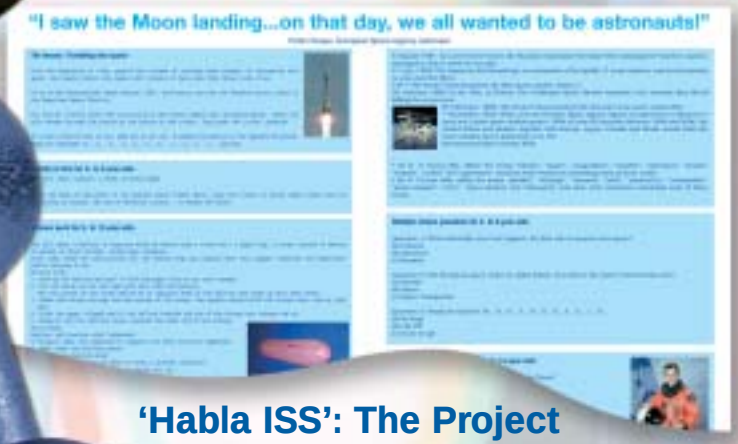
EDUnews

esa

European Space Agency's Newsletter on Education

No. 5 November 2003



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esa Education Office

http://www.esa.int/education

Editorial

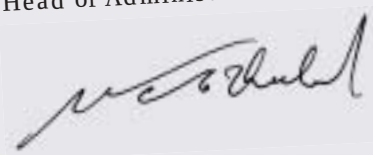
According to Agenda 2007, the plan proposed for the future of ESA by ESA's new Director-General Jean-Jacques Dordain, there is a growing awareness of the importance of education at international level. The development of an Education Programme is one of the objectives proposed in the Agenda, objectives which are for attainment within four years. They also include an evolution of the ESA / European Union Framework Agreement and a global increase of activities managed by ESA.

In support of the Member States and of the European institutions ESA is building up an Education Programme with two main target groups: young Europeans below the age of 18 for whom space is a source of inspiration and motivation for future choices, and students above 18 who have already made a career choice and are looking for high-level education and an open door to the working world.

Activities with cooperating states and international organisations are already part of ESA's education policy. The Physics on Stage programme, for example, promotes the improvement of physics and science teaching all over Europe. It was originally set up by three of Europe's leading research organisations (CERN, ESA and ESO) as part of the European Week for Science and Technology 2000. Since then the project has evolved, all organisers are members of the EIROforum whose proposal for a European Science Teachers Initiative has recently been submitted to the European Commission. The future of projects like Physics on Stage (that will soon become a more comprehensive Science on Stage) lay in the framework of continuous cooperation and exchange between institutions and international organisations.

This fifth issue of EDUnews focuses on education activities for teachers. It also includes a pedagogical central folder for primary schools on the mission of Pedro Duque to the International Space Station. Try the exercises in your classroom and send us your feedback! We hope you will enjoy it.

Walter Thiebaut
Head of Administration and Education



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Summer School Alpbach 2003

„Working and Living in Space: from ISS to Moon and Mars”

Michaela Gitsch
ASA

This year's – the 27th – Alpbach Summer School welcomed 55 students from different ESA Member States. The participants had to design visionary and credible space missions that could form the core for human spaceflight activities after the International Space Station.

Two astronauts, ESA's Claude Nicollier and NASDA's Chiaki Mukai talked about what is means to be an astronaut and provided the important point of view of the crew. Throughout the two weeks the Summer School students participated in a series of workshops. The purpose of the workshops was to foster the practical application of knowledge from the lectures, to develop organisational and team skills and to encourage creativity. Four teams competed for the best project, judged by an independent international jury, chaired by Prof. Roger Bonnet, former ESA Director of Science and Director of the International Space Science Institute, ISSI.

The work culminated in the design of the following space missions:

- A tourism-based commercial venture-based on a lunar habitat, with ISS as a stepping-stone: Project “Honee Moon”;
- A far-term expanded exploration strat egy for Mars: Project “M.A.R.S. (Mars Attractive and Really Sexy)”;
- A manned mission to a near-Earth asteroid: Project “A P E X - Asteroid Perturbation and Exploration”;
- An early manned mission to Mars: Project “Project M3 - Building an Orbiting Station Around Mars”

The projects were subsequently submitted to ESA's Aurora Student Design Contest. One of the projects, “Project M3”, was selected among the finalists of the contest and was presented at the Aurora Academia Workshop on 8/9 September in Barcelona. This is a further indication of the high quality of work accomplished by the students participating in the Alpbach Summer School.

ISU Summer Session

Strasbourg, France - The Summer Session Program (SSP) of the International Space University (ISU) closed with the participants' Team Project presentations and the Closing Ceremony in Strasbourg, France, on 4 and 5 September 2003 respectively.

At ISU, students work in interdisciplinary and intercultural teams of 30 to 50 graduate-level students and young space professionals to perform a comprehensive analysis and propose innovative recommendations on a topic of relevance to the space sector. The intensive programme lasts three months; this year, 107 students participated. The main objectives of the Team Projects are to encourage participants to put into practice what they learned during the SSP, to contribute with their own educational and professional backgrounds, to experience decision-making and organising team work in a multidisciplinary and intercultural environment, and to produce a comprehensive report of a professional level to be presented in a public session. After the SSP, these reports are also going to be presented at international conferences and meetings.

The participants of the Climate Change project, for example, decided to focus on "the development of a framework to better understand the abrupt climate change phenomenon in the North Atlantic region through the application of space technology". In addition to ISU's own faculty, this work benefited from experts made available by Université Louis Pasteur in Strasbourg, Météo France, EUMETSAT and from the National Oceanic and Atmospheric Administration -NOAA- in the USA.

For more information on ISU and future Summer Session Programs, see www.isunet.edu

GLOBE in Croatia

Dr. Sven Baerwalde

German Aerospace Center, DLR Space Operations and Space Technologies, GLOBE Management

Approximately 400 students, teachers and scientists from 23 countries around the world met during the 2003 GLOBE Learning Expedition (GLE) in Sibenik, Croatia. The GLE was organised by The GLOBE Program®, a worldwide hands-on, primary and secondary school-based education and science programme, and the Croatian Ministry of Education and Sports. Students presented research projects and showcased how easily real Earth Science environmental data can be used for science projects. The students also had two days of fieldwork at Krka National Park and on the island of Obonjan. The GLE gave the students an opportunity to experience and take Earth Science measurements in a new environment and learn from each other and the GLOBE scientists. For the full story and more about GLOBE, please see: www.globe.gov"

Garry Randolph from GLOBE Headquarters in front of a weather shelter explaining how to do weather measurements accurately.

Visit the website for more information: www.globe.gov

GLOBE is a cooperative effort of schools, led in the United States by a Federal interagency programme supported by NASA, NSF, EPA and the U.S. State Department, in partnership with colleges and universities, state and local school systems, and non-government organisations.

Life science students learn about “Life in Space”

Marie Diop, ESA-ESTEC (MSM /GS)

Over a period of two weeks European life sciences students had the opportunity to attend the "Life in Space" course in the Laboratoire Arago in Banyuls-sur-Mer, France. This ERASMUS-supported programme was coordinated by the universities of Paris VI, Nottingham, Bonn, Madrid and Sassari. For the second time in the history of "Life in Space", ESA was a supporting part of the programme.
In several lectures we got to know the important role of microgravity on life processes and the great involvement of ESA in human spaceflight.

Based on these insights, we created our own spaceflight experiments (including “Aging process concerning the thelomere shortening”, “Stemcells development under microgravity conditions”, “Orientation of water insects under microgravity conditions in small international groups”). This meant not only a significant improvement of our team working skills and research abilities, but also an increase in our knowledge of human culture.
The experiences we made and friendships we formed in the amazing surrounding of the "Laboratoire Arago" left a permanent mark in our memories. For the future we hope that more students will be able to make the same enriching experiences that we made.

Pulling threads – Ariadna to boost advanced space research in Europe

Torsten Bondo

Advanced Concepts Team

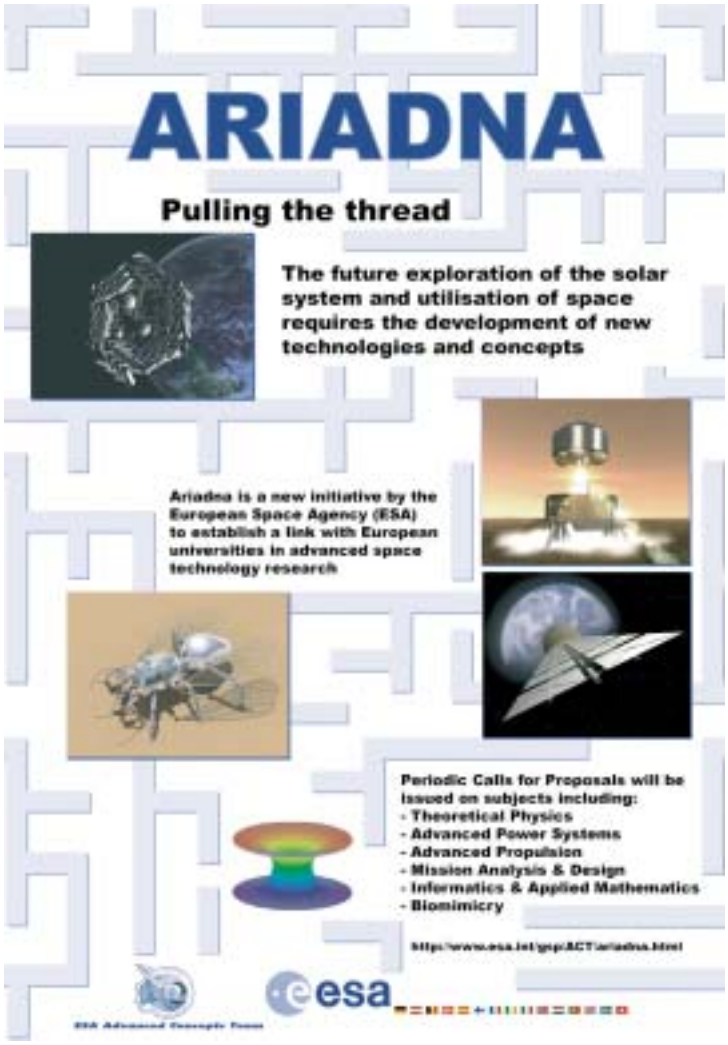
Will spacecraft travelling through interplanetary space be able to determine their positions by using signals from dead stars as astronomical clocks? Can artificial muscles made from electro-active polymers one day replace mechanical parts in spacecraft? Will it ever be possible to conceive an interstellar highway in which spacecraft journey across the galaxy using the delicate gravitational balance between neighbouring stars? These are just some of the imaginative, futuristic concepts that will be studied in the first call for proposals issued under a new ESA initiative named Ariadna.

Managed by the ESA Advanced Concepts Team (ACT) on behalf of the Agency's Advanced Concepts and Studies Office, Ariadna will strengthen the existing links between ESA and the European academic community.

Ariadna will be devoted to short, inexpensive studies involving research into radical new space technologies. The main categories of interest will be:

- Fundamental Physics. Focus on gravitational physics and quantum mechanics.
- Advanced power systems: Research beyond photovoltaic systems.
- Advanced propulsion: Innovative in-space and access-to-orbit propulsion systems.
- Mission analysis and design: Development of trajectory design strategies and novel mission concepts.
- Mathematics and Informatics: Research into advanced computing systems and mathematical tools.
- Biomimicry: Developing technology by imitating biology.

Small ESA contracts will be awarded to teams of research institutes and academic departments to perform work directly related to the objectives of the ACT.



More information on Ariadna and the first Call for Proposals can be found at: www.esa.int/gsp/ACT/ariadna.html

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It's relatively parabolic:

APTOVOL - A Parabolic Test Of the constancy of the Velocity Of Light

Fabian Guisset,
Séverine Ovyn,
Gregor Pfyffer,
Vinciane René de Cotret
D. Bertrand, J. Govaerts, Gh. Grégoire

Université catholique de Louvain, Institut de Physique Nucléaire

B-1348 Louvain-la-Neuve

Fabian Guisset, Séverine Ovyn, Gregor Pfyffer and Vinciane René de Cotret are science students in the Belgian University of Louvain-la-Neuve. Together with their supervisors Damien Bertrand, Jan Govaerts and Ghislain Grégoire they designed the "APTOVOL" experiment to test the constancy of the speed of light to fly it on the 6th Student Parabolic Flight Campaign.

The conception of a project

No April fool's joke: On 1 April we learned that our team was selected for the 6th ESA Student Parabolic Flight Campaign (SPFC). This is the start of an incredible journey. In only four months – and those months include university exams! – we have to design, fund and build the experiment we proposed. Our goal is to test one of the major principles of modern physics, namely the fact that the speed of light in vacuum c is supposed to be constant and does not depend on the motion of the reference frame. Previous experiments have already tested the dependence of the speed of light on the relative speed of the reference frame. But our set-up allows us to search for a possible dependence of c on the acceleration of the frame. Conditions in a parabolic flight are ideal because the variations of the acceleration of the airplane are almost 2000 times larger than in previous tests.

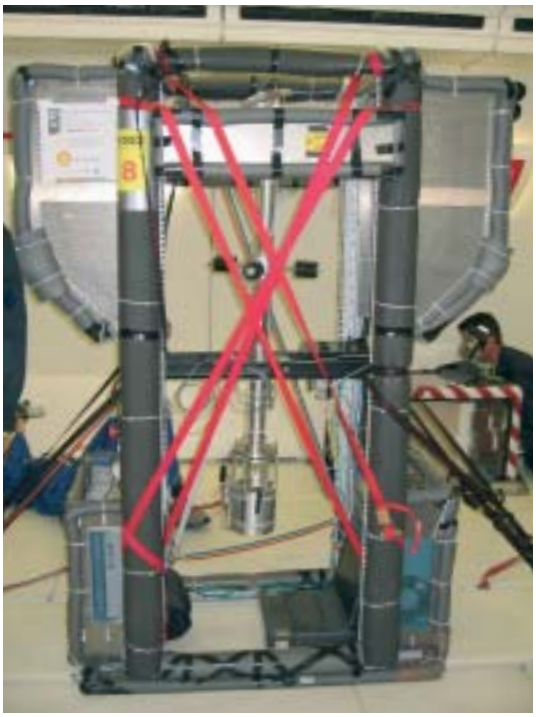
A member of the Belgian team during the flight

Our experimental set-up uses an infrared laser source whose intensity is modulated at high frequencies (450 MHz). The emitted light travels towards a receiver along a monomode optical fibre of 1 metre. The phase shift between the emitted and received modulation signals is directly sensitive to a possible variation in the velocity of light. Both signals as well as the acceleration of the plane were continuously monitored and stored in computer memory during the flights.

The complete description of the project and preliminary results are available on the website: www.aptovol.tk

The flight

The two-week campaign in Bordeaux started on 15 July with several days to finalise our experiment before installing it in the A300 Zero-G airplane. At the same time, we had to make minor adaptations to our set-up to comply with safety regulations. Then the microgravity experience started: during a test flight of five parabolas we were forced to remain on our seats. During the next days, each team member enjoyed a full flight with 31 parabolas, experiencing about 13 minutes of zero gravity.



The APTOVOL experiment

"It's a little like watching the speed of light in an elevator that goes up and falls down abruptly."

Back on the ground

The scientific campaign does not end with this first adventure! Back in Belgium, we already rushed through a preliminary analysis of some 4000 files of recorded data and studied the correlation between the acceleration and the phase angle between emitted and received light beams. The promising results have been presented at the ESA's Parabolic Flight Symposium. They make us work towards the submission of a professional proposal and hopefully to future flights.

Another team of Swedish and Greek students investigated the possibilities for practicing climbing on the International Space Station. The team, called Zero-G ExtremE, aimed to find a new approach to exercise on the ISS. It combines effectiveness with fun, sport and challenge for greater physiological efficiency and greater psychological value for the crew while not disturbing scientific progress on the Station. "We also hope that the new approach can contribute to making non-scientific people on Earth more curious about the ISS crew,"
says the team.

The equipment needed for the 0-g Climbing Experiment is very simple, which is of course essential for space travel. Before each parabola, the climber lay ready at the start of the climbing wall. During the parabolas, he had to climb to the top of the wall. The artificial pull on the climber was achieved by using a braking mechanism with a wire or a strap, which in turn is connected to a harness worn by the climber. The braking mechanism was designed to let out wire once a certain tension is reached. A set of rubber bungee connected the strap and the harness to prevent the strap slacking. The traction-force was fully adjustable to different body weights. "Our first impression indicated that 0-g Climbing is both fun and challenging," the experimenters say. According to the team, the long interior spaces on the ISS are ideal for climbing in zero gravity. With some extra reinforcement, climbing can even take place directly on existing surfaces. Deployable fabric walls, nets, ropes, etc. are other alternatives that can be used in combination.

Physics On Stage 3

Nathalie Olivier
Helen Wilson
ESA Education Office

Since the first edition of Physics On Stage, there has been no doubt of the success of this unique international project. This year's theme was "Physics and Life" to mirror the interdisciplinary aspects of all sciences and cover not only physics but also medicine or environmental science.

More than 400 delegates from 22 countries took part to the Physics on Stage festival in ESA/ESTC, Noordwijk, the Netherlands, between 8 and 15 of November. For the third time, European teachers gathered together to find solutions to stop the decline of interest of young people in science.

This year, the Physics on Stage 3 international teaching festival was opened by His Royal Highness Prince Johan Friso of the Netherlands. Minister Maria van der Hoeven of the Dutch Ministry for Education and several of the Directors

Liftoff for the third edition the Physics on stage science teaching festival! His Royal Highness Prince Johan Friso of the Netherlands launches a water rocket as the opening act.

General of the EIROforum organisations attended this ceremony and made a tour of the teaching fair.

Teachers started the festival by attending seminars organised by the organisers and partners of EIROforum. Throughout the festival, the teachers met in workshops to discuss different educational subjects, for example how to use drama or music to teach physics, or how to improve the link between teaching and research.

At the fair, the heart of Physics on Stage, teachers demonstrated and watched more or less complicated experiments explaining various physical and biological phenomena. Touring the fair, you could see a Spanish teacher playing with soap bubbles to study surfaces with mathematical and physical models, admire magnetic fields on a TV screen at the Hungarian stand or watch a "cat gymnast" – the robotic model of a cat that turns in midfall to land on its feet, enthusiastically presented by two Austrian teenagers. Another important ingredient for a successful Physics on Stage were the presentations of experiments and teaching methods by the delegates and performances by teachers and students to add an artistic view of physics.

As a special treat, a "chef" with a physics degree from Italy prepared a menu cooked in a scientific way – for instance, fish fried in liquid sugar instead of oil or a delicious coffee-nitrogen ice cream .

The active week ended with the Farewell Dinner, during which the participants with the most inspiring, innovative and useful projects were presented with the EIROforum European Science Teaching Awards.

National Events and Participant Selection

Physics on Stage is organised by the EIROforum (European Intergovernmental Research Organisations Forum) and co-funded by the European Commission as

To find out more about Physics on Stage, visit the website at www.physicson-stage.net

The most innovative and inspiring projects received the “EIROforum Teaching Awards”. Rudolf Ziegelbecker from Austria and his two students won the second prize for their “cat gymnasts”.

part of the European Science and Technology Week 2003.

The festival is only the culminating event of a year-long programme in each of the participating countries. National steering committees are in charge of selecting the delegates to the festival. Each delegate – teachers, professors, artists – has been selected for their projects, outstanding and original ideas.

Each country organised its own programme and national event, and in some countries, the national event has become famous, for example Spain’s “Física en Acción”. This national competition to select the members of the Spanish delegation takes place in a different museum each year.

In the Netherlands, for example, the main activity of this year consisted of a conference on the theme of “Medical applications, from radiation to image”, visits of laboratories, lectures, videos and discussions.

The involvement of the participating countries becomes stronger and more important each year.

The future: Science on Stage and ESTI

In 2004, Physics on Stage will continue and expand to become "Science on Stage". National events will once again take place across Europe, culminating in the next international festival in Grenoble, France (early 2005, date to be confirmed). The organisers also plan to launch ESTI, the European Science Teaching Initiative to stimulate a higher awareness of and interest in science and technology among the next generation of citizens by addressing science teaching in European schools. ESTI will provide continuous support to European science teachers.

Spanish National Event:

When “Physics on Stage 1” started running in the year 2000, the initial Spanish National Steering Committee thought about organising a national competition in order to select the members of the Spanish delegation. “Física en Acción” was born! Since, “Física en Acción” is a real success. It’s really well known throughout the country and the prestige of the project is very high, with important media coverage. There is always great expectation on the part of teachers in January and February, waiting for the new Fisica en Accion.
This year 2003 “Física en Acción 4” was organised in connection with “Physics on Stage 3”. The project, besides the competition, involves several lectures and training courses for teachers. The Spanish Royal Society of Mathematics (RSME) has been integrated in the project and the number of prizes for teachers has been increased. Teachers of Physics, Mathematics, Biology, Astronomy and Technology from universities, secondary and primary schools are included.

The new edition of “Fisica en Acción 5”is being planning next year 2004 in “El Parque de las Ciencias” in Granada. For three days the Science Museum adopts an “open doors” policy. Lectures on general scientific topics by important scientists are organised.
There are exhibitions on written or computer based didactic materials and several round tables are organised. But the most important and most visited section activity is the Fair.

Rosa M. Ros Spain National Representative

A team from Belgium presents “Playful Physics”.

Electric atmosphere at the fair…

Countries involved and national events:

22 countries: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, United Kingdom

National Space Education Activities: Norway

Birgit Stromshølm,
NAROM

The Norwegian Space Centre (NSC) and the National Centre for Space-related Education (NAROM) are cooperating closely on educational space-related activities. The web-resource SAREPTA for primary and secondary schools is one of these. SAREPTA is now outsourced to NAROM. The NSC identifies, develops and funds projects. It also grants scholarships to young Norwegians to take part in national and international space-related activities, such as the International Space University, the Space Camp at Andøya and EURISY-activities. NAROM initiates, develops, and performs educational activities, seminars and conferences at all levels within subject areas related to space, such as space technology, space physics, atmosphere and environment.

Examples of space-related activities at NAROM

- **SAREPTA, a space resource for the classroom, www.sarepta.org**

SAREPTA, Using Space in Education, is a unique source and electronic meeting place for students and teachers at upper primary and secondary school level for use in geography and science lessons. SAREPTA combines teaching and learning material, new satellite images with background information and exercises.

- **EUROPEAN SPACE CAMP**

Arranged by NAROM and the Norwegian Association of Young Scientists (FUF), this summer 22 young students from all over the world had the opportunity to spend one week at the European Space Camp at Andøya Rocket Range (ARR). The Rocket Range is located in the North of Norway, with unique facilities and laboratories to make the students experience a scientific atmosphere. The main co-operators are ESA, ARR and the NSC. For more information concerning the Space Camp, visit http://www.spacecamp.no

- **NCUBE-1, THE FIRST NORWEGIAN CUBESAT STUDENT SATELLITE**

www.rocketrange.no/ncube/
The NCUBE-1 is a satellite built by students from four Norwegian universities. ARR in co-operation with NSC and NAROM initiated the project in 2001 with a payload feasibility study involving 60 students. The main mission of the satellite is to demonstrate ship traffic surveillance from a LEO satellite using the maritime Automatic Identification System (AIS). The satellite will be placed in a low-earth circular sun-synchronous orbit with a perigee of approximately 700km. The inclination will be close to 98 degrees. The launch is scheduled to April 2004 from DNEPR, Ukraine.

- **STUDENT ROCKET PROJECT**

A hands-on activity during courses, seminars and camps organised by NAROM at Andøya Rocket Range. The rocket mass with payload is 3.2 kg, the rocket is 1.30 meters long and reaches an approximate altitude of 1000 meters with a flight time of 30 seconds.

EDUnews is read in many different European countries. From time to time we will present general and space-related activities in ESA Member States to provide an in-depth view of “space in your backyard” and points of contact. If you’d like to write about what’s going o in your country, please send an email to education@esa.int

‘Habla ISS’: The Project

Caroline Pujol,
ESA Education Office

Thanks to ARISS (Amateur Radio on the ISS), there has been live radio-contact between Pedro Duque during his “Cervantes” mission on the ISS and primary school children here on Earth. An educational programme called ‘Habla ISS’ has been developed based on this opportunity.

Ten complete lessons including activities for the classroom have been posted on the website. On 15 April, a letter from Pedro Duque was sent to all 14 000 primary schools in Spain, inviting the children to play with these pedagogical materials available online and to learn about ‘Being an astronaut’, ‘Weightlessness’ and the ‘International Space Station’.

The schools also had the opportunity to take part in a national contest, which involved sending drawings and stories on the theme “An astronaut and the ISS” to the ESA Education Office. The winners had the chance to talk to Pedro during his stay on the ISS in October. Portuguese primary schools were also invited to join the programme.

Many children in Spain and Portugal have used these activities in their classroom, and more than 5000 applied to the contest. On 14 August, 6 classes were selected. The 110 lucky winners were invited for one day of activities in the ‘Verbum’ museum in Vigo on 26 October. ESA astronaut Umberto Guidoni joined them on this very special day.

‘Teaching Space’ in primary school

Children have a natural interest in space. Relating activities to space can help them develop skills such as creativity, curiosity, enthusiasm, flexibility and the ability to work with others.

To develop new materials and projects for schools, ESA organises workshops, e.g. ‘Teach Space’, where teachers from all over Europe discuss their needs and ideas for new teaching material to introduce the topic space in the classroom.

The ‘Habla ISS’ lessons have been developed following teachers’ recommendations, e.g.:

- It is important that children participate actively in the activities. In so doing, they have control over the learning process and acquire knowledge more easily.
- It is important to introduce variety into the activities organised. Children do not differentiate between subjects. Space is an ideal topic for developing activities, which combine the various disciplines taught at school, such as maths, language, biology, art, sports, and so on.
- It is important to have a goal. In this particular case, the goal is taking part in the contest and having the chance to speak to Spanish ESA astronaut Pedro Duque while he is in space. Through Pedro, space becomes part of their world.

For more information, visit the project website at: www.esa.int/hablaiss or contact us at habla.iss@esa.int or caroline.pujol@esa.int

“I saw the Moon landing...on that da

Pedro Duque, European

The lesson: ‘Travelling into space’

From the beginning of time, people have dreamt of visiting other planets, of journeying into space. Astronauts travel into space with rockets to help make that dream come true.

To go to the International Space Station (ISS), astronauts can use the Russian Soyuz rocket or the American Space Shuttle.

But how do rockets work? The fuel burns in the rocket engine and produces gases. These can only escape through the nozzle at the bottom of the rocket. They push the rocket upwards.

It’s like a balloon full of air; when air is let out, it pushes the balloon in the opposite direction. Ready for countdown? 10... 9... 8... 7... 6... 5... 4... 3... 2... 1... 0... lift-off!

Activity in Arts for 6- to 9-year-olds

You will need: crayons, a sheet of white paper

With the help of the photo of the Russian Soyuz rocket above, draw the rocket in which Pedro Duque will be travelling in October. Use lots of different colours... to dazzle the stars!

Science work for 9- to 12-year-olds

You will need: a balloon (a long one would be better than a round one), a paper clip, a straw, thread (9 metres of sewing or nylon thread), sticky-tape, scissors.
First step: Read the instructions for the second step and imagine what will happen. Describe the experiment before carrying it out.
Second step:
1. Blow up the balloon and seal it with the paper clip so air can’t escape.
2. Cut the straw in two and tape each half onto the balloon.
   The two pieces of the straw should be at opposite ends of the balloon and lined up with each other.
3. Insert the thread through the two halves of the straw. Two people should hold the thread taut, one at each end.
4. Slide the paper-clipped end of the balloon towards the end of the thread and release the air.
5. Observe how the balloon moves towards the other end of the thread.

Third step:
Explain and analyse what happened:
• Compare what you expected to happen with what actually happened.
• What made the balloon move?
• How did the balloon stop?
• How could the balloon be made to cover a greater distance?
• What did the balloon’s movement remind you of?

History and English work for 6- to 12-year-olds

First of all, read about the history of the conquest of space:
1957: The Soviet Union launched the first satellite, Sputnik-1. This event prompted the USA, for strategic and military reasons, to speed up its technological research programme.
1960: The USA launched its first communication satellite Echo-1; competition with the Soviet Union drove up the number of launches.
12 April 1961: The Soviet Union placed the first ever human being, Yuri Gagarin, an air-force officer, into Earth orbit in the Vostok-1 capsule.
5 May 1961: The USA launched an astronaut, Alan Shepard, for the first time for a brief flight onboard the Mercury capsule. He was the second man in space.

ay, we all wanted to be astronauts!”

Space Agency astronaut

6 August 1961: In a new Soviet record, the Russian cosmonaut Gherman Titov manning the Vostok-2 capsule, managed to stay in orbit for one day.
21 July 1969: The American Neil Armstrong, as commander of the Apollo-11 lunar mission, was the first person to step onto the Moon.
1971: The Soviet Union launched the first space station, Salyut-1.
28 January 1986: In the USA, in Florida, the Challenger Space Shuttle exploded a few seconds after lift-off killing the seven crew.

20 February 1986: The Soviet Union launched the first part of its space station Mir.
1 November 1993: NASA and the Russian Space Agency signed an agreement in Moscow to carry out a joint space station project. With at least 45 launches between 1998 and 2006, the United States and Russia, together with Europe, Japan, Canada and Brazil, would build the most complex space laboratory ever, the International Space Station (ISS).

• for 6- to 9-year-olds, define the terms “history”, “space”, “competition”, “number”, “astronaut”, “record”, “tragedy”, “rocket” and “agreement” and then write sentences containing each of these terms.
• for 9- 12-year-olds, define the terms “satellite”, “strategic”, “research”, “orbit”, “manned by”, “commander”, “lunar mission”, “crew”, “space station” and “laboratory” and then write sentences containing each of these terms.

Multiple-choice questions for 6- to 9-year-olds

Question 1: What nationality was Yuri Gagarin, the first man to journey into space?
(a) Chinese
(b) American
(c) Russian

Question 2: The European space rocket is called Ariane, but what is the name of the Russian one?
(a) Shuttle
(b) Soyuz
(c) Space Transporter

Question 3: Ready for launch? 10... 9... 8... 7... 6... 5... 4... 3... 2... 1... 0...
(a) So long!
(b) Lift-off!
(c) Away we go!

Multiple-choice questions for 11- to 14-year-olds

Question 4: Who was the first man to walk on the Moon?
(a) Neil Armstrong
(b) René Descartes
(c) Pedro Duque

Question 5: Which of the following statements are true?
(a) Rockets are used to send astronauts to the ISS
(b) Rockets are used to place satellites in orbit around the Earth
(c) Rockets are used to study the properties of fuel

Question 6: In a book by Antoine de Saint-Exupéry, the main character is a boy who comes from a small planet and travels around visiting planets in space before arriving on Earth. What is the title of this book?
(a) “The vulcanologist”
(b) “Zorro’s friend”
(c) “The little prince”

And the winners are...

Illustrated poem by children from Ganzo, Cantabria (11 years)

Drawing by children from Sinarcas, Valencia (6 years)

En esa nube quisiera viajar
y el espacio muy de cerca contemplar.
Las estrellas en el cielo no dejan de brillar
y alegran cada noche mi soñar.
Sé que muy pronto a la luna he de llegar
y allí de mi soledad podré al fin disfrutar.

Story by children from Vigo, Pontevedra (10 years)

Rocket model in papier maché by children from Cartag Murcia (7 years)

(...)
- My grandfather Alberto who was astronaut, told me one day that there was a magical flower on Mars..
(...)
- I think that we will save the planet from this sadness, said Pedro Duque, full of confidence.
Some months later, our scientists just back on Earth could ascertain that the children' face were lighting up more happiness and confidence, the adults showing more solidarity, the rulers more dedicated to maintain peace in all the countries of the world, the planet more perfumed, food was not missing to anybody and all were taking care of each other.
- It is wonderful to live on such a planet!
(...)

Story by children from Sintra, Lisbon (8 years)

Drawing by children from El Puerto de Santa Maria, Cadiz (8 years)

“Space is about discovery, it’s about exploration, it’s also about science”

European astronaut Frank De Winne about being an astronaut, dreams and education

What inspired you first to become an astronaut?

When I was young I always wanted to become a pilot, to fly with airplanes. It’s also what I did in my initial career when I started to study. Then, when the first spaceship Columbia was launched (in April 1981) I watched it flying to space and coming back and landing and I thought: “This is something that one day I want to do in my career as well.” So I started to be really interested in space and I already wrote letters to NASA at that time to know how to become an astronaut. Finally, in the early 90s, ESA made a European astronaut selection and I joined them.

What is the best memory you have about the Odissea Mission?

The best memory of course is the flight itself, but also the all training around the year and a half that I spent in Russia and the fact that I met so many new people and I had the opportunity to get to know a new culture – and especially the fact that I have so many new friends.

How was you experience with students during the Odissea Mission?

Very nice of course, it’s always very nice to talk with students. After the mission I gave a lot of lectures and got a lot of contacts with students because they have very refreshing ideas sometimes. They ask very interesting questions that we sometimes would not think about. It’s really great to work with them because, of course, they are our future. It is also great to hear from them when you are up there.

Can you remember any particular special or difficult questions that young children asked you?

Not while I was on the space station, but from other times I can remember some strange question like “Did you meet extra-terrestrials when you were up there?” , “How is the weather up there in space?”, “How does it come that the Earth turns around, is there a motor inside?”– it’s really amazing sometimes what they come up with!

Frank de Winne, 42, from Ghent in Belgium, is an astronaut in ESA’s European Astronaut Corps. From 30 October to 10 November 2002 De Winne participated in the “Odissea” mission, a support flight to the International Space Station.

A prime task of the 11-day mission was the replacement of the Soyuz vehicle attached to the Space Station by the new TMA-1 spacecraft, in order to deliver a fresh “lifeboat” for the resident crew to be used in case of an emergency.

During his nine days on board the Space Station, De Winne, whose flight was sponsored by the Belgian Federal Office for Scientific, Technical and Cultural Affairs, carried out a programme of 23 experiments in the fields of life and physical sciences and education, including experiments in an important new research facility designed and developed in Europe, the Microgravity Science Glovebox (MSG).

What is in your opinion the educational value of the ISS?

The educational value of the ISS of course is that it can be inspiring for the youth. They see it could go to full operations with more European flying to the ISS . The ISS is great for people from all countries – we have heard a lot from Spain about Pedro Duque's mission this year, for example – because with more flights of European astronauts the European citizens feel more attached to this incredible project. Spaceflight and especially human spaceflight still inspires lots of young people, not only to do scientific careers, which is of course important for Europe, but it inspires them in general to be able to pursue their dreams. If they have a dream they want to pursue and they want to go for it maybe someday they can realise it. I think this is a very important message to give to our children.

Can we say its educational value is connected to International Cooperation too?

Well, this is a part of it of course. The ISS is an example of peaceful international cooperation, but this aspect is more appealing to the general public at large, I think, rather than to children at that age. For them is more the dream that you can pursue, and it is very important that society also needs to be able to dream and to pursue their dreams. If you do not do it then society is in decline.

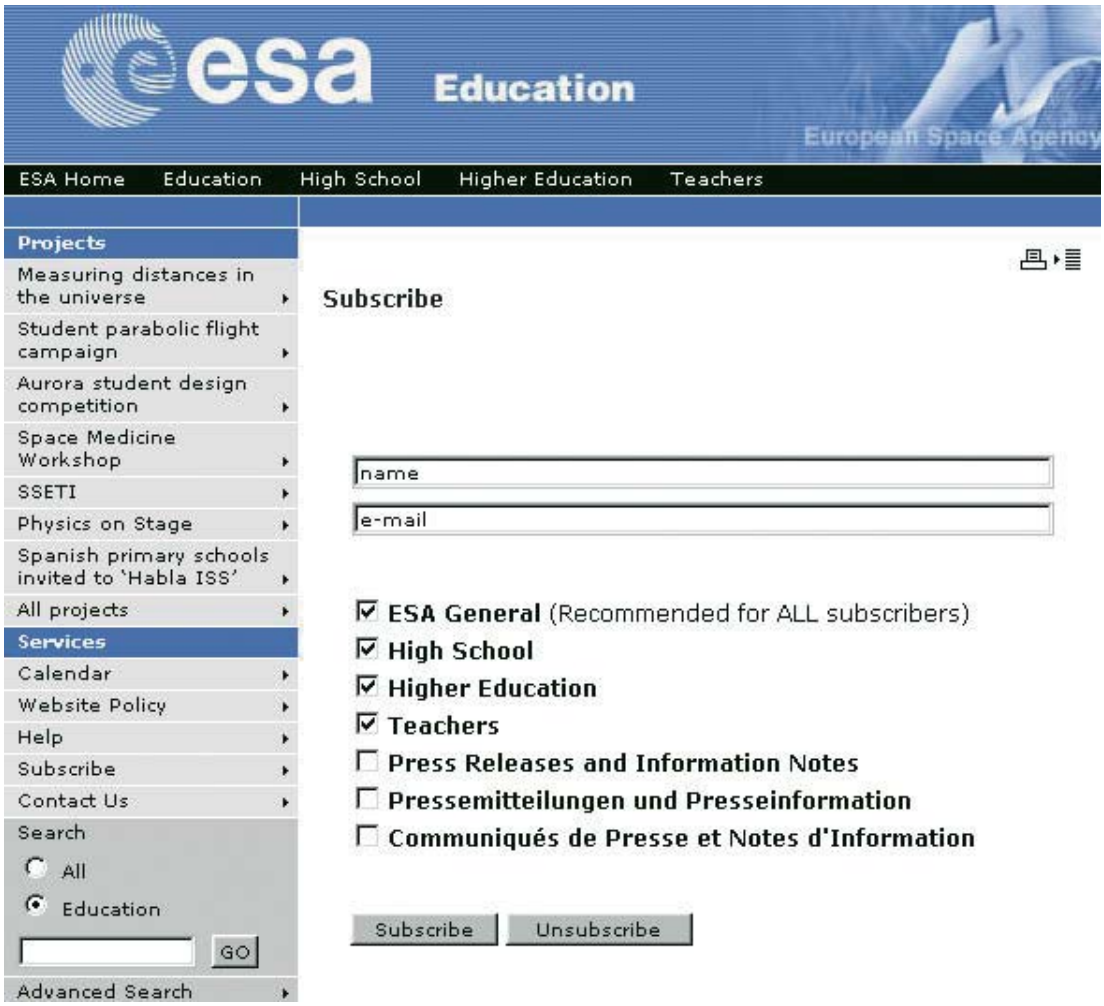
What are, in your opinion, the reasons for the current lack of interest in scientific and technical subjects?

I don't know much about it besides the fact that it is a difficult choice because the studies are not always easy, you need to learn very hard and it is difficult to see what job you can have after your study. Everything is so much concentrated in the commercial area that doing commercial studies maybe can get you more direct benefits.
But I think pursuing scientific studies and doing scientific research in the area of discovery is what we need to inspire young people. This is why space is so important. Because space is about discovery, it's about exploration, it's also about science. But you need to have visible elements to show this to young people again to make them dream about it and this is what human spaceflight can do.

Do you think that interest in space is declining?

I don't think so. I think that what the general public is missing again is inspiration. The general public was interested for example by my flight. It's something new, and it's doing something exciting, like in my case I was the first one to fly with the Russian and sit on the top of the Russian Soyuz. In the 60s we were doing all kinds of new things, we were going to space for the first time, we were flying to the Moon. There was the aspect of the race between the Russians and the Americans which now has changed more into International Cooperation. We don't explore anymore right now, we turn circles around our

Earth. Which is of course very important at this point of time for future exploration, but I think we will see very quickly that there would be a lot of interest again from the general public if we were to come up with a vision for Human Spaceflight centred around exploring our Solar System and travelling further than we have done before.



If you would like to receive the latest education news via email (conferences, workshops, launch of a new project, contests, etc), don't forget to subscribe to ESA education!

Under African Skies
Cosmos 2003 Education Expedition

Alex Tung, Cosmos Education USA

Vivian Nchogu, Cosmos Education Kenya

It's 11 a.m., and a crowd of almost 1000 students have gathered in their school yard outside the town of Kuruman, South Africa. At the centre of their attention is a Namibian medical student, sent by Cosmos Education's Under African Skies expedition, about to demonstrate a powerful chemical reaction that will launch a potato more than 50 metres into the air. After an explanation of the scientific process, the countdown starts: "3, 2, 1, Liftoff!" – a boom sends the potato rocketing into the air among cheers and whoops from the students.

Science demonstration and discussion session with a group of young Zambians.

Whether it be a school of 1000 students or an orphanage of 20 children, Cosmos Education, an international non-profit organisation, seeks the same goal with each visit: to inspire and empower young people in developing countries to become future leaders in their communities. The members of Cosmos have been active for the past four years in various countries of sub-Saharan Africa, using topics of science, health and technology to inspire African kids.

Central to achieving Cosmos' mission and goals is the "Under African Skies" expedition, which runs at least once a year. This year's expedition lasted eight weeks, starting in Cape Town, South Africa, in the beginning of July, and ending in Arusha, Tanzania. Team members gathered from around the globe to visit 85 schools, orphanages, and youth centres in South Africa, Swaziland, Botswana, Zambia, and Tanzania.

"Education is the single most important key to sustainable development. Children are the future and we hope to empower them to drive development from within," said Kevin Hand, who founded the organisation in 2000 and is currently a graduate student in geology at Stanford

inspires young students in Africa

University in California, USA. “We hope that the youth of Africa will drive development in a way that is compatible with the incredibly rich cultural and biological diversity of this continent.”

Members of the organisation come from many countries, including the US, UK, Canada, Croatia, Kenya, Tanzania, South Africa, Zambia, and Swaziland. This diversity is vital both for understanding local customs and traditions and also for inspiring the students with role models.

Typically presentations start with a general introduction of the team, emphasising the diversity of the group and focusing on planet Earth as our collective home. The students are then split up in modules for fun, interactive presentations on a variety of topics, including HIV/AIDS, physics and astronomy, chemistry, water quality and filtration, the greenhouse effect, waves and communications, vision and flight.

Because members visit schools and venues with students and children of varying levels of education, the programme is flexible and adaptable to the abilities of the students. The Cosmos team members use the students’ existing knowledge, apply it to a widespread and unsolved problem in their own countries, and challenge the students to think of ways to solve that problem. Applying students’ existing knowledge to problems they see in the world around them is one way of helping to empower young minds.

Cosmos Education is a small but rapidly growing organisation that hopes to set up a presence in developing countries throughout the world. The success of the organisation is highly dependent on skilled and dedicated volunteers.

For more information, and to learn how to get involved, visit
www.cosmoseducation.org
or send an email to
info@cosmoseducation.org.

Cosmos Education expedition team in their overland truck, journeying to visit young people in Eastern and Southern Africa.

Photo Gallery

Nuna-II, alias "the flying dutchman", won the 7th World Solar Challenge 2003 in a new record of 30 h 54 min (avg speed 97.02 km/h). The number 2, Aurora (AUS) followed at 1 hour 43 min while the US-team from MIT came in 1 hr 58 min later. The Nuna-II car was made by 12 students from the university of Delft with the latest space technology like state-of-the-art batteries, solar cells, power trackers, strategy software, composites materials etc. Currently a proposal is made for a tour of the car around European schools.

The Space Game at Le Bourget 2003

PFC projection in Athens, Greece

His Royal Highness Prince Johan Friso of the Netherlands and Mrs van der Hoeven, Dutch minister of Education, Culture and Science, guided here by Wubbo Ockels, chairman of Physics on Stage 3, attended the Opening Ceremony.

Participants met in workshops on different topics, all with aim to overcome the current crisis in physics teaching.

Adolf Cortel from Spain shows simple but effective experiments on the physics of vision.

As a special treat, an Italian chef prepared a meal "cooked with physics" – ice-cream made with liquid nitrogen, for example.

Two participants from Poland and Belgium exchange teaching ideas at the fair.

The Austrian performance "Eye Like Physics".

The ESA Space Exploration Programme Aurora and the Student Design Contest

Piero Messina

ESA Headquarters, Paris

Aurora is the name of ESA's initiative for robotic and human exploration of the Solar System and notably of Mars and the Moon. The Programme – currently in its preparatory phase – will define and implement a long-term exploration strategy with the final goal of landing a human on Mars by 2030. The road map that is being worked out includes a number of technology developments, robotic missions to Mars and manned and unmanned mission to the Moon in preparation of a human mission to Mars. A programme with such an ambitious goal and spanning over such a long period of time needs to ensure that there will be a constant in-flow of new ideas and concepts as well as of new skilled and motivated workforce. This is the reason why Aurora has an explicit provision for co-operation with European Technical Universities.

Aurora already has close relations with European University networks and the Future Space Exploration (FUSE) network that brings together top European universities with interest and expertise in space exploration. At the first Aurora / Academia workshop, held in September 2002, the idea of a Student Design Contest was launched.

The contest wants to:

1) raise awareness and motivate students and young researchers on the issues of space exploration and the challenges that go with it while offering an opportunity to tackle a design project with given requirements and in a given framework;
2) stimulate new ideas, innovative concepts and unexplored approaches that can spring from the academic environment and that could later be applied to the missions or facilitate the solution of related technical problems.

The above goals match the mandate and objectives of the ESA Corporate Education Office. The contest was launched and conducted in cooperation with it.

After the announcement in January 2003 the first deadline was in the beginning of March for team registration and submission of a project outline. Teams could be composed of a maximum of six students including one PhD candidate. The project outline was meant to make sure students had understood the scope of the contest and the Aurora Programme as well as the five categories in which projects could be submitted. These were "Flagship and Arrow class missions" (major missions with a scientific interest on their own the former; smaller, cost-capped, mainly technology demonstrator missions the latter); "Human Missions"; "New Enabling Technologies" and "Surface Robotics".

By the first deadline, 53 projects were received from all over Europe and Canada and from two international education institutions supported by ESA, namely the International Space University (ISU) and the Alpbach Summer School.

Once the teams had been notified that their project was eligible for the contest, they had five months to work on it and come up with a 20-page report and an

executive summary to be submitted no later than end of July 2003.

In the end, we received 36 projects, which triggered a very intense week of reading, evaluation, discussion and selection that occupied more than ten people from the Aurora Programme and ESA's Advanced Concept Team for one week. The quality of the work produced by the students was deemed to be so good that, in addition to the top three projects for each category, two additional projects were shortlisted in the "Human Missions" category. Finally, 17 teams were selected to go to Barcelona and present their projects to ESA experts and members of the Exploration Programme Advisory Committee (EPAC) with representatives from industry and academia.

The event was a great success, also thanks to the flawless organisation of the Universitat Politecnica de Catalunya.
The jury's task to identify the winners in the five categories special prizes was not an easy one. Chaired by the EPAC Chairman, Prof. J.P. Swings, the jury finally awarded 11 prizes in total – two more than planned – and congratulated all students for their excellent work.

While students are resting from the effort and looking forward to enjoing their prizes, the Aurora Student Design Contest team is back at work to publish the proceedings, collect the suggestions and have them integrated in the guidelines for the next Student Contest.

The extremely positive experience and response from students, professors and professionals alike provided the thrust to start organising a second Aurora Student Contest. While the structure of the contest is unlikely to be modified significantly we are trying to announce the contest much earlier than last year so that University professors have more time to plan such an activity.

Further information can be obtained from piero.messina@esa.int or students4aurora@esa.int and on the Aurora web site (www.esa.int/aurora).

What is ESA?

The European Space Agency is Europe's gateway to space. Its mission is to shape the development of Europe's space capability and ensure that investment in space continues to deliver benefits to the people of Europe.

ESA has 15 Member States: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom. Canada has special status and participates in some projects under a cooperation agreement. By coordinating the financial and intellectual resources of its members, ESA can undertake programmes and activities far beyond the scope of any single European country. ESA is an entirely independent organisation, although it maintains close ties with the European Union with whom it shares a joint space strategy.

ESA's job is to draw up the European space plan and carry it through. The Agency's projects are designed to find out more about the Earth, its immediate space environment, the Solar System and the Universe, as well as to develop satellite-based technologies and promote European industries. ESA also works closely with space organisations outside Europe to share the benefits of space with the whole of mankind.

ESA has its headquarters in Paris and it is here that future projects are decided upon. However, ESA also has centres throughout Europe, each of which has different responsibilities:

- ESTEC, the European Space Research and Technology Centre, is the design hub for most ESA spacecraft and is situated in Noordwijk, the Netherlands.
- ESOC, the European Space Operations Centre, is responsible for controlling ESA satellites in orbit, and is in Darmstadt, Germany.
- EAC, the European Astronaut Centre, trains astronauts for future missions and is situated in Cologne, Germany.
- ESRIN, the European Space Research Institute, is situated in Frascati, near Rome in Italy. Its responsibilities include collecting, storing and distributing satellite data to ESA's partners and acting as the Agency's information technology centre.

In addition, ESA has liaison offices in the United States, Russia and Belgium, a launch base in French Guiana, and ground and tracking stations in various parts of the world.

ESA's mandatory activities (Science Programme and the general budget) are funded by a financial contribution from all the Agency's Member States, calculated in accordance with each country's gross national product. In addition, ESA conducts a number of optional programmes. Each country decides in which optional programme it wishes to participate and the amount of its contribution.

What's coming up:

7th Student Parabolic Flight Campaign: This year the campaign might take place as soon as Easter 2004, so the application deadline for the experiments is Monday 12 January 2004. Visit www.esa.int/education/parabolic for updates!

'Zeg het ISS' project: developed by ESA Education Office in collaboration with the ARISS association (Amateur Radio on ISS). Dutch and Flemish primary schools are invited to participate in the contest. The winning classes have the opportunity to have radio contact with André Kuipers during the Dutch Soyuz Mission mid April 2004. The deadline of application is 15 February 2004. More information at www.esa.int/zeghetiss

6th Student Participation Programme 2004: The next IAF Congress will take place from 4 to 8 October 2004 in Vancouver, Canada. The application deadline is 20 February 2004. Visit the programme website at www.esa.int/education/iaf.

The Ariadna project call for proposals can be found at: www.esa.int/gsp/ACT/ariadna.html. Visit the site for updates as research opportunities will be announced periodically!

Calling all medical students or residents for the EURISY Spring School in Rabat, Morocco on the theme of Telemedicine – Public Health and Remote Sensing, co-sponsored by CRTS (Royal Centre for Remote Sensing, Morocco). Call for candidates on www.eurisy.asso.fr

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