Mars Express heads for the red planet

The European Space Agency's Mars Express space probe *(Frontiers* 16, p.19) was launched aboard a Soyuz rocket from the Baikonur Cosmodrome in Kazakhstan on 2 June. The probe deployed its solar panels successfully and performed manoeuvres to put it in a trajectory that will take it to Mars by late December.

The spacecraft also had to undergo a delicate but crucial operation – releasing the launch clamps fixing the Mars lander, Beagle 2 to the spacecraft during the launch so that it was not affected by the launch vibrations. The release was a key step, necessary so that Beagle 2 can be ejected when the spacecraft arrives at Mars.

The spacecraft is now well on its way to Mars. The various instruments, including the lander, have been checked and performed as expected. UK scientists are involved in three of the seven instruments on the mission's orbiter component.

- The Mullard Space Science Laboratory and Rutherford Appleton Laboratory are involved with ASPERA, the energetic neutral atoms analyser, which will look at how the solar wind erodes the Martian atmosphere.
- University Colleges London and the Open University are involved with HRSC, the high-resolution stereo colour imager, which will image the entire planet in colour.
- University College London, Queen Mary University of London and the University of Bristol are involved with MARSIS, the subsurface sounding radar/altimeter, which will search for water beneath the surface of Mars.

The UK leads the Beagle 2 lander project. Colin Pillinger of the Open University heads up the team, which also includes researchers from the University of Leicester and the Mullard Space Science Laboratory. The Open University is also responsible for a key instrument – the gas analysis package.

Mars Exploration Rovers follow

Mars Express has now been joined by two NASA Mars Exploration Rovers launched on 10 June and 7 July. This mission seeks to determine the history of climate and water at two sites on Mars where conditions may have once been favourable to life. Once on Mars, each rover will navigate itself around obstacles as it drives across the martian surface.

Mars Rover

Birthday Honours

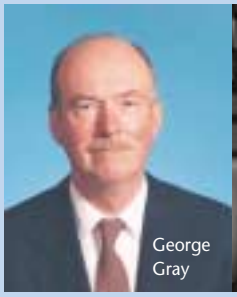
Two PPARC-supported scientists were recognised in this year's Queen's Birthday Honours List. Brian Foster (right), who is a member of the PPARC Council, received an OBE for services to particle physics research, while Colin Pillinger (left) was awarded a CBE for services to higher education and to science.

New Council members

Anneila Sargent and George Gray have been appointed to the PPARC Council, replacing Ian Ritchie and Andy Lawrence.

Professor Sargent has been appointed for four years. She is Professor of Astronomy at the California Institute of Technology (Caltech), director of the Owens Valley Radio Observatory and director of the Caltech/JPL Interferometry Science Centre. She has been President of the American Astronomical Society and chaired NASA's Space Science Advisory Committee as well as serving on many advisory committees to the National Science Foundation and the National Research Council. She will provide an international perspective to PPARC Council.

Dr Gray has been appointed for 2 years. He was chairman of NPL Management Ltd (the operating company for the National Physical Laboratory) from 1995 to 2002, and was also chairman of Regus plc and executive chairman of the Serco Group. Through Serco, he has many years of experience of working with the European Space Agency and the European Southern Observatory, and more recently with CERN. He is currently a member of the Cabinet Office Security Vetting Appeals Panel.



George Gray

Norman Seeff

Anneila Sargent

New laboratory facilities opened at Boulby

The new extension to the UK's unique underground facility to detect dark matter in the Universe, situated in the Boulby salt mine in Yorkshire, was officially opened by Lord Sainsbury at the end of April. The Science Minister gamely donned the requisite luminous orange miner's overalls and cumbersome safety gear before descending the 1100 metres to look around the refurbished laboratory.

The Science Minister Lord Sainsbury is briefed by dark matter researcher Neil Spooner (left) and Bob Boucher (Sheffield Vice-Chancellor)

The sensitive equipment, which is designed to detect signals from elusive subatomic particles which could make up most of the Universe's mass is housed in a specially designed area at the bottom of the working mine. Before reaching the laboratory, you have to pass along a series of rather intimidating dark tunnels filled with a hot, sticky fog of salt (potash) particles that prickle the face. The mine actually stretches for 5 kilometres under the North Sea.

In striking contrast, the laboratories themselves are clean, bright areas with good ventilation. Here, members of the UK Dark Matter Collaboration (Universities of Sheffield and Edinburgh, Rutherford Appleton Laboratory, and Imperial College London, as well as international participants) regularly check the operation and the data coming from the three world-leading dark matter experiments – NAIAD, ZEPLIN 1 and DRIFT. These are trying to detect WIMPs – weakly interacting massive particles – which may account for the observed anomalous motions of stars and galaxies in terms of the extra gravity supplied by the WIMPs' invisible mass (*Frontiers* 12, p.5, 13, p.21).

The laboratory has been upgraded with a £3.1 million grant from the Department of Trade and Industry's Joint Infrastructure Fund (JIF) which has also funded a new service building on the surface. The new area will eventually house more sensitive versions of the experiments, and possibly other projects that would benefit from a subterranean location that protects them from cosmic rays and other background radiation.

Nina Hall

Royal re-birth for the Lovell Telescope

Prince Charles visited Jodrell Bank Observatory at the end of April to commemorate the 're-birth' of the Lovell Telescope following its major upgrade funded by the Joint Infrastructure Fund (JIF) and administered by PPARC.

The £2.5 million upgrade saw the total replacement of the surface and the installation of a new, high-precision, drive system. Together, they will allow it to operate over a four-times greater range of frequencies so enabling exciting new science to be carried out. It will also be able to play a significantly greater role in the 217-kilometre MERLIN array and the European VLBI (Very Large Baseline Interferometer) network.

The Prince of Wales was shown the new telescope control and observing rooms, and was told about the work of the Observatory by its Director, Andrew Lyne, and Peter Wilkinson and Philip Diamond. He also met teachers and students from the Catholic High School in Chester who were making observations with one of the smaller telescopes. The Observatory has helped the school in its successful bid to become a specialist Science College.

A highlight of his visit was meeting Sir Bernard Lovell, who inspired the building of the telescope some 50 years ago. He told the Prince that when completed in 1957 it had been expected to have an operational life of only 10 years. "The fact that it is still in constant use, and now better than at any time in its history, is a truly magnificent achievement!," he said.

Having seen the telescope at close quarters, Prince Charles took part in the opening ceremony. He was welcomed by Manchester University's Chancellor, Anna Ford, and made an in-depth speech in reply to that by the Vice-Chancellor Sir Martin Harris. Following his unveiling of a commemorative plaque, his final act was to initiate a move of the telescope to the pulsar B0329+54 whose 0.7 second-period pulses were relayed over the public address system to signal the end of what had been a great event in the life of the Observatory.

Prince Charles at Jodrell Bank with Director Andrew Lyne (right) and Sir Bernard Lovell

Ian Morison
E-mail: *im@jb.man.ac.uk*

Gemini Observatory/GMOS-S Commissioning Team

Hubble Heritage Team/STScI/AURA/NASA

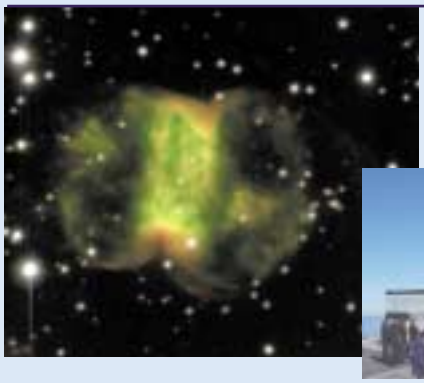
The galaxy group HCG87 imaged with GMOS-S (left) compared with a similar image taken by the Hubble Space Telescope

Images from new Gemini spectrograph rival view from space

Gemini's second multi-object spectrograph, GMOS-South, capable of obtaining hundreds of spectra in one 'snapshot,' has just finished undergoing commissioning on the 8-metre Gemini South Telescope at Cerro Pachón, Chile. The twin telescopes, Gemini North on Hawaii and Gemini South, now have identical general-purpose optical instruments, both constructed by a UK-Canadian collaboration *(Frontiers* 12, p.4).

During commissioning, the new imaging spectrograph, without the help of adaptive optics, captured images of astronomical objects, which are among the sharpest ever taken from the ground. The image reveals remarkable details, previously seen only with the Hubble Space Telescope, of the Hickson Compact Group 87 (HCG87). This is a diverse group of galaxies located about 400 million light years away in the direction of the constellation Capricornus.

Further upgrades to GMOS-South are planned including an Integral Field Unit (IFU), as for GMOS-North, and they will begin commissioning in early 2004 (*Frontiers* 14, p.7). Built by the University of Durham, it uses more than 1000 optical fibres, tipped at each end with microscopic lenses, to dissect an object under study. This gives GMOS a 3-D view of the target, in which each pixel in the image is replaced by a spectrum. This innovation allows GMOS-South to make detailed maps of, for example, the motion of stars and gas in galaxies.



First light for the Liverpool Telescope

The Dumbbell Nebula (M76) – one the first images obtained by the Liverpool Telescope (inset)

The Liverpool Telescope, the world's largest fully robotic telescope, is ready for scientific operations, following the formal signing of agreements in May to site and operate it on La Palma at the IAC. It took its first images in August.

The 2-metre optical telescope will be able to respond rapidly to requests for observations and data, putting the UK at the forefront of studying transient phenomena such as supernovae and gamma-ray bursts.

The PPARC-supported telescope is owned by the Astrophysics Research Institute (ARI) of Liverpool John Moores University (JMU), and was designed, constructed and commissioned by Telescope Technologies Ltd, a subsidiary company of JMU.

Forty per cent of observing time will be available to UK astronomers, with a further 5 per cent going to schools.

Michael Bode
E-mail: *mfb@astro.livjm.ac.uk*

Philip Williams
1939 – 2003

The solar-terrestrial physics community was saddened to learn of the sudden death in Cardiff of Professor Phil Williams at the age of 64.

After an early scientific career in radioastronomy, Phil Williams was appointed to the staff of the University of Wales, Aberystwyth in 1967. He quickly became interested in incoherent scatter radar, being involved in early work on developing the technique. He made significant contributions to solar-terrestrial physics, and played key roles in establishing and directing the EISCAT project (see p.16).
Phil spent several years in Scandinavia on secondment as Assistant Director of the EISCAT Scientific Association and pioneered the use of the facility to study the solar wind.

Phil also had a long interest in Welsh politics, playing an influential role in the leadership group of Plaid Cymru for several decades. He was elected to the first National Assembly of Wales in 1999, and as a member for South-East Wales he quickly made his mark, being named Welsh Politician of the Year in 2000. He chose not to seek re-election last month and had been planning to take up a more active involvement in scientific research. The solar-terrestrial physics community will miss Phil's outgoing enthusiasm and will wish to extend sympathy to his wife Ann and their two children and families.

Sue Horne
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INTERNATIONAL

Expanding international collaboration at the La Palma Observatory

Representatives of PPARC, IAC and the NWO sign a new agreement for the ING

The Isaac Newton Group of telescopes (ING) is a PPARC organisation responsible for running three telescopes on the island of La Palma in Spain, the largest of which is the 4.2-metre William Herschel Telescope. Until now, ING has been a joint effort between the UK and the Dutch national science funding agency NWO. However, last spring, the ING became a three-partner enterprise when the Astrophysics Institute of the Canary Islands (IAC) joined the international effort. On 6 May, the new agreement was signed in the IAC on Tenerife by Francisco Sanchez for the IAC, Richard Wade for PPARC, and Annejet Meijler for the NWO.

The IAC is responsible for the operation of the Observatory site, which now hosts a large and growing number of telescopes, combining the efforts of many European countries. Most notably, under current construction are the 17-metre MAGIC telescope which is designed to detect so-called Cherenkov light from cosmic radiation, and the 10.4-metre GRANTECAN, which upon completion will be the largest common-user optical and infrared telescope in the world. Spain, and specifically the IAC, are taking a leading role in the latter project.

Our new tripartite relationship between the UK, The Netherlands and Spain holds the prospect of future collaborations in scientific programmes and projects. With this new agreement, Spain gains nearly 10 per cent of the available telescope time at ING. In return, the financial contribution from the IAC offsets cost savings required from the UK side. Moreover, the IAC is constructing a world-class infrared spectrograph for the William Herschel Telescope which will be offered to all its users, thus enhancing the telescope's scientific capability.

With this agreement, ING has found a new balance with its three partners that will bring scientific benefits for all astronomers as well as new opportunities for collaborations with our Spanish colleagues.

Rene Rutten
E-mail: *rgm@img.iac.es*

esa News from ESA

By now, I hope, scientists and engineers of the Rosetta mission have learned to spell Churyumov-Gerasimenko. That's the name of our new target comet, announced at the end of May. When misgivings about the Ariane 5 launcher forced the cancellation of the intended January 2003 launch towards Comet Wirtanen, an urgent re-think followed. Comets don't stand still while you hesitate.

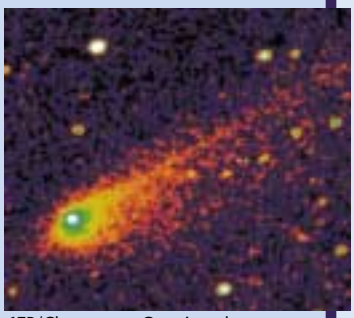
Our comet-chaser Rosetta was conceived to use a series of planetary swingbys to put itself into the same course around the Sun as a selected short-period comet. It can then go into orbit around the comet for many months, and drop a lander on the surface. Our colleagues at the European Space Operations Centre in Darmstadt tested many possible scenarios, with various comets.

Although Comet Churyumov-Gerasimenko soon emerged as a promising candidate, not much was known about it. Following its discovery in 1969, by Klim Churyumov and Svetlana Gerasimenko working at Alma Ata in Kazakhstan, it attracted little attention. Happily, we were able to arrange for fresh inspections of the comet by the Hubble Space Telescope and the European Southern Observatory's Very Large Telescope in Chile, before confirming the choice of target.

With an elongated nucleus about 5 kilometres long and 3 kilometres wide, Churyumov-Gerasimenko is more massive than Wirtanen. We have to reconsider our manoeuvres near the comet and the procedure for dropping the Rosetta Lander onto it gently. Also under discussion are the precise routing and timeline to interception, with regard to opportunities for inspecting Main Belt asteroids on the way.

Rosetta launch-date

The baseline itinerary now calls for a launch in February 2004, followed by swingbys of Earth and Mars, and Rosetta closing with the comet in November 2014. The mission nominally finishes about 5 months after Churyumov-Gerasimenko makes its closest approach to the Sun in August 2015. Altogether, the postponement adds more than 2 years to what was already a long-drawn-out project, and increases the number of team members who will be past their retirement ages before the end of it. That is not a trivial problem for the participating universities and institutes.



Rolando Ligustri/CAST

67P/Churyumov-Gerasimenko

As for the Ariane 5 launcher, we are satisfied with the reliability of the version intended for Rosetta. The reason for the failure of a more powerful version, in December 2002, is now understood and being rectified. We hope that during next year it will be flying successfully. In principle it could send Rosetta to Churyumov-Gerasimenko by the same rendezvous date, with a later launch, but we are minded to stay with the version we know.

John Ellwood
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News from CERN

On 10-12 December 2003, the first phase of the World Summit on the Information Society (WSIS) will take place in Geneva. The aim is to bring together key stakeholders to discuss how best to use new information technologies, such as the Internet, for the benefit of all. The International Telecommunications Union under the patronage of UN Secretary-General Kofi Annan is organising WSIS. The second phase will take place in Tunis in 2005.

The information society was made possible by scientific advances, and many of its enabling technologies were developed to further science. The World Wide Web, for example, was invented at CERN to enable scientists from different countries to work together. For these reasons, science has a vital role to play at WSIS. Four of the world's leading scientific organisations, CERN, the International Council for Science (ICSU), the Third World Academy of Science (TWAS), and UNESCO have teamed up to organise a major conference on the Role of Science in the Information Society (RSIS) as a side event to the Summit. The conference will take advantage of CERN's location close to Geneva to play a full role.

Through an examination of how science provides the basis for today's information society, and of the continuing role for science, the conference will provide a model for the technological underpinning of the information society of tomorrow. Parallel sessions will examine science's future contributions to information and communication issues in the areas of education, healthcare, environmental stewardship, economic development and enabling technologies. RSIS provides a meeting place for scientists, policy-makers and stakeholders to share and form their vision of the developing information society. Its conclusions will be discussed at a ministerial round table on science hosted by UNESCO at the Summit itself.

The RSIS conference is on 8-9 December. Participation will be by invitation and is limited to around 400. However, anyone who feels they have something to contribute can do so via a series of online forums accessible through the conference website: http://cern.ch/rsis

Fiftieth anniversary

Fifty years ago, at the sixth meeting of the CERN Council on 29 June to 1 July 1953, representatives of the 12 founding Member States signed the Organisation's convention, paving the way for the establishment of the world's leading fundamental physics research institution. Today, CERN numbers 20 European Member States, with several countries from beyond the European region participating in the Laboratory's world-class research programme. CERN officially came into existence on 29 September 1954, when the convention was ratified. Fiftieth Anniversary celebrations will kick off in March next year, with the launch of a commemorative stamp in Switzerland.

Pascal Couchepin, President of the Swiss Confederation, visited CERN on 4 June for the official inauguration of the underground cavern for the laboratory's ATLAS experiment. As the first new experimental cavern to be handed over to CERN by civil engineering contractors for the Laboratory's next generation of experiments, this represents an important milestone.

During the ceremony, President Couchepin announced an early 50th birthday present from the Swiss Confederation to CERN. Switzerland has decided to offer the Laboratory the 'Palais de l'Equilibre', a landmark building designed by Geneva architects for Switzerland's 2002 national exhibition. The building will be transformed into an exhibition and networking centre.

James Gillies
E-mail: *james gillies@cern.ch*

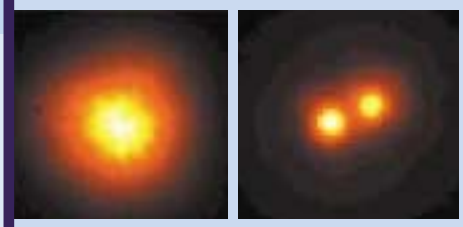
Pascal Couchepin

Palais de l'Equilibre

CERN in *Guinness Book of Records* for data-transfer speed

CERN shares a new entry in the *Guinness Book of Records* with the California Institite of Technology, the Los Alamos National Laboratory and the Stanford Linear Accelerator Center for a new Internet2 land-speed record set using the current standard Internet Protocol IPv4. The team achieved a sustained rate of 2.38 gigabits per second for more than an hour between CERN and California.The same team has since set another new record, this time with the next-generation Internet Protocol IPv6. They achieved 983 megabits per second for more than 1 hour between CERN and Chicago, equivalent to transferring a full CD every 5.6 seconds.

News from ESO



Images of the star HIC 59206 before (left) and after the MACAO system was switched on – which resolved it into a binary system

Now that the UK has joined the European Southern Observatory (ESO), UK industry, as well as astronomers, are set to benefit from new opportunities. In particular, UK companies can compete for contracts related to the construction of the Atacama Large Millimetre Array (ALMA), which will be the world's largest telescope – a network of 64, 12-metre telescopes in the Chilean desert. Contracts cover, for example, adaptive optics, radiofrequency systems, electrical and communications, software and computer technology, cryogenics and engineering. There is also the possibility of participating in construction – the largest contracts will be for the antennas.

Companies will also be able to bid for work on existing telescope instruments and infrastructure, and further opportunities will eventually become available for the next generation of large, ground-based optical telescopes, for example, the 100-metre Over-Whelmingly Large Telescope (OWL).

PPARC and ESO organised a seminar this summer to introduce representatives from across industry to ESO and ALMA, let them know about forthcoming contracts and procurement procedures, and meet key project personnel. Ian Stagg, PPARCs Industrial Liaison Officer anticipates a trade mission to ESO this autumn. *(Further information can be obtained from Ian, tel: 01208 851581; e-mail: ian.stagg@pparc.ac.uk.)*

In the meantime, the HARPS spectrograph (High Accuracy Radial velocity Planet Searcher) was successfully installed on the 3.6-metre telescope at the ESO La Silla Observatory this spring. It is optimised to detect exoplanets by measuring accurate (radial) velocity measurements with an unequalled precision of 1 metre per second.

A new adaptive optics facility, Multi Application Curvature Adaptive Optics (MACAO), also achieved first light at KUEYEN, one of the four 8.2-metre VLT Unit Telescopes at the Paranal Observatory (Chile). A similar system will be installed at each of the other three VLT telescopes. MACAO will allow the VLT telescopes to see celestial objects, 100 times fainter than now.

The MACAO system

INDUSTRY

PPARC KITE Club launched

Researchers, industrialists and government representatives met in May for the launch of PPARC's Knowledge, Innovation, Technology and Enterprise Club – the PPARC KITE Club – at the Queen Elizabeth II Conference Centre in London.

The KITE Club aims to bring a single identity to all of PPARC's technology development, and business and partnership activities, providing various opportunities to network, identify new partnerships, share best practice and explore enterprise. The Club will bring greater coherence and visibility for PPARC's technology and knowledge-transfer programme, and provide a focal point for PPARC-funded researchers, industry, government departments and other research sector organisations.

The morning session clearly highlighted the common vision between PPARC, HEFCE (Higher Education Funding Council for England) and the DTI (Department for Trade and Industry). Delegates heard an introduction to PPARC's knowledge-transfer strategy from the Chief Executive Ian Halliday, then David Hendon, Director Communications and Information Industries, at the DTI, gave the welcome address. Peter Fletcher followed describing the essence of the PPARC KITE Club while John Sutton of the Small Business Service gave an update on DTI innovation and business

Starting up in business with PPARC technology

With all the talk of stock-market slumps and difficult trading conditions, it's hard to remember that we now have the best conditions for starting companies based upon technology developed in the course of scientific research. More Government initiatives are in place than ever before, and venture-finance providers are starting to seek new opportunities. Whilst our core activity is scientific research, PPARC encourages the formation of spinout companies that create value for the UK economy. Several such companies have been established over the past few years and more are in the process of formation.

Before starting a new business, several questions should be answered:

* Is there a global, growing market for the product?
* Is the product or service a compelling purchase when compared with competitors?
* Should the idea be developed as a manufacturing company, a licence or a partnership?
* Is there strong, protected intellectual property?
* Does the inventor have the ambition to build a business and the ability to form a strong management team?

Of course, many researchers would rather develop the idea, with other managers running the business, and return to further academic research. This model is now well recognised by

support activities, and finally, Adrian Hill provided information on the Higher Education Innovation Fund. Overall, this session demonstrated that PPARC is in the mainstream of the national knowledge-transfer agenda and that the KITE Club is the correct vehicle to keep us there.

Delegates were able to network and share information as well as view the many posters and exhibits during lunch. Many business cards were exchanged and ideas discussed, and we hope to see new partnerships develop as a result. The afternoon session provided a deeper insight into PPARC business and partnership funding opportunities. A series of case studies presented by award holders highlighted schemes such as PIPSS, Faraday Partnerships and Enterprise Fellowships.

A full programme including links to the Powerpoint presentations, plus details about KITE Club membership and a registration form, are available on the KITE Club web pages www.pparc.ac.uk/In/Lettr/KITE.asp

This is your club! So if you have any comments, in particular any suggestions for future activities or events, please contact Susan Lansdowne, PPARC Business and Partnership Schemes Manager, e-mail: susan.lansdowne@pparc.ac.uk or tel: 01793 442056.

Seminar on how to form a spinout company

In July, the PPARC KITE Club held a seminar in which experts provided invaluable advice on the dos and don'ts of setting up a spinout company to commercialise technology ideas. Speakers included Ian Ritchie, a non-executive director of Scottish Enterprise and a former PPARC Council member, and finance expert Grant Hawthorne, who explained how to attract investors' attention with the right business plan, and the difference between venture capitalists and 'angel' investors. John Attard, the PPARC industry and CERN technology-transfer coordinator, discussed whether setting up a spinout company or licensing was the best route to exploiting ideas, and the importance of protecting intellectual property, while Nathan Hill explained about the vital role of marketing and putting together a team with broad commercial expertise. Terry Swainbank of the Rainbow Seed Fund and Andrew Wettern of UCL Ventures described how funds available to researchers operated, and ex-radioastronomer, now entrepreneur, Anthony Winter gave a fascinating personal account of his business experience and the importance of negotiation.

This kind of excellent advice is now available via such KITE club initiatives and contacts, so make good use of them!

Speakers Ian Ritchie (left) and John Attard at the spinout seminar

universities and venture-finance providers, who can help in the search for managers to work alongside the inventors.

So what of Government support? PPARC is running seminars on commercialising technology at CERN and two 1-day practical spinout formation seminars in London and Edinburgh. Researchers in the UK universities have access to substantial seed funds for market assessment and prototype development through the University Challenge funds. Staff of CERN, CCLRC and UKATC may now access the £4-million Rainbow Seed Fund, in which PPARC is an associate member. PPARC industry funds such as PIPSS may also be applied to technology development for spinouts.

In any new venture, it is important to develop a business plan. This may seem an intimidating proposition, but help in this area is also available. The Research Councils operate a Business Plan Competition, which incorporates training, and students are encouraged to attend a week-long entrepreneurial skills training course. Enterprise Fellowships are also available from PPARC, offering a year's salary and business-school training.

The PPARC Industry Coordinator team has considerable experience in the development of new businesses, and can provide assistance, help in finding partners and signposting to other resources. Advice and support for those considering the formation of a spinout company are also available from university technology-transfer offices.

*Please contact **Nathan Hill**, PPARC Industry Coordinator, **e-mail:** nathan.hill@qi3.co.uk; tel: 01223 422405, for confidential support. For information on the Rainbow Seed Fund, visit: www.rainbowseedfund.com and for other support from PPARC visit: www.pparc.ac.uk/In/intro.asp*

UK businesses benefit from CERN technology

Whilst CERN is best known for its pursuit of fundamental knowledge about the building blocks of the Universe, there are many examples of its technologies becoming commercially useful. CERN technologies are of value to industry because particle physics experiments demand ever-higher levels of technical performance. Current areas of interest include:

- Non-evaporable getters for improving the pumping speed of vacuum systems;
- High-speed imaging cameras for optical testing and inspection;
- ChemicalVia – a new method to make high-density microvias on printed circuit boards with reduced requirement for capital equipment;
- OpenLab – an open industrial collaboration, giving companies access to the development of new-generation data 'Grids' for high-volume data management.

The appointment of a UK Technology Transfer Coordinator for CERN in September 2002 was enabled with the support of a grant from the UK's Office of Science and Technology. Since then, we have seen the following highlights:

- We have started a series of technology commercialisation seminars for CERN staff and visitors. These have so far focused on evaluating the potential of technology, business partnerships and the formation of spinout companies.
- We have received the first PIPSS applications with CERN as the academic partner, and involving UK companies.
- Three technology surveys in the field of information technology (these are available for download from the PPARC website).
- Two industry briefings – one on vacuum technology and the other on e-business software available from CERN.
- Several companies have visited CERN in order to be briefed on specific technologies.
- Support for a CERN spinout company.

As a result of this activity, the number of companies dealing with CERN as a source of technology is increasing every month.

To find out more about working with CERN, please visit the PPARC Industry website at www.pparc.ac.uk/In/cerntt.asp, the CERN technology database at www.cern.ch/ttdb, or contact ***Nathan Hill****, e-mail: nathan.hill@qi3.co.uk tel: 01223 422405.*

EDUCATION

Academy for gifted children

PPARC officials visited Deborah Eyre, director of the new National Academy for Gifted and Talented Youth in June

The Academy is targeting gifted children, as there is less provision for them than for talented youth (for example, in music). It runs summer schools and shorter outreach events, and is very interested in adding programmes in 'big science'. Young people – roughly the top 5 per cent – can be nominated to become Academy members by their school, parents, or by themselves. The current age range is 11-16, with 16-19 year-olds being added next year, and primary school youngsters after that. An issue is that very bright youngsters like continuous intellectual challenge, and can drop out of subjects like science.

Projects discussed with Professor Eyre included masterclasses at CERN, the Rutherford Appleton Laboratory and Jodrell Bank, collaboration with the Faulkes and Liverpool Telescopes for schools, joint work with the 'Excellence in Cities' programme for inner-city schools, 'space schools', and collaboration with the Pupil Researcher Initiative. PPARC publications will be offered free to Academy members. We will be glad to put Academy staff in touch with interested researchers.

"We aim to engage some of the UK's best young minds with the big sciences, both for the renewal of the PPARC research community and for wider recruitment into UK science and engineering," said Robin Clegg, head of PPARC's Science and Society programme.

The Academy's website is at www.warwick.ac.uk/gifted
For further information contact ***Robin Clegg, e-mail:*** *Robin.Clegg@pparc.ac.uk*

The large spiral galaxy Messier 81 in the constellation Ursa Major (the Great Bear) in which school students are hunting for the tell-tale signs of novae. The image is a composite of three separate images in different colours taken specifically for this project with the telescopes of the Isaac Newton Group, La Palma

Bristol particle physicists offer portable cosmic-ray detector

The University of Bristol Particle Physics Group now has a portable cosmic-ray detector which researchers are welcome to borrow for giving talks and demonstrations to schools and public events. The device is a hand-held particle-tracking detector based on scintillating-glass, fibre-optic plate technology. It is housed in a light-tight box and is powered by a 9-volt battery. The output screen of the image intensifier can be viewed directly by eye under low-level room light conditions or via video imaging with a CCD camera. It reveals the presence of cosmic-ray muons and electrons; it can also be used to view particles produced by a radioactive source.

The detector was purchased in part by a PPARC PUS Small Award. There is a small fund available for travel, so please contact me if you would like to make use of it.

Kate Mackay, e-mail: *k.mackay@bris.ac.uk*

SPEAKERS FOR SCHOOLS

Bristol particle physicists are also willing to give talks to schools:

Helen Heath (helen.heath@bristol.ac.uk)

Small is beautiful: a look at size from us to the proton
Probing the proton: the ZEUS experiment at HERA
The basic building blocks of matter and how they were discovered
Hunting the Higgs: the Large Hadron Collider at CERN

Vincent Smith (vincent.smith@bristol.ac.uk)

Quarks and leptons: the Standard Model of Elementary Particle Physics
Relativity and the twin paradox
Wave particle duality: is the electron there when you are not looking?
Matter and antimatter

Kate Mackay (k.mackay@bristol.ac.uk)

Cosmic-ray studies

Physics on Stage 3

The third European festival of physics teaching will take place at ESTEC, the research centre of the European Space Agency in the Netherlands, during the European Science Week, 8-15 November 2003. It is organised by EIROforum, a consortium of seven of Europe's major international research organisations.

The theme of this year's event is 'Physics and life', emphasising the increasing links between physics and the life sciences. In a year which sees the anniversary of the unravelling of the DNA molecule by physicists Francis Crick and James Watson, it is appropriate to use these links in the classroom to motivate and enthuse students. As in previous years, Physics on Stage will feature an exciting range of demonstrations, presentations and a fair in which teachers from across Europe can display and share their work. In many ways, however, the key to the event's success is the coming together of 300 physics teachers from 22 countries and the resulting exchange of ideas and approaches to teaching. Some of these ideas have been showcased in the UK at the ASE annual meeting and at other events for teachers.

There will be 30 delegates from the UK at the event and, at the time of writing, they are being chosen from the list of applications received. The UK National Steering Committee represents teachers' organisations, professional bodies and research councils (including PPARC which is providing support for the Committee). For more information about the event, please contact the UK coordinator, Kerry Parker (e-mail: kerry.parker@iop.org).

Andrew Morrison, e-mail: *morrison@innotts.co.uk*

School students discover new exploding stars

Pupils recently got a chance to carry out some real astronomy, working with staff of the National Schools' Observatory (a PPARC-funded project) and using data gathered specifically for them by astronomers using the Isaac Newton and Jacobus Kapteyn telescopes on La Palma in the Canary Islands.

The aim of the project, called 'Excitement of Science', was to discover exploding stars – novae – in the galaxy Messier 81. Novae are caused by runaway thermonuclear explosions on the surface of white dwarfs as it sucks material from a companion star. A nova is up to 100,000 times more luminous than the Sun. In our own Milky Way, about three novae of this type are discovered every year. We think there are many more, but these go undiscovered partly because dust clouds in the disc of our Galaxy obscure our view. Observing other galaxies can reveal many more novae.

At an event in June at the Royal Institution, the 400 school students from 100 schools across the UK were told that they had discovered four previously unknown novae in M81. In addition, using these observations combined with observations of novae in M31 (gathered as part of PPARC research student Matt Darnley's PhD work at Liverpool John Moores University), we determined the distance to M81 'live' with the students. The value derived (3.6 megaparsecs, or 11.7 million light years) agreed very favourably with estimates made by totally different methods. The project will continue with observations from the newly commissioned Liverpool Telescope (see p.27).

Further information can be obtained from: ***Andrew Newsam****, National Schools' Observatory (e-mail: amn@astro.livjm.ac.uk; tel: 0151 231 2905) and* ***Michael Bode****, Liverpool John Moores University (e-mail: mfb@astro.livjm.ac.uk; tel: 0151 231 2920*

DIARY

8-12 September
British Association Festival of Science, Salford

11 September
Opening of Liverpool Semi-conductor Centre

16 September
Space Science Workshop, Institute of Physics, London

22 September
Galileo Spacecraft will be crashed into Jupiter

4-10 October
World Space Week

10 October
Closing date, PPARC Small Awards, autumn round

3-9 November
European Science and Technology Week

8-15 November
Physics on Stage, ESTEC, Noordwijk, The Netherlands

8-9 December
The Role of Science in the Information Society, CERN

25 December
Beagle 2 lands on Mars

January
Launch of NASA Swift mission

January
Stardust comet flyby

January
Faulkes North Telescope operational

8-10 January
Association of Science Educators meeting, Reading University

SCIENCE AND SOCIETY

Taking their science to Parliament

Frank Dumbleton

The PPARC-funded researchers who took part (in front of the Houses of Parliament). Left to right: Sarah Dunkin, Jon Couchman, Angela Wyatt, Glen White and Sara-Madge Wynn

In March, young scientists supported by PPARC got a chance to present their research to MPs during an event called 'Taking Science to Parliament' at the House of Commons. Organised by SET (Science, Engineering and Technology) for Britain – and now in its fifth year – it invites researchers between the ages of 21 and 35 from across the disciplines to present posters, meet their local MPs and network with a wider scientific community.

This year's event attracted more than 150 participants and 40 MPs. Five researchers from the PPARC science area took part – four particle physicists and one planetary scientist – Glen White (Queen Mary, University of London), Jon Couchman and Angela Wyatt (University College London), Sara-Madge Wynn (University of Liverpool) and Sarah Dunkin (Rutherford Appleton Laboratory and University College London).

The researchers said they enjoyed the experience: "It was interesting having to explain my research to a non-specialist public audience for the first time," said Glen White.

We hope that more researchers in the PPARC science area will be encouraged to take part in next year's event. Further details can be found on the SET for Europe website: *www.setforeurope.org, or from Eric Wharton, e-mail: ericw@setforeurope.demon.co.uk.*

Gill Ormrod
E-mail: *Gill.Ormrod@pparc.ac.uk*

Shocking physics in Plymouth

The largest ever science exhibition in Devon and Cornwall was recently organised by the University of Plymouth – helped by support from a PPARC Small Award

'Weird worlds – the interactive and exciting face of science', held in the spring at the Plymouth City Museum and Art Gallery, was a great success. The themes were: 'Robots on the move', 'Earth, air and water', 'Marine worlds', 'Awesome Earth', 'Shocking physics' and 'Bugs alive'.

'Shocking physics' was organised by the University's Particle Theory Group in the Department of Mathematics and Statistics together with the

Department of Mechanical and Marine Engineering, and the Department of Communication and Electronic Engineering. It displayed the entire Particle Physics Exhibition Project (PPEP) – a series of demonstration projects funded by PPARC. The hands-on contents ranged across much of physics to demonstrate its use in the real world and the insights it gives into the Universe around us. A central aspect was the continual presence of many academics, students and technicians who could answer questions and interact with visitors. This factor was crucial to the exhibition's success. The enthusiasm of the interpreters ensured that the exhibition was truly interactive.

Shocking physics received more than 5000 visitors including primary and secondary school groups. Visitors were excited to use the equipment and to engage with the science. The week was additionally supported by a well-attended evening 'sciBAr' in a town-centre cafe on 'What's the matter with anti-matter?' This was presented by Alan Walker from PPEP, who talked about an important effect called *CP*-violation which distinguishes between matter and antimatter, and the NA48 experiment at CERN to study this phenomenon. This provoked a great deal of discussion. As well as lunchtime lectures at the Museum to support the week, the Institute of Physics national schools lecture, 'Fantastic plastic' by Averil McDonald, took place at the University and was very well received. The first week of the exhibition was also used to launch the Science and Engineering Ambassadors scheme in Devon and Cornwall. The Minister for Science, Lord Sainsbury, visited the exhibition and was also given a preview of some of the physics week exhibits at the University of Plymouth.

Martin Lavelle, e-mail: *M.Lavelle@plymouth.ac.uk*

Is your research interesting?

Or more important, might the media think it's interesting? As PPARC's community press officer, I'm happy to advise you on how to publicise your results or milestones. If you think there's an interesting angle that would appeal to a wider audience (trade, general public, children, local media), please get in touch and I'll suggest the most appropriate kind of promotion and how to time your publicity. I can also edit or write a press release for you. I regularly visit research groups, so please let me know if a visit would be useful. Remember, the more PPARC science we bring to the attention of the world at large, the more future scientists we can 'turn on' – and the higher profile we have when bidding for funds.

Julia Maddock, e-mail:
julia.maddock@pparc.ac.uk

AlphaGalileo goes independent

In April, the AlphaGalileo service, Europe's Internet press centre for research in science and the arts, and originally started by PPARC, moved from the BA (The British Association for the Advancement of Science) to independent operation as a not-for-profit company limited by guarantee – the AlphaGalileo Foundation.

Under its new structure, the AlphaGalileo Foundation continues to provide a service for the European research area, bringing the excitement and significance of European research to the world's media.

Although a UK company, the service works closely with Europe's research community. The AlphaGalileo Supervisory Council, consisting of representatives from supporting nations, and key research and media organisations across Europe, provides strategic advice to the Foundation. The Supervisory Council is chaired by Ulrich Breuer from Germany.

AlphaGalileo was created by the UK's research councils led by PPARC. On its launch by Lord Sainsbury, the UK Minister for Science, in September 1998, the service transferred to the BA. Until 2001, AlphaGalileo was funded by the governments of France, Germany and the UK, with additional support by the Wellcome Trust. For the past 2 years the European Commission, in collaboration with research and science promotion bodies in Finland, France, Germany, Greece, Portugal, Spain, Sweden, Switzerland and the UK, has provided the service's funding.

For information about the AlphaGalileo Foundation, please contact:
***Peter Green**, Chief Executive*
E-mail:
peter.green@alphagalileo.org
***Website:** www.alphagalileo.org*

AlphaGalileo

Royal Astronomical Society meetings

Meetings are open to all. The meetings are held in Burlington House, Piccadilly, London.

[a] *Society of Antiquaries Lecture Theatre*

[b] *Geological Society Lecture Theatre*

10 October
Ordinary meeting

Paul Davies (The 2004 Gerald Whitrow Lecture)[a]

Specialist Discussion meetings

Redshift surveys[a]

Identifying the open-closed field line boundary in magnetospheric and ionospheric data sets[b]

14 November
Ordinary meeting[a]

Specialist Discussion meetings

Gamma-ray bursts at the launch of SWIFT[b]

Planetary volcanism[a]

12 December
Ordinary meeting

Anneila Sargent – The formation of planetary systems (The 2003 George Darwin Lecture)[a]

Specialist Discussion meetings

From the Interstellar Medium to Stars and Planets[a]

Twenty-two years of EISCAT: a meeting in memory of P. J. S. Williams[b]

//webwatch>

PARTICLE THEORY

Here are some good introductory websites for learning more about the building blocks of the Universe

The Particle Adventure
http://particleadventure.org/particleadventure/

Reflections on Matter
http://perso.club-internet.fr/molaire1/e_index.html

Why do physicists want to study particles?
http://public.web.cern.ch/public/about/why/why.html

Enquiring Minds The science of matter, space and time
www.fnal.gov/pub/inquiring/matter/index.html

Big Bang Science
http://hepwww.rl.ac.uk/pub/bigbang/part1.html

An introduction to Particle Physics
http://hepwww.rl.ac.uk/Pub/Phil/ppintro/ppintro.html

Searching for the building blocks of matter
www-ed.fnal.gov/projects/exhibits/searching/

Fun site with dancing quarks
http://Quarkdance.org

Antimatter: Mirror of the Universe
http://livefromcern.web.cern.ch/livefromcern/antimatter/

Stanford Linear Accelerator Center Virtual Visitor Center Theory
www2.slac.stanford.edu/vvc/theory.html

QCD made simple
www.aip.org/pt/vol-53/iss-8/p22.html

An Introduction to Lattice QCD
www.physics.gla.ac.uk/ppt/ResInter/LattIntro/

The Official String Theory Web Site
http://superstringtheory.com/