



An interview with departing Director-General Fotis C. Kafatos

After twelve years at the helm of EMBL, Fotis C. Kafatos will step down as the Laboratory's Director-General at the end of April. In a departing interview, he speaks of some of his lab's work on insect immunity, his involvement in the *Anopheles gambiae* genome project, and potential applications of this research in solving the global problem of malaria. The work has been motivated in part by Fotis' long interest in the social and political facets of science. The creation of the Science and Society Initiative and the Office of Information and Public Affairs will surely count among his important legacies for the Laboratory. He speaks with Russ Hodge and Háldor Stefánsson... [on page 5](#)

Nourishing the bioinformaticians of tomorrow: Open Day at the EBI

The EBI's first Open Day for Masters students from across Europe attracted a group hungry for information about bioinformatics as well as for sandwiches, tea and copious amounts of coffee. The day was organized in three parallel sessions including lectures, demonstrations and practicals. There were six lectures from group leaders and team members, and the day closed with a "Bioinformatics in Industry" lecture delivered by a representative of AstraZeneca. The event will be repeated next year; a date will be set soon. [on page 4](#)



Taking a break from the bench

Six years ago, Julius Brennecke had just finished his undergraduate degree in biology and wasn't sure what he wanted to do next. So he took a break and went to the Galapagos islands where he worked as part of a research team studying seabirds. After finishing, he returned to the lab and began his PhD studies at EMBL-Heidelberg. Last July he received his degree and before embarking on his postdoctoral career, he decided to go back, this time to study the conservation of albatrosses. Sarah Sherwood interviewed Julius about the contents of albatross stomachs, the problems faced by island species, and what it's like to switch from basic research to field studies. [on page 8](#)

EU networks focus on complexes and pathways

Among the most important issues in biology today are how the set of proteins produced by cells work together in complexes, how these molecular machines participate in pathways and networks, and how those interactions are disturbed by faulty molecules. These questions are crucial to understanding the systems at work in healthy and diseased cells; it's clear that making large inroads will require the work of many scientific groups working together. To tackle these fundamental questions, the EC is funding two networks: 3D Repertoire and Netsensor, in which Luis Serrano and the Structural and Computational Biology Unit will play a leading role. [on page 3](#)

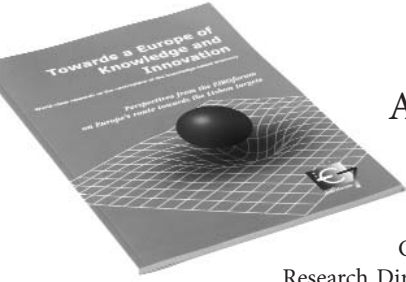
Calling all artists!

If you've got a twitch of artistic talent and want to share it, EMBL's Science and Society Programme is organizing a one-day festival on Friday, July 15. "Art in Science in Art" will bring in speakers from the world of art and philosophy for an interdisciplinary minisymposium on themes relating to creativity and abstraction in art and science. Afterwards, the Lab's own artists and performers will showcase their many talents. Find out more [on page 4](#)

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A vision for Europe's research facilities as the ERA moves forward

Five years ago, the European Commission's Research Directorate published a paper which outlined a course for the future of European science. The plan, which was discussed and refined in a strategic meeting in Lisbon, was to develop a "European Research Area" (ERA) aiming to become the world's most dynamic, knowledge-based economy by the year 2010. This vision has had a major impact on how science and related areas are being viewed and funded within Europe.

EMBL and six other major intergovernmental research facilities (CERN, ESA, ESO, ESRF, EFDA, and the ILL) formed the EIROforum partnership several years ago to leverage the vital role that these organizations play in European research. The EIROforum members have been doing science on a European scale for decades, demonstrating that nations can effectively combine their efforts in carrying out world-class research on a significant scale. The combined budget of the EIROforum organizations is comparable to the budget of the current Framework Programme of the European Union.

To promote their strengths and renowned expertise, the EIROforum has now published a science policy paper which presents perspectives from the seven organizations within the context of the ERA and goals set in the Lisbon meeting. This new document ("Towards a Europe of Knowledge and Innovation: world-class research as the centerpiece of the knowledge-based economy") will be presented on April 20 to the European Commission in the presence of the new European Commissioner for Science and Research, Mr. Janez Potocnik. EIROforum's vision is to create a climate in Europe in which relevant, competitive scientific research can be undertaken in an efficient, cost effective and successful way.

The new science policy paper will be presented at about the same time as the EC presents an outline of its next general funding scheme: Framework Programme 7 (FP7), due in April. The EIROforum document highlights the areas in which the European Commission should focus resources in order to create a successful ERA. This includes research infrastructures which are essential to realize major European research projects. The EIROforum organizations possess unique expertise in the conception, construction and operation of large research infrastructures, which can and

should be exploited in the wider European context. The creation of a European Research Council (ERC) as an autonomous, science-driven fund in support of competitive research is strongly supported by EIROforum. Attracting and retaining talent, and fostering mobility of researchers must be improved by providing the intellectual, cultural and financial incentives to train and retain top researchers. Links need to be formed with European industry such that Europe's technology edge remains sharp and its competence base remains strong. Public engagement with science and an open dialogue is necessary to foster dialogue and interest to secure the workforce for the future.

Attracting more young people to careers in science is vital for the future of European research. The EIROforum's proposal includes improving the visibility of European science in the media, creating a "Partnership for Science Education," continuing with their successful "Science on Stage" annual festival and participating in the "European Contest for Young Scientists," organized by the European Commission (see related story on page 9).

To receive a copy of the EIROforum science policy paper, please contact dg-office@embl.de

Buzzword malaria: Researchers gather at EMBL for first annual BioMalPar conference

EMBL-Heidelberg was abuzz with activity over the first weekend of March, and it all focussed on malaria. No, the swarms were not of mosquitoes emerging from the nearby forest, but of scientists who gathered for the First Annual BioMalPar Conference on the Biology and Pathology of the Malaria Parasite.

The conference was organized by BioMalPar, a Network of Excellence (NoE) coordinated by Artur Scherf (Institut Pasteur) and supported by the EC as part of Framework 6. The meeting brought together 250 scientists from 14 countries on four continents. Sessions focused on basic research on the biology of the malaria parasite and its interactions with the vertebrate host and the mosquito vector. The conference also provided an important opportunity for the organizers to present the BioMalPar network to the wider malaria research community.

The ultimate goal of this ambitious network is to unite the expertise of European scientists in the field of malaria into a single coherent network, which will be accomplished through sharing resources and developing joint research and training activities. EMBL is very actively involved in this NoE. There is a long history of excellent malaria research in Europe, stretching back to the French, English and Italian scientists who originally identified the cause of the disease. That tradition is maintained in recent advances such as the completion and analysis of the *Anopheles* genome and the development of new tools to understand the function of

mosquito genes, in which the groups of Fotis Kafatos, Peer Bork and Ewan Birney have played key roles. Researchers hope to be able to use this knowledge to develop novel intervention strategies to control malaria.

Making inroads into the disease will require a concerted effort of many laboratories and institutions. Currently BioMalPar gathers 17 major leading European centers working in molecular and cellular biology of malaria from seven



Malaria researchers gather at the First Annual BioMalPar Conference at EMBL-Heidelberg in March.

European countries as well as three African partners from malaria-endemic regions. Malaria is a major public health issue in more than 90 countries. It affects more than half a billion people and causes between 2 and 3 million deaths each year, most of them children. Past efforts to combat the disease have included prevention of transmission through insecticides and the development of medicines to treat patients. Despite these efforts, more people are dying of malaria now than 30 years ago,

due in part to the spread of drug-resistant parasites and insecticide-resistant mosquitoes.

BioMalPar benefits directly from its association with EMBL's Collaborative Training Programme (CTP), a new activity of the Laboratory's International Centre for Advanced Training (EICAT). A highlight of the conference was the participation of 16 students enrolled in the BioMalPar International PhD Programme (5 of whom come from malaria-endemic countries), launched in April 2004 and modeled on EMBL's International PhD Programme.

BioMalPar fellows receive theoretical and practical training for 3 to 4 years and conduct a collaborative research project under the supervision of at least two group leaders from participating institutions. The first installment of training was a core course in the molecular biology of malaria, held at the University of Heidelberg and EMBL in February. The students are co-registered at EMBL and at an EMBL partner university. After the successful completion of their thesis work, the PhD students will be awarded a joint degree from EMBL's CTP and the partner university.

"This is an extremely positive development," says Anne Ephrussi, Associate Dean of Graduate Studies at EMBL. "The BioMolPar group has adopted EMBL's standards of quality for their own programme, and we are happy that they can benefit from what EMBL has tried out and perfected over the years."

EMBL groups receive EU funding to study protein complexes and gene networks

Two of the most important issues today in biology are how the set of proteins produced in a cell work together in complexes and how these molecular machines participate in pathways and networks. These questions are crucial to understanding the systems that work in both healthy and diseased cells; it's clear that making progress will require the combined work of many scientific groups. Two EC-funded networks, in which Luis Serrano and the Structural and Computational Biology Unit will play a leading role, will tackle these fundamental questions.

3D Repertoire: increasing interaction to make things less complex

Proteins rarely work alone. A single molecule on its own can't do much. It's when they work in concert that the exciting stuff happens. Scientists have made good progress in understanding the composition of protein complexes, but there is still much to be done to understand how molecular machines form and interact to modulate cell behaviour.

When tackling such ambitious projects, scientists rarely work alone either: they get much more done when they interact. This is the *raison d'être* behind 3D Repertoire, an integrated project funded by the European Commission as part of the 6th Framework Programme and coordinated by Luis Serrano. The goal of the project is to allow scientists with diverse and complimentary expertise to join forces and come up with a detailed look at the structures

of all protein complexes in yeast. The EU funding of 3D Repertoire gives Europe its first large-scale project to analyse multiple protein complex structures.

"In the past, creating useful models of cellular function has faced major obstacles in that you need a wide range of expertise to cover all aspects of protein-complex structure and modelling," says Luis. "You also need an infrastructure to bring that expertise and the data together. Our hope at the end of four years will be to provide the basis to go for something a little bit more challenging: Getting the structure of a cell at atomic resolution."

Partners in 3D Repertoire include most of EMBL's Structural and Computational Biology Unit, plus groups from EMBL-Hamburg. They'll team up with researchers from ten internationally renowned institutes and universities in seven different countries. The project also includes significant input from private enterprise, including four industrial partners. The 3D Repertoire kickoff meeting, held at EMBL-Heidelberg on March 30-31, highlighted that the project will not only produce a pipeline of structural information, but will also provide training and job opportunities for young researchers in an exciting multidisciplinary environment.

By bringing together the right mix of expertise and increasing interaction, scientists hope that things will be a lot less complex. Now we can sit back and watch the exciting stuff happen.

Netsensor: finding faulty genes

If a gene becomes faulty, the effects on cell function can be catastrophic. However, it is often impossible to tell where the error is, which is a prerequisite to trying to fix it. Netsensor, a Pathfinder project funded by the European Commission under Framework 6 aims to put "sensors" in place to detect where things go wrong. The project is coordinated by Luis Serrano. EU Pathfinder projects are focused on specific, highly challenging objectives in emerging scientific and technological fields.

This four-partner project combines expertise in building small artificial gene networks and cancer biology with excellence in a variety of gene delivery systems. By exploring which network topologies and effector systems function best, the partners intend to provide a generally applicable framework to build synthetic networks to react to aberrant cellular pathways. Ultimately, Netsensor aims to develop robust cancer sensors with therapeutic potential.

"This is a very ambitious project in which instead of trying to understand how a biological system operates, we want to engineer and design new properties in a rational manner," says Luis. "This is what the EU defines as Synthetic Biology. This new discipline is now starting to walk on its own and the EU wants to see what kind of opportunities and expertise is around and what things we can expect to do in the coming years." - Phil Irving

EMBLEM and Carl Zeiss to make microscope developed at EMBL

A new high-tech microscope developed by Ernst Stelzer's group at EMBL-Heidelberg will be made available to labs everywhere in the next few years. EMBLEM and technology giant Carl Zeiss have signed a licensing deal to commercialize the new technology, called SPIM (for Selective Plane Illumination Microscopy).

Ernst and his group developed the SPIM technology to allow scientists at EMBL to observe complex, three-dimensional processes in whole, living organisms. "Especially today, it's important to study biological systems in their real context and to move away from 'flat' cell biology," Ernst says. "That's now possible thanks to the many methods available for fluorescent microscopy. The technical innovations we have introduced, including software developed by Jim Swoger to combine multiple images, will certainly be of great help."

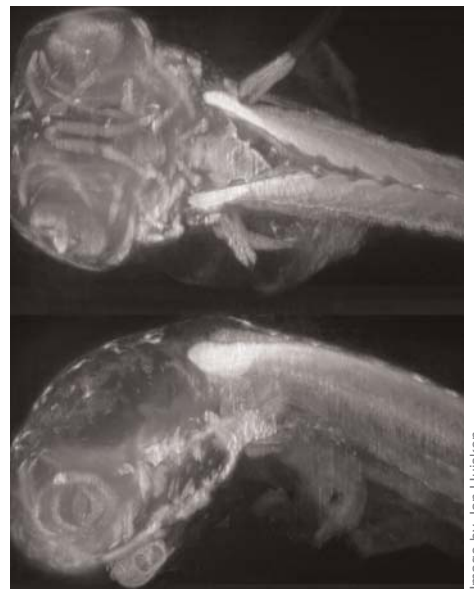
With SPIM, a sample is passed through an extremely thin sheet of light, capturing high-quality images layer-by-layer. "The sample is kept alive in a liquid-filled chamber and can be rotated and viewed along different directions," says PhD student Jan Huisken. "This eliminates blurry and unwanted light, which prevented

scientists from looking deep into tissues in the past." Images slices are captured and quickly assembled into a high-resolution, three-dimensional film. Because light enters the sample from the side (rather than the line-of-sight), it is possible to achieve high resolution in all three dimensions. Illuminating the sample from the same direction as the eye or camera, as was done in the past, meant that the image was blurry along that axis.

Ernst and his colleagues are developing fascinating applications of the instrument with Jochen Wittbrodt and other EMBL scientists. The presentation of SPIM at scientific conferences has generated a flood of requests for the instrument. Last month, EMBL Director-General Fotis C. Kafatos, EMBLEM Deputy Managing Director Martin Raditsch and Ernst met with Carl Zeiss' Executive Board Member Norbert Gorny and General Manager for Microscopy Ulrich Simon to finalize the details of the agreement.

"We were extremely pleased to have found Carl Zeiss as an excellent partner to translate this technology into a product," says Martin. Carl Zeiss is equally happy with the agreement.

According to Ulrich Simon, "The products based on this technology will form a perfect match with our lines of confocal and multiphoton 3D-imaging systems."



A medaka fish embryo as seen by the SPIM.

EBI gets into the festival spirit at the Cambridge Science Fair

Daleks, hovercrafts and necklaces of your own DNA! These were just a few of the attractions at “Science on Saturday,” part of the annual Cambridge Science Festival which ran from March 16-23, in and around the University of Cambridge. This year’s festival, built around the theme of time travel, was a seven-day celebration of all things scientific, featuring talks, hands-on workshops and demonstrations by people who study or work in science.

EBI staff got into the festival spirit as part of an event called “Getting into your Genes,” which by 3 pm had welcomed over 2,500 visitors! The EBI stand included a “Crack the Code” quiz, a Tetris-like game in which visitors had to build

a strand of DNA as the bases fell down, a DNA decoder which translates your name into protein sequence and finds the nearest protein and species match from the UniProt database, and a “find the gene” competition.

The day was heralded as a huge success by everyone involved, with many more visitors than expected. It was just one of the ways by which the EBI is hoping to communicate its work to a wider public of scientists and non-scientists.

For more, see

www.admin.cam.ac.uk/univ/science/

– Jane Lomax



Vincent Lombard from the EBI shows a visitor how to translate her name into DNA. (Photo by Pamela Black, Public Health Genetics Unit, Strangeways Research Laboratory, Cambridge, UK.)

Masters students from across Europe gather for an open day at the EBI

They got up early, traveled far, and battled their way through the traffic jams of Cambridge all to be present at the first EBI Open Day for Masters students from the UK and Europe. Those who made it were glad they did.

The day was organized in three parallel sessions – lectures, demonstrations and practicals. Everything was washed down with copious quantities of tea and coffee and enough sandwiches to sink several battleships in an effort to nourish the bioinformaticians of tomorrow...

There were six lectures from various group leaders and team members describing their

current research. The demonstrations were designed to cover a variety of EBI services and team members were on hand to talk students through individual databases and answer questions. The practicals consisted of a choice of five online tutorials and once again, EBI researchers and service providers were on hand to answer questions and discuss the software. At the end of the day everyone attended a “Bioinformatics in Industry” lecture given by a representative of AstraZeneca, a member of the EBI Industry programme.

Current EBI students participated in the lunch and spoke to several of the visiting students to give them an idea of what life is like as a PhD student in Cambridge and on the Wellcome Trust Genome Campus.

Feedback was very positive from both students and staff. “Transcription Regulation” and “Text Mining” lectures commanded the most questions from the audience and plenty of interaction occurred between students and EBI staff during the database demonstrations. The date for an Open Day next year will be set soon.

– Ujjwal Das and Nicky Mulder

science&society

Art in Science in Art: EMBL to get arty in July

Science has increasingly become a source of inspiration in various forms of art. From Leonardo Da Vinci’s drawing of the *Vetruvian man*, Erik Satie’s piano solo *Embryons desséchés*, Michael Frayn’s play *Copenhagen* to various science fiction movies, such as *2001: A Space Odyssey* and *GATTACA*, the world of science and art come together now more than ever before (see *Nature*’s recent focus on science, arts and culture at www.nature.com/nature/focus/arts). Scientists and artists, through their thoughts, projects and products, bring about cultural transformations in our society.

To celebrate the various aspects of creativity generated by these two fields, the EMBL Science and Society Committee is holding a one-day festival on Friday, 15 July, 2005, called “Art in Science in Art.” The main part of the programme will consist of an interdisciplinary symposium focusing on how art and science interact with each other and how they may continue to do so in the future. Speakers include artists Suzanne Anker from the School

of Visual Arts, New York, and Christa Sommerer, University of Art and Design, Linz who will share their experiences of focusing on the life sciences as a source of inspiration for creating art. Philosopher Arthur I. Miller from University College London will speak about abstraction in art and science.

The second part of the programme will feature “Scientists as artists” and will showcase the many talents of EMBL scientists in a variety of areas, including music, theater and visual arts.

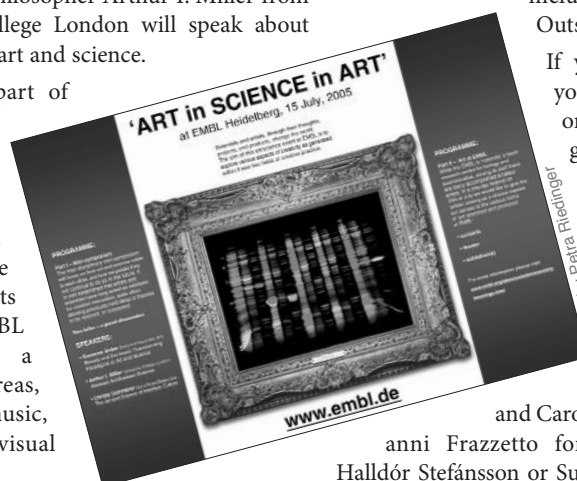
Anything goes, so tune up your vocal chords, or get out your paintbrushes or plaster of Paris. You can exhibit

your personal masterpieces, or get together with a group of friends and be arty. Participation in this science-art event is strongly recommended to everyone at EMBL, including staff at the Outstations.

If you’ve got ideas that you’d like to contribute, or want to participate, get in touch with the organizing committee. They are Julia Willingale-Theune, Fabien Bonneau, Malgorzata Duszczczyk and Stefanie Denger for science-art images

and Caroline Lemerle or Giovanni Frazzetto for music or theater. Halldór Stefánsson or Susanne Monschauer will help you with general inquiries.

www.embl.de/staffonly/generalinfo/committees/sciencesociety.html



From insect immunity to science and society: an interview with outgoing Director-General Fotis C. Kafatos

ONE OF THE DOMINANT THEMES OF YOUR RESEARCH OVER THE PAST SEVERAL YEARS HAS BEEN THE IMMUNE SYSTEM OF THE MOSQUITO *ANOPHELES GAMBIAE*, THE MAJOR VECTOR OF HUMAN MALARIA. HOW DID YOU BECOME INTERESTED IN THIS TOPIC?

That has deep personal and scientific roots, and was stimulated by an invitation by the MacArthur Foundation to spend some of my research time in the field. The roots include a social conscience, my love of insects, and the urge to pioneer. To work on the vector of one of the most important human diseases quickly became a consuming priority for me. I started in 1990 and progressively shifted the emphasis of my research, until around 2000, when it had become the only focus.

THAT WORK HAS LED TO SOME FASCINATING DISCOVERIES ABOUT THE EVOLUTION OF IMMUNITY, THE COMPLETION OF THE *ANOPHELES* GENOME, AND NEW APPROACHES TO THE FUNCTIONAL GENOMICS OF THE MOSQUITO. HOW DID ALL OF THIS COME ABOUT?

My interest in the mosquito coincided with a revolution in immunology, with the recognition that innate immunity is a fundamental part of the immune system. This is a very ancient but by no means primitive type of immunity; it's a crucial first line of defense dating back to the origins of multicellular organisms. I was very fortunate to link up with a group of three collaborators: Jules Hoffmann in Strasbourg, a pioneer in *Drosophila* immunity and now one of my warmest scientific friends and collaborators; Charles Janeway of Yale, a giant in immunology who died prematurely, and Alan Ezekowitz of Harvard, a human immunologist with boundless energy who has made fundamental contributions in the clinic and the laboratory. Our intercontinental group had a significant impact in the development of the field, with comparative studies in insects and mammals, validating my belief that cooperation is a powerful approach to science.

When we started working on *Anopheles*, the concept of genetically manipulating mosquitoes was already there. Yet I was deeply convinced that what we really wanted to understand first and foremost was the biology of the mosquito, before attempting interventions. My intuition said that there was nothing more important to work on than the immune system – although at the time there was actually no consensus whether there was anything like an immune response of the mosquito to the parasite. As I had initiated the *Drosophila* genome project in Europe, it was a natural step to develop a vision of immunology coupled to genomics.

Then in 1997, at the airport in Mali, after teaching a course on Biology of Disease Vectors, Frank Collins and I sat down and outlined a plan for genomics in *Anopheles*. We contacted the World Health Organization and they were fantastically supportive, inviting a small group of experts from genomics and from insect biology to a meeting in Geneva where we developed further these initial ideas.

A parallel initiative started in France between the Pasteur Institut and Genoscope, and then Celera Genomics came into the picture, with Craig Venter announcing that they would to sequence the genome. I didn't want to see another conflict between private and public sequencing efforts, so I put in considerable time bringing these various projects together. We all met at the Institut Pasteur and planned an integrated genomics effort, with a commitment from everyone, Celera included, that all results would be placed in the public domain. Spectacularly, the actual sequencing was done in about two months with libraries shared between Celera and Genoscope. We attracted quite early on Ewan Birney's *Ensembl* team to present the genome, Peer Bork's group to help in the comparative genomic analysis, and also many friends and colleagues in the *Drosophila* community.

In our EMBL lab, we did a pilot by sequencing half a megabase and doing the first comparative genomic analysis of *Anopheles* with *Drosophila*. We made the dramatic discovery that whereas parts of the mosquito sequence had low polymorphism, what you normally expect to find in a species, there were adjacent DNA areas where the polymorphism was huge. At first we thought this was an artifact; had we

contaminated our mosquito colony with a different species? Thankfully this was not the case, and when the whole genome was sequenced it became clear that this genome shows peaks and valleys of polymorphism. We still don't understand the phenomenon and are exploring it in Africa, together with collaborators from Montpellier.

THIS FIELD IS INTIMATELY CONNECTED TO THE AREA OF "MOLECULAR MEDICINE." HOW CLOSE DO YOU THINK WE ARE TO CLOSING THE GAP BETWEEN TRADITIONAL MEDICINE AND MOLECULAR BIOLOGY?

The convergence of medicine and biology is ongoing. It's a process whose time has come, and which has already generated a tremendous dynamic within the last 10 years. You can no longer think of disease without trying to understand its molecular basis. On the one hand, the thematics of medicine are entering the mainstream, orienting fundamental biological research. Correspondingly, medicine (which by its nature is both a science and an art) is becoming more grounded in novel knowledge. The cultures are different, but biomedicine is emerging as a blended culture in its own right.

YOUR RESEARCH ON THE MALARIA PARASITE AND THE MOSQUITO VECTOR HAS BROUGHT YOU INTO CONTACT WITH THE SOCIO-POLITICS OF GLOBAL DISEASES. YOU GAVE THE KEYNOTE ADDRESS AT AN EMBL SYMPOSIUM ON THIS TOPIC LAST YEAR. TO WHAT EXTENT CAN DEVELOPMENTS IN THE LIFE SCIENCES HELP TO REDUCE DEPLORABLE INEQUALITIES IN HOW SCIENTIFIC DISCOVERIES AND THEIR APPLICATIONS BENEFIT SOCIETY?



Fotis C. Kafatos (middle) and (from left) George Christophides, Elena Levashina, Stephanie Blandin and Mike Osta study Battista Grassi's drawings of the life cycle of the malaria parasite.

There's currently an important transformation going on in terms of political and social attitudes towards progress for global health. This year, particularly in the UK, there is a major move towards pushing development in the poorer parts of the world, both through debt forgiveness and by promoting science there, especially in regard to research for disease control.

We are studying the mosquito immune system for its own sake, but also because of its possible utility in controlling malaria. Possible approaches are to produce transgenic mosquitoes inherently incapable of passing along the disease, or "smart sprays" which will affect the insects' immune system, making them inhospitable to parasites. I don't think such strategies will materialize in less than a decade. There will have to be an extremely careful consideration of all aspects of such applications. We will need a very mature understanding of mosquito populations and the environmental systems that include the insects. We will need to consult not only scientists but also the broader society about potential interventions. On the other hand, we would be criminally negligent not to pursue all possible opportunities to control malaria, the third most important infectious disease in the world.

WHEN YOU MOVED TO EMBL, YOU BROUGHT A CULTURE OF DIALOGUE BETWEEN SCIENCE AND SOCIETY THAT HADN'T BEEN PRESENT IN THE LABORATORY BEFORE.

Science is a profoundly human, social activity and addresses the deepest questions. The prescription "know thyself" is central to science. Science, the open frontier, expresses the desire of the human mind to understand ever more fully ourselves and the world around us. The interest for science in society is part of my Hellenic heritage.

At Harvard in 1969, I was prodded by postdoctoral fellows to teach a novel course on Biology and Social Issues. At EMBL I was prodded by graduate students to start an educational reflection on Science and Society. I was very proud of that group of young students who came into my office in 1997, together with a group leader, at about the time when Dolly the sheep was born. Davide Corona, Freddy Frischknecht, Michael Boutros, and group leader Peter Becker suggested that we have a minisymposium to inform all parts of the EMBL community about issues related to cloning. The event was greeted enthusiastically by scientists and non-scientists alike. Hans Schöler, at the time a Group Leader working on early embryos of mice, spoke about the science itself, Thomas Graf, (a socially-conscious coordinator) on the history of cloning in lower animals, myself on ethics in biology, and Frank Gannon on potential commercial interests. This success led to discussions in a Senior Scientist meeting, resulting in an important step. We created the Office of Information and

A few of Fotis' accomplishments as EMBL's Director-General

Fotis C. Kafatos assumed the role of Director-General of EMBL in 1994 after a distinguished career at Harvard University, adjunct professorships at the Universities of Athens and Crete, and having founded and directed the Institute of Molecular Biology and Biotechnology at the Research Center of Crete. Under his leadership at EMBL, three new units of the Laboratory were established very successfully: the European Bioinformatics Institute in Hinxton, the Mouse Biology Programme in Monterotondo, and the Developmental Biology Unit in Heidelberg. He has solved challenging political and funding problems and integrated EMBL much more effectively into the scientific strategies of Europe, notably among EMBL's 18 individual member states (including most of the EU, Switzerland, Norway, Iceland and Israel). He has also played an active role in EIROforum, a new coordinating body of the seven large inter-governmental institutions of Europe, which he chaired in 2002-2003. He has used EMBL's five-year programmatic and funding cycle as an opportunity to promote new scientific directions in Europe, in particular Functional Genomics in 2000 and Systems Biology for the coming decade. He has built up the core facilities of EMBL, substantially expanded PhD training and opportunities for visitors, and introduced an institutional partnership scheme that engages EMBL with locally-funded initiatives to promote the molecular life sciences in Europe. He has introduced a proactive and effective technology transfer and a Science and Society programme, and has established an Endowment Foundation to support innovation at EMBL. He has contributed generously his time to serve on senior science policy bodies and advisory committees guiding many international scientific centers and organisations.

His scientific achievements and leadership have been recognized by numerous medals, honorary degrees and professorships and memberships in seven Academies, including the National Academy of Sciences, USA, the Royal Society of London (Foreign Member), the French Academy of Sciences (Foreign Member) and the Pontifical Academy of Sciences. In 2004 he was awarded the prestigious German civil medal of honour, the Bundesverdienstkreuz 1. Klasse.

Public Affairs, including a very important component of Science and Society. I realized that OIPA had the potential to promote the public appreciation of science, and that an associated Science and Society forum would enrich the culture of the Laboratory, cultivating reflection and our own sense of what is proper, and listening to the concerns of our fellow citizens.

I'm very, very happy that these areas have developed in the way they have. That has been a profound and deep development in the history of EMBL.

YOU'RE NOW TAKING A STEP THAT IS CENTRAL TO THE NATURE OF EMBL: YOU'RE ABOUT TO LEAVE. WHAT ARE THE NEXT CHALLENGES YOU'VE SET FOR YOURSELF?

For the next ten years, I'll be professor of Immunogenomics at Imperial College in London. I'm planning to focus my energies on the scientific opportunities that have arisen from the last 12 years at EMBL: the work that my group, my collaborators and the broader community have done on innate immunity. This area offers fantastic possibilities for the future. I'm looking forward to continuing to do science very actively with people moving with me from EMBL. At Imperial College, we will have a joint group co-supervised with Giorgos Christophides, my staff scientist, who will become a senior lecturer. The environment at Imperial College is very good, with superb colleagues, several working on related subjects. We

will surely continue the style of being deeply engaged in collaborations.

We all sometimes ask ourselves if there's life after EMBL. I will certainly miss EMBL, all of you, and what EMBL represents as an alive community. I will also miss Heidelberg, a wonderful city. But I am leaving happy in the knowledge that EMBL is in good hands and will continue to thrive.

This is an abridged version of an interview conducted by Russ Hodge and Halldór Stefánsson; the complete text will appear in the EMBL Annual Report 2004-2005.





Working towards standards in systems biology

March 2005 saw the launch of *Molecular Systems Biology*, a new open-access, online journal from EMBO and Nature Publishing Group dedicated to the rapidly emerging field of systems biology.

Systems biology demands close interactions between biologists, mathematicians and computer scientists – and more critically a change in mindset in all three. Biologists are increasingly aware that computational modelling is essential to make sense of the vast and ever-increasing quantities of experimental data generated by high-throughput technologies. At the same time, there is a realization that these models need to be quantitative and can only be created with the full integration of experimental, computational and theoretical mathematical approaches.

In this way, systems biology requires information standards that allow data to be shared and evaluated consistently. This unified approach is also important for further development of models on a collaborative level within the community. *Molecular Systems Biology* addresses this challenge. Like many other recent additions to the scientific literature, the journal is open-access and electronic – guaranteeing rapid publication of research. What sets the journal apart is its recognition of the need to set standards for data quality, format and exchange in order to promote further cooperation in the field.

Open-access helps make data-sharing a reality by providing unrestricted access to the entire community. However, this is only part of the bigger picture. *Molecular Systems Biology* also strongly encourages authors to submit their data and models to the journal's structured data archive in Systems Biology Markup Language (SBML) or a related format called CellML. Both languages are computer-readable and based on XML (eXtensible Markup Language). Although there are some important differences in approach and application, both are capable of encoding formal models that define and describe molecular entities, their

interactions and reactions in mathematical terms. This facilitates modelling of a range of biological phenomena including metabolic pathways, transport phenomena, genetic regulatory networks and signal transduction chains.

This is a key advantage for authors submitting their papers to the journal, but how will readers benefit from these modelling languages? For those already familiar with SBML, there are more than 75 software tools currently supporting the language. The ability of these tools to operate on the same representation of a model eliminates errors during translation from one format to another and also guarantees a common starting point for analysis and simulation. For less experienced readers, the journal offers web-based applets that allow "point and click" model visualization on the fly.

By supporting this kind of technology and promoting a standardized quality environment for data-sharing, *Molecular Systems Biology* aims to act as a catalyst within the scientific community – helping biologists discover systems biology and join the quest to turn data into knowledge.

www.molecularsystemsbiology.com

– Les Grivell

New initiatives in EMBL's personnel section

You may have noticed a few new faces in EMBL's Personnel Section, and of course the arrival of new people often means new ideas and ways of doing things. While implementing and further developing many ongoing projects, the Personnel Section, under new leadership since early 2004, has also introduced a number of new initiatives.

The introduction of user-friendly web pages has been a major achievement in providing as much information as possible related to employment at EMBL and settling in. The site can be accessed via the "staff only" link and contains various subheadings, like an FAQ section, downloadable forms, and Staff Rules and Regulations. The FAQs, which are continually updated, cover various subjects, such as information for newcomers, details about EMBL insurances and allowances to overtime and leave entitlement. Answers to questions ranging from "How do I register my car in Germany?" to "How much of my hotel expenses will be reimbursed following EMBL-related travel?" and "How do I report an accident at work?" can be found here.

If you can't find the answers you are looking for, direct email links put you in contact with a Personnel Officer in Heidelberg. Administrators in the Outstations are also well informed of personnel matters and are happy to help in any way they can.

The Personnel section is continuously working on improving its services and playing a more active role in supporting members of personnel to develop the skills necessary to

perform their EMBL functions, as well as to pursue new careers after leaving EMBL (don't forget, staff members must leave the laboratory after a maximum of nine years). Recently, the Personnel Section together with EMBO and a consulting company offered a management training seminar for EMBO Young Investigators, as well as group leaders, team leaders, and facility managers at the EMBL Laboratory. The goal was to provide staff with theoretical and practical advice on managing a team and maximizing its productivity, in which they may have little prior experience.

"Good management is essential when working in a fast-changing and competitive environment," says Andreas Ladurner, who left a postdoc position at UC Berkeley in 2003 to become a Group Leader in EMBL's Gene Expression Unit. "The training I received as a postdoc, learned by example and derived from books, is useful, but can always be improved on by a targeted course for people who are at the beginning of their independent careers. One of the most useful sessions was on active listening. Group members come to their leaders for lots of reasons: when they have a problem, when they're unsure about something, and sometimes even when they have lost confidence in their ability to carry out a specific experiment. We need to be able to listen well, acknowledge our lab members' emotional state, and get to the heart of the problem before we can begin to do our job and guide them through it."

– Carla Sciarretta

the swiss connection

Swiss university students flocked to the University of Lausanne on March 14 to discover the ins and outs of working in an international organization. The event was the International Career Day Fair organized by the AIESEC (a student-run foundation) and the Swiss Federal Department of Foreign Affairs to increase awareness of career opportunities in international organizations and to promote the recruitment of Swiss nationals to intergovernmental organizations.

The 26 exhibitors included several United Nations agencies as well as international research institutes, like EIROforum partners EMBL and the European Space Agency. More than 1,500 students attended, hearing presentations on the activities of the organizations and visiting booths to get the low-down on what it's like to work in a fast-paced international environment.

"We had considerable interest at the EMBL booth," says recruitment officer Silvia Galbusera. "The students were very enthusiastic and wanted to know all about EMBL's research and related activities such as the European Learning Lab for the Life Sciences."

Taking a break from the bench: Julius Brennecke counts albatrosses in the Galapagos

Six years ago, Julius Brennecke had just finished his undergraduate degree in biology and wasn't sure what he wanted to do next. So he took a break and went to the Galapagos islands where he worked as part of a research team studying seabirds, led by Dave Anderson from Wake Forest University in North Carolina. Afterwards, he returned to the lab and began his PhD studies at EMBL-Heidelberg. Last July he received his degree and before embarking on his postdoctoral career, he decided to go back, this time to study the conservation of albatrosses.

WHAT DID YOU LEARN ABOUT ALBATROSSES?

The Galapagos provide a very unique setting for evolution and conservation research. Certain species are endemic to the archipelago – they live or at least breed only there. The island of Española, for example, harbours 99% of the breeding population of the waved albatross. From a conservation point of view, these birds are very interesting. It has recently been shown that industrial fishing techniques are putting the world's albatross population at risk. "Long-line" fishing, where boats trail fishing lines – up to 80 miles long – with up to 10,000 hooks and bait, is a technique used to catch tuna and swordfish. Sadly, before the lines sink, seabirds – mostly albatrosses – and other "by-catch" try to feed on the bait, get caught and drown. It's a problem for many species. The project that I worked on focused on gathering data to study the decline in the albatross population.

Albatrosses are monogamous and have the lowest reproductive rate of all birds. They nest once a year at most, laying a single egg. To ensure the survival of the chick, the albatrosses have an elaborate rearing strategy. When the chick is young it is very vulnerable: one parent stays home to protect it while the other fetches food nearby. When the chick is older it needs more food, so the parents embark on an incredible journey that takes them from Galapagos 1,000 km away to Peru. There, they fish for squid, which has a very high fat content. Albatrosses have special storage stomachs. They digest the squid, which separates into a layer of water and one of fat. The water sinks to the bottom of the stomach and is expelled, allowing the bird to take in more squid until its stomach is completely filled. Then it's time to head back home.

We would be working in the colony counting the albatrosses and nests, when all of a sudden we'd hear a *whoomp!* We'd turn around to see the mother landing. She'd call out and the chick would come running. She'd then proceed to pump the entire contents of her stomach into the chick – turning it into a fat little oil barrel that could barely move. The mother would then turn around and take off again for Peru.

If a parent is killed, the chick will not survive. Here we have a long-lived species that breeds very slowly and is incredibly vulnerable to population decline. The question now is whether the impact of the fishing industry is measurable, and for that you need data. This was our job. Over the past five years, the team had caught several thousand albatrosses on the island and tagged each with a numbered band. Every day we would go through the colony and report on every bird. We know which parents had which chicks, which chicks fledged and which did not, and which had starved to death. The team has basically been doing a daily census for the past five years, gathering survival



Photo by Julius Brennecke

The courtship dance of the waved albatross.

data for that period. At the beginning of the study, there was a 95% survival rate, but last year it dropped to 85%. A 95% survival rate means an average life expectancy of 17 years, but for 85% it drops to six. The problem is that albatrosses breed for the first time when they are seven. The birds need to be long-lived if the species is to survive. If the current rates continue, the species will be extinct in a matter of years. More than 20 of the birds tagged during 2004 have already been reported dead by fisherman off the coast of Peru – there is an email address on the tag that each albatross wears, and some fisherman are cooperative and will let the research team know if they've caught one. The chicks of these birds have starved to death. The data that is collected are essential in helping to put pressure on governments to regulate fishing practices.

DID YOUR TRAINING IN MOLECULAR BIOLOGY HELP?

Not really – the science was completely different. I did have to take blood samples from the birds, though. I spun the samples on our small

solar-panel-driven centrifuge and boiled the serum in SDS sample buffer on a camping stove. In the field you have to be resourceful – you don't always have access to fancy equipment.

The experience did show me that the kind of science I am doing here at EMBL is the kind I want to do. In the field, research can be very slow. You can spend years trying to answer a question, and sometimes the answer that you get doesn't help you to understand your problem. In a lab, you can put forth a hypothesis and test it relatively quickly. The result of that helps you to move on to the next question.

WHAT WAS LIFE LIKE ON THE ISLAND?

There were five of us on the island – me and four biology students from the US. You live in complete isolation. There is no internet, and mail only comes once a month. We had a mobile phone which we would use to call the lab back in the US to discuss research, but that's about it. You have to be able to deal with being alone.

The camp was quite comfortable. Each of us had a large tent, with a mattress, and a driftwood table and a chair. We had a central covered area with two tables, a camp stove and a small oven. A supply boat would come by every 2-3 months and bring fresh food – and when it did it was like Christmas. We'd feast on carrots, potatoes, onions, garlic and cheese. When the fresh stuff ran out we had cans. Lots of them. We became quite adept with our cooking, and made our own pizzas, bread and cakes. We'd also go fishing once in a while.

We had about five hours of research to do a day. The rest of the time was spent on camp duties and snorkeling. We shared a beach with about 50 sea lions and would swim with them every day. They'd come right up to your face. Sometimes you would come home to your tent and find one sitting on your bed. But, as with everything in nature you must respect territory. The bulls can be quite aggressive. Sometimes they come at you like torpedoes and chase you out of the water.

One thing I learned is that you really feel a dependence on your environment. You get to know the island like your own pocket – by day, by night, in rain, in sunshine, at high tide and low tide. You also begin to see the impact that humans have on nature – even if it was just five of us. We did everything we could to minimize this.

Then there are moments when you are sitting on a cliff and 30 meters below the waves are crashing against the rocks. The sun is setting and a hundred dolphins pass by in the water below. It's incredible.

InterPro celebrates fifth anniversary

In April, InterPro (the EBI's database of protein families, domains and functional sites) will be five years old. The mood is upbeat and the curators and programmers are busy working for the upcoming release, 10.0. It has been fantastic so far. In the last five years, the number of entries has seen a staggering fourfold increase. Databases like UniProt, PROSITE, PRINTS, Pfam, and ProDom joined forces long ago. SMART, TIGRFAMs, PIRSF, SUPERFAMILY, PANTHER and Gene3D have been integrated over the years.

Be it domains, protein families, post translational modifications, repeats, functional sites, structural domains (SCOP/CATH) – you name it, they are all tucked into the InterPro database. With a touch of a button, the information is displayed on your favourite web browser. Searching the InterPro database could not be easier. Text search, keyword search, search by InterPro entry, UniProt entry, GO (Gene Ontology) ID, PDB entry, taxonomy and what-not, are all allowed in the search field. Release 10.0 will include graphical views

of the InterPro entry relationships. Integrating these features and making it possible to visualize different annotations in the most coherent fashion makes it a powerful tool.

Already, the InterPro database is widely used for automated large-scale characterizations of proteins predicted in genome projects. In automatic annotation of protein sequences, InterPro has been utilized to provide a reliable characterization of sequences, identifying them as candidates for functional annotation.

Rules based on the InterPro characterization are used as the main tool at the EBI to apply automatic annotation to unknown sequences. The annotated sequences are stored and distributed in the TrEMBL protein sequence database.

InterPro also provides a means to carry out statistical and comparative analyses of whole genomes. In the Proteome Analysis Database, InterPro analyses have been combined with other analyses based on CluSTr, GO and structural information on the proteins.

www.ebi.ac.uk/interpro – Ujjwal Das

Video conferencing now available across EMBL sites

EMBL now has a new, state-of-the-art video conference facility. The TANDBERG Video Conference systems can link all EMBL sites together for events, meetings, seminars and conferences. The Wednesday Pink Seminars in Heidelberg are the first regular event to be broadcast to all sites, but any event can be viewed if held in a video conference room. These video conference rooms are: the Heidelberg Operon, the main conference room at the EBI, the Hamburg seminar room, Grenoble's seminar and meeting room and the main conference room in Monterotondo.

EMBL staff can also use this equipment to videoconference with sites outside the

Laboratory. Since nearly all video conferencing equipment uses a common language, the exact brand of equipment does not have to be the same – the connection can take place no matter which type of system the sender and receiver have.

Video conference administrators have been designated for each EMBL site for staff to contact regarding booking or viewing an event. They are: Thomas Heinzmann, Doros Panayi and Erich Schechinger in Heidelberg, Craig Panner and Mark Carter in Monterotondo, Remi Pinck in Grenoble, Frank Schmitz in Hamburg, and John Livingstone at the EBI.

European Union's Young Scientists Contest winner visits EMBL-Heidelberg

Budding young scientist Julius Bogomolovas, a 17-year-old student from Lithuania, spent four days visiting EMBL-Heidelberg this past February. Julius won the trip to EMBL at the 16th European Union Contest for Young Scientists held in Dublin, September 25-29, 2004. Over 100 of Europe's high school students from 34 countries showcased their projects and over 15,000 people attended the event.

Already a winner at his home country's national science contest, Julius presented his project "Viscotoxin extraction and cytotoxicity" to an international jury of 15 experts. Despite some logistical problems (his poster got sent by mistake to Tbilisi, Georgia, instead of Dublin, Ireland), he took home the prize of a trip to EMBL. The prize was sponsored by EIROforum – a group of seven intergovern-

mental European research organizations, of which EMBL is a member.

Julius may be a young scientist at 17, but his scientific career goes back even further. At age 14 he was doing experiments at his local biochemistry institute. "I started entering national competitions but had to settle for runner-up prizes," says Julius. "The organizers told me I was too young to participate in the European competitions." One of his many projects focused on "Antiepileptic activity of extract from European mistletoe on Mongolian gerbil epilepsy."

Julius visited EMBL from February 22-26 and spent time in the Genomics Core Facilities to learn more about their services and technologies. He was impressed with the lab's openness

news&events

■ **Let your fingers do the walking.** E-journals have become increasingly important for researchers at EMBL, and demand has soared. The Szilard Library has recently added several new titles to their collection, including *ScienceExpress*, *Nature Chemical Biology*, *Nature Methods*, *Annals of the New York Academy of Sciences* and *Current Protocols in Bioinformatics*. Safari, an electronic reference library for programming and IT professionals, provides access to titles from Addison-Wesley Professional, Cisco Press, O'Reilly & Associates and Microsoft Press. EMBL researchers working on systems biology can now access two new journals on this topic. Twenty new e-books including *DNA Microarrays*, *Bioinformatics*, *Perl for Biologists* and *Flow Cytometry* round out the collection. Thirty new book series, including *Advances in Cancer Research* and the *International Review of Cytology*, will soon be available.

■ **85 PhD student candidates arrived at EMBL-Heidelberg** on March 7 for an intense week of interviews and selection rounds to be part of EMBL's International PhD Programme. This year a record 496 applications were received, reflecting the successful launch of the programme's on-line application process. In the end, 45 students were offered positions and will begin their studies later this year.

■ **Université Paris 6 Pierre et Marie Curie and the University of Iceland** have become the newest institutes to sign partnership agreements with EMBL's International PhD Programme. Twenty-three institutes in 16 countries now offer joint PhD degrees.

and the willingness of the staff to collaborate. Julius plans on coming back to EMBL next summer as an intern to work with Vladimir Benes and Rainer Pepperkok.



Prize-winning Lithuanian high school student Julius Bogomolovas gets a hands-on look at research at EMBL.

people@EMBL



Nick Luscombe is the newest research group leader to join the EBI. He studied for a degree in Natural Sciences at Jesus College Cambridge in 1996 and then completed his PhD in Janet Thornton's group in London in 2000. After that, he worked as postdoc with Mark Gerstein at Yale University. Nick's main research interest is to study the transcriptional regulatory system by integrating diverse information sources such as genomic sequence, gene expression and ChIP-chip data. His most recent project examined the dynamic usage of the yeast regulatory network under distinct cellular conditions, and he hopes to continue working on different aspects of the transcriptional system as well as expand into other forms of intracellular regulation.

awards&honours

The International Society for Computational Biology has named two scientists from the EBI as the winners of its awards for 2005. **Janet Thornton** wins the Senior Scientist Accomplishment Award while the Overton Prize goes to **Ewan Birney**. Thomas Lengauer, the ISCB's newest Awards Committee member, says "Janet could be described as Miss Structural Bioinformatics. She has made outstanding and seminal research contributions to her field and, as director of the EBI and the coordinator of the BioSapiens Network of Excellence, has selflessly dedicated herself to developing the research landscape in computational biology. Ewan is the driving force behind Ensembl, arguably the most widely used genome browser in the world." See more at www.embl.org/aboutus/news/press/2005/press28feb05.html

EMBL-Hamburg's **Matthias Wilmanns** and long-time collaborators **Orsolya Barabás**, **Veronika Pongrácz**, **Júlia Kovári** and **Beáta Vértessy** have received first prize from the Hungarian Academy of Sciences for their joint paper, "Structural insights into the catalytic mechanism of phosphate ester hydrolysis by dUTPase" (*J. Biol. Chem.*, 279, 42907-15). The paper describes a series of high-resolution crystal structures of various catalytically relevant complexes of *E. coli* deoxyuridine triphosphatase, providing for the first time a clear insight into the catalytic mechanism of this enzyme. The structures identify unambiguously the catalytic water and also provide evidence for the associative nature of the enzyme-catalyzed reaction. First author Orsolya Barabás spent more than a year in Hamburg working on the project, and was funded partly by a EU Marie-Curie training fellowship. "This is a significant recognition," says Matthias, "and demonstrates what can be achieved when groups across Europe and specialized research facilities like ours in Hamburg meet. The group of Beáta Vértessy has become a leading group in Hungary with an excellent international reputation. We are very glad that we have been able to complement their research activities with the provision of our synchrotron radiation beamlines and our research expertise."



Photo by Maj Britt Hansen

Neither snow, nor rain, nor heat, nor gloom of night stays these couriers from the swift completion of their appointed rounds. This year the US postal service's motto can certainly be borrowed to describe Mustafa Uyguner (right), Mario Hopf (left) and EMBL's building maintenance team. During one of the snowiest winters on record in Heidelberg, they spent many an early morning braving the elements to clear the streets, sidewalks and parking spaces of the EMBL campus. Thanks, boys, for a job well done! Now where's the post...

who's new

Aurelien Bancaud (Ellenberg), Evangelos Bantras (EBI Database Applications), Daniel Castano Diez (Frangakis), Paul Flicek (Ensembl), Gabriella Frigerio (EBI Sequence Database), Delphine Gandelin (EBI Administration), Sanjay Ghosh (Ephrussi), Stefan Andreas Graef (Ensembl), Sudeshna Guha Neogi (EBI Microarray), Fabrice Guillemot (Cusack), Petra Haas (Gilmour), Jan Hörning (LAR), He Huang (Protein Expression and Purification Core Facility), Pieter Janse Van Rensburg (EBI Sequence Database), Ulrike Laabs (Scheffzek), Eva Löser (Cohen), Pierre Maziere (Ouzounis), Antonio Mendes (Kafatos), Sandra Münch (Childcare), Annabel Parret (Scheffzek), Vivian Pogenberg (Wilmanns), Anna Schnitger (Kafatos), Nicole Schueller (Wilmanns), Oleg Sklyar (Huber), Jan Soetaert (Rørth), Henry Joy Ant Te Welscher (Rosenthal), David Thorneycroft (EBI Sequence Database), Joern Toedling (Huber), Silke Wolterink (Gilmour)

events@EMBL

14 April, 2005

EMBL-Heidelberg

Farewell celebrations for Fotis C. Kafatos

22-24 April, 2005

Mont Sainte Odile, Alsace, France

EMBL Postdoctoral Retreat 2005

29-30 April, 2005

EMBL-Heidelberg

7th EMBL Minisymposium on Molecular Medicine: Proteins and Drug Target in Genetic Diseases

12-14 May, 2005

EMBL-Monterotondo (in Rome)

6th EMBL International Predoc Symposium on Animal Models – Tips and Tricks from Nature

19-22 May, 2005

EMBL-Heidelberg

Alan Wolffe EMBO Conference on Chromatin and Epigenetics

28 May-2 June, 2005

EMBL-Heidelberg

EMBO Practical Course on Quantification of gene expression by real-time qRT-PCR

4-5 June, 2005

EMBL-Heidelberg

EMBL Symposium on Insect Genomics: Immunity and Disease Models

For more events, see

www-db.embl.de/jss/EmblGroupsOrg/t_1