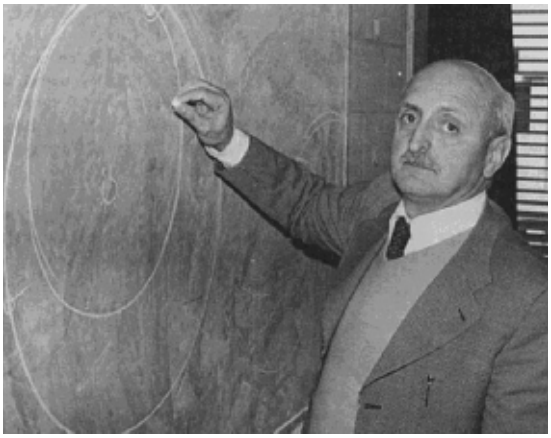
In Brief

Mercury Mission Named ‘BepiColombo’ in Honour of Space Pioneer

Meeting in Naples on 20-23 September, ESA’s Science Programme Committee recognised the achievements of the late Giuseppe Colombo of the University of Padua by adopting his name for the planned ESA Mercury project. Almost everything known until now about the planet Mercury comes from three passes by NASA’s Mariner 10 in 1974-75 and inspired by Colombo’s calculations. He suggested how to put a spacecraft into an orbit that would bring it back repeatedly to Mercury. The Italian scientist also explained, as an unsuspected resonance, Mercury’s peculiar habit of rotating three times in every two revolutions of the Sun.



Giuseppe (Bepi) Colombo (1920-1984)

ESA’s mission to Mercury is one of ESA’s science programme ‘Cornerstones’. In the course of the comprehensive Horizon 2000 Plus review of the programme five years ago, it was identified by Europe’s space scientists as one of the most challenging long-term planetary projects. Mercury is the least known of the inner planets. Its orbit close to the Sun makes it difficult to observe from a distance and hard to reach by spaceflight. As a result, questions raised by the Mariner 10 fly-bys of a quarter of a century ago remain unanswered.

“I am very pleased we have given the name of BepiColombo to our Mercury cornerstone. Bepi was a great scientist, a great European and a great friend; we could do no better than name one of our most challenging and imaginative missions after him” said Roger Bonnet, Director of the ESA Science Programme.

Scientists cannot claim to fully understand the origin and history of the Earth itself until they can make sense of Mercury. Why is the planet surprisingly dense? Where does its magnetic field come from? What were the effects of massive collisions suffered by Mercury, apparent in shattered zones seen by Mariner 10? Is Mercury geologically active? How does its close proximity to the Sun affect its surface, its tenuous atmosphere and the small magnetic bubble, or magnetosphere, which surrounds it? BepiColombo will seek the answers to these and other questions with three separate sets of scientific instruments. According to preliminary studies completed in April 1999, a Planetary Orbiter will examine the planet from an orbit over the poles, using two cameras and half a dozen other remote-sensing instruments. Seven detectors in a smaller Magnetospheric Orbiter will observe Mercury’s magnetic field and its interactions with the solar wind.

A Surface Element dropped by BepiColombo will land near one of the poles of Mercury, where the temperature is milder. Here the instruments will include a camera, a seismometer, a detector for chemical elements, and a package for assessing the temperature, heat capacity, density and hardness of Mercury’s ‘soil’. The Surface Element is expected to operate for at least a week and the two orbiters for about 12 months.

When ESA began contemplating a mission to Mercury, the journey time was expected to be nearly four years, with a complex series of manoeuvres around Venus and Mercury designed to bring the spacecraft into an orbit similar to Mercury’s. Now BepiColombo’s journey will be cut to about 2.5 years with the aid of a solar-electric propulsion module, which ejects heavy xenon ions at high speed to provide a small but continuous acceleration over many months. Swing-bys of Venus and Mercury are still part of the mission profile, and a chemical propulsion module will finally put BepiColombo’s main spacecraft into orbit around Mercury.

Giuseppe (Bepi) Colombo (1920-1984) was a mathematician and engineer of astonishing imagination, whose bald head and grey moustache were familiar in the corridors of both ESA and NASA. Apart from his work on Mercury, Colombo invented tethers for tying satellites together. As one of the initiators of ESA’s mission to Halley’s Comet he suggested its name, Giotto, but he died before that project was accomplished. At the University of Padua his work continues in CISAS, the Centro Interdipartimentale Studi ed Attività Spaziali ‘G. Colombo’.

In 1985, to commemorate this great scientist, ESA created a ‘Colombo fellowship’ to be granted to European scientists working in the fields of science explored by G.Colombo.

XMM Draws Youthful Interest

Recently, ESA has been actively promoting a series of activities addressing the younger generation, in a concerted effort to stimulate their interest in space and involve as many young Europeans as possible in the Agency's activities.

In line with these activities, and to celebrate the December launch of XMM, two competitions for European schools in the ESA Member States were announced in September: 'Draw me a Telescope' and 'What's new Mr Galileo?'

Draw me a Telescope
This competition invited school children aged 8 to 12 to draw a telescope as a class activity. Out of over 350 entries received, one per Member State was selected to be included in the official XMM logo. This logo was displayed for the first time on the fairing of the Ariane-5 rocket launching the XMM spacecraft. Additionally, ESA invited one child per country, representing the winning class, to French Guiana to see the launch.

The winning classes come from the following schools:

AUSTRIA:	Bundesgymnasium, Baden bei Wien
BELGIUM:	Gesubsideerde Vrije Basisschool, Brugge
DENMARK:	Nordstrandsskolen, Dragor
FINLAND:	Mäntysalon Koulu, Klaukkala
FRANCE:	Ecole du Vieil Orme, Rambouillet
GERMANY:	Gerhart Hauptmann Schule, Griesheim
IRELAND:	North Dublin National School Project, Dublin
ITALY:	Scuola Elementare "5 giornate", Milano
THE NETHERLANDS:	International School of Amsterdam, Amstelveen
NORWAY:	Kringsjå skole, Oslo
SPAIN:	Colexio Apóstol Santiago (Jesuitas-Vigo), Vigo
SWEDEN:	Hubertusgården, Lund
SWITZERLAND:	Ecole Primaire de La Roche, La Roche
UNITED KINGDOM:	The School of St. Helen and St. Katherine, Abingdon.

What's new Mr Galileo?
This competition was open to youngsters aged 13 to 15 whose classes had to write, in English, a one-page vision of astronomy and its benefits for humanity. In one month's time, ESA received and assessed over 100 essays. The winning classes, one per Member State, were invited to Kourou to visit the launch facilities.

The winning schools are:

AUSTRIA:	Bundesrealgymnasium, Graz
BELGIUM:	Lycée Emile Jacqmain, Bruxelles
FINLAND:	Helsingin Suomalainen Yhteiskoulu, Helsinki
FRANCE:	Collège Buffon, Paris
GERMANY:	Ignaz Kögler Gymnasium, Landsberg A. Lech
IRELAND:	Malahide Community School, Dublin
ITALY:	Istituto Michelangelo Buonarroti, Verona
THE NETHERLANDS:	Niftarlake College, Maarssen
NORWAY:	Enebakk Ungdomsskole, Enebakk
SPAIN:	Colegio El Ave Maria, Benimamet (Valencia)
SWEDEN:	Hökarängsskolan, Farsta
SWITZERLAND:	Cycle d'Orientation du Gibloux, Farvagny
UNITED KINGDOM:	Haggerston School for Girls, Shoreditch, London

Ariane-4 launches

The 118th Ariane launch (V118) took place successfully on Thursday 12 August at 19:52 Kourou time. An Ariane 42P vehicle (equipped with two solid strap-on boosters) lifting-off from the Guiana Space Centre – the European Spaceport in Kourou, French Guiana – placed into geostationary transfer orbit the Indonesian telecommunications satellite TELKOM 1.

Ariane V120, again using a 42P vehicle, was launched on Saturday 4 September at 19:34 Kourou time, delivering the Korean telecommunications satellite, Koreasat 3, into geostationary transfer orbit.

Ariane V121 was launched on Saturday 25 September at 03:29 Kourou time. The 44LP vehicle (equipped with 2 liquid and 2 solid strap-on boosters) lifted off with the American telecommunications satellite, TELSTAR 7.

The 122nd Ariane launch (V122) took place on Tuesday 19 October at 03:22 Kourou time, successfully placing into super-synchronous transfer orbit the American telecommunications satellite ORION 2.

Ariane V123 lifted off on Saturday 13 November at 19:54 Kourou time carrying the American telecommunications satellite, GE4, into geostationary transfer orbit.

50th IAF Congress

The 50th Congress of the International Aeronautical Federation (IAF) took place on 4-8 October 1999 at the RAI Conference Centre in Amsterdam (NL), bringing together over 2000 space community professionals under the theme 'Space – an integral part of the information age'. The exhibition was opened on Monday, 4 October, by His Royal Highness Wilhelm-Alexander, Prince of Orange.

ESA played a major role in the Congress providing information on current and future programmes with presentations and demonstrations of space technology, Earth observation, space science, navigation and telemedicine. Particular highlights included a 3-D presentation of the International Space Station, the original capsule of the Atmospheric Reentry Demonstrator (ARD) and the X-ray mirrors developed for the XMM spacecraft.

A total of 464 students from ESA Member States were sponsored by the Agency's Education and Outreach Office to attend the Congress. This was the first time that such a significant number of students were given the opportunity to follow the various sessions, and to exchange views and ideas with experts from all over the world.

Bus trips to ESTEC were organised on two afternoons, providing Congress participants with the opportunity to see the Artemis and Envisat flight units, and visit the Erasmus User Centre. A number of ESA staff were on hand to welcome the visitors and answer their questions.

An inaugural speech was given by ESA's Director General, Antonio Rodotà

ESA's DG, Antonio Rodotà, gave an inaugural speech on Monday, 4 October, responding to the address by Annemarie Jorritsma-Liebink, Dutch Minister of Economic Affairs. On Wednesday, 6 October, he opened the plenary session on the 'Future of European Space'. On the evening of 7 October, Mr Rodotà addressed the 464 invited European students and congratulated the winners of the lottery prizes.

Hans Kappler, ESA's Director of Industrial Matters and Technology Programmes, spoke at the plenary session on 'Space Technology needs for the 21st century', as did his counterparts from NASA, NASDA, the Canadian Space Agency and Ball Aerospace. Jörg Feustel-Büechl, Director of Manned Spaceflight and Microgravity programmes, announced the winners of 'Success', ESA's Student Competition for the best ISS Experiment Proposal and handed out prizes at a special event opened as well to the general public.

Altogether, ESA's representatives included fourteen session chairmen or co-chairmen, one symposium coordinator, two rapporteurs and twenty-eight speakers.

The next IAF Congress and Exhibition (51st) will be held on 2-6 October 2000 in Rio de Janeiro. For more information visit the IAF website at <http://www.iafastro.com/>

His Royal Highness Wilhelm-Alexander, Prince of Orange, and Annemarie Jorritsma-Liebink, Dutch Minister of Economic Affairs (centre)

The ESA exhibition provided information, presentations and demonstrations of current and future space technology

The interest and enthusiasm the students demonstrated throughout the Congress were rewarded with a prizes at a special student social event. Prizes were drawn by Antonio Rodotà (centre) and Wubbo Ockels (left), Head of Office for Educational Project Outreach Activities. Charly Pache (right), Ecole Polytechnique Fédérale de Lausanne (CH), was the second prize winner of a trip to Kourou to witness an Ariane launch.
The third prize was a special Internet account received by: Luigi Adamo, University of Palermo (I), Joost van Leeuwen and Wouter Jonker, TU Delft (NL), Mario Roberto Carraro, University of Bologna (I), and Raffaele de Amicis, University of Bologna (I).
The lucky first prize winners were Erik Wouters and Stephan Ullmann, TU Munich (D), who each received a trip to Rio de Janeiro to attend the 51st IAF Congress next year

464 students were sponsored by ESA to participate in the Congress

A True SUCCESS Story

The 50th IAF Congress also saw the presentation of prizes to the winners of another contest launched by ESA last year (November 1998). Dubbed SUCCESS (Space Station Utilisation Contest Calling for European Students' IdeaS), the contest was designed to introduce students and their ideas to space and non-space industries in order to stimulate potential for future industrial research and technology development on the International Space Station.

ESA received 103 experiment proposals from 126 students in Austria, France, Germany, Ireland, Italy, The Netherlands, Norway, Spain and the United Kingdom, spanning the fields of technology, life sciences, physics, materials science, and Earth observation.

Under the aegis of ESA's Director for Manned Spaceflight and Microgravity programmes, Jörg Feustel-Büechl, prizes were awarded to:
1st prize: José Mariano López-Urdiales, Fernando Mancebo-Ordóñez, Daniel Meizoso-Latova and Pablo Valls-Moldenhauer, Instituto Universitario "Ignacio da Riva", Universidad Politécnica de Madrid, Spain
2nd prize: Paolo Ariaudo, Università degli Studi di Napoli "Federico II", Italy.
3rd prize: Alexander Roger and Anna Glennmar, University of Glasgow, UK.

The Spanish students will each be granted a 3-month fellowship at ESA's Research and Technology Centre, ESTEC, to work on their experiments and get ready to test them on a parabolic flight campaign. The Italian student won a laptop computer, while the British students will be able to choose a trip to either KSC to attend a Shuttle launch or to Kourou to witness an Ariane launch.

Finalists of the SUCCESS contest

The first prize, 3-month fellowships at ESTEC, was awarded to four students from the Universidad Politécnica de Madrid

ESA Parabolic Flights to Prepare for the International Space Station

On 25 October, a specially adapted Airbus A-300, took off from Bordeaux-Mérignac airport in France on the first day of a week-long (25-29 October) campaign of parabolic flights designed to carry out experiments in weightlessness, and to test instruments and equipment before they embark on a real spaceflight. These campaigns observe how technical systems and biological, chemical and physical processes function in the absence of gravity. This campaign, the 27th organised by ESA, will focus mainly on how the human respiratory system works and how new materials can be produced.

During a parabolic flight, the aircraft performs a nose-up manoeuvre to put it into a steep climb. This creates a centrifugal force of 1.8 g (1.8 times the force of gravity on the ground) for about 20 seconds. Then the pilot reduces engine thrust to almost zero, injecting the aircraft into a parabola. The plane continues to climb till it reaches the apex of the parabola, then it starts descending. This condition lasts for about 25 seconds, during which the passengers and all unstrapped equipment in the cabin float in the weightlessness resulting from the free fall of the aircraft. When the angle below the horizontal reaches 45°, the pilot accelerates again and pulls up the aircraft to come back to a steady horizontal flight. These manoeuvres are repeated 30 times per flight.

During the weigthlessness periods, the 28 scientists on this flight – from research institutes in six European countries and the US – carried out their work: measuring blood pressure under various conditions, monitoring a newly-developed instrument or heating metals in a purpose-built furnace, in order to confirm a hypothesis, test instruments or replicate results obtained during an earlier spaceflight. The 26 previous campaigns that ESA has conducted since 1984 have produced a total of 2650 parabolas and almost 15 hours of weightlessness, the equivalent of flying around the Earth (in low-Earth orbit) nearly 10 times. A total of 360 experiments have been carried out.

With Europe and its international partners now building the International Space Station, where research will be carried out for the next 15 years, parabolic flights are crucial to the preparation of experiments, equipment and astronauts, and allow scientists to have their experiments tested before they are actually flown on a space mission.

Over the coming four years, ESA will run two parabolic campaigns a year. Scientists are regularly invited to submit experiment proposals for review and selection by peers. Those whose experiments are selected have the possibility to participate in an ESA parabolic flight campaign. In each of its future campaigns, ESA will also include experiments proposed by students to encourage the scientists of tomorrow to learn all about experimention in weightlessness and the extensive research opportunities the International Space Station is going to offer.

Further information on ESA parabolic flights can be found at ESA's special parabolic flight Internet pages at <http://www.estec.esa.int/spaceflight/parabolic>.

Experiments and scientists involved in the 27th ESA parabolic flight campaign

1. "Gravity and lung function, first use of ARMS in microgravity", Prof. D. Linnarsson (Karolinska Institute, Stockholm, S), Prof. M. Paiva (University of Brussels, B) and Dr G.K. Prisk (University of California, San Diego, USA). Focuses on the quantitative relationship between lung geometry, gas diffusion and convective gas transport.
2. "Does weightlessness induce peripheral vasodilatation?", Dr P. Norsk and Dr R. Videbaek (DAMEC, Copenhagen, DK). Tests hypothesis on the dilatation of the heart and the peripheral vascular system that could be caused by weightlessness.

Experiments 1 and 2 above make use of ESA's "Advanced Respiratory Monitoring System" built by Innovision (DK) and Alcatel Space (CH) which is to be flown on the Shuttle in January 2001.

3. "Respiratory mechanics under 0g", Prof. P. Vaïda (University of Bordeaux 2, F) and Prof. G. Miserocchi (University of Milan, I). Studies pulmonary mechanics.
4. "Otolithic control of the cardiovascular system during parabolic flights", Drs P. Denise, H. Normand (University of Caen, F) and Dr P. Arbeille (University of Tours, F). Tests the hypothesis that otolithic receptors, part of the inner ear balance system, affect the cardiovascular system.
5. "In vivo monitoring of the mechanical environment of fractures in microgravity", Prof. M. Hinsenkamp and Prof. F. Burny (University of Brussels, B). Measures mechanical constraints in healing bones in subjects having recently fractured tibia.
6. "The effects of a change in gravity on the dynamics of prehension and the kinematics of the upper limb during cyclic arm movements with a hand-held load", Profs. J.L. Thonnard, N. Heglund and P. Willems (University of Louvain-La-Neuve, B). Measures the grip force and total load force of test subjects.
7. "The effect of short-duration microgravity on leukocyte early signal transduction events and cytoskeleton dynamics", Drs J. Hatton, J.P. Breittmayer (Hôpital Archet, Nice, F) and Dr B. Hashemi (National Space Biomedical Research Institute, Houston, USA). Leukocytes are white blood corpuscles found in suspension in human blood plasma; this experiment will help explain the mechanisms of leukocyte sensitivity to gravity.
8. "Investigations of metallic foam production under microgravity conditions", Dr S. Odenbach (ZARM, University of Bremen, D) and Dr J. Banhart (IFAM, Bremen, D)". Studies metallic foams, new materials with interesting properties of high firmness and low weight with potential applications in lighter car shock absorbers, for instance.
9. "Thermal analysis of pure silicon and aluminum-silicon alloys by mirror furnace experiments", Prof. H. Fredriksson (Royal Institute of Technology, Stockholm, S). Investigates samples of pure silicon and aluminum-silicon alloys using a special furnace developed by the Swedish Space Corporation and flown several times on previous ESA campaigns.
10. "Critical velocities in open capillary flow (choking)", Dr M.E. Dreyer, U. Rosendahl and Prof. H.J. Rath (ZARM, University of Bremen, D). This fluid physics experiment aims at determining the maximum flow rate, which can be established in a capillary channel.
11. "Completion of fault arc investigations at cable bundles under weightlessness conditions", Prof. König, J. Hanson and F. Hörtz (Darmstadt University of Technology, D). This technological investigation looks at the characteristics of insulated cables after exposure to the thermal effect of different electrical powers in microgravity.

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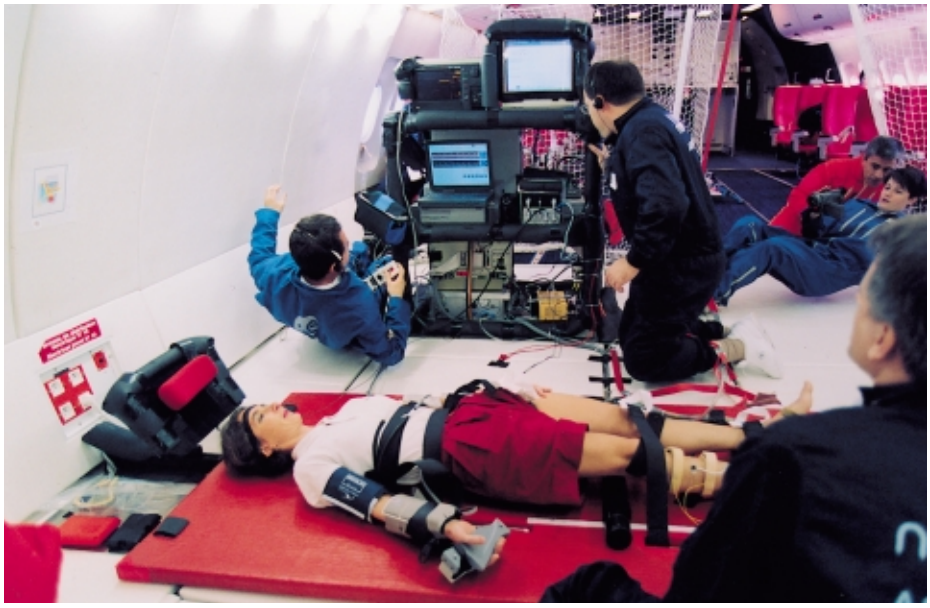

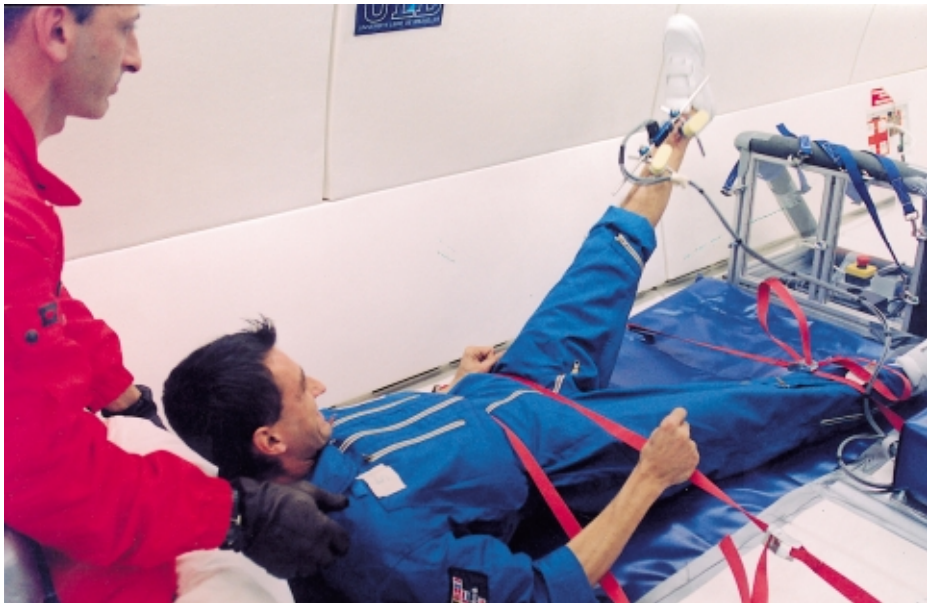

Foton-12 Success

The international Foton-12 mission, carrying a record-size Agency payload, was launched from Russia's Plesetsk Cosmodrome on 9 September. After 14.6 days in orbit, its descent capsule landed safely in southwest Russia; the ESA payload was retrieved within hours and carried back to Europe. Foton's 11 ESA experiments covered fluid physics, biology, radiation dosimetry, material science and meteoritics – another first.

Making its debut was the FluidPac facility, with its associated Telesupport unit, which, for the first time, provided scientists with online monitoring of their experiments. Two fluid physics experiments (MAGIA and TRAMP) were successfully performed, while BAMBI suffered a technical failure and had to be aborted.

ESA's Biopan external exposure facility, completing its fourth flight, performed well. The unit's lid was opened 20 hours after launch, by telecommand from the Moscow control centre, to expose the four radiation and exobiology experiments directly to the space environment. It was closed after 303 hours. Biopan was returned to ESTEC and the experiments extracted on 28 September.

Like Biopan's experiments, the standalone ALGAE (cell biology) and SYMBIO (botany) went as planned and were safely recovered after landing. The novel reentry study, STONE, with simulated-meteorite rock samples embedded in the capsule's heatshield, went well, although one of the three samples was lost during descent.

Another ESA experiment processed three samples in the Agat furnace to investigate the diffusion coefficients of tellurium and indium in gallium antimonide. Other payloads, from France, Germany and Russia, were also flown. Throughout the mission, Foton-12's status could be closely followed on the Web, where a special homepage was updated daily. Further information can still be found at <http://www.estec.esa.nl/spaceflight/foton/>; see also page 95 of this issue.

Plastics and Space Meeting the Challenges to Mankind

ESA and the European plastics industry have presented new research showing how plastics and space research will help address some of the future challenges facing mankind. A joint press conference on the subject, organised by ESA's Technology Transfer Programme headed by Pierre Brisson of the Directorate of Industrial Matters and Technology Programmes, was held on 7 October at ESTEC's Erasmus User Centre.

The proceedings, opened by Jörg Feustel-Büechl, ESA's Director of Manned Spaceflight and Microgravity, were followed by representatives of the European plastics industry, environment and sustainability experts, and over forty journalists working for the international media

The report 'Coming of Age: Plastics and Space Meeting the Challenges to Mankind', commissioned by the European plastics industry and the ESA Technology Transfer Programme, was presented. It highlights some of the key issues facing mankind, such as climate change, pressure on finite resources and terrestrial habitat, and shows how transferring technologies developed for space applications could provide some of the required solutions.

Numerous examples illustrated in the report include:

– water purification systems, based on technology for use on the International Space Station, are currently under development to deliver fresh water to millions of needy people in India and the Far East
– lightweight vehicle construction techniques, applied to components of the Space Station, Space Shuttle and other space systems, are integral to new generations of eco-efficient aircraft and automobiles
– the use of solar light, and the efficient use and retention of energy on board spacecraft, are opening up the development of alternative energy sources on Earth and ensuring efficient use of fossil fuels through improved domestic insulation.

For further information about ESA's Technology Transfer Programme, visit the website <http://www.esa.int/technology/>.

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Pierre Brisson, Directorate of Industrial Matters and Technology Programmes

On 7 October, ESA's Technology Transfer Programme organised a joint press conference with the European plastics industry on the benefits of plastics and space research, at ESTEC's Erasmus User Centre

New Head of ESA Cabinet

The new Head of Cabinet, Mr Brian Walker, took up duty on 1 August 1999. His Office provides the Secretariat to the ESA Council, manages planning, information, representational and operational requirements for the Director General, and is responsible for the Agency's official record and the management of its archives.

A long-serving ESRO and ESA staff member, Brian Walker joined ESTEC (NL) in October 1964 to work on the ESRO-2 satellite project, as deputy Project Manager with specific responsibility for checkout and orbital operations. In 1967, he moved on to the TD1A project to manage checkout design and procurement.

In 1968, he moved to the newly created European Space Operations Centre, ESOC (D), to work on ESRO-1 operations and the preparation of the operations for the re-launch (following the initial launch failure) of ESRO-2. He subsequently progressed at ESOC to become Head of the Mission Management Branch and later Division, Head of the Office for Coordination and Management, and ultimately Head of the Ground System Engineering Department.

In 1989, he moved to ESA Headquarters to Head the Coordination and Management Office, where one of his many functions was to Chair the Agency's Adjudication Committee (1989 to 1994). In 1994, he was appointed Associate Director for Information Systems, with additional responsibility from 1997 for the reform of Purchasing, Records Management, and Information and Documentation Services.

In his new role as Head of the ESA Cabinet, Brian Walker will also be responsible for the Agency's Central Management Support Unit.

Brian Walker

Mercure Project Successfully Completed

On 6 October, the Mercure project was formally concluded during a meeting of its Governing Board, held at the Ministry of Foreign Affairs in Madrid. The project was created in Madrid on 25 November 1994 when six ESA Member States – Austria, Belgium, Norway, Spain, Switzerland and the United Kingdom – signed a Memorandum of Understanding, together with the Agency, to participate in and to contribute to the project. Mercure is a European response to the importance that the United Nations Conference on the Environment, UNCED, held in Rio de Janeiro in June 1992, placed on the need to improve the availability of and access to environmental information in achieving sustainable development.

The project is elaborated by the United Nations Environment Programme, UNEP, in partnership with ESA. Under the auspices and technical coordination of ESA and the leadership of the Spanish Company INDRA in Barcelona, a consortium of industry from the participating States, including Newtec CY (B), Nera (N), Softlab (A) and CIR SA (CH), has provided satellite earth stations and associated equipment, installed at several of UNEP's world-wide centres. Global capacity on the Intelsat system is used to interconnect the earth stations. The overall Mercure network is controlled by a Master Station operated by Swisscom Telecom in Leuk (CH).

The Mercure network is now an integral part of UNEPnet, which is a dedicated global Internet for environment and sustainable development. Its role is to improve environmental data and information exchange and to address the 'widening gap' between the industrialised and developing worlds. Responsibility for the technical implementation and day-to-day operation of the UNEPnet/Mercure programme rests with the UNEPnet Implementation Centre in Arendal, Norway.

UNEP's ability to operate as a UN centre from Kenya is entirely dependent on reliable and cost-effective communications not only with other UN centres, but also with UNEP's own offices around the World and the national governments served by the programme. High-capacity Internet services, video conferencing and electronic publication of UNEP's products would simply not be feasible without Mercure. In fact, Mercure has greatly increased UNEP's ability to collaborate effectively with other centres around the World.

The Space Generation Forum Sister Conference at ESTEC

The Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) was held in Vienna, Austria from 19-30 July 1999. The UN had agreed that an international youth forum for university students, graduate students and young professionals, called the 'Space Generation Forum (SGF)' and organised by International Space University (ISU) alumni, should be held in conjunction with UNISPACE III.

It was proposed by the Forum committee that local brainstorming sessions, known as Sister Conferences, should be held around the World before the Vienna meeting to collect and assimilate ideas and thereby provide as meaningful an input as possible for the Forum. To involve the younger staff at ESA in the above activities, it was decided to hold one of the SGF Sister Conferences at ESTEC, in Noordwijk (NL).

The ESTEC Sister Conference, held on the morning of 3 June, was built around two main discussion groups: Education & Public Outreach and Science & Technology. The event was supported by the ESA Office for Education Projects and Outreach Activities. Seventeen people participated, seven of whom chose to be in the Education and Public Outreach discussion group, and ten in the Science and Technology group.

The Education and Outreach group focused on eight topics:
1. Education and Outreach: present concerns
2. NASA versus ESA Experiences
3. Europe's Needs
4. Added-value of a European Approach
5. Organisation of a European Effort
6. Use of ISS for Education and Public Awareness
7. Pan-European Student Micro-satellite Programme
8. Our Future in Education and Outreach.

The Science and Technology group also had eight main topics as a starting point:
1. Microgravity
2. Physiology
3. Breakthroughs in Propulsion Systems
4. How to Develop Innovative Technology using Space Missions?
5. Space Weather
6. Astrophysics, Astronomy
7. Planetology
8. From the Smallest to the Largest (fractal geometry?).

One of the most important results of the Education and Outreach discussion group was the concept of the added-value of a European approach, using all of our cultural differences to our advantage. The importance of high-level communication between institutions, academia, industry, etc. was highlighted. The creation of 'space projects' with the capacity to involve a large number of young Europeans, and the use of the International Space Station for education and public outreach, were just two of the recommendations to emerge.

Participants at ESTEC
Education & Public Outreach Discussion Group:
Cedric Bouvry
Ana Colorado McEvoy
Viney Dhiri
Christian Henjes
Tobias Horn
Paul Tucker
Sander Van Dijk

Science &Technology Discussion Group:
Antonio Manuel Araujo
Nicolas Boulant
Anne Cizeron
Patrick Couta
Jean-Christophe Dunat
Annette Jaeckel
Sandra Mingot
Esther Martinez
Oscar Martinez
Erik Nijs

Basically two topics stood out in the Science and Technology discussion group: how to use the effects of

microgravity to our advantage, and how to avoid hazardous space-weather effects. The participants were intrigued by how microgravity might be used to benefit science, technology and physiology research. It was suggested that more new materials (e.g. medicines, polymers, computer chips, crystals, etc.) with very pure properties could be developed (as yet unknown types of atomic binding might be possible in microgravity?). It was emphasised that these new materials should be developed for peaceful purposes! Also, it was suggested that microgravity could be used to test some of our basic theories about, for example, atomic structures. The need for more research into the effects of microgravity on the human organism (bone loss and muscle weakness) was emphasised. Could research in microgravity lead to new immunisation possibilities against disease?

The participants also found the subject of space weather highly important for the advancement of the utilisation of the space environment. 'Space weather' (i.e. how the space environment may have unwanted effects on both technological and biological systems in space and on Earth) is becoming a topic of world-wide interest due to the fact that it directly and/or indirectly influences everybody on Earth. It was agreed that improved prediction techniques for the radiation and particles coming from the Sun is essential. Also the growing problem of debris (natural and man-made) in space was deemed to be a very important issue in this context.

The Space Generation Forum in Vienna

The Space Generation Forum was funded mainly by the Austrian Government, the UN and commercial sponsors, such as Boeing and Lockeed Martin. The available budget was used to promote the event and to finance approximately 200 young people (students and young professionals) from all over the World to participate.

The areas that the SGF delegates in Vienna focussed on were:

- Public Awareness and Outreach
- Education
- Development of Society & Meeting Basic Needs
- Arts and Humanities
- Philosophy, Religion, Ethics/Morality
- International Co-operation
- Transmission of Knowledge
- Environment
- International Security and Peacekeeping
- Military
- Commercialisation
- Science and Technology
- Access to Space.

The SGF Participants at UNISPACE III in Vienna, July 1999

Forty-nine recommendations were drawn up by the SGF participants and ten of them, representing the younger generation's vision for the future of space, were selected by democratic vote for presentation to the official Delegations to UNISPACE, representing 60 countries:

Recommendations:

1. Education without Frontiers: a Global Education Curriculum: indicating that education is a priority for young people.
2. Priority Access to Mobile Satcom Network for Disaster Emergency Relief: indicating that direct benefits of space technology to humankind is a concern.
3. International Space Authority: indicating that young people expect leadership.
4. SGF Follow-up: indicating that the SGF participants appreciated the Forum as a means of expressing their opinions and their vision.
5. Establishment of an International Centre for Space Medicine (ICSM): indicating that health is a main concern.
6. International Space Chamber of Commerce: indicating that young people would like to see an official institution that would provide funding for space activities all over the World.
7. Action Plan for Meeting the World's Basic Needs through Technology: indicating the same conclusion as for R-3.
8. Nobel Space Prize: indicating a common desire to increase awareness of space among the general public and to raise its status in the scientific community.
9. UN Space Youth Advisory Council (YAC): indicating that young people want to have a voice and to participate actively in long-term policy making.
10. Planetary Defence/Protection: indicating that there is a common awareness, among young people, that our species needs a global understanding of such natural threats as possible impacts of Near Earth-Objects with the 'Blue Planet'.

Five of these ten recommendations – R1, R2, R4, R8 and R9 – were integrated into the so-called 'Vienna Declaration' emanating from UNISPACE III. Further information concerning these Recommendations can be found under 'Declaration of the SGF Conference', at www.space-generation.org.

Many ESA staff were involved in the SGF conference in Vienna, and several former and present ESTEC employees were on the event's Local Organising Committee. Mr Clovis de Matos presented the results of the ESTEC SGF Sister Conference during the poster exhibition.

C.J. de Matos, C. De Vos, N. Crosby & J. Kraemer *Local SGF Organising Committee, ESTEC*

SOHO Rescuers Honoured

On 16 July, during the 1999 NASA Honor Awards Ceremony at Goddard Space Flight Center (GSFC) in Maryland (USA), ESA's Francis Vandenbussche was presented with the NASA Medal for Public Service by Mr A.V. Diaz, Director of GSFC, and Dr Edward Weiler, NASA Associate Administrator for Space Science, *"in recognition of his inspiring leadership, engineering insight and diplomatic skills, which were the key to the successful recovery of the ESA/NASA Solar and Heliospheric Observatory (SOHO)".*
On the same day, Mr Vandenbussche also received, on behalf of the European SOHO Recovery Team, the NASA Group Achievement Award, *"in recognition of the outstanding achievements of the ESA/NASA Recovery Team who successfully restored operation to the disabled Solar and Heliospheric Observatory."* esa

Francis Vandenbussche with Mr A.V. Diaz (left) and Dr Edward Weiler (right)

European Satellite Technology Helps Fight Forest Fires

In managing emergency situations, such as forest fire fighting, modern organisations require real-time communications between command centres and those 'in the field', as well as deployment over the affected region of, for example, helicopters, vehicles and heavy fire-fighting equipment.

Newly emerging and existing space-based technologies such as navigation satellite systems, satellite communications and Earth observation methods could satisfy many of today's emergency management requirements. But a gap currently exists between these technologies and their operational use. How can this gap be bridged?

ESA has come up with an answer by promoting a new initiative for REal-time Management of emergency situations via SATellite. REMSAT makes maximum use of existing space technologies (telecommunications, positioning, Earth observation systems) as well as hand-held terminals carried by firemen, in order to provide communications with central Emergency Management Control Centres via transportable Intermediate Satellite Terminals.

REMSAT not only provides improved communications between fire crews in the field and the fire-fighting control centres, but also data, video images and geographical location capabilities, through to the positioning and status information of all resources. It also allows additional background information on the fire area, in the form of satellite imagery, aerial photography and meteorological data – essential aids to fire modelling, prediction and suppression.

A pilot demonstration of REMSAT capabilities was conducted in Canada last September. Under an ESA contract, MacDonald Dettwiler & Associates (CDN) – a company with extensive expertise in space-based operations and transportable equipment – teamed up with the British Columbia Forest Service. The BCFS is charged with fighting forest fires in B.C, protecting communities and timber resources in an area of over 1 million square kilometres. The protection programme is deployed for an average of over 3000 fires annually.

Under the demonstration scenario, a nominal fire lasting 19 days was simulated. Positioning functions were provided by GPS, messaging by the Orbcomm LEO satellite system and low/high data rate voice and video services by the Canadian GEO satellite system Anik. The results met with an enthusiastic response from Provincial Government Minister of Forests, Mr David Zirnhelt and the BCFS. A further two (full-scale) simulations are planned in spring 2000, followed by full operational deployment of the system in a real fire that summer.

Forest fire fighting was the selected application for the pilot demonstration, but REMSAT can be adapted to meet the needs of many other types of emergencies such as earthquakes, floods, exceptionally heavy winter conditions and those involving hazardous materials. It can also be made compatible with various satellite systems currently available. esa

Planets, Planets Everywhere

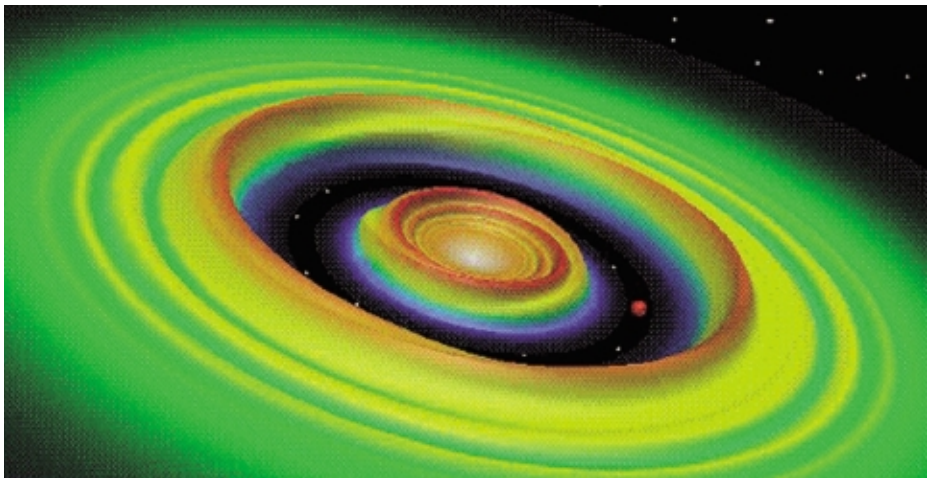
More than a dozen planets orbiting other 'suns' have been found in the last few years, but are they the rule or the exception? ESA's Infrared Space Observatory (ISO) has shown that the formation of extra-solar planets must be a very common event. As explained in the journal Nature (30 September 1999), ISO has found that almost all young stars are surrounded by a disc of debris – a requisite for planet making – while most above a certain age are not. Correlating these data and certain events in the history of our own Solar System, such as the formation of the Moon's craters, astronomers postulate that the discs of older stars have vanished because they have already condensed into planets.

The authors, an international team led by Harm Habing, from Leiden University (NL), wanted to know if stars belonging to a particular class were more likely than others to form planets. In our own Solar System, planets formed out of a disc of small particles of dust, so every star surrounded by such a disc is a potential planet-forming star. The astronomers therefore chose a sample of 84 nearby stars, all of them very common and in the most stable phase of their lives – the 'main sequence' – but of different ages. Which ones would have discs?

Discs are difficult to see because they emit very faintly; only a few have been positively detected so far. Using ISO, the international team found that 15 stars in their sample did have a disc. Then they analysed the ages of the stars: it turned out that most of those younger than 400 million years had discs, while the great majority of the older ones did not.

"We show for the first time that the presence of a disc around a main sequence star depends strongly on the star's age. Why do those above a precise age not have discs? We searched for clues in our own Solar System, and realised that it was just when the Sun was that age (about 400 million years) that planets were forming", Habing says.

In our Solar System, several facts demonstrate that very soon after the formation of the planets the disc orbiting the Sun disappeared. Some evidence comes, for instance, from Moon craters.



Computer rendering, based on a hydrodynamic model which calculates the evolution of a protostellar disk as a giant protoplanet forms (Image courtesy: Geoffrey Bryden, Lick Observatory, University of California, Santa Cruz)

These 'scars' on the lunar surface were made while the planets were completing their formation phase and the Sun was losing its own disc of debris, during the 'clean-up phase' of the Solar System. The newly-born planets scattered the remaining planetesimals, which were ejected from the system, fell into the Sun or collided with other large bodies, such as the Moon. The age determinations of lunar rocks brought back by the Apollo missions prove that all this happened when the Sun was 300 to 400 million years old.

In the light of these facts, the authors postulate that the young stars in their sample – those with a disc – are now undergoing their 'heavy bombardment' period. When this process finishes, the disc will vanish and proto-planets will orbit the star instead.

Does this theory mean that all stars for which a disc cannot be observed are surrounded by planets?

"This is something we cannot say. That's where the knowledge barrier is", Habing answers. *"However, we think the Sun has the same history as the other planetary systems. When the planets form they destroy the disc".* esa

World Experts on Space Debris Meet

Space debris experts from around the globe gathered from 11 until 13 October 1999, at the European Space Agency Operations Centre (ESOC), Darmstadt (D) for the 17th meeting of the Inter-Agency Space Debris Coordination Committee (IADC).

IADC is concerned with all technical issues of the space debris problem. The main objectives of IADC are to exchange results of research in the field of space debris, to cooperate in research activities and to identify debris mitigation options.

The 17th IADC discussed ways and methods to control the growing amount of orbiting debris. Radar and optical telescopes regularly track over 10 000 artificial objects in space. The number of untrackable objects in the size range from 1 cm to 10 cm that could seriously damage an operational spacecraft, is estimated at between 100 000 and 150 000. The International Space Station (ISS) will be equipped with about 200 shields in order to defeat impacts of particulates about 1-2 cm size.

Some recent and current topics of the IADC include:
- guidelines for the disposal of spacecraft in the geostationary orbit
- data exchange procedure and communications for reentry of risk objects
- common database of space objects
- risk assessment for the 1999 Leonids and countermeasures
- measures to reduce the growth of the debris population in low-Earth orbit.

The results from the work of the IADC will provide a technical basis for deliberations on space debris at next meeting of the Scientific and Technical Subcommittee of UNCOPUOS in February 2000. esa