

Vittori, taxis and tourists

A mission to the International Space Station (ISS) returned to Earth on 5 May after successfully delivering a new 'lifeboat' to the Station. The members of the Marco Polo flight were ESA's Italian astronaut Roberto Vittori, Russian mission Commander Yuri Gidzenko, and South African 'space tourist' Mark Shuttleworth. The Marco Polo crew safely descended to Earth in a Soyuz capsule, ending a 10-day mission with a textbook landing on the plains of Kazakhstan at 10h55 local time (04:55 GMT).

Vittori, a former Italian Air Force test pilot, described his maiden voyage into space as "the most exciting and challenging experience of my life". After Umberto Guidoni and Claudie Haigneré, he is the third European astronaut to visit the Space Station in a year. During his eight-day stay he worked alongside the resident crew on the ISS – Expedition Four commander Yuri Onufrienko and flight engineers Dan Bursch and Carl Walz – overseeing four European scientific experiments.



The perfect lift-off of the Marco Polo flight from Baikonur, Kazakhstan on Thursday 25 April 2002, at 12:26 local time (06:26 GMT).

In Brief



The experiments examined the forces involved in moving around in microgravity and the effects on humans of cosmic particles during long missions, assessed newly developed clothing, and tested a non-intrusive blood pressure monitoring device.

Marco Polo – following the equally successful Andromède mission last October with ESA's French astronaut Claudie Haigneré – was the latest in a series of European manned missions to the Space Station.

Belgian ESA astronaut Frank De Winne has already started training for a similar 'taxi' mission in October and Sweden's first astronaut Christer Fuglesang will be on the Space Shuttle for an important assembly flight next spring.



Roberto Vittori returns to Earth after spending eight days on the ISS.

Ariane-4 safe deliveries

Since the beginning of the year, six Ariane rockets have been successfully launched from Europe's spaceport in French Guiana, marking a record-breaking number of 112 launches for the most successful Ariane launcher ever built. The latest passenger was the French CNES SPOT-5 satellite, others included Dutch and Japanese telecommunications satellites and a pair of mini-satellites for amateur radio. Flight 152, the next launch from Kourou, is scheduled to take place on 5 June.



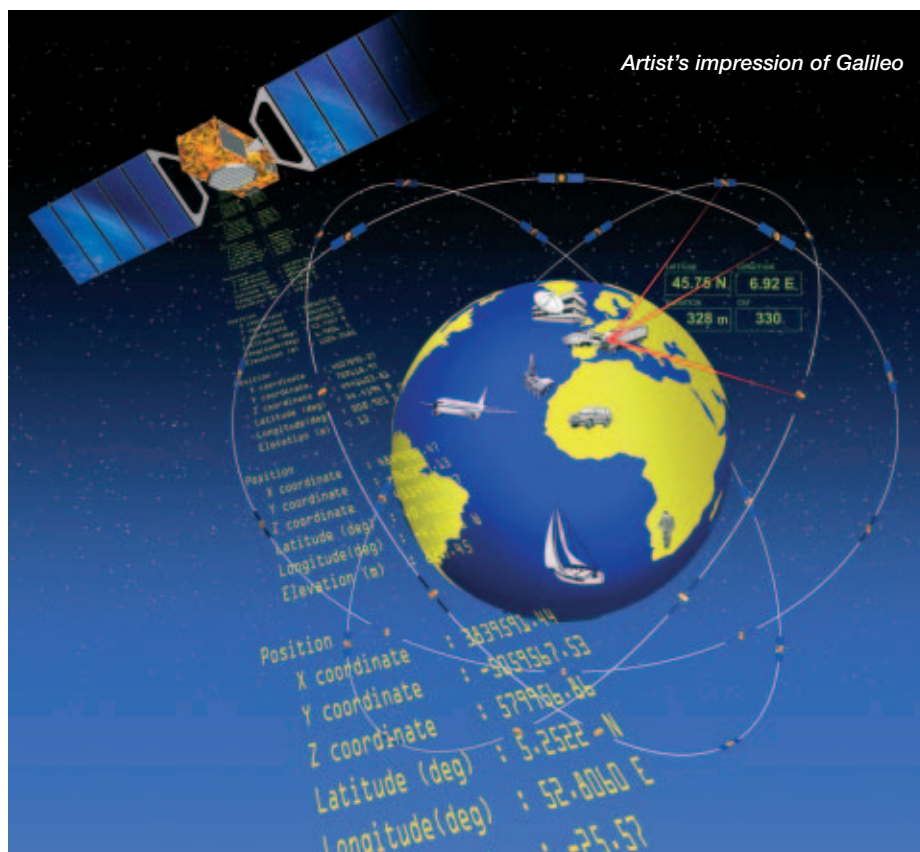
Go, Galileo!

Galileo is definitely going to happen. The European Union Transport Ministers gave the final go-ahead at a meeting in Brussels on 26 March.

Developed by ESA in collaboration with the European Union and co-funded by the two organisations on a 50-50 basis, Galileo is a complete civil system, designed to be operational from 2008 to provide the world in general and Europeans in particular with an accurate, secure and certified satellite positioning

system. It is the first project to be conducted jointly by ESA and the European Union.

The go-ahead for Galileo is particularly important for European industry, which will now be able to develop the advanced technologies required not only for the purposes of the satellite network and its ground support system, but also for the numerous applications associated with it.



TESEO: helping to safeguard the environment

Maybe "Treaty Enforcement Services using Earth Observation" (TESEO) is not one of the catchiest titles but the work it does is more interesting – and useful – than it sounds. A new website now helps to spread the word about the project (<http://earth.esa.int/teseo>).

Earth observation satellites can play a useful role in ensuring that international conventions and treaties are respected and put into effect. To follow through this

idea, in 2001 ESA set up TESEO, which is also part of its contribution to Europe's Global Monitoring for Environment and Security (GMES) initiative.

The four areas of environmental protection with which TESEO is presently concerned are marine pollution (MARPOL 73/78 and regional conventions related to marine pollution), wetlands (Ramsar Convention), forest monitoring (Kyoto Protocol to the UN Framework Convention on Climatic Change), and desertification (UN Convention to Combat Desertification).

Although ESA's Earth observation satellites are not there to police the skies, TESEO

can help to implement treaty objectives. Together with the local, national and international organisations involved in treaty enforcement, TESEO project teams will assess and evaluate ways in which existing and future Earth Observation technology can help to implement international agreements, particularly those of interest to Europe. An added benefit is that this will also increase awareness of how Earth observation satellites can help in environmental monitoring.



Envisat's spectacular view of the Earth

A major new health check on the Earth got under way on 1 March 2002 with the launch of ESA's Envisat, the largest and most sophisticated Earth-observation satellite ever built. From its vantage point in Sun-synchronous orbit, Envisat is tirelessly sweeping the Earth's land surfaces, oceans and atmosphere, using a suite of ten highly sophisticated scientific instruments.

The first images from Envisat's Medium-Resolution Imaging Spectrometer (MERIS) and Advanced Synthetic-Aperture Radar (ASAR) instruments are of exceptionally high quality. The first data available from the satellite were acquired via the Kiruna station in Sweden and processed at the ESA/ESRIN establishment and the processing and archiving centres throughout Europe.

**West African Coast
MERIS, 22 March 2002**



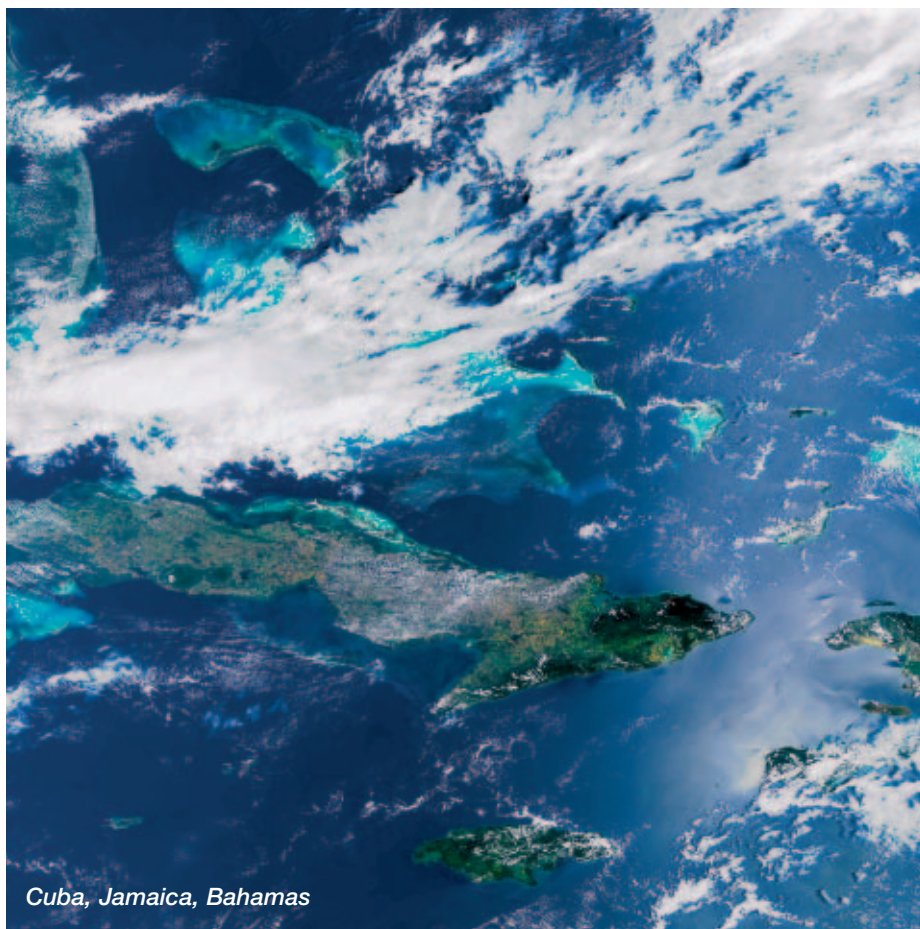
West African Coast

This MERIS image shows the complex river system of Casamance, with its heavy discharge into the sea. Series of such images are needed to monitor the transport of the sediment, which originates from inland soil erosion. The overall scene covers the transition between savannah in the north and tropical vegetation in the south. MERIS can also monitor the intensification of land use, which leads to increased erosion and soil loss.

Cuba, Jamaica, Bahamas

Central in this image is Cuba, the largest and most westerly of the Caribbean islands. Cuba's 3735-km coastline has coral islands, and white sandy beaches to the north.

South of Cuba lies Jamaica. The highest point on the island is Blue Mountain Peak (2256 m). Jamaica has a high degree of biodiversity, with some three thousand



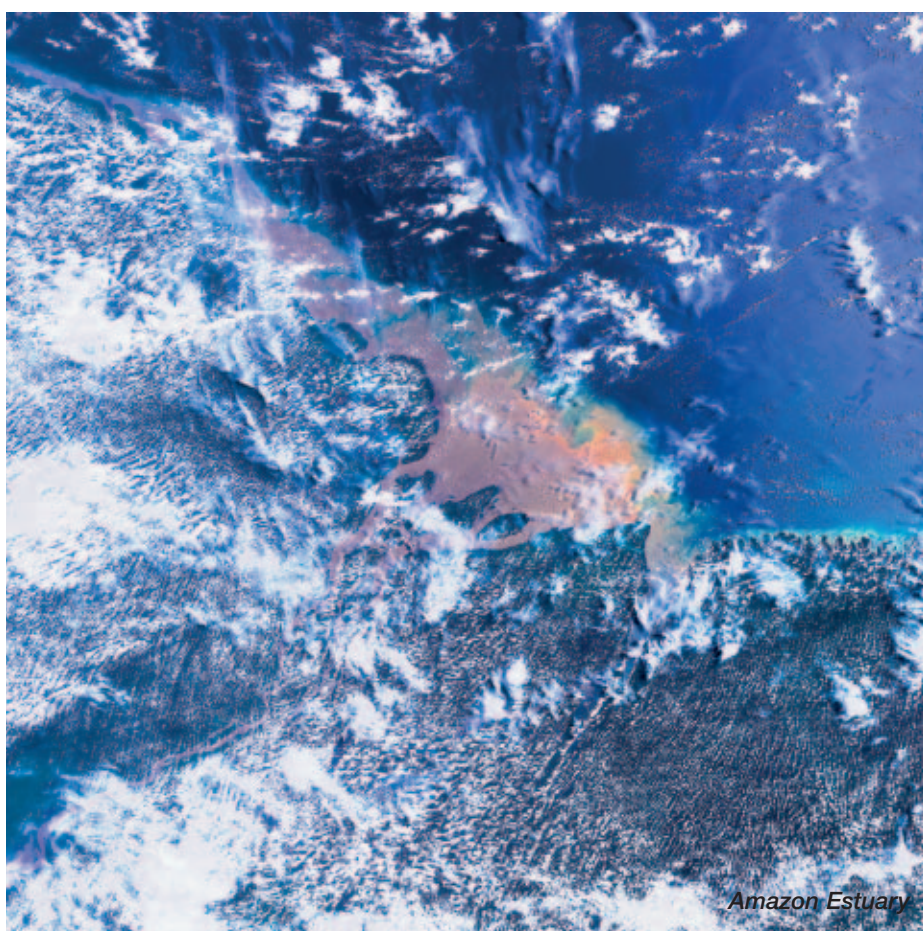
Cuba, Jamaica, Bahamas



Europe
MERIS, 24 March 2002

In this image one can distinguish several European countries as seen from space by MERIS: Andorra, Austria, Belgium, England, France, Italy, Spain, Switzerland... Two mountain ranges covered with snow are clearly visible: the Pyrenees and the Alps, with their highest points at 3404 m (Aneto peak) and 4807 m (Mont Blanc), respectively. The image also shows all of the major French cities and their surroundings: Paris, Lyon, Marseilles, Bordeaux and Toulouse. The Rhone, the Seine and the Garonne rivers are pouring large quantities of sediment, visible as green plumes, into the Mediterranean Sea and the Atlantic Ocean.

Amazon Estuary
MERIS, 25 March 2002



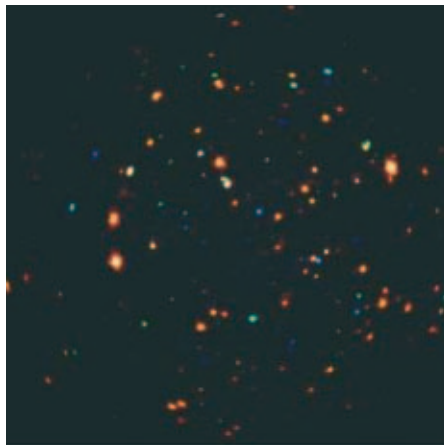
Flowing more than 6400 km across Brazil, the Amazon River originates in the Peruvian Andes. It is second in length only to the Nile among the World's rivers. The Amazon discharges huge amounts of sediment, carried away from the vast lands that it crosses, depositing an estimated daily average of 3 million tons of sediment near its mouth. The outpouring of water and sediment is so vast that the salt content and colour of the Atlantic Ocean are altered over distances of several hundred kilometres from the estuary.

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XMM-Newton proves supernovae can cause gamma-ray bursts

New results from the XMM-Newton space telescope confirm the theory that the death of very massive stars in supernova explosions can cause gamma-ray bursts. Gamma-ray bursts are the most powerful explosions ever detected in the Universe. They are also one of the greatest mysteries of modern astronomy, since so far no clear evidence has existed to prove what causes them.

By analysing the afterglow of a gamma-ray burst that occurred last December in X-ray light, scientists have produced the first ever evidence of the presence of chemical elements which are the unmistakable remnants of a supernova explosion that had occurred just a few days before. *"We can now confidently say that the death of a massive star, a supernova, was the cause of a gamma-ray burst. However we still don't know how and why these bursts, the most energetic phenomena in the Universe, are*



A gamma-ray burst

exactly triggered," says ESA astronomer Norbert Schartel, a co-author of the original paper, published in Nature in April.

The observations revealed two important facts: first, the material in the source was moving quickly towards Earth, at 10% of the speed of light; and second, the chemical analysis of this material showed that it had to be the remnant of a supernova explosion.

XMM-Newton detected large amounts of magnesium, silicon, sulphur, argon and calcium, but very little iron. This is the kind of material a massive star would produce shortly before exploding as a supernova. Nuclear reactions in the stars' cores fuse light chemical elements into heavier ones, a process that generates the energy needed by the stars to shine; different elements are synthesised at each stage of the stars' evolution. The supernova explosion would have ejected this material into the surrounding environment, producing the sphere subsequently illuminated by the gamma-ray burst afterglow seen by XMM-Newton.

ESA's International Gamma-Ray Astrophysics Laboratory, Integral, to be launched in October 2002, will be the most sensitive gamma-ray observatory ever built. It will be able to detect radiation from the most distant violent events and hopefully answer some more of the many remaining questions in the 'case of the gamma-ray bursts'.



ESA and CNES sign contract on CSG

ESA and CNES signed a contract at the Guiana Space Centre (CSG) in Kourou, French Guiana, on 2 May that assures funding to cover the fixed costs of the 'CNES/CSG facilities'. The total amount of these fixed costs over the five years from 2002 to 2006 is put at 617.4 million Euros.



Jean-Jacques Dordain (seated left), ESA's Director of Launchers, and Gérard Brachet, CNES's Director General, signing the contract at Guiana Space Centre.

This contract, signed by Mr Jean-Jacques Dordain, ESA's Director of Launchers, and Mr Gérard Brachet, CNES's Director General, follows on from the decision on Guiana Space Centre (CSG) funding taken by the ESA Council meeting at Ministerial Level in Edinburgh, under which the Agency will cover two-thirds of the fixed costs, amounting to 411.6 million Euros. The other third is being met by CNES out of its budget for national activities, bringing the overall French contribution to 56% of the total.

Under the contract, the term 'CNES/CSG facilities' means the CNES facilities at the

CSG and those belonging to ESA made available to CNES for the purposes of carrying out the contract (the downrange stations and the payload preparation complexes operated by CNES). The contract does not however cover the Ariane launch sites in French Guiana made available by ESA to Arianespace. It is Arianespace that is responsible for meeting the variable costs, which depend on the number of launches carried out.

Gérard Brachet took pride in the fact that *"Europe has, in the CSG, one of the best equipped and most efficient launch bases*

in the world. The service to users is universally recognised as outstanding. The costs of operational upkeep are well below those of the American bases funded by the Department of Defense and, with productivity gains already identified, they will be reduced by over 15% between now and 2006".

"The process of Europeanising the CSG set in train under the previous contracts is going to be continued through cooperation between the ESA and CNES teams", said Jean-Jacques Dordain after the signing ceremony, *"especially in the field of industrial policy, the target being to ensure that every ESA Member State has a satisfactory industrial return by the end of the period 2002-2006."*



Hubble's new camera unveils a new view of the Universe

Jubilant astronomers unveiled humankind's most spectacular views of the Universe as captured by the NASA/ESA Hubble Space Telescope's new Advanced Camera for Surveys (ACS) on 30 April. They also reported that Hubble is operating superbly since the March servicing mission and are looking forward to more pictures from the newly revived NICMOS camera.

The camera's tenfold increase in efficiency will open up much anticipated new 'discovery space' for Hubble. *"ACS will allow us to push back the frontier of the early Universe. We will be able to enter the 'twilight zone' period when galaxies were just beginning to form out of the blackness following the cooling of the Universe from the Big Bang,"* says Johns Hopkins University astronomer Holland Ford, the lead scientist in the ACS's seven-year development.

Among the suite of four 'suitable for framing' ACS science demonstration

pictures is a stunning view of a colliding galaxy, dubbed the 'Tadpole', located 420 million light-years away. Unlike textbook images of stately galaxies, the 'Tadpole', with a long tidal tail of stars, looks like a runaway pinwheel firework. It captures the essence of our dynamic, restless and violent Universe.

But what came as an unexpected bonus is the enormous number of galaxies behind the Tadpole galaxy – as many as 6000, twice the number in the legendary Hubble Deep Field (HDF) in 1995. Amazingly, the ACS picture was taken in one-twelfth the time it took for the original HDF, and in blue light it shows even fainter objects than the HDF. Like the HDF, the galaxies stretch back to nearly the beginning of time and contain myriad shapes that are snapshots of galaxies throughout the Universe's 13 billion-year evolution.

The ACS images are so sharp that astronomers can identify 'building blocks' of galaxies, colliding galaxies, an exquisite 'Whitman's Sampler' of galaxies, and extremely distant galaxies in the field. The ACS image of the Tadpole illustrates the dramatic gains over the Wide Field

Planetary Camera 2 that were expected from doubling the area and resolution, and the five times improvement in sensitivity.

The other pictures include a stunning collision between two spiral galaxies – dubbed 'the Mice' – that presage what may happen to our own Milky Way several billion years in the future when it collides with the neighbouring galaxy in the constellation Andromeda. Looking closer to home, ACS also imaged the Cone Nebula, a craggy-looking mountaintop of cold gas and dust that is a cousin to Hubble's iconic 'pillars of creation' in the Eagle Nebula, photographed in 1995.

Mounted aboard the world's premier optical-ultraviolet telescope, the ACS is a camera of superlatives. It is expected to go beyond the sensitivity of the largest ground-based telescope to eventually see the very faintest objects ever. Its camera delivers a panoramic crispness comparable to that of a wide-screen IMAX movie, a staggering 16 million picture elements (megapixels) per snapshot (typical consumer cameras are 2 to 4 megapixels).

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This picture of the galaxy UGC 10214 was taken by the Advanced Camera for Surveys (ACS), which was installed aboard the NASA/ESA Hubble Space Telescope in March during Servicing Mission 3B. Dubbed the 'Tadpole', this spiral galaxy is unlike the textbook images of stately galaxies. Its distorted shape was caused by a small interloper, a very blue, compact, galaxy visible in the upper left corner of the more massive Tadpole. The Tadpole resides about 420 million light-years away in the constellation Draco. Credits: NASA/ESA-ACS Science Team



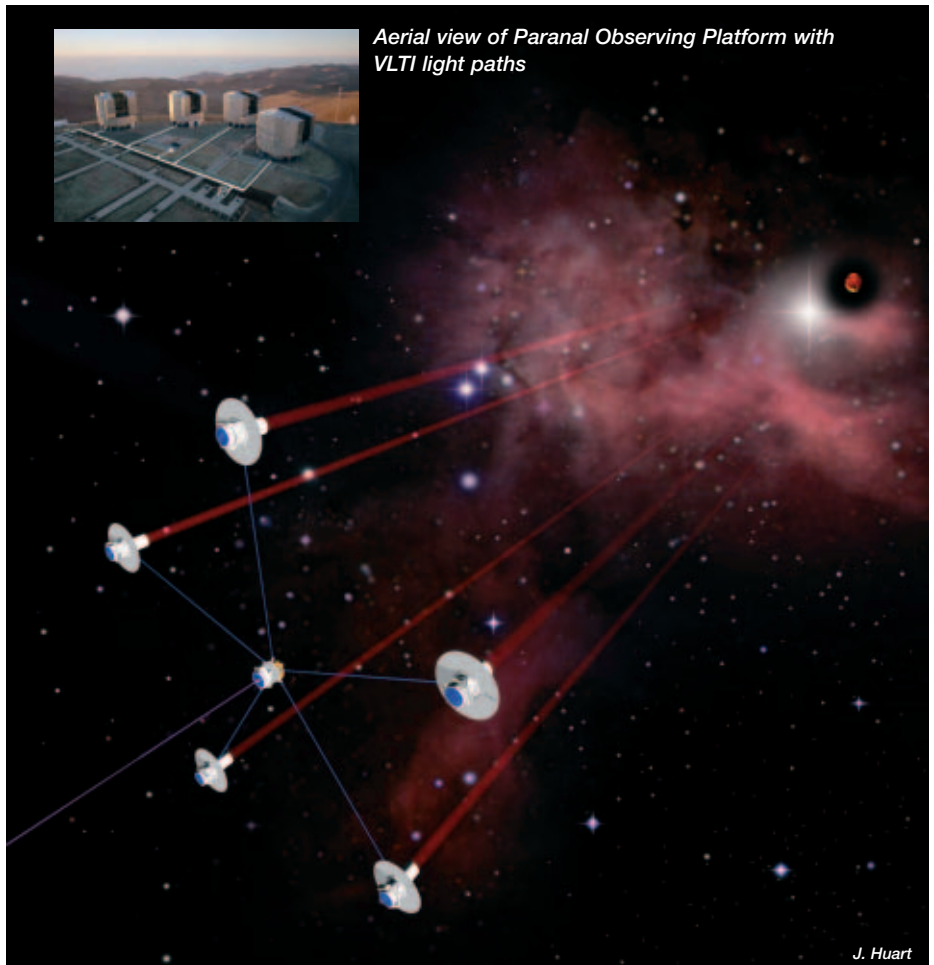
ESA to test the smartest technique for detecting extrasolar planets from the ground

ESA and the European Southern Observatory (ESO) are going to build a new instrument to test nulling interferometry from the ground before ESA applies it in space. Nulling interferometry combines the signals from a number of different telescopes in such a way that the light from the central star is cancelled out, leaving the much fainter planet easier to see.

ESA and ESO will build the new instrument called GENIE (Ground-based European Nulling Interferometer Experiment) using ESO's Very Large Telescope (VLT), a collection of four 8-metre telescopes in Chile. It will be the biggest investigation of nulling interferometry to date.

Using GENIE to perfect this technique will provide invaluable information for engineers about how to build the 'hub' spacecraft of the Darwin flotilla. Scheduled for launch in the middle of the next decade, Darwin is a collection of six space telescopes and two other spacecraft, which will together search for Earth-like planets around nearby stars. The hub will combine the light from the telescopes.

GENIE will see failed stars, known as brown dwarfs and, if the instrument



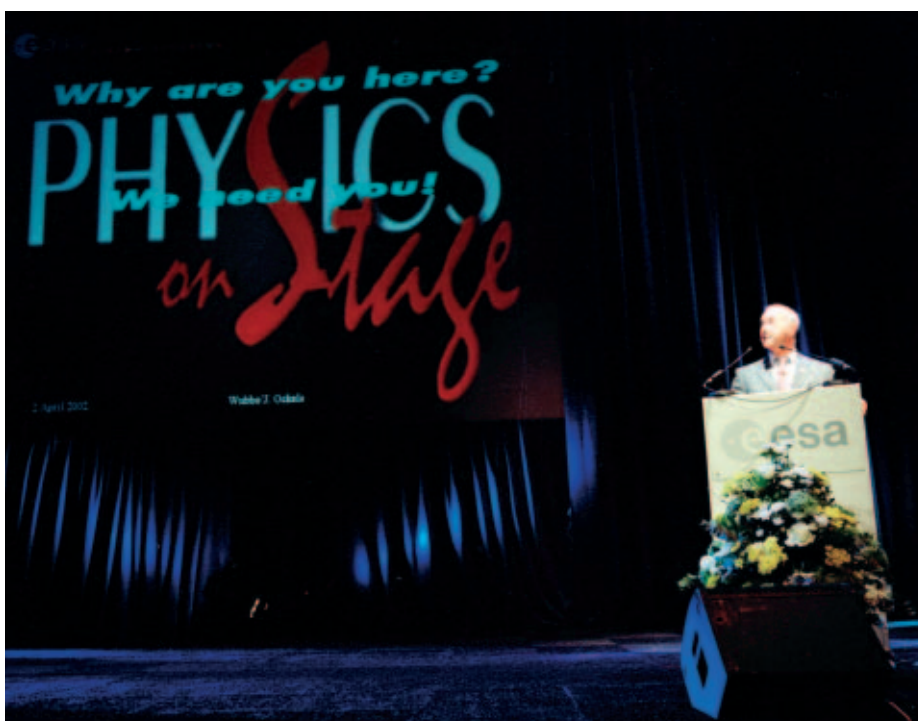
Aerial view of Paranal Observing Platform with VLT light paths

J. Huart

Artist's impression of the Darwin space telescopes.

performs to expectations, may also see some of the already-discovered giant planets. So far, these worlds have never

been seen, only inferred to exist by the effect they have on their parent stars.



Focus on teachers

The Physics on Stage 2 festival was held at ESTEC from 2 to 6 April 2002. It was a great success, with over 400 teachers and educational experts from 23 countries taking part in the intensive programme of presentations, workshops, performances and lively fair sessions. They all had a common goal: to solve the current crisis in physics education by making physics more attractive for schoolchildren and to address general European-wide curriculum issues. The participants showcased a large number of exciting and inspiring physics teaching projects, and made many constructive recommendations, which will allow ESA and its EIROFORUM

Wubbo Ockels, Chairman of Physics on Stage 2, gave the opening speech.

partners to better target future educational projects. The experiments and projects presented ranged from measuring the speed of light with the help of grated cheese and a microwave oven, a walk-in pinhole camera and a transportable planetarium in a tent, to textbook development and teacher training.

The Education Office welcomed several VIP guests to the festival, including Dutch Minister for Education Loek Hermans, Spanish senators Josep Varela and Carlos Bonet, and the Austrian Minister for Education, Science and Culture, Christian Dorninger. Philippe Busquin, European Commissioner for Research, arrived on the last day to listen to all of the recommendations from the workshops and to present recognition awards for teaching excellence, inspiration and motivation of young people, at the festival's Farewell Dinner. Another guest of honour at the dinner was Gerard t'Hooft, winner of the 1999 Nobel Prize for Physics.

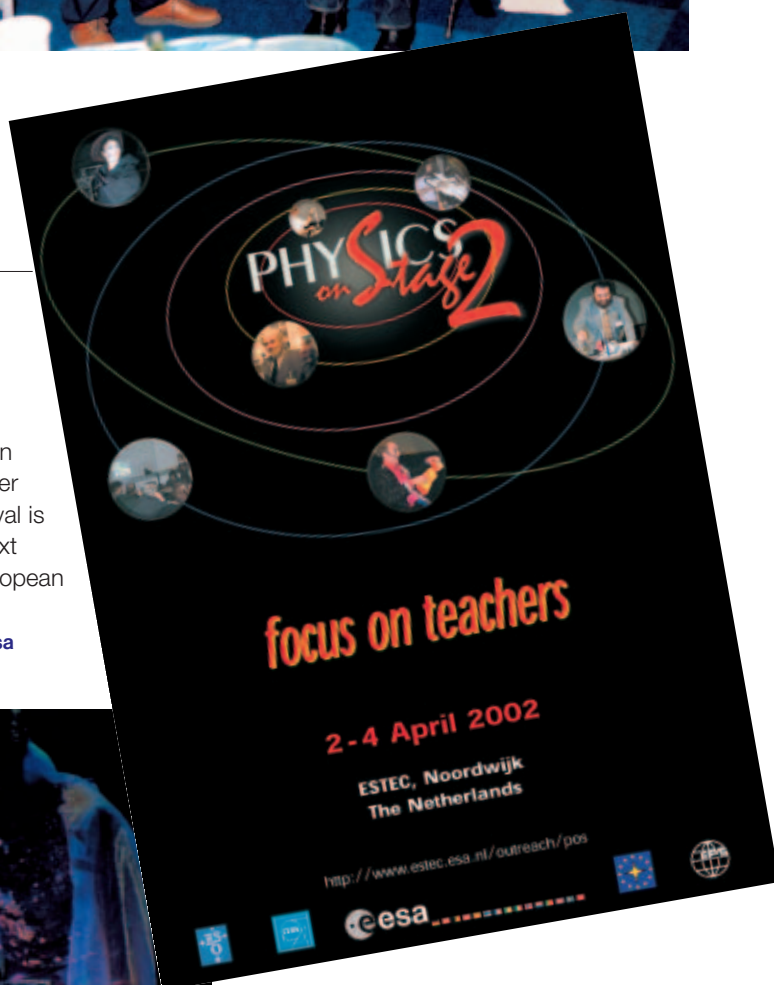
"I got a lot out of it and felt fortunate to be involved. In fact, as the week progressed and I became more and more aware of the high quality of the conference, I realised that I was indeed lucky to be talking with some of the leading physics educators from the various ESA countries", says Jim Tisel, a participant from the Netherlands.

The Physics on Stage network continues to be active, with national events and



Miguel Cabrerizo from Spain won the first prize for his entertaining range of experiments called 'Recreational Physics XXL'.

activities taking place in many of the 23 member countries. A third festival is already planned for next year as part of the European Week for Science and Technology 2003. 



The Bulgarian performance 'A Restaurant at the End of the Universe'

Space Walking at ILA2002

The ILA 2002 international aerospace exhibition took place between Monday 6 and Sunday 12 May at Berlin Schoenefeld Airport in Berlin, Germany. "With contracts and cooperation agreements running into billions of Euros, 1,067 exhibitors from 40 countries, 90,000 trade visitors from Germany and abroad, and 215,150 visitors in total, the International Aerospace Exhibition ILA2002 reconfirmed its status as a major European marketplace for the entire aerospace industry", says the official ILA press release.

1600 square metres of European space activities ranging from space science, Earth observation, telecommunications, satellite navigation, launchers and the International Space Station to industrial matters and technology programmes were on show in Hall 2, the 'Space Hall' with ESA, DLR (the German Space Agency) and the German space industry as exhibitors.

Main attractions were the German-developed Phoenix model and ESA's




Photo: FOTAC/Kirst

models of the ISS and the ATV. A daily live video link in 3D to the Columbus module under construction at Astrium in Bremen also drew many visitors.

The ILA was opened by German Chancellor Gerhard Schröder, and many prominent guests including Mrs Edelgard Bulmahn, Minister for Education and Research and Chair of the ESA Ministerial Council and ESA's Director General. Directors and Astronauts talked to the

German Minister for Research and Education, Mrs Edelgard Bulmahn, poses 'on Mars' with ESA astronaut Gerhard Thiele and children from a German TV programme.

large number of international journalists present, who showed great interest in the development of the Galileo programme and the International Space Station. 

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Serco is the largest technical services contractor to ESA. We have been supporting the Agency's programmes for over 30 years and regularly have job opportunities based at ESTEC (Netherlands), ESRIN (Italy), ESOC (Germany), ESA/HQ (France) and Kourou Spaceport (French Guiana).

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