As mentioned in the last section, in case of concluding results, scientific paper can be written.

The paper is organized as follows. Each section corresponds to one of the main step of a project. Next section exposes the experiment choice as well as the way the experimental setup

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is built. Section III presents the flight itself, while Section IV illustrates results interpretation. A summary is given in Section V.

2 Preparing the experiment

The choice of the experiment to be performed results from a discussion between student teams and lab members. This step is necessary because at this stage of formation, students do not have in mind what is doable in practice and what is pure theoretical point of view. Moreover, researchers of the lab take part to professional campaigns of experimentation in micro-gravity. They are thus able to prevent the students for going in a direction that would only lead to deception.

Students are then asked to write a proposal and submit it to an ESA commission. In case the project fits ESA interests and appears as well fitted for micro-gravity, the young team can start building the flying machine ! Drawing plans is the first and generally the apparently fastest step. Screwing, gluing and hammering is an hard job but one of the most amazing task. This is actually the first time students can build an experimental setup by their own. Figure 1 shows one of our students starting from zero and ending up with a safety visit validating the experiment. Time delay between the first and last images is typically two months.

Figure 1: (First row) Starting from scratch but with fournitures and help, students are able to come up with an experimental rack. (Bottom row) This setup is approved as ESA conform.

3 Performing

As soon as they apply, students have in mind the final deadline, that of the flights. These take place at Bordeaux (France) under control of Novespace. On board of an Airbus A300 [see Fig. 2 (left)] all experimental racks are well fixed in place of seats. Front and rear areas are left with seats for landing and taking off. During the flight, students have to make all possible to make the experiment going the right way and... not to be sick.

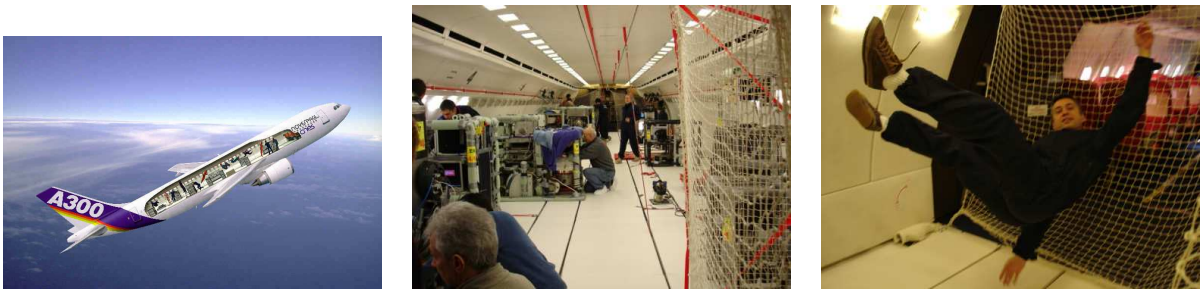

Figure 2: The flight finally takes place.

Flights span over two days. Each of these, two of the four students are with the experiment. This way, all students have the opportunity to flight in a non over-crowded aircraft. This is also more convenient to adapt the setup if something went wrong with the expeirment the first day. Each day is composed of 31 parabolas allowing each for 22 sec of microgravity. Once again, the experiment choice is important in order to have a phenomenon fitting in this small time.

4 Scientific results

Once they come back to the lab, students have to analyze the results. As for the other parts of the project, researchers help them in this task. A brief report is required by the department, while an oral presentation is proposed to other students which were not involved in the project.

In most cases, the experiment that has been achieved is quite new and related to up-to-date research. This allows us to go further in education and help the team to write a real scientific paper. This paper is then submitted to physical community for publication in a high-level journal. Figure 3 shows a typical result obtained during one of such student campaign. This experiment was related to the behavior of an aqueous foam under micro-gravity. Since gravitational forces were absent, only capillarity ones act. Therefore, the liquid located under the foam in Earth was able to reach the top of the foam. A curve giving the rising of the liquid as a function of time is also presented in this figure. It should be noted that the results obtained with this experiment were the first experimental proof of a theory proposed a few years before. Even this case is particularly excellent, each team benefits of the same help and new ideas are proposed.

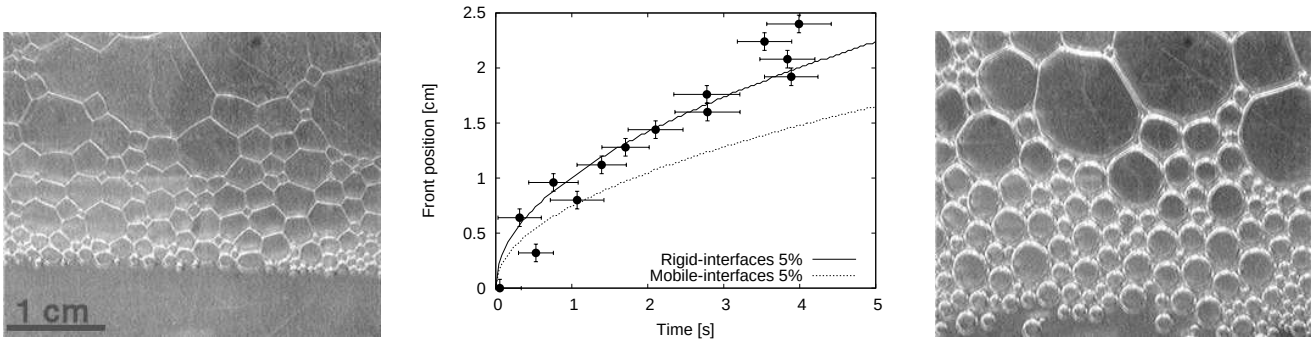

Figure 3: (Left) A two-dimensional aqueous foam under Earth condition. (Right) The same foam in microgravity conditions. The liquid is invading the foam from bottom to top, due to capillary forces. (Middle) Position of the liquid as a function of time.

5 Conclusions

Micro-gravity experimentation, as proposed by ESA under "Parabolic Flight Campaigns" is a really motivating activity for students. On the side of researchers, these constitute an opportunity for attracting pupils to experimental research. Such project is an unbelievable activity allowing to show a whole research job, from thinking of an experiment until publishing the results.

Acknowledgements

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La main à la pâte*: a French endeavour to renovate science education in primary schools

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Abstract:

Since almost 10 years, the French operation *La main à la pâte* has developed a broad network of teachers, trainers and scientists not only in France but through world-wide collaborations to reconcile children and teachers with science. Inquiry-based science teaching has proven to be highly efficient in revitalizing science education in primary schools. Focussing on interdisciplinary activities -including physics and astronomy, several exciting projects have been developed, which involve hundreds of schools at international scale and propose simple scientific activities for young pupils. Two ongoing projects, *Europe of discoveries* and *In the footsteps of Eratosthenes* will be presented as well as the renewed teaching method based on the process of investigation and the fundamental questioning attitude.

1 Introduction

Launched in 1996, the French *La main à la pâte* operation has undertaken to renovate and revitalize the teaching of science in primary schools. Supported by the Académie des sciences, and in close collaboration with the Ministry of Education, it has developed a new approach of science education, that has been recently integrated in national French curricula. In 2004, it was shown that more than 35 % of children really practice science in their classroom, whereas there were only 3 % when the operation was started, thus demonstrating the efficiency of the effort undertaken.

2 Inquiry-based science teaching

The program is based on 10 principles, which focus on developing the questioning attitude of children when they face a concrete experiment. The proposed activities, based on experimentation and observation of facts, encourage teachers to accompany the pupils in building their own knowledge. The minimum time to be dedicated represents about 2h/week during more than 6 months. A progressive and interdisciplinary approach of science is favored in a

http://www.lamap.fr (French site) ; *http://www.mapmonde.org* (international site)

"Astrophysics, and how to attract young people into Physics"; Proc. JENAM 2005 *Distant Worlds*, Liège (Belgium), eds. Nazé et al., p. 16-19

close collaboration between pupils and teachers. Instead of accumulating large amounts of knowledge, teachers are encouraged to make the children appropriate the scientific concepts and experimental techniques through their own process of investigation.

Learning by doing is the leitmotiv of the pedagogical approach, based on the personal investigation, that helps pupils develop cognitive processes as well as the sense of curiosity and creativity. In front of new and unexpected concrete situations, they are invited to reason, argue and question the nature itself, thus building up a new relationship to the sensitive world and to the "truth". Inquiry-based activities allow them to acquire new communication skills, through open debates in the classrooms, and with the teacher. Instead of the classical schemes of memorization and concentration of scientific concepts or formulas, the proposed methodology insists on the appropriation of knowledge through the individual investigation and questioning attitude, leading the children to learn by experimenting in partnership with the teacher.

3 A world-wide initiative

Initially tested in 3,000 classrooms in France, the program has been extended to more than 10,000 classrooms, linked to 14 local pilot centers that mutualize resources, coordinate the activities and eventually propose to support the teachers in their school. In parallel to this national enlargement, there has been a constant and progressive extension of the interest for the renovation of science education world-wide. Similar national initiatives have been developed in China, Columbia or Chile, inspired by the well experienced operations *Hands on physics* in the United States and *La main à la pâte* in France.

Besides, a tens of countries can be considered as direct collaborators of La main à la pâte, implying regular exchanges of material and know-how (bilateral translations of locally developed activities, short-time training of teachers or exchange of pedagogical material). Such partnerships are very active in Afghanistan, Argentina, Brazil, Cambodia, Chile, China, Columbia, Egypt, Malaysia, Morocco, Mexico, Senegal, Slovaquia and Romand Switzerland, often initiated through the support of national academies. Mirror websites have also been created in Chinese, Arabic, Spanish and Portuguese. In addition, there are more than 20 partner countries directly involved in built-in activities available through the web site (in various languages) and who participate to international projects led by the French team.

4 Interdisciplinary projects

We will present two of these international scientific projects, that aim at encouraging collaborations between classrooms beyond the national frontiers, taking advantage of their geographical or cultural differences. Astronomy can play a major role in such projects because it is a fascinating field where physics, mathematics, technology, computer science, chemistry and even biology meet together. It offers a unique opportunity to propose interdisciplinary activities in an integrated teaching, that allows pupils to reinforce their knowledge in various fields and practice exciting science at the same time.

The first initiative, called *Europe of discoveries*, aims at introducing scientific discoveries to European pupils, that can lead to developments and experimentations in the classrooms. Volta's battery or Galilee's telescope are excellent examples of possible technological developments inscribed in a well-known national historical context. The project usually starts from an historical observation or question raised by the famous scientist, which led to a major discovery and has to be reproduced, step by step, by the pupils with basic and affordable material.

Figure 1: Summer solstice measurement of the circumference of the Earth by Egyptian pupils in front of the new Great Library of Alexandria.

Figure 2: Intensive debate after experimentations: the questioning attitude as a key-point of the La Main à la pâte approach.

In the case of Galilee's telescope, the starting point can be his observations of mountains on the moon or of sunspots through his instrument. During the activities, the children do not only learn the scientist's discovery or play with lenses and telescopes: they face unexpected situations and problems for which they have to find a solution through experimentations and debates in a team-working spirit. How to align the lenses and maintain them in a tube ? How to stabilize the instrument to allow continuous observations ? Why do the images of the moon or stars move behind the ocular ? Do the sunspots really belong to the sun or are they dirty spots on the lens ? They build hypotheses, that they have to test through new experiments (which are defined with help of their teacher) and thus explore their own path before converging toward a solution. Every step of the reasoning and experimentation is written on the notebook to register the progressive approach of each group and improve the mastering of written and oral language. Once completed, the project is summarized and presented to other classrooms to allow children to appropriate the new scientific concepts, acquire communication skills and share experiences.

The second initiative, started in 2000, is well designed for international collaborations since it aims at sizing the Earth thanks to the very simple and well-know method discovered 22 centuries ago by the ancient Greek Eratosthenes. Since the beginning, the project has gathered hundreds of schools world-wide, which have followed month after month the evolution of the shadow of a stick, planted vertically in the ground. The pupils discovered that, by comparing their measurement of the shadow at solar noon with that of a partner located at a different latitude, it is possible to measure the size of our planet with a remarkable precision without moving away from their school ! The interdisciplinary activities are very appreciated by children who can practice technology, mathematics and physics together with history and geography. They discover and experiment the relationship between shadows and light, observe the daily path of the sun in the sky and the associated evolution of shadows, learn the solar noon, experiment that the Earth is really round. They build they own instrument (a vertical stick) and learn how to install and tune it, they measure angles and compute circuferences. The project can also provide a good opportunity to learn about old civilizations, historical and geographical notions (like the latitude and longitude). Finally, the use of new technologies (to report their measurements) is highly motivating and very helpful for exchanges and comparisons with other partners from other countries, through a dedicated website, that mutualize all the measurements of the year. The website, developed by the La main à la pâte team, provides all the pedagogical material to

help teachers setting up the activities in their school. This includes: a multilingual description of activities guidelines, scientific documentation for teachers, dedicated web tools, e-postcards facilities to contact other partners from other countries, follow-up of the classrooms involved in the project. On the summer solstice, when the historical measurement was performed, an international event is organized, consisting of synchronous measurements at solar noon from various schools including egyptian classrooms from Alexandria and Aswan, near the historical site of Syena. The project, although quite long and strongly constrained by meteorological conditions, has proven to be a motivating adventure, where even pupils experiencing difficulties at school can find a role in a team, express their own point of view and finally change their relationship to the teaching.

5 A partnership with the teachers

In order to assist teachers in setting up the experimental activities, a partnership is proposed in various ways. Two broad networks of pedagogical trainers and engineers and scientists has been created, who can be contacted via the main website. Teachers can ask questions related to scientific concepts, technological problems or teaching methods and share with other partners their own experience and difficulties or pedagogical advices. They are also invited to report their activities and propose locally developed projects. Workshops and short time training are organized, where teachers are placed in the same pedagogical situation as children. Without any scientific background, they have to face new situations, build experiments, argue, make hypotheses, draw conclusions and finally learn the scientific investigation process .

Teachers can find large amounts of resources on the main website (*http://www.lamap.fr*), that offers not only an extensive description of experimental activities but also scientific documentation written by specialists and the complete set of exchanges with scientists and trainers. An international website (*http:www.mapmonde.org*) has been recently developed, that proposes comparable resources in various languages and links towards international projects. Five major projects will be organized in 2005-2006 : Marco Polo on the road of knowledge, Living with the Sun and Hygiene and beauty in the roman world (in addition to the already mentioned In the footsteps of Eratosthenes and Europe of discoveries), that have been based on an interdisciplinary and fully integrated approach. The new methodology, which is encouraged by the La main à la pâte program does not only help to make science more attractive, it has also deeply changed the relationship between teachers and pupils and has successfully renovated the manner of teaching science in thousands of primary schools.

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Astronomy and astrophysics in Košice *

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Abstract:

Astronomical education of young people has very long history in the Department of planetarium and observatory of the Free-time Centre in Košice. The Club of young astronomers "Pallas" has already brought up three generation of young people. Activities of this club gained new dimension through collaboration with Faculty of Sciences, P. J. Šafárik University in Košice mainly with Department of theoretic physics and astrophysics. Many attractive and interesting events like observations of Solar and Lunar eclipses, Venus transit, Virtual university, Hubble 15th Anniversary, With telescope on the road invited hundreds and hundreds young people to astronomy, science and wish to learn about world surrounding us.

1 Introduction

It is very well known that interest of young people for physics as well as science systematically decreases in this commercial oriented world. Astronomy and astrophysics have special position in the science field. There is very close relationship between man and the universe: everybody who is born, lives and also dies under the sky, so everybody is a part of the universe. If we use this relationship astronomy can work as an attractor - tool that tightens young people to physics, science and the wish to learn about the world surrounding us. Such aim is not easy for astronomy and therefore it is necessary to join efforts of many organisations of various types. In this paper we would like to present one special and probably the remarkable type of such cooperation that was born in Košice, Slovakia.

Košice is the second largest city in Slovakia. You can find this city with rich history in eastern part of the Slovak Republic. The first written mention of the suburb can be dated back to the year 1230. Due to its advantageous business and strategic position the City of Košice grew quickly. Košice has the oldest coat-of-arms from among all cities in Europe. Nowadays Košice is a modern European town.

The astronomy has a long tradition in Košice where young people, scholars, students and all persons interested in astronomy can visit two planetariums what is the Slovak rarity. The

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first and older one occurs downtown in Slovak Technical Museum. The second planetarium you can find together with observatory in the Free-time Centre Domino. By the way it is a rare occasion to find observatory and planetarium in such facility.

2 The Free-time Centre Domino

The Free-time Centre Domino is an organisation mainly oriented on spare time activities of young people. Scholars and students come to our Centre to spend their free time actively in many clubs: dancing (modern, country as well as folklore), musical (brass bands, rock and pop bands), art, ceramic, photographic, dramatic, scenic, theatrical, scientific, computer and of course astronomical ones. Besides these regular club activities the Free-time Centre organises many special cultural, sporting and educational events and interesting camps during the holidays. Another part of the centre activities represents shows in planetarium and night sky observations in the observatory for groups of scholars and students as well as for all visitors and amateur astronomers.

Astronomical education of young people has a long-term tradition in the Department of planetarium and observatory of Free-time Centre. The Club of young astronomers "Pallas" is one of the best successful interest groups in the Centre; it has already brought up three generation of young people. Main activities of this club are connected with observations of the sky: from solar and moon eclipses, through planets, asteroids, comets, showers, to binaries and deep sky objects like nebulas, star clusters and galaxies. Some members of Pallas club are strongly interested in photography - art to immortalize the beauty of the night sky on photographic films and recently on CCD chips of their digital cameras. Activities of this club as well as whole observatory and planetarium department gained new dimension through collaboration with Faculty of Sciences, P. J. Šafárik University in Košice mainly with Department of theoretic physics and astrophysics.

3 Pavol Jozef Šafárik University

Pavol Jozef Šafárik University was established in 1959 as the second university in Slovakia, but the tradition of higher education in Košice goes back to the year 1657, when the bishop Benedict Kishdy founded the "Academia Cassoviensis" by the Memorandum of "Studium Universale". Later, the university was changed into a royal university and then to the Law Academy which operated until 1921. Old University traditions were renewed by foundation of Pavol Jozef Šafárik University in Košice which consisted of Faculty of Medicine in Košice and Faculty of Philosophy in Prešov. The new University has enlarged by new faculties: 1963 - Faculty of Science, 1973 - Faculty of Law and in 1998 - Faculty of Public Administration.

The key mission of Faculty of sciences is to provide higher education based on the newest scientific findings in a wide international context, following the European trends and goals. Faculty of Science prepares experts in natural sciences, mathematics, informatics and teachers. The graduates of our Faculty have a very good reputation all over the world. One part of our faculty - Institute of Physics coordinates education of physics for students of Physics teacher branch and education for student of physics branches: Condensed matter physics (specialization: magnetism, physics of metals, low temperature physics), Physical engineering of materials, Nuclear physics, Biophysics and chemical physics and recently Astronomy and astrophysics.

Astronomy and astrophysics (as a part of Department of theoretic physics and astrophysics) has not long history (the first student of this branch graduated in 2000), but it has a perspective

to become the best educational institution in this branch in Slovakia (and probably in larger European territory) due to the study conditions that are offered to our students. The very important role plays our very close cooperation with other institutions, mainly with Astronomical institute of Slovak Academy of Sciences in Tatranská Lomnica. This cooperation assure the high quality of presented information in educational branch as well as the significant scientific research. Our colleagues from Astronomical institute give lectures from various astronomical branches like the physics of the Sun, Interplanetary matter and interacting binaries, admit diploma thesis for our students; some lectures are realised directly in the Astronomical institute. Another promising cooperation rises with Kolonica Observatory, equipped by the largest telescope in Slovakia (diameter of primary mirror 1 m).

4 Cooperation

Our goal is to attract more young people into astrophysics. We try to exercise an influence on university students - young people, who are mostly decided to do their scientific careers. We realise that it is necessary to start the popularisation of astrophysics (and physics at all) from scholars to students. In this field the Free-time Centre has quite strong position. In 2000 the agreement about cooperation between the Free-time Centre Domino and Faculty of Sciences, P. J. Šafárik University was signed up.

The main goal of this cooperation is to aggregate forces to enhance achieved results in educational process and popularisation of astronomy, natural sciences and science at all. On one side scholars and students - members of astronomical clubs in the Free-time Centre have chance to work with scientists on particular scientific problems using professional equipment, what is very attractive for them. Some former members of astronomical clubs are now students of astronomy and astrophysics in our faculty. On the other side our university students use equipment of observatory and planetarium during their special lectures (Elements of Astronomy and Astrophysics, Astronomical equipments, etc.) or during preparation of their Diplomas (Reduction of long-term observation of solar photosphere - V. Kozarová, From the life of stars - K. Meňuchová, Short history of the Universe - M. Pančišin - new shows in the planetarium for scholars and students). Students of Physics teacher branch can achieve the first educational experiences during leadership of clubs in the Free-time Centre. Preparation and organisation of conferences, public presentations and special astronomical events represent additional part of our collaboration.

One of our great astronomical events, which was realised in the frame of our cooperation was Venus transit 2004. Faculty of Sciences started to operate the optical network in the Free-time Centre during 2003. In the frame of so called "Virtual University" (the faculty's project of utilisation of optical network for educational purpose - e.g. for propagation of educational presentations) was observation of this event (using video camera mounted on the telescope in observatory of the Free-time Centre) propagated as the live transmission in Internet. So besides hundreds of scholars, students and people interested in this event which came to the Free-time Centre next thousands had possibility to see this unique astronomical presentation in Internet. Moreover, the videoconference was established, so people interested in this event could directly communicate with professional astronomers. This observation had besides the propagation character also scientific importance: our young astronomers were involved into the ESO project of astronomical unit measurement.

Another very successful common event was celebration of the 15-th anniversary of launching of Hubble space telescope in April of this year. This event was organised in cooperation with European space agency. The Faculty of sciences purchased new equipment for planetarium this

year. We cooperate during preparation and organisation of conference for teachers of physics in Košice region, competitions, expeditions and camps for young people interested in astronomy and astrophysics.

5 Conclusions

We are going to prepare another public observations of special astronomical events like solar eclipses in October 2005 and March 2006 and many others. So we can proudly say that our cooperation brought the first results and we hope that the cooperation will continue successfully in the future. We hope that it can be inspired and useful for the colleagues in the Europe.

Acknowledgements

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Stars in the eyes, birth of a vocation ?

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Abstract:

It is generally difficult to interest people to sciences, especially physics. However, astronomy has a great power of fascination, and can thus be used to attract people into the scientific world. Here in Liège, we are trying to develop several different aspects of astro-education: they will be detailed in this paper. For example, we organize interactive activities for primary schools, and also help high school students to consider a scientific career. Our undergraduate students also benefit from our experience: for example, they have the possibility to observe at a *real* observatory, they can train at ESA facilities,... The general public is also invited to discover astronomy and, through it, physics, thanks to several specific events. Finally, media, the links between the public and the researchers, are not forgotten: our astro-news service was specifically created for this purpose.

1 Introduction

One may wonder why use astronomy to attract people into sciences. In fact, astronomy is an old physical science that has always fascinated the human being: it is therefore one of the best tools to interest people to sciences, especially for formal education purposes. Astronomy benefits from multiple advantages. First, it is a multidisciplinary domain: astronomy can help to increase people's awareness in physics, new technologies, history, biology, and even philosophy! In addition, it is by itself very attractive: apart from a deep fascination it has always exerted since ancient times, astronomy also presents beautiful pictures, new discoveries every day, big technological challenges (like building a 100m telescope) and human adventures (like landing on the Moon or going to Mars). Finally, it triggers easily the scientific curiosity since it is linked to timeless questions, e.g. is Earth the only planet?, how big is the Universe?, are we alone?, what will be the fate of the world?,...

So astronomy potentially interests everybody and we should therefore target *everybody* in our astronomical dissemination projects. We have then tried, here in Liège, to do so by organizing a wide range of activities regarding astronomy. I'll now present a few of them.

2 *De 7 à 77 ans*: Schools and General Public

All year long, there are many opportunities to attract people's attention towards sciences by means of astronomy. Here are a few examples.

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A first possibility is to join a science fair. In southern Belgium, the science network 'Scité' organizes each year such a science fair, called 'Printemps des sciences', lasting 7 days. Schools (primary and secondary alike) are invited during the week, while families come to visit during the week-end. Each year, a different theme is chosen. Since astronomy is multidisciplinary, it is rather easy to make an astronomical exhibition while strictly focusing on the chosen theme: for example, in 2005, the theme was 'the town', and we have then explained the problem of light pollution and talked about the links between astronomy and sustainable development, a very fashionable topic at the moment.

Events only related to astronomy are always a big success, especially since many different activities can be organized.

As you all know, *bigger is better*, i.e. big experiments always impress people a lot, and being impressed may then trigger a new interest for sciences. astronomy is the ideal laboratory for impressive experiments. For example, the Foucault pendulum. Regularly, the Liège astronomers, amateurs and professionals together, gather in a no longer active church in the city's center. There, they invite the schools and the general public to come during 2 weeks while trying to prove that the Earth is rotating. Another unforgetable experience linked to astronomy is a planetarium session. In the old Observatory of Cointe, astronomers from Liège are giving planetarium shows to primary and secondary school students. There, in agreement with the official learning program, the students learn about celestial motions from different points of view (e.g. as situated on Earth or from outer space). They discover by themselves how the Earth moves in space, and can then deduce what this motion induces: seasons, day and night alternance,... Finally, seeing the 'real sky' through a telescope keeps a lot of appeal even in a high-tech era. That's why we are offering a few observing sessions each year, either during the day (for the Sun) or at the beginning of the night (when children are not yet confined to their bed, so the whole family can come). Since the weather is not always good (especially in Belgium), the best thing to do is to organize such sessions as a complement to another (indoor) event like conferences or worskhops: the observations then constitute the 'cerise sur le gâteau'.

Each year, at least one 'hot topic' related to astronomy arises in the media like e.g. Venus transit in 2004 and Huygens landing in 2005. At that time, everybody, at school as well as at home, is talking about it: from our point of view, this is a perfect opportunity to organize an 'astro day'! Be assured that it will attract a lot of schools (teachers have to talk about current events but know little - if not nothing - about astronomy), the public at large, and also... the media.

If punctual events are interesting, one should not forget loger-term education. In this context, we have recently built in the woods surrounding the university an attraction called 'Piste des planètes' (Planet Walk): it is a one-km walk with a scaled Solar system along it. Contrary to what is usually done, we have decided to keep the same scale for sizes and distances. With this enjoyable walk, perfect for a sunday afternoon, people can therefore learn about the actual dimensions of the Universe, and see how small and fragile the Earth is.

For primary schools in particular, we also organize specific activities called 'astro lessons', with small conferences on the current 'hot topic', and/or astro workshops for e.g. building a mobile sky chart. Questions and answers sessions are always very much appreciated at that age, but be aware that it can be difficult to reply to apparently 'simple' questions (e.g. why is the Earth round?) in simple terms.

Finally, we also regularly welcome students from the last year of high school at the Institute, for one day to one week. According to the length of their stay, we propose different activities: discussions with professional astronomers to see the diversity of topics in astronomy and how real astronomers work (e.g. not with the eye glued to the eyepiece like in the nineteenth

century). They can even work with real data (like e.g. in the ESO/ESA exercise series), a first approach to actual research. We may also help them when making a final work oriented towards astronomy.

3 Undergraduate Students

Once students are doing university studies in sciences or applied sciences, the challenge of having them become real scientists is not yet won but astronomy can still be of help. In Liège, there are of course several possibilities to discover astronomy, from a few general astronomical courses for the bachelor degree to masters or PhD in astronomy or astronautics. But more importantly, undergraduate students can discover the real research world through astronomy. For example, they have the opportunity to go to the Haute-Provence Observatory in France, where they have to deal with a real telescope, with which they get real data that they have to interpret correctly. Students can also do internships at CSL or ESTEC (two ESA facilities), for discovering how European space missions are conceived and what can be done with the data. They may also participate to ESA parabolic flights or to the building of a microsatellite, called LEODIUM. These activities are very different from formal education, and they represent a first contact with real research: this can really trigger a career as a researcher, actually not always related to astronomy itself.

4 Media

Media are defintely important to consider in the context of science dissemination. Don't be mistaken: the first contact of people with sciences generally happens through a TV show, a radio program or a newspaper - not by an encounter with researchers. And since media professionals are the first ones who will explain science to the general public, it is certainly better that they have access to good information in the first place, so researchers should not be afraid to be key persons for the media. It should also not be forgotten that journalists prefer 'live actions' to images, so an astro day with hundreds of children talking of THE hot topic of the day should assure a reasonable media coverage.

In addition, since press releases are not always correctly decrypted, we have organized in Liège a news service: every day, two professional astronomers summarize in easily understandable French all the press releases related to astronomy and geophysics, and a computer assistant makes them available to the public through a web page[1] and a mailing list. Since 2000, we have issued more than one thousand news! Such a service can help to debunk bad astronomy concepts, and prevent the spreading of definitely non-news (the 25th announcement of planet #10, 'discovery' of a quark star,...).

5 Amateur Astronomers

For doing all these activities, we can always count in Liège on the local amateur astronomer society (the Société Astronomique de Liège). These amateurs are especially useful for organizing observing sessions (real or at the planetarium): they are skilled observers, possess many instruments, and know the sky very well. In exchange, mmost of the conferences that they are organizing are given by professional astronomers, and the science articles of their magazine are

[1] http://www.astro.ulg.ac.be/news/fran/nouvelles.html

often written by professionals. One should not be too afraid of amateurs: their help can really be precious in disseminating astronomy once they have created regular rendez-vous with the public since the latter feels closer to them than untouchable high-level university professors...

6 Conclusions

Because the night sky is mysterious and attractive, there exists everywhere a clear demand for astronomical activities. This desire can certainly be used to bring people into sciences. Astronomy being multidisciplnary, a lot of different activities can be organized, from workshops (building astronomical charts or rockets) to conferences with beautiful images, without forgetting observing through a real telescope. All these activities can easily be linked to other scientific fields, like biology (e.g. when talking of life in the Universe), chemistry (for the Universe's content), physics (for rocket propulsion) or sustainable development (light pollution, greenhouse effect in different planets, terraforming).

Since everybody is interested in astronomy, we should not restrict to a specific age: nobody forgets what he/she learned at a young age and a grandparent who just participated to one of your activities will probably share his/her newly gained knowledge with his/her grandchildren.

Of course, the media constitute a key for a winning dissemination program. The press reaches everybody and usually likes astronomical events. However, we should try to go even further and organize some specific activities for them, like a news service, in order to avoid as much as possible the usual scientific mistakes in the press. With the help of everybody (media, schools, amateurs), professional astronomers may really trigger the birth of a new generation of scientists.

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The importance of Scientific literacy in our Society

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Abstract:

Scientific literacy in our society has entered a period of serious decline. Contrary to our perception, the interest of lay people for the sciences has not grown in parallel with the advances that science has brought to society. Advanced communitites are starting to feel the shortage of bright scientists. In what follows I will try to examine the situation and raise a number of questions relevant to the problem outlined here.

1 Introduction

Traditionally, education has been associated with the classics. The huge progress that Science has achieved has not prevented the formation of a divide between a fraction of society that has been educated in the classics and that trained in the sciences. There are indeed important exceptions, however the division is clearly perceptible in our society.

Is this feature ingrained in human nature? The question stems from the fact that the Classical intellectuals from Greece and Rome were versed in both natural philosophy and letters. With the passage of time, however, the "Letters" aspect of our Classics had reached a relatively wide audience, certainly much wider than that of the scientific legacy of the classical age. In the Middle Ages the only whisper of culture cultivated or maintained in monasteries was mostly related to letters. This was not so much the case for the Arabic golden age. Indeed, important scientists developed medicine, mathematics and the natural sciences, and were excellent keepers of the classical legacy in both letters and the sciences.

Nowadays, science is all around us. Modern life can't be conceived without science, yet, scientific literacy in our society is far from adequate. Many educated people do not have an interest in becoming even minimally educated in science, not to mention the uneducated population...

2 Modern life paradoxes

2.1 A rejection of the industrial revolution?

The XVIII century was a harvesting one. In the XVIII century famous physicists, chemists, and natural philosophers in general, made impressive contributions to science, based on the legacy,

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left during the previous two centuries, which started in the glorious Renaissance. The XVIII century witnessed the Industrial Revolution in the UK and other European advanced countries. The Industrial revolution brought the vapour machine, new textiles, new construction materials, etc. Products elaborated through processes involving new laws of Physics and Chemistry, as well as new Mathematics put forwards by eminent scientists.

It is true that the Industrial Revolution also brought hard conditions for workers throughout Europe. The benefits of the Industrial Revolution did not seem to reach out to the workers and lower classes of society. On the contrary, these poor people felt exploited by the harsh working conditions in many industries.

The XIX century intellectuals, unimpressed by the Industrial Revolution, took pride in rejecting technology and by extension everything related to Science. In addition to this, Science was instrumental in the invention of new and more destructive weapons.

Intellectuals were thus clearly uninterested in Science, and in many cases openly opposed to teaching and learning sciences. It is perhaps in this century where the great division between the sciences and the Classics become notorious.

In more recent times, nuclear weapons, nuclear waste, greenhouse effects, environmental disasters, etc have added to the unfavourable perception of Science that many people have in our society.

2.2 A question of pedagogy?

Or it is perhaps a problem made and cultivated by scientists? Science seems to be perceived as obscure, difficult, strange, etc., by many people. Other more friendly souls would claim that Science is for the smartest, or even for crazy people.

Perhaps we scientists have not been smart at showing our good side to society. Perhaps we scientist have been so busy in our wonderful world that we have forgotten to share our excitement with the rest of society. Perhaps, in a rapidly changing world, we scientists, important players in bringing out that change, have not been alert enough to catch the fears of society. We scientist have not noticed the need to build bridges with other groups and types of peoples.

2.3 So Science is irrelevant!

Yes, or so it seems! Common people are not interested in Science. Few people show some curiosity, but even these are a minority. So let's now turn our attention to the upper classes in society.

I could say that wealthy people are no more interested in Science than less wealthy ones. There are exceptions, there are philanthropists, but most wealthy people tend to be unaware of Science.

How about politicians? Most politicians do not have scientific backgrounds. Besides, they try to respond to the interests of their constituencies. So, the fact that they themselves do not have a particular interest in Science, combined with a population whose interests are not science related, leads to a society where Science is not in the agenda.

3 But Science is important for Society

Indeed it is! Even if society does not realise it. But let us not fall into the old position of scientists fully convinced of the relevance of their work to society, in a society where their scientific work seems to be irrelevant.

Few people would contest that Science has brought many advances to society. Moreover, modern life could not be imagined without Science. In every activity, in every field, Science is present. Technology is driven by Science. Both Science and Technology have changed the shape of mankind. In communications, medicine, transport, the automotive industry, in pharmacy and cosmetics, in computing. Science and technology are everywhere. Also, unfortunately, in the weapon industry.

And very importantly, Science has a place in Mankind cultural heritage. Science is part of Mankind's history.

3.1 Economical impact of Science

The Economy is also part of Mankind's history. Economy is indeed important for society, and indeed Science should appreciate it. Science should also show its economical aspect, and as such there should be ways to measure both its cost to society and the economical benefits derived from the scientific activity.

Although not often publicised, there have been numerous econometrics studies trying to describe the scientific activity in term of standards economical parameters. I will refer to two studies carried out by the Committee on Economic Development and the Science Committee of the U.S. Congress, which conclude that the economic return of investments in Science has been of the order of 30% per year, consistently over the last 50 years. This is to be compared with the return of investments in more traditional activities, which is of the order of 10% per year when the economy is in a period of growth.

The above figures are not very well know, although economic journals and magazines, such as The Financial Times, are well aware of it. The numbers given should made us all want invest more in Science. However. It is true that investments in Science have to be faced in the long term.

One more example come in handy. While eliminating the ever high US deficit, currently running at about M$500000, would add to the US Gross Domestic Product (GDP) a mere 0.1% annually for the next 10 years, investing in Science has been adding at least a 30% increase to the US GDP for the last 50 years.

Many more examples could be given. For instance, the GPS navigation system. The GPS system would not be possible without both an understanding of the General Theory of Relativity, and the discovery of Atomic Clocks. By 1995 the GPS market amounted to M$2300 and employed more than 100000 people. Today these figures have skyrocketed.

It is therefore hard to believe that both governments and companies are not more interested in investing in Science. Governments mostly in Basic Science to provide the atmosphere for discovery, the opportunities for advancing in many diverse fields of research. Companies should in turn be alert to benefit from the research done at Universities and research centres to bring the new results closer to products that can be marketed.

If the above scenario is correct, it is hard to believe that when the economy is growing there are no more investments in Science. Moreover, it is also hard to believe that even when the economy is stalled, there is no more funds flowing to Science, as it is Science that ensures a steady and firm economic growth.

4 Why is then Society not more interested in Science?

There may be many answers to this question. There may not be any simple answer. And if we can't find simple answers perhaps we will not be able to find solutions.

The only hope I see is Education. Education is important at all ages. Science education should be part of the school curricula from the very early ages. Science is fun, and as such teachers should find no difficulties in conveying the excitements of Science.

In this respect, astronomy has an important role to play. Astronomy is a science that is close to society. This has always been so from the very earliest times, and is still so. Astronomers should endeavour to use astronomy to entice the society into a better and fuller scientific education. Moreover, this should be done from very early in the educational system. Astronomy is ideal for teaching young children about numbers, or the day-night cycle. Later on in their career, astronomy will show student the importance of mathematics, physics, chemistry, geology, engineering, or even biology and medicine. If this is done from the early stages of education, on a par with education in the humanities, we will have a future society where scientists will be valued as key figures not only for their economic impact but also for the wider aspects of cultural life of society.

Indeed Astronomy should not be the only subject, but Astronomy is a good anchor, students will subsequently follow other scientific careers, but they would have been attracted to them by Astronomy.

5 Conclusions

Science is an important part of human activity. Science is also important for its economic return. However, Science is often avoided by people as difficult, or even obscure.

People should understand the important value of Science, both for its cultural implications as well as for its economical impact. It is important to scientifically educate the general population, so that Science is welcome in our lives as an exciting activity. It is also important that young bright people decide to follow scientific careers.

Astronomy can help attracting people to the Sciences as it is a subject that has interested Mankind since the very ancient times.

Is mass media beneficial or not for the information of the general public?

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Abstract:

The International Year of Physics reminds us, among other things, of the way in which Einstein became famous. In spite of all his remarkable scientific results, without the contribution of the press he would not have become so well known in the entire world as he was and continues to be after a century. And he is not the unique example of celebrity due to mass media (see Carl Sagan or Stephen Hawking). In 1969 the first man stepped on the Moon. It was maybe the first cosmic event, which became famous due to a live TV broadcast. Others followed, if we are to mention only the total solar eclipse of 1999 or Venuss transit of last year. Consequently, mass media can make a scientist famous, can also make an event understood and admired and can attract hundreds or maybe millions of people to science. The same mass media can also destroy a personality or an event. We shall give only two examples: the distrust of many people concerning the same Moon landing or the manipulation of millions of people by means of astrology. All this urges us to make a very thorough analysis of the way in which scientific information is communicated to the general public: well done, it can be beneficial; otherwise it may drive the new generations away from research, the understanding of the phenomena, the neglect of the environment and finally from the neglect and the destruction of our own planet.

1 Introduction

2005 has been the International Year of Physics. All of us have celebrated 100 years of relativity. But the same event has reminded us the way in which Einstein became famous.

A total solar eclipse was the best event to verify his theory. German astronomers went to Siberia for the total solar eclipse (TSE) of 21 August 1914. Unfortunately, the First World War started and they were taken prisoners. The experiment was not done, but the journals talked about it. It was also the chance of Einstein. His theory was not yet finished, so the expedition could be a fiasco.

But only in a few years, on 29 May, 1919 a new TSE was announced. Sir Arthur Eddington, a British royal astronomer went to observe it to the African island of Principe. The experiment proved the truth of the theory and Einstein became famous over night, but not only due to his scientific results. It was also the contribution of mass media. A British astronomer verifying a German theory! That was quite an event after the war between the two nations. On November 7, 1919 the London Times wrote: Revolution in science New Theory of the Universe Newtonian ideas overthrown.. On November 10, 1919: The New York Times published: Lights All Askew in the Heavens / Men of Science More or Less. Agog Over Results of Eclipse observations / Einstein Theory Triumphs. The Einstein image in mass media exploded.

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Moreover, Intellectual Hero prior to the WW II link with the atom bomb. $E = mc^2$ not crucial for atomic energy but in popular culture as the sorrowful father of the atomic age, whose genius was used to tragic ends. T-shirts, mugs, cartoons, calendars, post cards, and also featured in popular films. A wild-haired, sock less, disheveled, eccentric genius with a heart-our popular culture hero, this is the currently accepted symbol of intelligence.

2 Back in history

It is maybe the most exciting example of the role of mass media but we have to go down in history to see how it evolved.

There was a monk and mathematician, Marin Mersenne (1588-1648), who could be considered the first post office for all scientists in Europe. It was an epoch of letters, but he succeeded to inform the large public about the scientific news.

On 5 January 1665, the judge Denis de Sallo published Les Journals des savants, maybe the first scientific journal for the large public.

The series of scientific journals had just started: Philosophical Transactions (1665-1678, 1683-1775) of the Royal Society published world news from science and technique. The number of such journals increased everywhere in the world.

3 Scientific journalism and scientists

In our days the public has to face an avalanche of news from all sciences, astronomy being the most exciting of them. How to manage it? Some scientists are ready to help them. Who are they? Difficult to say. It is enough to look at three of them to see that maybe the unique common particularity is their enthusiasm. The most famous was maybe Carl Sagan (1934-1996). As one of the Time covers shows, he was really a showman of science. He emphasized:

- the need for skepticism in critical thinking and the necessity for checking and corroboration of claims before accepting them;
- the role of the mass media in shaping our characters and opinions;
- more and more mass media operations are coming into the possession of fewer and fewer individuals or groups;
- the need for scientists to be communicators, to use the media and the classroom to explain to the masses the truths and beauties of science, instilling in them the sense of wonder, which drives people, like himself.

He was hopeful that the internet will be an antidote for this concentration of control over information. His criticisms of typical science instruction and the paucity of science writers for popular markets are right on target and worth being perused by science educators.

A special case is Stephen Hawking (b. 1942). It's not often that a physicist gathers together a large auditorium full of enthusiastic fans specially when tickets range in price from 28USD for students to a pricey 69.50USD. On April 27th at the University of Toronto's Convocation Hall, 1200 people welcomed him. The audience stood up to greet the 56-year-old, stricken with Lou Gehrig's Disease, with prolonged applause as he wheeled his wheelchair up to the front of the darkened auditorium, a lone light shining on his face. They came to hear him speak about the "theory of everything" an attempt to unify all the elements of physics in one single theory, from the tiny atom to the vast universe. As his computer synthesized voice rang out over the speakers, the hushed audience listened with attention to a man considered to be the most brilliant since Einstein.

Hubert Reeves (b. 1932). He is one of the most popular scientists in France, very present in the media, with his white beard and friendly smile. He promotes an optimist view of the universe and of our prominent place in it. He is the main guest of the annual "great mass" of popular Astronomy: "The night of the stars" at the national network France 2.

So, everyone could be an example why astronomy has to be transmitted to the large public and the success of everyone proves that people are hungry for scientific information.

4 Special astronomical events and mass media

From time to time different astronomical events attract the large public.

Maybe the first cosmic event, which became famous due to a live TV broadcast, was the first step of the man on the Moon. Everyone expected breathlessly the dream to become reality. But did men really land on the Moon? Look at the question which came up quickly in the journals. The famous Gallup answered: only 6% of the public believes the landing was faked and another 5% have no opinion.

Each eclipse, especially the total solar ones gathers millions of people to look at such spectacular phenomenon. Remember the transit of Venus in 8 June 2004, maybe the most disseminated event in the world, by TV, radio or internet.

5 Mass media and scientists

Certainly, we could ask the question: which is the role of mass media in promoting science, of the scientists themselves?

- for most of us it was the first step taken by science. Many years ago Jules Verne was the first book read by the young which were attracted to the mystery of science. Now it is useless to talk about the role of Discovery channel, scientific journals for amateurs or the internet.
- Journalism can be an interesting and rewarding career. And many of the necessary skills, such as curiosity, the ability to follow a complex argument, and problem solving to elicit information, may be found in science graduates.
- Science writers have to cover stories pertaining to various scientific disciplines - from energy and the environment to epidemics and astronomy.
- Specific scientific knowledge is less useful than the ability to grasp new concepts quickly and present them in a way that makes them entertaining and informative to a broad audience.

6 The malefic effect of scientific journalism

Such an effect exists. It is enough to mention the inflation of horoscopes in the mass media of any country. People like them more than anything else. The truth is that they are only creating an illusion of science, they are using science to win money and audience.

But false information comes not only from astrology. Life in the universe, this inexhaustible source for the amateurs of UFO, is one of the most distorted mass media subjects.

Even the space missions are not circumvented by false communication. Think of how many journalists create public fear. It is enough that they speak about the alignment of the planets, eclipses, fall of asteroids, or comets and what should be a source of knowledge becomes a source of terror.

7 Conclusions

This paper should be an alarm signal for our colleagues: scientists or journalists. We have to do more so that science is perceived in all its beauty and for profit of all mankind. But we would like to draw a few conclusions.

- *Scientific journalism training* The faculties of journalism have to introduce classes of natural sciences. Otherwise, with the weak knowledge received in the school and being themselves victims of the mass media, it is not difficult for the students to take what they know for good.
- *Advice for scientific news* All of us know that it is not pleasant to interrupt your work to explain why the sky is blue, why there is full moon and thousands of other questions. But if we dont make time for this, others will and public knowledge will suffer.
- *Better links between scientists and journalists* It is an advice for both sides. If everyone is working for himself, without any connection, any dialogue, the result will be negative for the public.
- *A more courageous attitude versus astrology* We complain of what is written in the journals but how many of us are daring to face such a delicate problem as astrology.
- *A deeper interdisciplinary analysis of scientific journalism: sociology, psychology, teaching, science* The cooperation between them will raise the level of the mass media and the public will be better informed. Well know better why we do what we do and how to do it better. Maybe international bodies such as the European Astronomical Society should organize special working groups to create a strategy in this interdisciplinary field of interest.
- European funding for national scientific mass media is necessary, especially for poor countries where this is the last one on the budget or is practically missing.

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EAAE and Astronomy for European schoools

Fernand Wagner

EAAE president

Abstract:

The aim of the European Association for Astronomy Education (EAAE) is to promote astronomy education in schools and to stimulate the interest of pupils and students for astronomy. European projects for students and teachers such as Catch a Star, Sea and Space Life in the Universe, Physics on Stage and EAAE-Summer Schools show the different EAAE activities. Science on Stage 2005 and the European Astronomy Day 2007, two joint European projects with EAAE involvement are presented.

1 The History and the role of EAAE

Astronomy-oriented high-school physics teachers from approximately 20 countries met in 1994 at the ESO Headquarters for a workshop about Astronomy Teaching in European Secondary Schools and decided the creation of the European Association for Astronomy Education. The activities of the European Association for Astronomy Education (EAAE), officially founded in 1995 in Athens, are best described by an excerpt of its statutes.

The purpose of the European Association for Astronomy Education is to improve and promote astronomical education at all levels in all institutions involved in teaching astronomy in Europe.

AAE may be considered as a network of teachers coming from more than 25 European countries, who are acting as a link between high level research and education, between the professionel scientists and the students. EAAE brings students from all over Europe directly in contact with various astronomical subjects, independently of their national curricula, offers the possibilty to collaborate in european wide projects and enables the contact between students from different nations interested in astronomy.

Motivation of students and teachers for astronomy and support for teaching astronomy is achieved by different kinds of EAAE activities, such as the participation in joint European projects and the organisation of EAAE summer schools.

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2 Promoting Astronomy Education by joint European projects

2.1 Astronomy On-Line

Astronomy On-Line was organised in 1996 in the frame of the 4th. European Week for Scientific and Technological Culture by ESO (European Southern Observatory) and EAAE. Astronomy On-Line was the first programme in the world to bring together more than 5000 students from 39 countries to explore challenging scientific questions, using modern communication tools, both for obtaining and for communicating information. The world's biggest astronomy event on the world-wide-web offered to the student groups a great variety of interesting and educational activities. These ranged from collaborative projects which require astronomical observations made by many groups all over Europe, to the opportunity to contact professional astronomers, from simple astronomical observations guided by teachers to the possibility of submitting observing programmes for telescopes at 10 major observatories. Many side benefits were registered, such as stimulating schools to go on-line or prompting international cooperation among young people.

2.2 Sea & Space

Sea & Space was a collaborative project between ESA (European Space Agency), ESO and EAAE including a contest. A poster and a newspaper contest for pupils and students allowed to select a winning team in each of the 22 participating countries. All these winning teams were invited to the final event of Sea & Space that took place at the EXPO 98 in Lisbon in August 1998. Many astronomy related topics could be treated by the student groups in the different parts of the programme, for instance astronomical measurements, historical methods, navigation with astronomical methods and with GPS, the Moon and the tides, water detection in space with telescopes and satellites. An important effect of the Sea & Space programme was the fostering of interdisciplinary awareness of all the participants.

2.3 Life in the Universe

Life in the Universe is an educational outreach programme organised in 2001 by ESA, ESO and CERN (The European Organisation for Nuclear Research). An important basic information package was produced by some of the world's leading scientific experts in collaboration with educators, and made available on the web. 14 to 19 years old students from 22 countries were joining in a contest and preparing projects representing their ideas on Life in Universe. The contributions to the contest could be scientific or artistic. The winners were invited to present their work at CERN in Geneva, where the best presentations were awarded with an invitation to an Ariane launch at the ESA Spaceport in Kourou and visit of the ESO Very Large Telescope at Paranal in Chile.

2.4 Catch a Star!

The web-based programme "Catch a Star!" organised jointly by ESO and EAAE within the context of the European Science and Technology Week 2002 was centred on an astronomy competition for European students not older than 18 years. Groups of up to three students and one teacher had to select an astronomical object, to collect information about this object,

to compare it to similar objects and to submit a report (in HTML format with images and text). The winning team invited to visit the Very Large Telescope (VLT) at the ESO Paranal Observatory in Chile. All the accepted reports, which represent a huge amount of astronomical information and of useful material for students and teachers, are available on the web. Further editions of "Catch a Star!" were organized every year with a growing success. "Catch a Star!-4" starts in October 2005.

2.5 Physics on Stage

Physics on Stage is an initiative for European science educators and was first set up in 2000 by ESA, ESO and CERN with the participation of EPS and EAAE. This year the fourth edition is enlarged to Science on Stage and it is run by a consortium of seven large research organisations called EIROforum. Science on Stage, with national activities and events in 29 participating countries culminates in a European science teaching festival at CERN in November 2005. Science on Stage provides teachers with opportunities to exchange innovative ideas, successful educational tools and good practice. It also offers the teaching community a direct link to the combined expertise of Europe's leading scientists and allows to identify exceptional teaching projects and outstanding educators in each country.

2.6 EAAE Summer Schools

Since 1997 the European Association for Astronomy Education (EAAE) organises a teacher training course every year during the summer holidays, which aims at improving and promoting scientific and astronomical education in schools all over Europe. The Summer School, one of the important EAAE projects, gathers European teachers (members and not members of EAAE) interested in astronomy and astronomy teaching. The Summer School is hosted every year by another European country and the participants (45-100 teachers), which come from more than 20 European countries, have the opportunity to share their experiences during one full week At least 14-16 countries are represented at the Summer School events and about 25% of the participants come from the respective host country. The tenth edition of the EAAE Summer School will be held in July 2006 in Tenerife.

2.7 The European Astronomy Day.

After the Venus Transit 2004 final event in Paris, the national representatives of the 25 participating countries agreed to initiate a European Astronomy Day that may serve as an umbrella under which different European-wide, national and local activities related to astronomy may be organised. Some of the main activities could be: a central website, solar observations, night observations, public showings, teaching programmes, actions aimed at different target groups including primary and secondary schools, exhibitions, competitions, cultural activities, media coverage. The first European Astronomy Day is supposed to be organized in 2007.