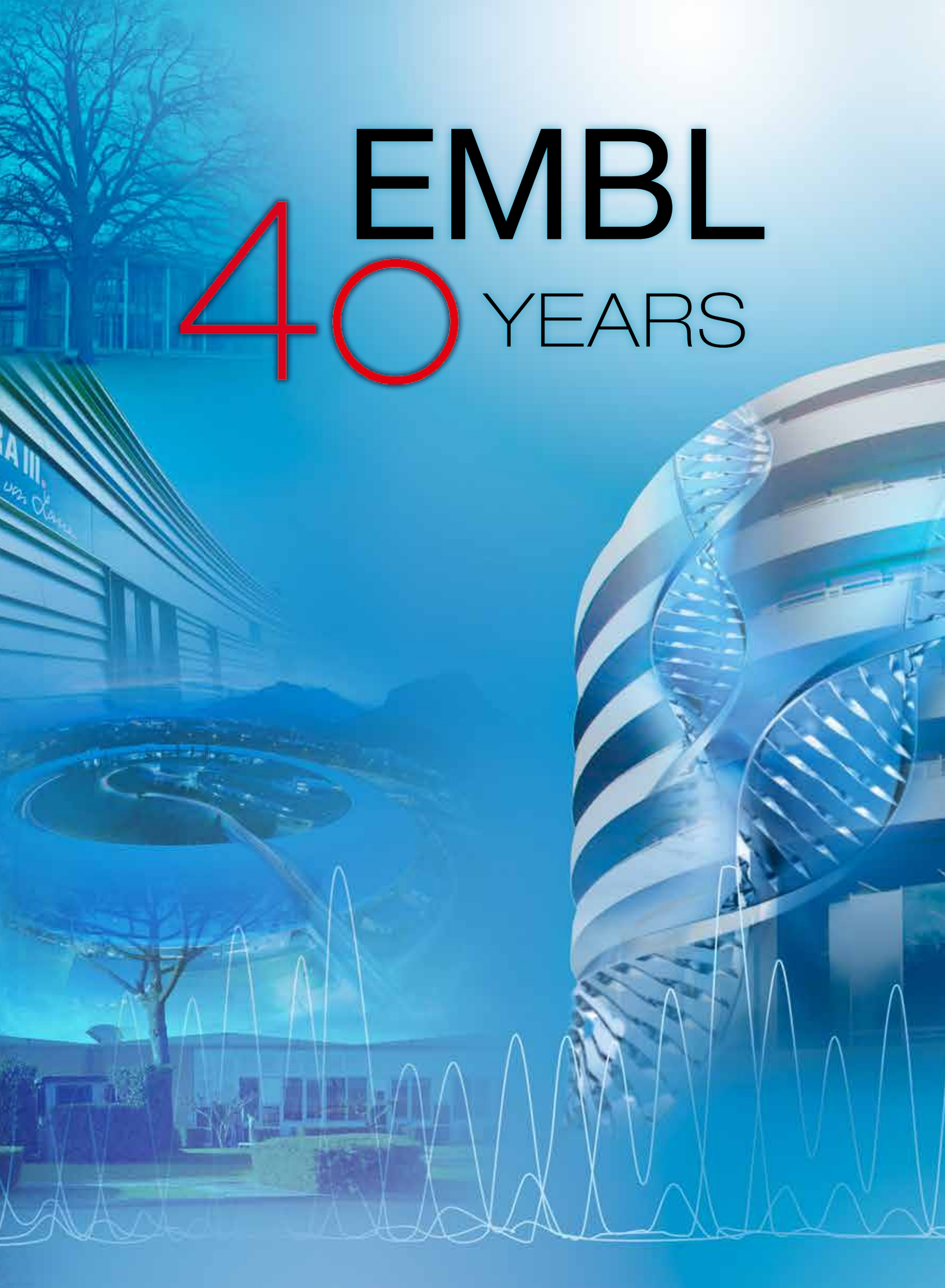
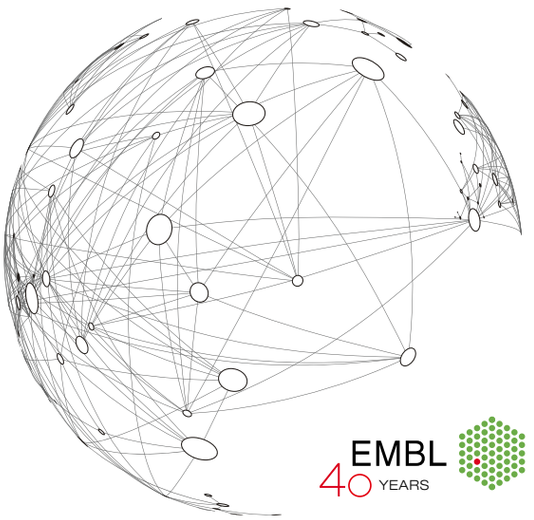

EMBL
40 YEARS

Dedicated to all those no longer with us,
yet very much alive in our memories.



EMBL Mission

- Basic Research
- Services
- Advanced Training
- Technology Development and Transfer
- Integration of Life Science Research

EMBL Alumni Association Mission

To advance EMBL and the relevance of life science research in the scientific community and society at large, by fostering connections between the Laboratory, the alumni and the public.

EMBL Member States:

Austria, Belgium, Croatia, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

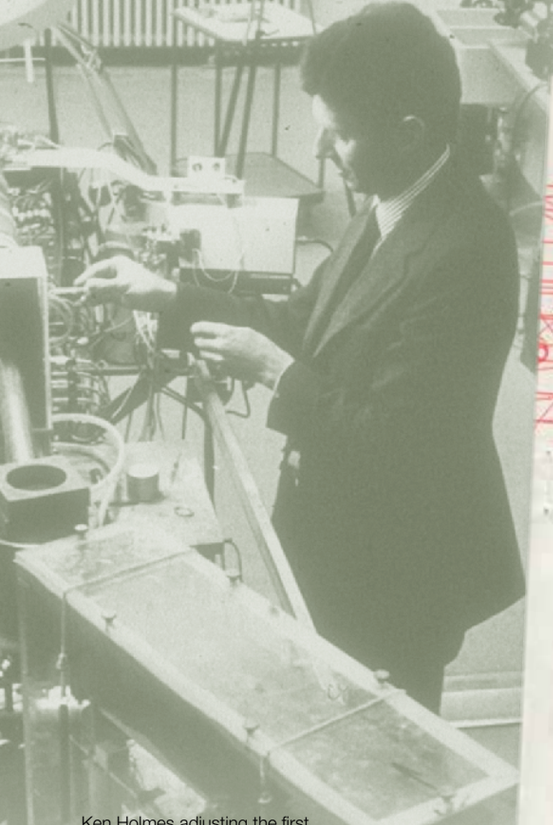
EMBL Associate Member States:

Argentina, Australia.

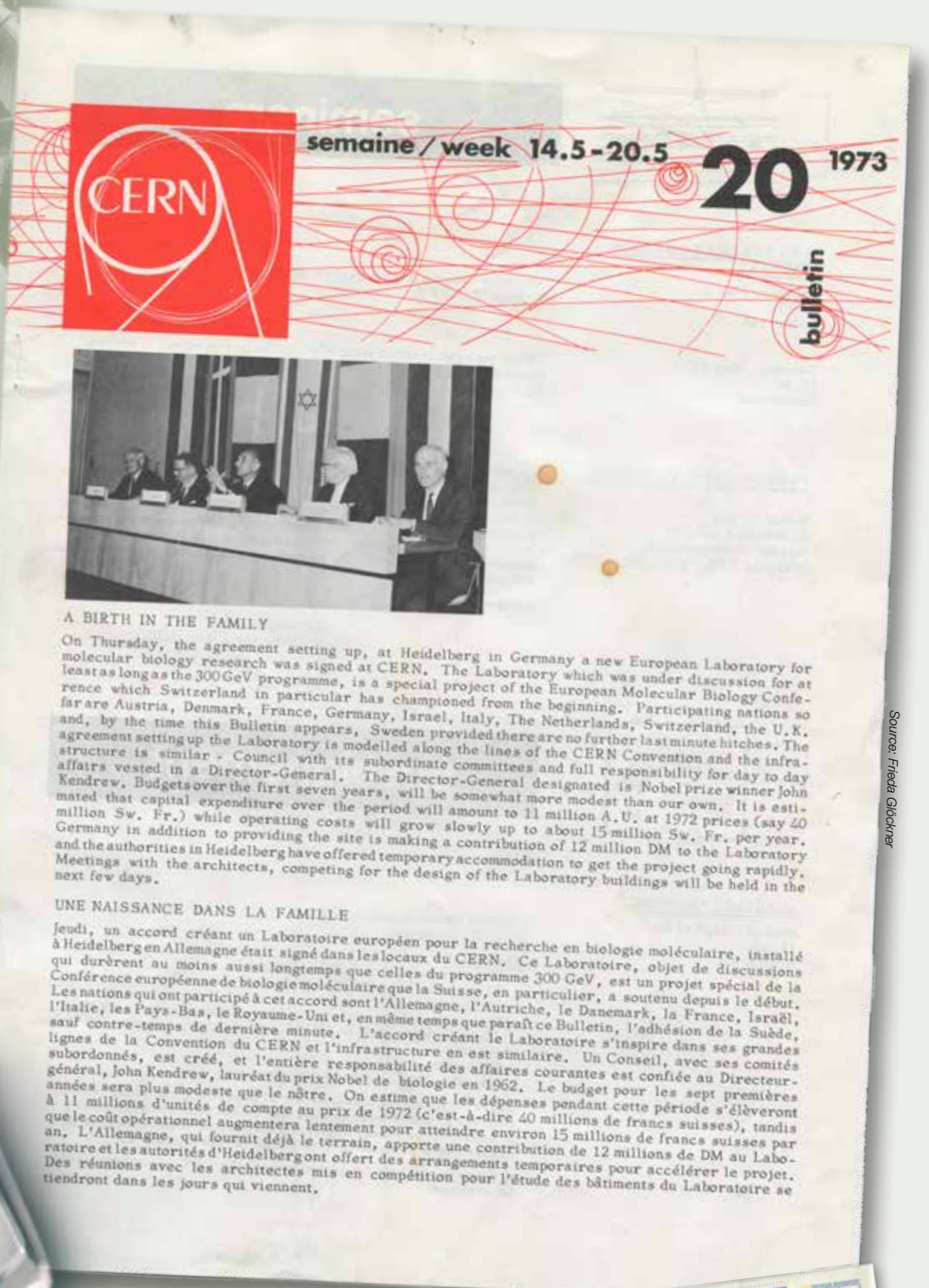
EMBL Prospect Member State:

The Slovak Republic.

TABLE OF CONTENTS



Ken Holmes adjusting the first ever X-ray beam line in Bunker 2 at DESY, 1974



CERN bulletin semaine / week 14.5-20.5 20 1973

A BIRTH IN THE FAMILY

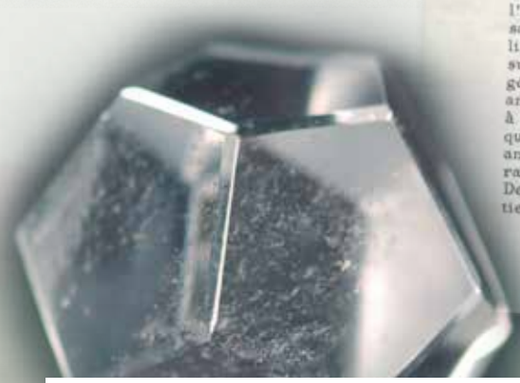
On Thursday, the agreement setting up, at Heidelberg in Germany a new European Laboratory for molecular biology research was signed at CERN. The Laboratory which was under discussion for at least as long as the 300 GeV programme, is a special project of the European Molecular Biology Conference which Switzerland in particular has championed from the beginning. Participating nations so far are Austria, Denmark, France, Germany, Israel, Italy, The Netherlands, Switzerland, the U.K. and, by the time this Bulletin appears, Sweden provided there are no further last minute hitches. The agreement setting up the Laboratory is modelled along the lines of the CERN Convention and the infrastructure is similar - Council with its subordinate committees and full responsibility for day to day affairs vested in a Director-General. The Director-General designated is Nobel prize winner John Kendrew. Budgets over the first seven years, will be somewhat more modest than our own. It is estimated that capital expenditure over the period will amount to 11 million A.U. at 1972 prices (say 40 million Sw. Fr.) while operating costs will grow slowly up to about 15 million Sw. Fr. per year. Germany in addition to providing the site is making a contribution of 12 million DM to the Laboratory and the authorities in Heidelberg have offered temporary accommodation to get the project going rapidly. Meetings with the architects, competing for the design of the Laboratory buildings will be held in the next few days.

UNE NAISSANCE DANS LA FAMILLE

Jeudi, un accord créant un Laboratoire européen pour la recherche en biologie moléculaire, installé à Heidelberg en Allemagne était signé dans les locaux du CERN. Ce Laboratoire, objet de discussions qui durèrent au moins aussi longtemps que celles du programme 300 GeV, est un projet spécial de la Conférence européenne de biologie moléculaire que la Suisse, en particulier, a soutenu depuis le début. Les nations qui ont participé à cet accord sont l'Allemagne, l'Autriche, le Danemark, la France, Israël, l'Italie, les Pays-Bas, le Royaume-Uni et, en même temps que paraît ce Bulletin, l'adhésion de la Suède, sauf contre-temps de dernière minute. L'accord créant le Laboratoire s'inspire dans ses grandes lignes de la Convention du CERN et l'infrastructure en est similaire. Un Conseil, avec ses comités subordonnés, est créé, et l'entière responsabilité des affaires courantes est confiée au Directeur-général, John Kendrew, lauréat du prix Nobel de biologie en 1962. Le budget pour les sept premières années sera plus modeste que le nôtre. On estime que les dépenses pendant cette période s'élèveront à 11 millions d'unités de compte au prix de 1972 (c'est-à-dire 40 millions de francs suisses), tandis que le coût opérationnel augmentera lentement pour atteindre environ 15 millions de francs suisses par an. L'Allemagne, qui fournit déjà le terrain, apporte une contribution de 12 millions de DM au Laboratoire et les autorités d'Heidelberg ont offert des arrangements temporaires pour accélérer le projet. Des réunions avec les architectes mis en compétition pour l'étude des bâtiments du Laboratoire se tiendront dans les jours qui viennent.

CERN newsletter: announcing birth of EMBL

Source: Frieda Glöckner



Commemorative cover on the Laboratory's inauguration

EMBL 40 YEARS

Published by the EMBL Alumni Relations Office

Planning Mehrnoosh Rayner, EMBL Alumni Association board

Co-ordination and Composition Mehrnoosh Rayner

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With special thanks to the EMBL Alumni Association for initiating and co-funding this magazine, and Iain Mattaj and Matthias Hentze for their valuable input and feedback.
4th July 2014

Dear Reader,

This magazine is a birthday gift from the EMBL Alumni Association to EMBL. It contains 40 pages for 40 years with contributions from staff and alumni for the whole EMBL community.

Its purpose is to celebrate EMBL's 40th Anniversary by documenting why and how EMBL has been and continues to be relevant in the life sciences. The magazine cannot and does not try to be comprehensive, especially in capturing the contribution of individuals and groups. This is not possible in 40 pages. It does, however, touch upon EMBL's core missions in the selection of articles.

We are particularly delighted that it includes the voices of alumni from the last four decades, EMBL administration and support services and EMBL leadership from all sites today.

We hope it inspires you to contact us with your stories, documents and photographs. All your contributions will support the building of an EMBL Archive, briefly mentioned in this magazine and our most ambitious community project to date. Longer versions of these articles are available on the EMBL alumni pages: www.embl.org/alumni/your_stories

In German "Geschichte" means both story and history. We thank all of you for sharing directly or indirectly your stories, EMBL's history, with us in this issue.

Wishing EMBL and the community who helped build it a Happy 40th Anniversary!

Matthias, Giulio and Mehrnoosh

Giulio Superti-Furga
Chair, EMBL Alumni Association
Scientific Director, CeMM

Mehrnoosh Rayner
Head of Alumni Relations

Matthias Hentze
Director, EMBL

Successes, Challenges and the Future

Iain Mattaj on EMBL

EMBL 40 YEARS | 1974–2014

Iain Mattaj, EMBL Director General, 2005-present. At EMBL since 1985.

Giulio Superti-Furga, Scientific Director and CEO, CeMM, Vienna

EMBL Team Leader, 1991-2004, Developmental Biology

Interview by **GIULIO SUPERTI-FURGA**

GIULIO: Iain, what are the most important ingredients of EMBL's success over the past 40 years?

IAIN: I don't think there is a single ingredient. The turnover system is a critical aspect of how EMBL functions, because people need to be able to succeed in a short time. This provides constraints on how EMBL has to be organised, but it also provides incentives. I think one of the secrets of EMBL is that the Unit heads are always looking for people with the potential to open new scientific directions. That takes everybody's science further and I think that it's a cultural thing, to always be looking for people who can do things you yourself cannot do.

GIULIO: What measures do you take as DG to ensure that group leaders have the freedom to explore new areas?

IAIN: For me the most critical thing about developing as an independent scientist was being able to bounce my latest idea or my latest results off people who understood and who were interested in what I was doing, without fear. EMBL helps people be fearless about exposing their ideas.

GIULIO: What is the biggest threat for the future?

IAIN: One reality of life as a leading research institute is that it's expensive. And another is that we need the ongoing support of our member countries. They have always been extremely supportive and very generous with EMBL. In a period of recession like now, these countries need to be brave to continue to invest in education and research. Lack of funding is a danger but I do think the countries really do appreciate the quality of what EMBL is doing, the way EMBL works and what they get back from EMBL.

GIULIO: The organisation has been very innovative. We as alumni admire that no matter how high the bar gets EMBL seems to be capable of jumping over it.

IAIN: I think a major part of the explanation was in my answer to your first question. Choosing the right people. Another is related to the fact that we are intergovernmental rather than national and therefore both want and need to serve our member states. In the context of molecular biology this means we have to try to do things in ways or in combinations that national labs do not or cannot do. The fact that we have major activities in providing scientific services, in technology development and transfer, in advanced training and in international collaboration in addition to research is a powerful motor and motivation for developing new ways in which these activities can interact productively and synergistically. I can't think of a single other life science organisation that has the same drivers for innovation.

GIULIO: How do you recognise hidden heroines and heroes?

IAIN: I think there are lots of people who make the place work. EMBL does many things, from research through services to courses and conferences to open days for visitors to helping develop European scientific initiatives. People throughout the organisation, in administration and in support services, give up their time to make it more pleasant for people to be here either as staff or as visitors. The staff association plays an important part in keeping EMBL a happy place, and the alumni association makes it easy and interesting for everyone to stay connected with EMBL for life.

GIULIO: Did EMBL start technology transfer and industrial relationships too late? On reflection, would you do something differently?

IAIN: Historically I think EMBL started late. Wilhelm Ansorge and others were engaged in technology development and commercialisation from the very beginning, but this wasn't made use of in an institutional way. People gradually became aware that to develop intellectual property and to be involved in its use (or translation as it is now referred to) was an interesting intellectual activity in its own right. Everybody learns something from being engaged in new activities and I found being involved in technology transfer and helping set up a company completely fascinating. It is a totally different world, with completely different values than the values that I used as a researcher, and this broadened my worldview.

GIULIO: What do you think could be themes that the new director could take on in the next 10-15 years? Where is EMBL going?

IAIN: Biology will continue to become more relevant to human health and this will change EMBL. The development in imaging technologies will continue, as will the ability to "do biochemistry" using imaging. We need to be flexible. People have asked whether EMBL should do more immunology, plant biology or neuroscience. The answer is maybe yes, but we need to have the right people with the right ideas to do so.

GIULIO: What about the deluge of data?

IAIN: Well I think there has been a paradigmatic change. When we both started in life science and molecular research, we could understand intuitively what we were doing and what our results meant. We didn't need anybody to explain them to us. Nowadays that's no longer the case; many data sets are not intuitively comprehensible and so we need computationally based methods of data analysis and that brings with it a whole set of new requirements. One of these, in research as in many walks of life, is the capacity to deal with big data.

GIULIO: Is there something you want to say on the occasion of this fantastic and important 40 years of EMBL?

IAIN: It is a privilege to be here – it's a really exciting and fun place to be, and I'm enormously grateful for the support the community of EMBL staff and alumni give to the Lab that keeps the place running and promotes its way of doing science worldwide.

EMBL signing ceremony, Geneva, 1973

A Gift to Europe

The First Two Decades: 1974-1994

John Kendrew, James Watson, Heidelberg

John Kendrew, Francis Crick, Heidelberg

Two Manhattan Project physicists, Leo Szilard and Viktor Weisskopf, met at CERN in 1962 to bemoan the post World War II brain drain of much of Europe's best scientific talent to America. Szilard suggested that Europe replicate the CERN model for molecular biology. The two enlisted two Nobel Prize winning biologists to their cause – James Watson and John Kendrew. The latter took over the organisational reins and it was largely his scientific stature, tireless energy, and political skill that would lead to the realisation of their vision.

In 1963, an informal committee of biologists met in Italy to discuss the framework for an international lab for molecular biology. They first created the European Molecular Biology Organisation (EMBO), to serve as an international academy of sciences. Its members were tasked with organising scientific conferences and advanced courses in new molecular techniques. EMBO also formed a council to promote the lab project.

Establishing a central European laboratory proved to be challenging. While EMBO's membership supported the idea, ministers from national governments were concerned that a central lab would draw away their country's best scientists.

However, the council agreed that the laboratory should support critical instrumentation that would be difficult for individual national labs to support. The laboratory should also manage and facilitate the use of the energy sources by structural biologists at large radiation facilities that had been created for physics research. The young biophysicist, Kenneth Holmes, who was exploring the theoretical use of synchrotron radiation in his own research, suggested that the council support him in setting up biological facilities at the DESY

Kai Simons, EMBL inauguration ceremony, 1978

Minister Hauff, John Kendrew, EMBL inauguration ceremony, 1978

Minister Späth, Konrad Müller, visit to EMBL

synchrotron ring in Hamburg. He predicted that successful results would provide a critical proof-of-principle to sell their international collaborative proposal to governments.

Holmes provided the first exciting results at a council meeting in 1970. Soon afterwards, Heidelberg was selected as the site for the main Laboratory along with an Outstation at DESY. Finally, in 1974, the ten member nations ratified the Laboratory proposal and EMBL was born. In 1975, EMBL also signed an accord to develop an Outstation for biological research at the Institut Laue Langevin (ILL) in Grenoble – then the world's leading nuclear reactor for research. Initially, the Unit focused on the development of critical methodology, such as small angle neutron scattering techniques and detectors. Under Bernard Jacrot and later Stephen Cusack, EMBL made significant research contributions through collaborations with national laboratories. The Outstation was perfectly situated for EMBL to take advantage of the construction of the large scale radiation sources for biological research at the European Synchrotron Radiation Facility on the same site.

John Kendrew's first tasks as Director General included building the facility and recruitment. His new strategy focused fully on attracting highly recommended and talented investigators at the beginning of their careers. Many of these scientists had spent their postdoctoral years in the United States – and their return to positions at EMBL had a direct impact on reversing the brain drain.

The young recruits brought with them the latest molecular techniques and fresh perspectives in return for full research independence. While Kendrew was clearly key to the foundation of the lab, it was the cohort of young scientists who created the new culture of scientific investigation at EMBL, which emphasised collaboration, new approaches, and the willingness to take on high-risk projects. Remarkably, that culture remains one of the defining features of the organisation.

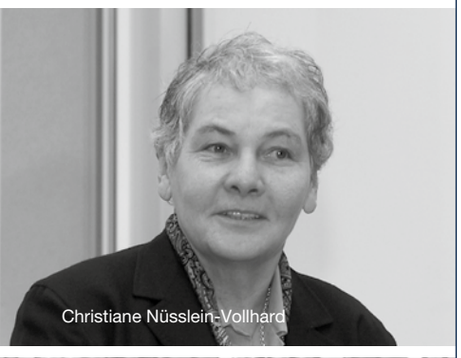
In 1982, Lennart Philipson replaced John Kendrew as Director General and during his 12-year tenure, the Heidelberg Laboratory tripled in size. Philipson instituted new formal administrative procedures, including the creation of a senior scientist advisory committee. He codified many of the organisation's founding principles, including setting rolling tenure for group leaders and other staff. This enforced turnover kept fresh perspectives and approaches pouring into the Laboratory. It also ensured that EMBL-trained scientists made their way back to their national labs to the benefit of the member states, exporting the EMBL way of conducting science and creating collaborative networks across Europe. In close collaboration with EMBO Secretary General John Tooze, Philipson expanded course offerings and built firstrate meeting and guest-house facilities. He also introduced EMBL's first predoctoral training programmes.

Among EMBL's many accomplishments during its first 20 years was its research in cell biology. This was a critical period of change in the field, with many discoveries and technical approaches being driven by very young scientists. One of these scientists was Kai Simons, who brought the Semliki virus with him from Finland in 1975. Early initial success, coupled with the careful recruitment of talented, similarly minded new group leaders, soon led to seminal studies of cellular membranes, as well as mapping of the pathway followed by membrane proteins from endoplasmic reticulum through the Golgi complex to the cell surface. Simons was the leader of a talented and closely knit

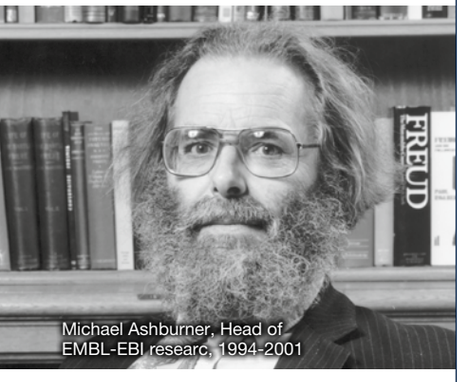
EMBL Laboratory
completed in 1978

Eric Wieschaus

Lennart Philipson (far left), Richard von Weizsäcker (middle), Konrad Müller (front right): Visit to EMBL



Christiane Nüsslein-Vollhard



Michael Ashburner, Head of EMBL-EBI researc, 1994-2001

David States, Biomedical Grant Writer, University of California, Santa Cruz

EMBL Writer, 1993-1997, Office of Information and Public Affairs, Heidelberg

This text is dedicated to Christian Boulin

Symposium in Honour of Sir John Kendrew
- Proteins as Machines -
EMBL, April 1997

group of young researchers, including Ari Helenius, Henrik Garoff, Bernhard Dobberstein, Graham Warren, Daniel Louvard, and Gareth Griffiths, followed later by Eric Karsenti, Marino Zerial, Bernard Hoflack, and Wieland Huttner.

During the early eighties, Christiane Nüsslein-Volhard and Eric Wieschaus carried out their paradigm-changing genetic screens of Drosophila embryos at EMBL. Their story is an example of the benefits of offering EMBL's young investigators the freedom to execute high-risk and creative research. In the end, their courageous and dogged approach to finding developmental mutants would permanently alter the way scientists utilise genetics – and result in the 1995 Nobel Prize for Medicine.

In 1980, as rapidly evolving sequencing technologies came into play, EMBL founded its Data Library as a resource for investigators everywhere. It was the world's first large-scale depository of nucleotide sequences and, a decade later, it was transformed into another EMBL Outstation – the European Bioinformatics Institute (EMBL-EBI). Some of the most remarkable aspects of EMBL were born of the decision to have physicists and engineers develop instrumentation in direct collaboration with the biologists who would use it. It was a simple concept, but remains rare in practice.

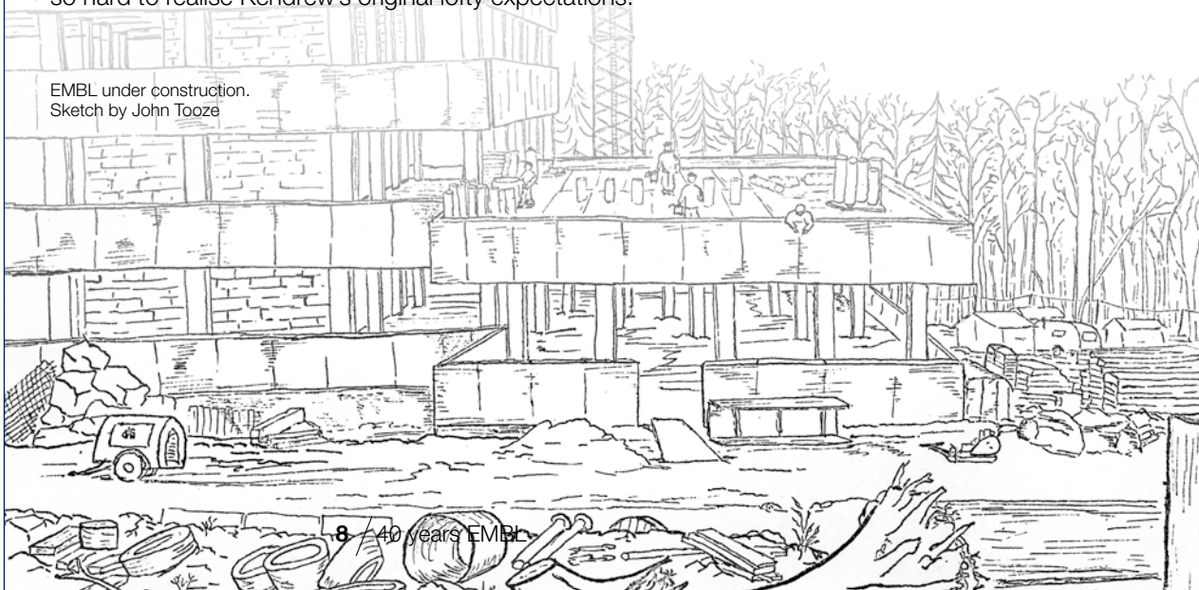
One of EMBL's greatest strengths has always been its ability to evolve with the rapidly changing technology and the intellectual demands of a shifting scientific landscape (not to mention Europe's complex political economy). What remains astounding is the incredible continuity between the original ideal vision of EMBL and the institution we see today.

EMBL was created to provide Europe with a critical international resource for its scientists and to cultivate both cooperative action and intellectual excellence. It still does so. The Heidelberg campus and EMBL's expanded set of Outstations continue to offer priceless resources to investigators across Europe and throughout the world. It continues to train some of Europe's brightest young investigators in cutting-edge scientific techniques and leadership skills – and those who pass through its revolving doors still export these important skills to academic and industrial research settings throughout Europe.

Each of these scientists carry with them a deeply embedded belief in the value of independent research, yet couple this with a highly collaborative philosophy. Almost every EMBL-trained scientist will testify to his or her rich network of professional relationships in laboratories across Europe.

EMBL still works – more effectively now than ever. This was a gift to Europe – a gift from Sir John Kendrew, protected and extended by the three Directors General who have followed in his footsteps, as well as the scientists and all the support that they could rely on, who have worked so hard to realise Kendrew's original lofty expectations.

EMBL under construction.
Sketch by John Tooze



Deepening, Consolidating, Expanding

EMBL's Third Decade: 1994-2004

By the mid-1990s, the complex puzzle that was the EMBL was almost complete, ready to bear the fruits of 20 years of scientific and political savvy. There are many ways to tell the story of what happened over the next ten years: one is from an institutional point of view, against the background of a changing landscape of European science funding and policy. Another is a fascinating story of science, of course: there have been many watershed moments in molecular biology, and the period starting in the mid-90s represents a period of astounding change. What is most interesting about EMBL, perhaps, is the marriage between the two: how a flexible, creative institutional structure could produce so many dramatic findings in so many areas of science. This article focuses on important institutional accomplishments; the full text (at www.embl.org/alumni/your_stories) explores particular scientific achievements.

The arrival of Director General Fotis C. Kafatos coincided with the establishment of the third EMBL Outstation – the European Bioinformatics Institute in Hinxton (EMBL-EBI) – after many years of dedicated effort to create databases and computational resources. In 1994 the Human Genome Project was in its early stages, powered by methods invented by Fred Sanger and technologies that were, in part, being worked out in Wilhelm Ansorge's lab (with the development of Arakis sequencing) and elsewhere. While the complete DNA sequence of humans and most other organisms was still a distant dream, biological data had already swelled beyond the most optimistic predictions. Taking advantage of it would require new databases and tools.

EMBL's foresight in this area made bioinformatics a part of lab culture far ahead of most other institutes, giving groups unique access to data that could be harvested and turned into biological knowledge. That was made possible by intensive efforts on the part of Gregg Hamm, Graham Cameron and others, particularly by convincing journals to require that sequence data be submitted to public databases, a thankless task taken on by Patricia Kahn. This represented a significant change in a scientific culture, which had formerly seen sequencing data as proprietary knowledge. Now they could be harvested, compared, and organised into evolutionary and functional taxonomies to generate and test new hypotheses.

The mid-1990s also saw the establishment of the fourth Outstation in Monterotondo, initially headed by immunologist and geneticist Klaus Rajewsky, and in Heidelberg the creation of core facilities and technology platforms. These provided important services for many groups and also served as interfaces to

EMBL-EBI Opening Ceremony, 1994. Graham Cameron (far left); Fotis Kafatos (2nd left); Princess Anne (far right)

biotechnology companies, which profited from the use of cutting-edge equipment in excellent scientific projects and as training platforms for visitors. The core facilities spawned important collaborations between groups and external partners, and represented an important interface between the communities of academic research and the pharmaceutical industry.

The 1990s and the early part of the next decade saw steady progress on synchrotron technologies under the leadership of Matthias Wilmanns and Stephen Cusack at Hamburg and Grenoble with the building and refinement of beamlines that were capable of capturing ever more detailed views of molecules.

Funding from the EU and other sources drew these activities and the EMBL core facilities into major European projects whose purpose was partly to establish well-integrated, international pipelines for the investigation of biological molecules.

EMBL's efforts to capitalise on the results of research did not stop with the scientific community. Other important developments at EMBL during this ten-year period were a range of efforts aimed at training and outreach, aiming to give scientists and political and public stakeholders a greater awareness of the importance of the Lab's research. Alongside the growing number of courses and conferences, often carried out with support from EMBO, EMBL created the Office of Information and Public Affairs to create new modes of communication within the

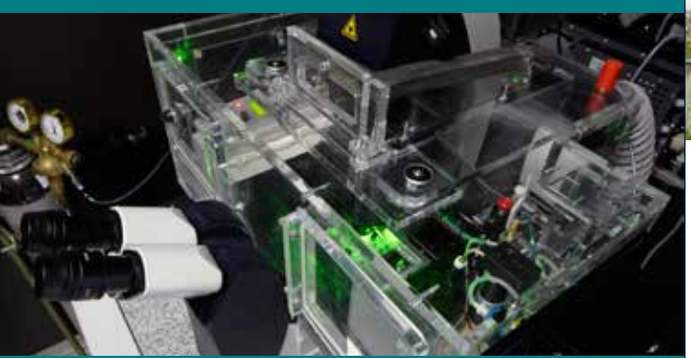
Laboratory and beyond, the Science and Society programme, and the European Learning Laboratory for the Life Sciences (aimed at high-school teachers across Europe). Many of these activities were carried out in collaboration with EMBO and the EIROFORUM, a consortium involving the seven international European scientific research institutes that was formed during this period.

The projects conducted at EMBL have withstood the test of time well, and all are special – because EMBL provided a unique environment in which they could happen, at a unique moment in the history of science.

Russ Hodge, Science Writer, Max Delbrück Center for Molecular Medicine, Berlin

EMBL Head of OIPA, 1997-2008, Heidelberg

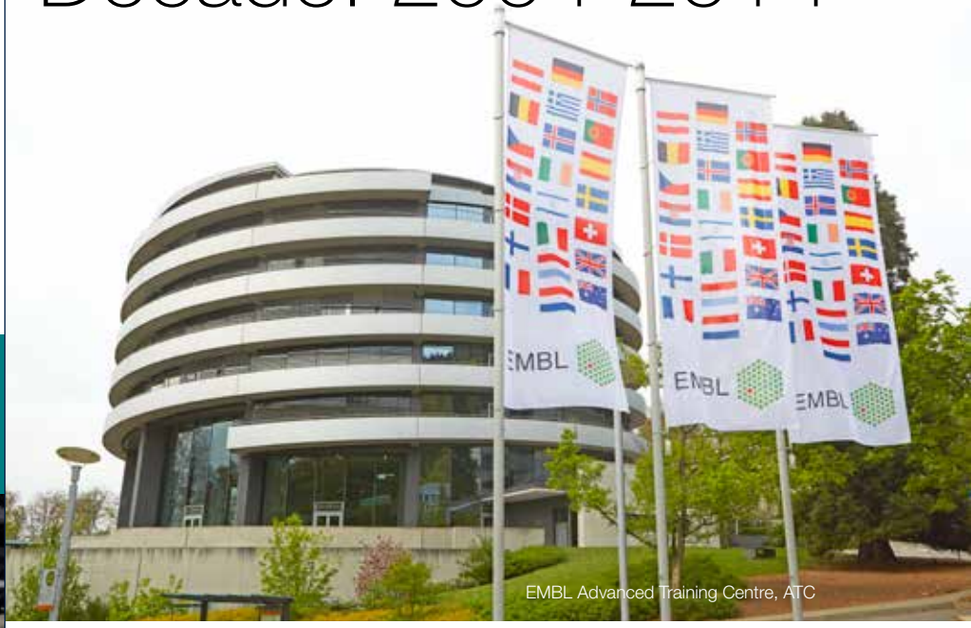
Microscope incubator – a success story



The EMBL Mechanical and Electronic Workshops offer a service second to none in craftsmanship, quality and attitude towards challenging tasks. “Geht’s nicht, gibt’s nicht” (can’t do, won’t do) is the motto of the Heads of the Workshops, Leo Burger and Siegfried Winkler, who both love challenges. Amongst outstanding products built and exported worldwide by the workshops during its 40 years’ existence is the microscope incubator (see photo above) – a unique design that was created at EMBL as a collaboration between the Advanced Light Microscopy Facility and the Electronic and Mechanical Workshops in the late 1990s. It has been copied widely since then while remaining unrivaled in design and function. To date 186 models have been made for internal use and export worldwide. The models are each built to order and unique because they allow full control of the atmosphere inside the incubator for live cell imaging.

Collaborations and Big Data

EMBL’s Fourth Decade: 2004-2014



EMBL Advanced Training Centre, ATC

In 2004 the fundaments had been put in place by the first three EMBL Directors General and, since 2005, our current Director General Iain Mattaj has further built on those by strengthening EMBL’s five missions: basic research in the life sciences; services; technology development and transfer; training; and integrating life sciences in Europe and beyond. It has achieved these in a variety of ways in the last decade.

EMBL has long held a leading research position in Europe. However, with the development of Omics and other new systems-based approaches in the last decade, projects can no longer be carried out by a single laboratory. EMBL has fostered interdisciplinarity, allowing EMBL Principal Investors to take a leading role in many large scale research consortia. These include ENCODE, 1000 Genomes, International Cancer Genome Consortium, International Human Microbiome Consortium and many different consortia sequencing genomes from a variety of species. In addition, the number of inter-unit collaborations has increased significantly. Since 2007, EMBL has selected postdocs to take part in the EMBL Interdisciplinary Postdoc scheme (EIPOD), and EMBL Centres provide a mechanism for accessing cross-cutting technologies.

Another EMBL pillar is its services – bioinformatic databases and tools, the provision of structural biology services linked to beamlines at EMBL Hamburg and Grenoble and the Core Facilities. EMBL-EBI now has the world’s most comprehensive range of freely available and up-to-date molecular databases. However, this exponential growth in data makes that new strategies are needed to be able to meet the needs of the researchers. In the area of structural biology, EMBL together with ESRF in Grenoble and DESY

in Hamburg pushes forward technology to provide state of the art services. At the end of 2012, after 38 years of operations, the DORIS ring on the DESY campus was shut down and activities moved to the PETRA III storage ring giving access to immensely bright beams of X-rays.

The research and service missions of EMBL are complementary to and essential for technology development and transfer at EMBL. A good example of technology development and transfer at EMBL has been the Selective Plane Illumination Microscopy (SPIM) – technology first developed at EMBL in the group of Ernst Stelzer, which led to a first patent application in 2002. Further success stories include the 16 spin-out companies and the more than 250 patents and copyrights managed by the EMBL Enterprise Management Technology Transfer company (EMBLEM), which was created in 1999 to relieve the scientists from the administrative burden of technology transfer.

As you can read elsewhere in this magazine, EMBL inaugurated its Advanced Training Centre in 2010 as the central European hub for advanced training for the life sciences. Since then the number of course and conference participants has increased substantially.

The fifth and latest defined mission is the integration of the life sciences in Europe and beyond. One example has been the establishment of five local and four remote partnerships. The remote partnerships were inspired by the desire of member states to make sure that EMBL's research strategy and successful operational model are implemented on the national level. These successful partnerships – with SARS, CRG, the Nordic partnership for Molecular Medicine and EMBL Australia – show that the EMBL way of working stimulates excellence and internationalisation.

A second example is EMBL's involvement in the European Strategy on Research Infrastructures (ESFRI) process. EMBL coordinated two ESFRI projects (ELIXIR and Euro-BioImaging) during their preparatory phase and has been involved in six other ESFRI biomedical projects. ELIXIR was formally launched in December 2013 as the distributed infrastructure for biological data in Europe, supporting life science research and its translation to medicine, bioindustry and society and will complement the work performed at EMBL-EBI. In the area of imaging EMBL coordinated the biological pillar of Euro-Bioimaging. Euro-Bioimaging has now finalised its preparatory phase and 11 European countries and EMBL have, at the end of March 2014, launched the Interim Board, which will work on all issues relevant to the construction of Euro-BioImaging.

From left: Minister Frankenberg (Baden-Württemberg), Klaus Tschira (Klaus Tschira Foundation), Minister Schavan (Germany), Iain Mattaj (EMBL Director General), Eero Vuorio (Chair of EMBL Council).

The third example is EMBL's ability to keep on attracting countries to become EMBL member states. Until 2007, membership was limited to European countries but to respond to the increasingly global nature of big scientific challenges this changed in 2008 when Australia became the first associate member, followed by Argentina in February 2014.

The last example are EMBL alumni – a body of highly trained scientists, science communicators and administrators who are ambassadors of the EMBL model, culture and spirit and play a pivotal role in EMBL's continued success.

It is clear that EMBL is not sitting still but has and is reinventing itself to meet the challenges and opportunities of this Big Data era. It makes that we can look with confidence to the next 40 years.

Nancy Podevin, EMBL Scientific Strategy Officer, Director General's Office, Heidelberg, 2012-present

EMBL-EBI South Building

Administration
Breaking Cover

It is axiomatic that the best one can hope for, if one works in Administration, is that nobody notices that you are there. When we both joined EMBL in 2001 we expected that this truism would also apply at EMBL, and in many ways it does, but we also discovered exceptions, the Canteen and Building Maintenance, for example, are often more directly involved in scientific activity.

However, apart from those areas where the Administration is able to contribute directly to the scientific effort, the basic aim of not being noticed remains the usual mode of operation. Normally this would not present difficulties, but at EMBL the Administration must operate with different languages and widely differing expectations and cultures among its members of personnel who come from around 80 different countries.

To address differences based on culture, language or expectation, we adopt the EMBL culture of openness, helpfulness and dedication to the task. We encourage a friendly and cooperative atmosphere within the Administration by ensuring that we all know each other personally through our biannual Administrative Assemblies, thereby ensuring that when problems arise, those responsible for resolving them can do so in cooperation with colleagues they already know and like.

On top of this, the Laboratory is run by scientists; and the trouble with EMBL scientists is that they are so inventive! This means that we are continually presented with strange ideas to implement and expectations of responsiveness and flexibility which are difficult to reconcile with public sector standards of accountability. We have tried to achieve this by instilling a culture of seeing Admin's task as helping scientists to achieve their goals without hindrance. A request to do something which would break the rules is met, not by a refusal, but rather by an explanation and a suggestion of how the aim might be met by more acceptable means. We have been reducing the friction of Administration and increasing its usefulness to scientists for many years by increasing use of new information technology, and with the rapid developments in tablet and smart phone technology we are now developing means to enable scientists to monitor and progress their projects wherever they happen to be in the world and whenever they wish to do so.

Our challenge is having an inherently rigid activity like Administration responsive to an inherently flexible and fluid activity like science without reducing the effectiveness of either. We hope we have succeeded.

Keith Williamson, EMBL Administrative Director, 2012-present; Head of Finance, 2003-2012; Head of Personnel, 2001-2003

Bernd-Uwe Jahn, Retired; EMBL Administrative Director, 2001-2012

In the **Service** of EMBL

Descriptors for the uniqueness of EMBL are mainly associated with the scientific side and include the collaborative, collegiate environment and the freedom to work afforded by minimal bureaucracy and strong service support. Together with its excellent reputation, this has made the Laboratory an extremely attractive home for the scientific community.

However, what of the staff who work in the non-scientific service side? These colleagues remain in the background, supporting the research activities but have the same needs for career and work fulfillment. How is EMBL for them?

During my recruitment, 22 years ago, clear emphasis was made on the priority that the Laboratory sets on strong, modern service support and minimum bureaucracy.

The hunger for fast and efficient services requires support in mind and wallet from an organisation. The constant influx of new colleagues and experiences from all over the world means the expectations of scientific users remain high and a moving target. This has been fully appreciated by the Laboratory which encourages initiatives from the service side to be tabled and supported. There is a place for staff wanting a steady, demanding work environment and for those with ambition and energy to be more engaged.

Four Directors General on, the strong support for service in EMBL has not wavered. An organisation which accepts that excellent science and well run and funded support services are symbiotic is unusual, but one that accepts it and does it, unique!

Having EMBL on your CV may not have the same prestige for a non-scientist as for a scientist, but the work environment, the experience of a fast moving supported career, collegiate atmosphere, personal development possibilities and the international social scene are second to none!

I therefore dedicate this article to the unsung heroes, the service staff of EMBL:

Be just as proud for the achievements and reputation of the Laboratory over the past 40 years and make sure you stay in touch with the growing EMBL family once you leave.

EMBL Photolab team.

From left: Jan Abda, Claudiu Grozea, Udo Ringeisen, Marietta Schupp, Doros Panayi, Hugo Neves, Sean Nightingale

EMBL member and associate member states

A Case for EMBL

In my 25 years at EMBL, I have witnessed many changes. Unchanged is the palpable excitement about science, the collaborative and collegial culture, and the spirit of tackling big problems in bold ways. The cost of pursuing cutting-edge science has grown enormously in the last decades. That EMBL has stayed competitive is owed to the success of EMBL scientists in securing grants, and first and foremost to the unwavering dedication of our member states even in difficult times. We now enter into a new phase when we must also excite private philanthropists about the importance of what we do and take them with us on our journey to uncover some of the big secrets of life.

Matthias Hentze, EMBL Director, 2012-present; Associate Director, 2005-2012. At EMBL since 1989

Why **grant funding** is essential for a healthy EMBL

Getting a grant is not easy. Applications are time-consuming and proposed projects have to tick the right boxes, meet an acceptable budget and have the right partners. After all that effort, the odds on getting funded are low. With the restrictions, reports and other obligations that come with grants, why would anyone go through the time consuming stress of applying in the first place?

For one thing, without grants, there would not be enough money for EMBL researchers to do all the things that they want to do. The variety and novelty of our research is reflected, for example, in the award of 18 ERC grants to EMBL group leaders.[1]

Today's research relies on the intersection of skills and knowledge that is rarely held by one group, and collaborative grant-funded projects are a great way to achieve the necessary connections. In such grants, scientists at EMBL and partner organisations strengthen existing collaborations and create new ones. The success of these approaches for EMBL and its partners can be seen in the immense impact of ESFRI grants, such as ELIXIR and Euro-bioimaging, in building durable Europe-wide research infrastructures.[2]

Grants are also made for networking, training, conferences or workshops to create input for Europe-wide policy.

In 2013, grants from external funders brought in excess of 40 million euros to EMBL, from more than 350 grants provided by over 50 different funders. Grants allow researchers at EMBL to fully follow their research visions and passions whilst simultaneously helping to fulfil EMBL's goals to create more great science.

Phil Irving,
EMBL Head of
Grants Services,
2004-present

1 ERC: European Research Council
2 ESFRI: the European Strategy Forum on Research Infrastructures

Why **philanthropy** matters for EMBL

EMBL has played for many years in the world's top league of research institutes, but to continue our success, we need support. This means engaging the public and public philanthropy so we can follow up on our high priority missions and remain competitive on a global scale.

The term 'philanthropy' usually evokes thoughts of social causes and wealthy people. In truth, philanthropy is a cosmos of relationships centered around a cause of common concern and interest, and the more relevant the cause the livelier the cosmos.

During our 40th anniversary year we have launched a comprehensive communication campaign with the aim of building our own cosmos of long-term relationships around a cause relevant to us – namely life. With the campaign message "Vom Leben lernen" (Learning from life) we are taking to the homes and companies of potential EMBL supporters, initially in Germany but later in our other host nations, the fascinating questions that life is putting before us.

The secret to the fundraising success of prominent academic institutions is in the lasting relationships they have built over decades. As these relationships mature they inspire ever more generous giving. They are not about the needs of the institution but the supporters' love and desire to see the institution grow and become even better at what it does for the benefit of society at large.

When people associate EMBL with life in the same way they equate NASA and ESA with space exploration and CERN with particle physics, we will have accomplished one part of our mission – communicating our relevance. Our other task is then to inspire support for the Laboratory not by what we need but by what we do.

Astrid von Soosten,
EMBL Head of
Resource Development,
2012-present

ALUMNI ON **EMBL**

What has EMBL contributed to your life, scientifically or personally?

1970s

"A passion for structural biology and French wine."

DAVID HULMES, Research Director, CNRS, Lyon, France. (Postdoc, 1976-1978, EMBL Grenoble).

"The awareness of how powerful and fun research can be when you work together in teams and networks."

GARETH GRIFFITHS, Associate Professor, University of Oslo, Norway. (Group leader, 1977-2009, Cell Biology and Biophysics).

1980s

"Academically-built self-confidence."

MANJU BANSAL, Director, Indian Institute of Science, Bangalore, India. (Postdoc, 1981-1982, Structural and Computational Biology).

"Opened the world of different cultures, nations and people and the world of science to me."

MICHAEL HORTSCH, Associate Professor, University of Michigan, Ann Arbor, USA. (Predoc, 1983-1987, Cell Biology and Biophysics).

"My experience at EMBL was the most important for my professional and personal autonomy both as a cook and as a molecular biologist."

ELDA PERLINO, Group Leader, CNR, Bari, Italy. (Postdoc, 1983-1987, Genome Biology).

"The sense that colleagues were really working together and not against each other."

Marie-Christine Dabauvalle, Senior Lecturer, Biocenter, University Würzburg, Germany. (Postdoc, 1984-1987, Cell Biology and Biophysics).

"Experiencing the humility, modesty and humour of truly clever and talented people. Oh, and I did meet my husband there."

CHRISTINE TEBB, Human Resources Assistant, United Nations Office on Drugs and Crime, Vienna, Austria. (Secretary, 1986-1988. Genome Biology).

"A sense that I could deal with any questions at any conference having survived predoc talks in the Operon in the presence of John Tooze or Graham Warren."

KARIN RÖMISCH, Professor, Saarland University, Saarbruecken, Germany. (Predoc, 1987-1991, Cell Biology and Biophysics).

"Excellent scientists who were also excellent football players and who became excellent friends."

JEAN-PIERRE GORVEL, Group Leader, Centre d'Immunologie de Marseille-Luminy, Marseille, France. (Visiting Scientist, 1989-1992, Cell Biology and Biophysics).

1990s

"EMBL showed me that if you fill a sandbox with some really cool toys, mix in some super smart kids from all over the world, remove most of the supervision and just let them play and imagine, magic will happen. Change any of that and the magic disappears."

KELLY MCNAGNY, Professor of Medical Genetics, Interim Co-Director, Biomedical Research Centre, University of British Columbia, Vancouver, Canada. (Postdoc &

"The sense to judge people by merit and not by reputation, and expect the unexpected from people and from experiments."

ANASTASSIS PERRAKIS, Group Leader, Netherlands Cancer Institute, Amsterdam, the Netherlands. (Predoc & Staff Scientist (1992-1997, EMBL Hamburg & 1997-2000, EMBL Grenoble).

"A loveable, brilliant and eccentric bunch of colleagues, all speaking different languages but managing to understand each other."

BENOÎT LEBLANC, Lecturer, Sherbrooke University, Shebrooke, QC, Canada. (Postdoc, 1993-1995, Genome Biology).

"A collection of science cartoons and Eppendorfs signed by potential Nobel Prize winners."

CUSTODIA GARCÍA JIMENEZ, Associate Professor, Universidad Rey Juan Carlos, Madrid, Spain. (Postdoc, 1993-1998. Genome Biology).

"Friends for life. A scar on my left elbow, fruit of a bike fall going down Meyerhofstrasse on a dark, wet, night."

MIGUEL ANDRADE, Group Leader, MDC Berlin, Germany. (Postdoc, 1994-2003, Structural & Computational Biology).

"Always finding great people who happened to be specialised in what you needed right at that moment."

JACOMINE KRIJNSE LOCKER, Group Leader, University of Heidelberg, Germany. (Postdoc, 1994-2006, Cell Biology & Biophysics).

"My best collaborator and husband whom I fell in love with whilst trying to understand signaling by wingless in Drosophila during the Predoc courses."

ERIKA MANCINI, Research Fellow, Oxford University, UK. (Predoc, 1996-2000, Structural & Computational Biology).

"A fantastic opportunity to play in what seemed like scientific Disneyland at a very exciting time!"

PIERRE GÖNCZY, Group Leader, Swiss Federal Insitute of Technology, Lausanne, Switzerland. (Postdoc, 1996-2000, Cell Biology & Biophysics).

"Discovering British understatement at its finest: sitting down for a coffee or a chat with past and future Nobel Prize winners and scientific leaders who would convey complete respect and interest for the opinion and words of a 22-year-old fresh out of University."

ELIA STUPKA, Co-Director, Center For Translational Genomics and Bioinformatics, San Raffaele Scientific Institute, Milan, Italy. (Scientific Programmer, 1999-2001, EMBL-EBI).

2000s

"Eric Karsenti's words: Let the data tell you its story."

CHAITANYA ATHALE, Assistant Professor, IISER (Indian Institute of Science & Research), Pune, India. (Postdoc, 2005-2009, Cell Biology & Biophysics).

"An incurable life-long addiction to bretzels."

JEROEN RAES, Group Leader, VIB/KU Leuven, Belgium. (Scientist, 2005-2009 Structural & Computational Biology).

2010s

"The supreme importance of taking the time to get to know people; never have coffee or lunch alone."

ANDREW ROBERTSON, Chief Scientific & Medical Officer, National Psoriasis Foundation, Portland, Oregon, USA. (Scientific Coordinator, 2011-2012, EICAT).

"A long list of people whom you will at some point refer to as 'A great mind that I got to work with.'"

PAUL COSTEA, Predoc, 2012-present, Structural & Computational Biology.

"The great opportunity to closely work with scientific geniuses. And to run everyday at 3pm to get chocolate cookies. Loved that!"

VÍTOR DANIEL SOUSA NETO E COSTA, Predoc, VILT, Braga, Portugal. (Trainee, 2013, EMBL-EBI).

ALUMNI ON **EMBL**

you were at EMBL in the 70s/80s/90s/00s/10s if…

1970s

"…some of the greats like Sir John Randall and Sir John Kendrew dropped in for tea."

DAVID HULMES, Research Director, CNRS, Lyon, France. (Postdoc, 1976-1978, EMBL Grenoble).

"...everyone in the Grenoble Outstation coffee room would continue chatting in French, even though we were from the UK, Germany, Spain, Italy, the Netherlands... and the two French people had left 10 minutes ago."

VALERIE FOWLER-HUNGERFORD, Scientist, Novartis, Basel, Switzerland. (Research Assistant, 1978-1980, EMBL Grenoble).

1980s

"Riccardo Cortese would appear every night in the lab at around 12 asking, 'news?'"

Elda Perlino, Group Leader, CNR, Bari, Italy. (Postdoc, 1983-1987, Genome Biology).

"…Riccardo Cortese and Lennart Phillipson would walk into the lab smoking their pipes."

GABOR LAMM, Managing Director, EMBLEM Technology Transfer GmbH, Heidelberg, Germany. (Predoc, 1989-1994, Genome Biology).

1990s

"…the Scientific Instruments Maintenance Group was repairing nearly every machine used in the Lab (and even common household items) to make EMBL staff happy with their equipment and successful at work."

HENK SCHOLTEN, Service Engineer, Bausch + Lomb, Spain. (Engineer, 1992-2001, Core Facilities & Scientific Services).

"…you saw Matti Saraste wearing electric blue leggings and a puffy white shirt singing ABBA songs."

ELENA BARALDI, Team Leader, University of Bologna, Italy. (Predoc, 1994-1998, Structural & Computational Biology).

"…you saw Fotis Kafatos breathless at a predoc ceremony because he had just danced the sirtaki."

KAI TE KAAT, Director, QIAGEN GmbH, Hilden, Germany. (Predoc, 1995-2000, Structural & Computational Biology).

"…you regard O'Reilly's Irish pub in Heidelberg as an EMBL Outstation."

PAUL YOUNG, Group Leader, University College Cork, Ireland. (Predoc, 1996-2000, Structural & Computational Biology).

2000s

"… you spent night after night at the beamline helping a future Nobel laureate to collect the best diffraction data in the world."

EHMKE POHL, Associate Professor, Durham University, UK. (Team Leader, 1999-2003, EMBL Hamburg).

"…you remember Kafatos' Clip Clop Shuffle! You knew he was coming because the first thing you heard were the clip-clopping of his shuffling clogs... I never knew clogs could shuffle!"

BERNADETTE MAYES, Home Executive, Biberach/Riss, Germany. (Invoice and Inventory Control Officer, 2000-2009, Administration).

"…you remember deleting the archive of the human genome from the Ensembl database by mistake on a Saturday night, and hearing Ewan Birney from a few offices away utter a collection of the finest and most intricate British swearwords."

ELIA STUPKA, Co-Director & Head of Unit, Center For Translational Genomics and Bioinformatics, San Raffaele Scientific Institute, Milan, Italy. (Scientific Programmer, 1999-2001, EMBL-EBI).

"…you remember Kai Simons' farewell party. That was awesome!!!"

GUILLERMO DE CARCER, Staff Scientist, CNIO, Madrid, Spain. (Postdoc, 1999-2002, Cell Biology & Biophysics).

"... if you stayed at the 'Conventino' when you first arrived at EMBL Monterotondo."

CARLA SCIARRETTA, BASEL, Switzerland. (Research Technician, 2000-2006, EMBL Monterotondo).

"…no matter how late you stayed in the lab, there was always someone available for a table football match while 'your gel was running.'"

DONATELLA GIOVANNINI, Postdoc, Institute of Molecular Genetics, Montpellier, France. (Visiting Scientist, 2003-2004, Directors' Research).

"…whatever you looked at, all you could see were patterns of microtubules."

LINDA SANDBLAD, Associate Professor, Umeå University, Sweden. (Predoc, 2003-2008, Cell Biology & Biophysics).

"… you would hear some explicit (and non-translatable) Spanish in the corridor and then realised it was just Carmelo fixing another computer."

MATTHIAS HAURY, Chief Operating Officer, Max Planck Florida Institute for Neuroscience, Jupiter, USA. (Coordinating Manager, 2006-2010, EICAT).

"... you went into the old cafeteria the morning after a Euro Soccer Championship game and found a Spanish flag on top of the DNA helix fountain to celebrate one of their many victories during the '00s."

JOHANNA SCHEUERMANN, Postdoc, MIT, Cambridge, USA. (Predoc, 2006-2010, Genome Biology).

"…you still get lost in the buildings, especially on your way back from the Photo Lab."

SAMAN HONARNEJAD, Predoc, Harvard Medical School, Boston, USA. (Trainee, 2006-2008, Cell Biology & Biophysics).

"…if you saw a world scientific leader coming to work with short white socks and sandals."

MARCO SALOMONE STAGNI, Scientist, Free University of Bozen, Bolzano, Italy. (Predoc, 2006-2010, EMBL Hamburg).

"…no single day was complete without a greasy panino from Renato's Van parked outside Monterotondo Outstation."

ADITYA SANKAR, Predoc, BRIC-Copenhagen, Denmark. (Visiting Scientist, 2010-2011, EMBL Monterotondo).

Survey conducted by:

Sarah Sherwood,
Head of Communications and External Relations, Institute for Research in Biomedicine (IRB), Barcelona, Spain

EMBL&cetera Editor, 1999-2005, Office of Information and Public Affairs

Vienna Leigh,
Head of Communications and Outreach, Institute for Bioengineering of Catalonia, Barcelona, Spain

EMBL&cetera Editor, 2005-2010, Office of Information and Public Affairs

Thomas Graf
Greatest Achievements

Interview by **FÁTIMA GEBAUER** & **JUAN VALCÁRCEL**

FÁTIMA AND JUAN: How did your relationship with EMBL start?

THOMAS: One day in 1983, while working at the German Cancer Center (DKFZ) in Heidelberg, I got a totally unexpected phone call from Lennart Philipson, EMBL's newly installed director, inviting me to come for an interview about the possibility of creating a new Programme in Cell Differentiation[1]. This happened after a brainstorming meeting of EMBL's advisory board chaired by David Baltimore.

FÁTIMA AND JUAN: What was it about EMBL that made a difference for your career?

THOMAS: While working on leukemia-inducing oncogenes I became more and more fascinated by the question why certain oncogenes selectively affect specific blood cell lineages. The move from the DKFZ to the EMBL gave me the opportunity to concentrate on this aspect of cancer, and how a single gene can direct the differentiation of stem cells into specialised cell types. Also, being made into a Head of Unit gave me a tremendous opportunity to create a critical mass of highly talented people working on questions related to my own interests and to help develop biomedical science in Europe.

FÁTIMA AND JUAN: What were your three main achievements at EMBL?

THOMAS: Firstly, bringing Claus Himburg to lead the EMBL canteen (his 'potatoes-la-Graf' was an essential addition to the menu), secondly, establishing the EMBL Kinderkrippe with my wife Patricia Kahn and thirdly, discovering transcription factor induced blood cell reprogramming.

FÁTIMA AND JUAN: Why did you leave EMBL and why did you come back to Europe afterwards?

THOMAS: Both moves were based on a mixture of science related and personal reasons. After having been at EMBL for 15 years, it was time to expand my horizon. And so when my wife decided to return to her hometown, New York, I did not have to think twice where to go next. Coming back to Europe was somewhat similar. I had married a Spanish doctor and after eight years in the US we were longing for the European way of life.

FÁTIMA AND JUAN: The CRG operates somewhat similarly to EMBL. Is the EMBL scheme transferable?

THOMAS: The EMBL scheme has worked exceptionally well for the CRG. At the beginning it was difficult, because the ideas of an international staff and high turnover to foster researchers' motility were concepts nearly unheard of in Spain. I think the export of EMBL's model to other European countries (as Kai Simons has tirelessly advocated) is one of the institute's greatest achievements, and there are now a number of biomedical research institutes created in a similar mold that compare with the best in the US.

FÁTIMA AND JUAN: If you could rewind, is there something that you would do differently?

THOMAS: I might be a bit more daring and venture more often into fields about which I know nothing. Looking back I missed a few great opportunities. Of course, radically changing course can also lead to unproductive distractions.

1 EMBL Units used to be called programmes, and the Cell Differentiation programme is now the Developmental Biology Unit

Picture from left to right: Fatima,Thomas and Juan

Fátima Gebauer, Group Leader, CRG, Spain
EMBL Staff Scientist, 1996-2002, Genome Biology

Thomas Graf, ICREA Research Professor, CRG, Spain
EMBL Head of Unit, 1983-1998, Cell Differentiation then Developmental Biology

Juan Valcárcel, ICREA Research Professor, CRG, Spain
EMBL Group Leader, 1996-2002, Genome Biology

Ernst Stelzer
Applying Physics to Biology

Interview by **RUSS HODGE**

RUSS: Your group at EMBL was technically very creative, coming up with new approaches and new instruments every few years. What do you consider the most important developments?

ERNST: Certainly the development of confocal fluorescence microscopy (CFM) and its applications in the life sciences, understanding optical tweezers, confocal 4Pi and Theta microscopy, which initiated super resolution light microscopy, and most recently light sheet-based fluorescence microscopy (LSFM) and its implementations SPIM and DLSM.

RUSS: What kinds of scientific questions did they permit you to address in new ways?

ERNST: The results with CFM at EMBL are well documented in numerous excellent papers. Our work on optical tweezers and optical levitation allowed us to explore mechanical and motile aspects of proteins such as motor proteins inside cells. LSFM has revolutionised fluorescence microscopy, providing totally new views of entire embryos, plants, the three-dimensional behavior of microtubules, etc.

We also published a number of theoretical papers, which both influenced and were inspired by our instruments. I am not an engineer; I have never built a piece of electronics, made a blueprint or analysed an optical layout! My designs were always in a pencil-and-paper style.

RUSS: As well as excellent instruments, your group produced excellent scientists: What have they gone on to accomplish?

ERNST: My former PhD students Philipp Keller and Jan Huisken have pushed LSFM to a new level with new applications. Stefan Grill and Holger Kress are well known for their quantitative approach to biology. Stefan Hell is now Director at an MPI in Göttingen and best known for his work on super resolution. Alexander Rohrbach has contributed novel contrasts to LSFM and, like Ernst-Ludwig Florin, continues to apply optical tweezers. Emmanuel Reynaud has made his name in marine biology and, with Francesco Pampaloni, is pushing three-dimensional cell biology.

RUSS: How do you see three-dimensional light microscopy developing in the coming years? What current challenges or areas of research might particularly benefit from new instruments?

ERNST: I see this in the context of three-dimensional biology: life is "changes in three dimensions as a function of time," which means the community of "real biologists" have to preserve the three-dimensionality of the object. We are interested in how cells grow and interact with other cells. This is fashionable now, but we've been doing it since it was not mainstream and was essentially nonfundable.

RUSS: What are you most proud of?

ERNST: A highlight is certainly the derivation of formulas that describe the lateral and axial resolution of optical instruments, from an uncertainty relation and work perfectly at high numerical apertures. However, my deep understanding of CFM and two-photon absorption gives me a view of physical limitations. Confocal theta microscopy, tetrahedral microscopy and then LSFM came with a vision to vastly improve our penetration of biological tissue and develop tools that supported a novel approach to recording spatio-temporal changes in developmental biology.

A major part of the success of my group has been the strength of mathematics and physics and our ability to describe our findings in optics as well as biology, within a rigid, confirmable framework.

Ernst Stelzer, Professor,
Goethe University, Frankfurt
EMBL Group Leader, 1983-2011, Cell Biology and Biophysics

Russ Hodge, Science Writer,
Max Delbrück Center for Molecular Medicine, Berlin
EMBL Head of OIPA, 1997-2008, Office of Information and Public Affairs

EMBL TIMELINE

1960s

1962 – Leó Szilárd, Victor Weisskopf, James Watson and John Kendrew meet in Geneva to discuss possibility of establishing an international laboratory for molecular biology.

1963 – At a meeting in Ravello, Italy, scientists decide to pursue the idea of the laboratory. They form the European Molecular Biology Organization (EMBO) in order to realise this goal. International fellowships and advanced courses are added to the EMBO agenda.

1969 – The European Molecular Biology Conference is founded, associating 14 governments with EMBO, providing the organisation with stable funding and scientific independence.

1969 – The first proposals to include Outstations in addition to the main Laboratory and stronger emphasis on technological development and service functions for the European Molecular Biology Laboratory (EMBL) are made at a meeting at Lake Constance.

1970s

1971 – Heidelberg is chosen as the site for EMBL's main Laboratory.

1973 – Delegates of the ten participating countries sign an agreement at CERN in Geneva to establish a European Molecular Biology Laboratory. The countries include: Austria, Denmark, France, Germany, Israel, Italy, the Netherlands, Sweden, Switzerland and the United Kingdom.

1974 – The EMBL Agreement is ratified and EMBL becomes a legal entity. Sir John Kendrew is appointed as the first Director General.

1975 – The EMBL Headquarters Agreement is ratified between EMBL and Germany as the host country. Construction begins.

1975 – An agreement is signed to establish an EMBL Outstation at the synchrotron ring in Hamburg, Deutsches Elektronen-Synchrotron (DESY).

1976 – An agreement is signed to establish a second Outstation at the site of the Institut Laue-Langevin (ILL) in Grenoble.

1978 – EMBL scientists move from temporary facilities at the German Cancer Research Centre (DKFZ) into the newly built Laboratory at Heidelberg.

1978 – Introduction of the EMBL Social Security System.

1980s

1980 – The EMBL Data Library is founded – the first central depository of nucleotide sequence data in the world – precursor to the EMBL-EBI.

1980 – EMBL is the first international organisation to introduce its own budgetary Health Insurance Scheme.

1982 – Lennart Philipson is appointed as EMBL's second Director General. EMBL is reorganised into scientific research and instrumentation Units.

1984 – First EMBL Guesthouse is inaugurated.

1983 – The EMBL predoctoral training programme is established.

1984-1986 – Four more countries join EMBL: Finland and Greece (1984), Norway (1985), Spain (1986).

1988 – First childcare facilities are open at EMBL Heidelberg.

1989 – Hotel ISG is established.

EMBLEM
TECHNOLOGY TRANSFER

1990s

1990-1998 – Two more countries join EMBL: Belgium (1990), Portugal (1998).

1992 – EMBL Council votes to establish the European Bioinformatics Institute (EMBL-EBI) and locate it on the Wellcome Trust Genome Campus, alongside the major DNA sequencing efforts of the Sanger Centre. The transition of the EMBL Data Library into EMBL-EBI begins.

1993 – Fotis Kafatos is appointed as EMBL's third Director General.

1994 – The European Bioinformatics Institute (EMBL-EBI) is officially founded.

1995 – Christiane Nüsslein-Volhard and Eric Wieschaus receive the Nobel Prize for Medicine for the first systematic genetic analysis of embryonic development in the fruit fly – research conducted at EMBL Heidelberg.

1997 – The Advanced Light Microscopy Facility (ALMF) is established at EMBL Heidelberg – the first of the current generation of Core Facilities designed to provide important services to groups, visitors and collaborators.

1997 – EMBL is granted the authority to award PhD degrees, an exceptional distinction for a non-University Institution.

1999 – EMBLEM GmbH, EMBL's technology transfer arm, is established.

1999 – The EMBL Monterotondo Outstation is founded near Rome, Italy. EMBL launches a new programme in mouse biology at the site.

2000

2000 – EMBL/EMBO jointly sponsor their first Science and Society conference, which becomes a major annual event.

2000 – The first EMBL PhD Symposium is organized by students for students.

2001 – The EMBL Technology Fund I is established.

2001-2004 – Establishment at EMBL Monterotondo of the Monoclonal Antibody Core Facility; and at EMBL Heidelberg the Core Facilities: Protein Expression and Purification, Genomics, Proteomics, Electron Microscopy, Flow Cytometry and Chemical Biology.

2002-2007 – EMBL establishes partnerships with:

- the Medical Faculty of the University of Heidelberg as the Molecular Medicine Partnership Unit (MMPU) (2002);
- the European Synchrotron Radiation Facility (ESRF), the Institut Laue Langevin (ILL) and the Institut de Biologie Structurale (IBS) as the Partnership for Structural Biology (PSB) (2002);
- the Sars International Centre (2003);
- the Centre for Genomic Regulation (CRG) (2006);
- the universities of Oslo, Norway, Umeå, Sweden and Helsinki as the Nordic EMBL Partnership for Molecular Medicine (2007);
- Grenoble University and CNRS as the Unit of Virus Host Cell Interactions (UVHCI) (2007).

2002 – Europe's seven largest intergovernmental research infrastructure organisations establish EIROforum, a co-ordination and collaboration Council with their Directors General as its members.

2002
Angus Lamond elected as Chair and Albert Stegmüller as Treasurer of the EMBL Alumni Association board.

2004
The EMBL Alumni Association awards a three year Swedish Postdoctoral Fellowship to Johan Ledin, funded by the Swedish Foundation for Strategic Research, thanks to the efforts of Lennart Philipson.

Introduction of the PhD shared applicant pool, an initiative of the Alumni Association board.

2005
Alumni Relations Programme led by Mehrnoosh Rayner and Matthias Hentze.

Angus Lamond re-elected as Chair, Niovi Santama as Vice Chair.

2007
The John Kendrew Award (JKA) is initiated and sponsored by the EMBL Pensioners thanks to the efforts of Konrad Müller.

2008
Giulio Superti-Furga elected as Chair, Maria dM Vivanco as Vice Chair and Oscar Martin-Almendral as Treasurer.

2009
Introduction of alumni lunch cards for life.

ALUMNI TIMELINE

1999
The EMBL Alumni Association (EAA) is founded by Fotis Kafatos. Its main goal is to support European integration in Science.

Alumni Relations Programme led by Sarah Sherwood and Iain Mattaj.

The Association is registered in the names of Angus Lamond (Chair), Bernhard Dobberstein and Wieland Huttner (Vice Chairs).

2003 – The newly-established European Learning Laboratory for the Life Sciences (ELLS) hosts its first LearningLAB for teachers.

2003-2007 – EMBL extends:

- EMBL Monterotondo opens new extension to the mouse facilities (2003);
- EMBL Hamburg opens Europe's largest high-throughput crystallisation facility (2005);
- EMBL Council approves construction of an Advanced Training Centre (ATC) at Heidelberg headquarters – made possible by generous donation from the Klaus Tschira Foundation. This was initiated by the European Life Scientist Organisation, ELSO (2006).
- Funding announced for EMBL@PETRAIII, an integrated infrastructure for life science applications on the high-energy PETRA III storage ring at DESY (2007).
- EMBL-EBI opens its new East Wing (2007).

2003-2008 – Five more countries join EMBL: Ireland (2003), Iceland (2005), Croatia (2006), Luxembourg (2007) as members; Australia as first associate member (2008).

2005 – Iain Mattaj is appointed as EMBL's fourth Director General.

2006 – Science in School, Europe's first international, multidisciplinary journal for science teaching, launches at EMBL, published by EIROforum.

2010s

2010-2013 – EMBL extends:

- Opening ceremony of the EMBL Advanced Training Centre (ATC) made possible by the Klaus Tschira Foundation. Facilities include Training Labs funded by the Dietmar Hopp Foundation (2010);
- Celebration of the first beam at EMBL@PETRAIII, a new suite of endstations constructed by EMBL Hamburg staff (2011);
- Opening of the EMBL-EBI South Building, also home to the ELIXIR hub and a new Innovation and Translation Centre (2013).

2010-2013 – EMBL establishes partnerships with:

- Monash University (hub), Group of Eight (Go8) Australia, Commonwealth Scientific and Industrial and Research Organisation (CSIRO) as the EMBL Australia Partnership Laboratory (2010);
- Aarhus University, Denmark as an extension to the Nordic EMBL Partnership for Molecular Medicine which is also renewed (2013).

2011 – The EMBL Technology Fund II is established.

2013 – ELIXIR, Europe's emerging research infrastructure for life-science information, becomes a legal entity following ratification by EMBL and five countries.

2013 – EMBL fellows are incorporated in the EMBL Pension Scheme.

2014 – Seven countries and EMBL formalise plans for Euro-BioImaging, an open access research infrastructure for imaging technologies in Europe.

2014 – Three more countries join EMBL: the Czech Republic as member; Argentina as associate member; the Slovak Republic as prospect member – the first country to join the new transitional membership scheme.

2014 –The Centre for Therapeutic Target Validation (CTTV), a public-private partnership between EMBL-EBI, Glaxo Smith Kline and the Wellcome Trust Sanger Institute, that will generate pre-competitive open access information, is established on the Hinxton campus.

2010
Roland Specker takes on the John Kendrew Award sponsorship.

The EMBL Archive initiative is launched by the EMBL Alumni Association board.

The Matti Saraste Courtyard is completed between the grounds of the new EMBL ATC and canteen, thanks to generous donations from EMBL staff and alumni.

2011
Giulio Superti-Furga re-elected as Chair, Maria dM Vivanco and Marja Makarow as Vice Chairs and Oscar Martin-Almendral as Treasurer.

2012
Introduction of the alumni Google map. Alumni are now searchable on the EMBL website.

2013
Annabel Goulding elected as Treasurer.

2014
The Lennart Philipson Award (LPA) is initiated and sponsored by EMBLEM.

The Archive becomes operational.

Cell Biology and Biophysics

1 Dynamic reorganisation of Microtubules is required for the repositioning of organelles and cell components as an epithelium forms.

Bacallao R, Antony C, Dotti C, Karsenti E, Stelzer EH, Simons K. (1989). The subcellular organization of Madin-Darby canine kidney cells during the formation of a polarized epithelium. J Cell Biol. 109, 2817-2832.

2 Proteins rab2, rab5 and rab7 are differentially associated with specific cellular compartments dedicated to transporting material into and out of the cell and thus control different stages of those processes.

Chavrier, P., Parton, R. G., Hauri, H. P., Simons, K., & Zerial, M. (1990). Localization of low molecular weight GTP binding proteins to exocytic and endocytic compartments. Cell, 62(2), 317-329.
AND
Bucci, C., Parton, R. G., Mather, I. H., Stunnenberg, H., Simons, K., Hoflack, B., & Zerial, M. (1992). The small GTPase rab5 functions as a regulatory factor in the early endocytic pathway. Cell, 70(5), 715-728.

3 For the meiotic spindle to form, only microtubules, chromatin and associated factors are required – centrosomes and kinetochores are not needed for this process.

Heald R, Tournebize R, Blank T, Sandaltzopoulos R, Becker P, Hyman A, Karsenti E. (1996). Self-organization of microtubules into bipolar spindles around artificial chromosomes in Xenopus egg extracts. Nature, 382(6590), 420-425.

4 Systematic screen for all the genes involved in cell division on chromosome III of the worm *C. elegans,* one of the first systematic RNAi screens

Gönczy, P., Echeverri, C., Oegema, K., Coulson, A., Jones, S. J., Copley, R. R., ... & Hyman, A. A. (2000). Functional genomic analysis of cell division in C. elegans using RNAi of genes on chromosome III. Nature, 408(6810), 331-336.

5 Decade-old controversy over structure of nuclear pore solved by new super-resolution microscopy method.

Szymborska A, de Marco A, Daigle N, Cordes VC, Briggs JA, Ellenberg J. (2013) Nuclear pore scaffold structure analyzed by super-resolution microscopy and particle averaging. Science, 341(6146), 655-658

Developmental Biology

1 Nobel-prize winning work: identification of 15 genes that control how a fruit fly's body parts are initially specified; similar genes are later shown to exist in humans.

Nüsslein-Volhard, C., & Wieschaus, E. (1980). Mutations affecting segment number and polarity in Drosophila. Nature, 287(5785), 795-801.

2 At least two oncogenes must act in concert to cause leukaemia.

Beug, H., Leutz, A., Kahn, P., & Graf, T. (1984). Ts mutants of E26 leukemia virus allow transformed myeloblasts, but not erythroblasts or fibroblasts to differentiate at the nonpermissive temperature. Cell, 39(3), 579-588.
AND
Kahn, P., Frykberg, L., Brady, C., Stanley, I., Beug, H., Vennström, B., & Graf, T. (1986). v-erbA cooperates with sarcoma oncogenes in leukemic cell transformation. Cell, 45(3), 349-356.

3 The sequence of Hox genes along a chromosome corresponds to the roles of the genes in specifying the vertebrate body plan: the first genes define which part becomes the head, the next group define the torso, and so on.

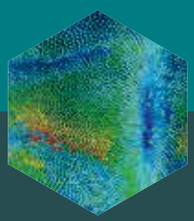
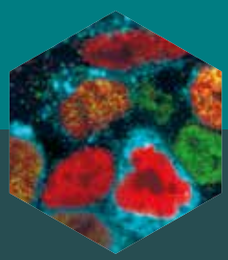
Izpisua-Belmonte, J. C., Falkenstein, H., Dolle, P., Renucci, A., & Duboule, D. (1991). Murine genes related to the Drosophila AbdB homeotic genes are sequentially expressed during development of the posterior part of the body. The EMBO journal, 10(8), 2279.

4 Linking cell proliferation and cell death: in the fruit fly embryo, a microRNA called bantam controls cell proliferation and turns off a gene that promotes cell death.

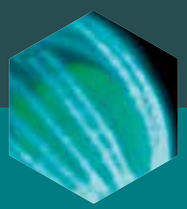
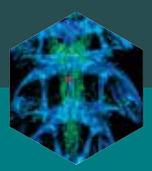
Brennecke J, Hipfner DR, Stark A, Russell RB, Cohen SM. (2003). bantam encodes a developmentally regulated microRNA that controls cell proliferation and regulates the proapoptotic gene hid in Drosophila. Cell 4;113(1):25-36.

5 First complete developmental blueprint of a vertebrate: using the DSLM microscope they developed, EMBL scientists tracked the movements of all the cells in a zebrafish embryo for the first 24 hours of its life.

Keller PJ, Schmidt AD, Wittbrodt J, Stelzer EH (2008) Reconstruction of zebrafish early embryonic development by scanned light sheet microscopy. Science, 322(5904), 1065-1069.

HEIDELBERG
RESEARCH
HIGHLIGHTS


Genome Biology

1 New method for identifying proteins in a sample by identification of peptides – fragments of proteins – in mass spectrometry experiments.

Mann, M., & Wilm, M. (1994) Error-tolerant identification of peptides in sequence databases by peptide sequence tags. Analytical Chemistry, 66(24), 4390-4399.

2 Identification of CRM1 as the first known protein that exports cargo macromolecules from the nucleus.

Fornerod, M., Ohno, M., Yoshida, M. and Mattaj, I.W. (1997) CRM1 is an export receptor for leucine-rich nuclear export signals. Cell 90, 1051-1060.

3 Contrary to what was previously thought, the majority of promoters – DNA sequences that tell the cellular machinery to start transcribing a gene – drive transcription in both directions.

Xu, Z., Wei, W., Gagneur, J., Perocchi, F., Clauder-Münster, S., Camblong, J., ... & Steinmetz, L. M. (2009). Bidirectional promoters generate pervasive transcription in yeast. Nature, 457(7232), 1033-1037.

4 An inherited mutation in gene p53 is likely the link between "exploding chromosomes" (chromothripsis) and the paediatric brain tumour medulloblastoma.

Rausch, T., Jones, D. T., Zapatka, M., Stütz, A. M., Zichner, T., Weischenfeldt, J., ... & Pfister, S. M. (2012). Genome Sequencing of Pediatric Medulloblastoma Links Catastrophic DNA Rearrangements with TP53 Mutations. Cell, 148(1), 59-71.

5 Systematic identification of genetic switches called enhancers and the molecules that activate them – transcription factors – can be used to draw a cell's family tree.

Junion, G., Spivakov, M., Girardot, C., Braun, M., Gustafson, E. H., Birney, E., & Furlong, E. E. (2012). A transcription factor collective defines cardiac cell fate and reflects lineage history. Cell, 148(3), 473-486.

Structural and Computational Biology

1 Method for preparing and observing unfixed and unstained frozen biological samples using cryo-electron microscopy.

Dubochet, J., Lepault, J., Freeman, R. B. J. A., Berriman, J. A., & Homo, J. C. (1982). Electron microscopy of frozen water and aqueous solutions. Journal of Microscopy, 128(3), 219-237
AND
Adrian, M., Dubochet, J., Lepault, J., & McDowall, A. W. (1984). Cryo-electron microscopy of viruses. Nature, 308(5954), 32-36.

2 3D structure of the molecular machine that collects energy from light in green plants.

Kühlbrandt, W., & Wang, D. N. (1991). Three-dimensional structure of plant light-harvesting complex determined by electron crystallography. Nature, 350(6314), 130-134.

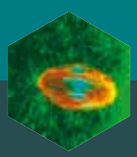
3 First comprehensive map of protein interactions in yeast cells highlighted that most tasks are performed by networks of proteins.

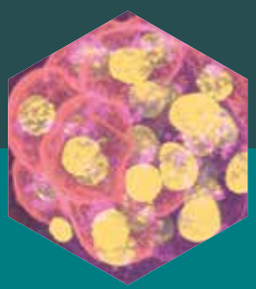
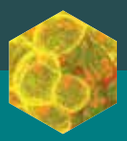
Gavin, A. C., Bösche, M., Krause, R., Grandi, P., Marzioch, M., Bauer, A., ... & Superti-Furga, G. (2002). Functional organization of the yeast proteome by systematic analysis of protein complexes. Nature, 415(6868), 141-147.
AND
Gavin, A. C., Aloy, P., Grandi, P., Krause, R., Boesche, M., Marzioch, M., ... & Superti-Furga, G. (2006). Proteome survey reveals modularity of the yeast cell machinery. Nature, 440(7084), 631-636.

4 The combination of microbes in each person's intestine falls into one of three 'gut types'; also the identification of microbial genetic markers related to age, gender and body-mass index.

Arumugam, M., Raes, J., Pelletier, E., Le Paslier, D., Yamada, T., Mende, D. R., ... & MetaHIT Consortium. (2011). Enterotypes of the human gut microbiome. Nature, 473(7346), 174-180.

OUTSTATIONS
RESEARCH HIGHLIGHTS




EMBL Grenoble

1. **Proteins that load amino acids – protein building blocks – onto tRNA come in at least two types, implying that their evolution was more complex than previously thought.**

   Cusack, S., Berthet-Colominas, C., Härtlein, M., Nassar, N., & Leberman, R. (1990). A second class of synthetase structure revealed by X-ray analysis of Escherichia coli seryl-tRNA synthetase at 2.5 Å. Nature, 347(6290), 249-255.

2. **First 3-dimensional structure of the proteins EF-Tu and EF-Ts, involved in the elongation of protein chains by ribosomes, bound to each other showed how EF-Ts acts as a reset button to allow EF-Tu to transport amino acids to the ribosome that will assemble them into proteins.**

   Kawashima, T., Carmen Berthet-Colominas, Michael Wulff, Stephen Cusack, and Reuben Leberman (1996). The structure of the Escherichia coli EF-Tu· EF-Ts complex at 2.5 Å resolution. Nature, 379, 511-518.

3. **New microdiffractometer for handling protein microcrystals in crystallography experiments, designed for maximum precision and ease of use.**

   Perrakis, A., Cipriani, F., Castagna, J. C., Claustre, L., Burghammer, M., Riekel, C., & Cusack, S. (1999). Protein microcrystals and the design of a microdiffractometer: current experience and plans at EMBL and ESRF/ID13. Acta Crystallographica Section D: Biological Crystallography, 55(10), 1765-1770.

4. **First 3-dimensional structure of the transport protein importin-ß bound to part of importin-α showed that the former wraps around the latter, implying that, after entering the cell's nucleus, importin-ß has to undergo a dramatic change to uncoil and release the cargo it has carried inside.**

   Cingolani, G., Petosa, C., Weis, K., & Müller, C. W. (1999). Structure of importin-β bound to the IBB domain of importin-β. Nature, 399(6733), 221-229.

EMBL Hamburg

1. **Pioneering use of synchrotron radiation for X-ray crystallography.**

   Rosenbaum, G., & Holmes, K. C. (1971). Synchrotron radiation as a source for X-ray diffraction. Nature, 230, 434-437

2. **Developed a versatile data processing system for multi-element detectors that enabled made accurate measurements for longer-running X-ray crystallography experiments possible, and which later impacted small-angle scattering (SAXS).**

   Hendrix, J., Fuerst, H., Hartfiel, B., & Dainton, D. (1982). A wire per wire detector system for high counting rate X-ray experiments. Nuclear Instruments and Methods in Physics Research, 201(1), 139-144

3. **Three-dimensional structure showed that Titin – a protein that plays an important role in muscle development and contraction – is activated in a two-step process when muscle fibres are forming in the embryo.**

   Mayans, O., van der Ven, P. F., Wilm, M., Mues, A., Young, P., Fürst, D. O., ... & Gautel, M. (1998). Structural basis for activation of the titin kinase domain during myofibrillogenesis. Nature, 395(6705), 863-869.

4. **New software for generating better models of the 3-dimensional structure of molecules based on crystallography data: faster, more objective and more reliable than previous methods.**

   Perrakis, A., Morris, R., & Lamzin, V. S. (1999). Automated protein model building combined with iterative structure refinement. Nature Structural & Molecular Biology, 6(5), 458-463.

EMBL Monterotondo

1. **Mouse model of cot death (sudden infant death syndrome, or SIDS): deficits in serotonin in the brainstem can be sufficient to cause cot death, supporting the idea that a congenital defect in serotonin function could be involved in the condition.**

   Audero *et al.* (2008) Sporadic Autonomic Dysregulation and Death Associated with Excessive Serotonin Autoinhibition Science 321 (5885), 130-133.

2. **Identification of a crucial genetic switch for muscle repair, which switches white blood cells called macrophages from clean-up mode to promoting regeneration.**

   Ruffell, D., Mourkioti, F., Gambardella, A., Kirstetter, P., Lopez, R. G., Rosenthal, N., & Nerlov, C. (2009). A CREB-C/EBPβ cascade induces M2 macrophage-specific gene expression and promotes muscle injury repair. Proceedings of the National Academy of Sciences, 106(41), 17475-17480.

3. **Revised model of how transposons – fragments of DNA that copy-and-paste themselves in the genome, with potentially hazardous consequences – are silenced: a protein called Mili generates piRNA molecules that guide another protein, Miwi2, to the transposon DNA to inactivate it.**

   De Fazio, S., Bartonicek, N., Di Giacomo, M., Abreu-Goodger, C., Sankar, A., Funaya, C., ... & O'Carroll, D. (2011). The endonuclease activity of Mili fuels piRNA amplification that silences LINE1 elements. Nature, 480(7376), 259-263.

4. **Cells called microglia play a crucial role in brain development: they trim connections between neurons, shaping how the brain is wired.**

   Paolicelli, R. C., Bolasco, G., Pagani, F., Maggi, L., Scianni, M., Panzanelli, P., ... & Gross, C. T. (2011). Synaptic pruning by microglia is necessary for normal brain development. Science, 333(6048), 1456-1458

EMBL-EBI

1. **A new way to predict protein interactions by virtue of the fact that sometimes proteins working together will fuse into a single, multifunctional polypeptide. Their algorithm is still used today to determine co-functionality for thousands of pairs of proteins.**

   Enright, A. J., Iliopoulos, I., Kyrpides, N. C., & Ouzounis, C. A. (1999). Protein interaction maps for complete genomes based on gene fusion events. Nature, 402(6757), 86-90.

2. **An international scientific collaboration produced a draft sequence of the human genome and made it freely available in the public domain. This act had a profound impact on the advance of biology, as it allowed scientists the world over a to freely explore this extraordinary trove of information about human development, physiology, medicine and evolution.**

   Lander, E. S., Linton, L. M., Birren, B., Nusbaum, C., Zody, M. C., Baldwin, J., ... & Grafham, D. (2001). Initial sequencing and analysis of the human genome. Nature, 409(6822), 860-921.

3. **A detailed map of genome function that identifies four million gene 'switches'. The ENCODE project published over 30 papers under open-access license in several different journals, with the contents linked by topic and united for optimum exploration in a single interface provided by *Nature*. A virtual machine allows readers to explore the data in context and reproduce the experimental conditions.**

   ENCODE Project Consortium. (2012). An integrated encyclopedia of DNA elements in the human genome. Nature, 489(7414), 57-74

4. **A novel, scalable approach to the long-term archiving of data, using the 'natural' storage archive provided by DNA itself. The new method involves translating binary digital files into non-repeating strings of A, T, G and C and – crucially – applying an error-correction algorithm similar to those applied in everyday technologies such as mobile phone transmission.**

   Goldman, N., Bertone, P., Chen, S., Dessimoz, C., LeProust, E. M., Sipos, B., & Birney, E. (2013). Towards practical, high-capacity, low-maintenance information storage in synthesized DNA. Nature.

EMBL Hamburg:
Big Biology – Big Infrastructure

Matthias Wilmanns on EMBL Hamburg

Interview by **PAUL TUCKER**

PAUL: EMBL celebrates its 40th birthday this year, but as you know so does the Hamburg Outstation. I believe you plan celebrations for the Hamburg Outstation later this year. Would you care to say something about those plans and perhaps explain why you think it is important to have a separate event?

MATTHIAS: We will have a celebratory symposium on the 27th and 28th of November here in Hamburg. EMBL Hamburg has been a pioneer in the use of synchrotron radiation for the life sciences and we feel it is important to celebrate this achievement.

PAUL: If you were to name one key element for EMBL's success, what would it be?

MATTHIAS: With my EMBL Hamburg hat on, I would say it is the construction and provision of research facilities to the international research community. This is the central part of our life here in Hamburg. We have also had some notable successes in the field of technology transfer – for example, the development of the image plate scanner which for many years, was a market leader in 2D X-ray detectors, not only at synchrotrons. Software developments have also had a big impact in the field allowing automation of data evaluation and interpretation.

PAUL: I would like to ask about your views on the PETRA III beamlines? Has this development lived up to your expectations? I understand that before the current shutdown you were already doing experiments that could not be done elsewhere. And do you think EMBL Hamburg will have the same vision and influence when exploiting the properties of the X-ray free electron laser (XFEL) currently being constructed in Hamburg?

MATTHIAS: The developments we saw last year at PETRA III exceeded my expectations. After years of planning and building we are now able to reap the rewards with some important results being published. Recently scientists from DESY, EMBL Hamburg, and Hamburg and Lübeck Universities showed they were able to collect data from microcrystals at the EMBL Hamburg Beamline P14 at PETRA III. These results are equivalent to data collected on the same enzyme at the X-ray laser in Stanford. This, in itself, is great news but just consider the future with proteins that cannot be crystallised! This opens up a lot of opportunities and shows how the XFEL and the PETRA III beamlines might complement each other in the future. We hope our users will be able to choose to either work on PETRA or XFEL, or indeed both.

PAUL: Hamburg has always been a provider of experimental infrastructures to the research community – but the support of this requires scarce resources. Do you think this affects the quality and quantity of curiosity-driven research – in my view one of the hallmarks and strong points of the institute as a whole?

MATTHIAS: Many people working at EMBL Hamburg have substantial additional tasks related to the running of the research infrastructures, and obviously have less time for curiosity-driven research as you put it. We have to be honest about this when we are recruiting people and it is for many a personal challenge to balance these two tasks.

PAUL: Another strength of EMBL has been the ability to produce exceptionally productive collaborations between groups. How has this aided your own science?

MATTHIAS: This, for me, was one of the main motivations for joining the institute. I think the collaborative spirit in its different guises has been a hallmark of EMBL. The EIPOD scheme, now well established, has meant a tremendous increase in bottom-up collaborations. This is very special.

PAUL: Over the years EMBL has built up a very strong alumni base. Do you find this a useful asset?

MATTHIAS: Historically speaking EMBL Hamburg is a big family and we have very close contact to our alumni. The EMBL alumni in general are also an important part of EMBL. We will always have to justify using taxpayers' money so it is really important to have a group of people who will continue to support us in the ways they can and in the roles they have. I think the 40 year celebrations are also a bit about giving them something back and thanking them for their support.

Matthias Wilmanns,
Head of EMBL Hamburg,
1993-present

Paul Tucker, Retired,
Westeremden, the Netherlands
EMBL Group Leader, 1984-2009,
EMBL Hamburg

EMBL Grenoble:
Bright Ideas – Bright X-ray Sources

Stephen Cusack on EMBL Grenoble

Interview by **ELENA CONTI**

ELENA: How long have you been at EMBL and Head of the Grenoble Outstation?

STEPHEN: I joined EMBL Grenoble as a postdoc in 1977 and then became Head of Outstation in 1989.

ELENA: Many group leaders come and go. What was your motivation to stay?

STEPHEN: It's a combination of the spectacular mountains around Grenoble and the opportunity to do good science, mainly structural biology and crystallography, especially since the installation of the ESRF Synchrotron (European Synchrotron Radiation Facility).

ELENA: You have made important contributions. What keeps you awake at night?

STEPHEN: I've worked mainly on different protein-RNA systems but one thing I set out to work on in the 1990s was the influenza RNA-dependent RNA polymerase, the viral replication machine. This has been very slow to get going (nearly 20 years), but now I think we're close to achieving the goal. It does keep me awake at night!

ELENA: You have been behind and driven many technological developments, for example mircrocrystallography. What are you most excited about and what do you dream can be developed in the future?

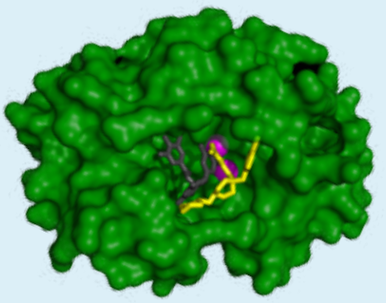
STEPHEN: When the ESRF came online in the mid-1990s, this opened new opportunities. One thing I was particularly interested to develop was the ability to do crystallography on micro-crystals. I was instrumental in getting Florent Cipriani and his team at the Grenoble Outstation, in collaboration with ESRF colleagues, to develop the micro-diffractometer which enables very precise shooting of small crystals with very intense and small beams. This has now taken off throughout the world and I am pretty proud of EMBL Grenoble's role in this. With the current developments associated with the free electron laser, it has been found that with ultra-short and intense X-ray pulses, you can just get one frame from one sub-micron sized crystal and you gradually build up a data set. This is the next development that may have a major impact on crystallography.

ELENA: There have been many changes in structural biology in the past two decades. Is this reflected in the profile of the group leaders you have?

STEPHEN: Structural biology has become more interdisciplinary. You can't afford to just do one technique like X-ray crystallography; you have to master the biology, the biochemistry and several biophysical techniques. In recent years, we've recruited people who have electron microscopy experience, people who introduced new technologies for expression of proteins and protein complexes and even non-structural biologists who bring a different perspective. This creates a broader environment and hopefully keeps us ahead of the field. The nice thing about EMBL is that you do have these opportunities every few years to recruit new group leaders.

ELENA: What is the profile of the people you now want to recruit?

STEPHEN: We need people who are interdisciplinary but also real experts in at least one structural biology technique. They



Stephen Cusack and colleagues' work on influenza polymerase led to an EMBL spinoff company, Savira Pharmaceuticals, whose aim is to develop new anti-influenza drugs. Figure shows two different inhibitors (yellow, grey) bound to two metal ions (magenta) in the cave-like active site of the endonuclease domain of the polymerase (green). Such inhibitors can block the replication of influenza virus in infected cells.

also need to have a much broader vision of what's important in biology, and, with the advent of genomics, that has changed a lot. The last person we recruited is a structural biologist and his interest is in long non-coding RNAs and their complexes with proteins, this is currently a very hot topic.

ELENA: The Grenoble Outstation has been very successful in integrating with the Synchrotron but still you maintain the EMBL flair. How do you do this?

STEPHEN: It goes back to one of the original ideas of John Kendrew. If you're doing forefront research then you require forefront technologies and you may need to develop them in order to be able to do your research. Our philosophy is to focus firstly on the scientific goals and then develop technologies that are needed to achieve those goals.

ELENA: Was this integration with the Synchrotron part of a vision you had from the start or has it grown over time?

STEPHEN: For the first ten years I was in Grenoble no one knew the ESRF would be built here, but the coming of the ESRF was an enormous opportunity, and it is the key to our current success here. I made a big effort to find a way EMBL could become involved in the ESRF while still maintaining its own identity. We've done that through our instrumentation developments and also in exploiting to the maximum what the ESRF can do for challenging structural biology projects. Lennart Philipson advised me to think where we wanted to be in ten years and then find a way of getting there. I think that's what we've done. I always wanted to keep the collaboration with the ESRF at the forefront of our activities.

ELENA: You've also been involved in several European-wide structural biology initiatives. What is your take on what genomics initiatives have brought to the community. What is the future for this kind of initiative?

STEPHEN: The structural genomics initiatives forced people to look at how they could make the process of protein production, crystallisation and structure determination more efficient. It promoted new technologies and new ways of thinking about how to do structural biology. In Grenoble we took the opportunity of the European structural genomics initiatives to introduce novel expression technologies and crystallisation facilities. These have now become platforms available to both local and outside users, which is a development that wouldn't have happened so fast otherwise.

ELENA: What's next?

STEPHEN: The Synchrotron model for user access has been extremely successful and is now applied to other major technologies, such as NMR (nuclear magnetic resonance) and electron microscopy (EM). EM is now undergoing a major revolution and everyone needs the most expensive equipment because that gives you the best data. It's very interesting that at the Diamond Synchrotron they are opening an advanced EM facility, which they are going to run as a Synchrotron beam line in terms of user access. I hope it's successful.

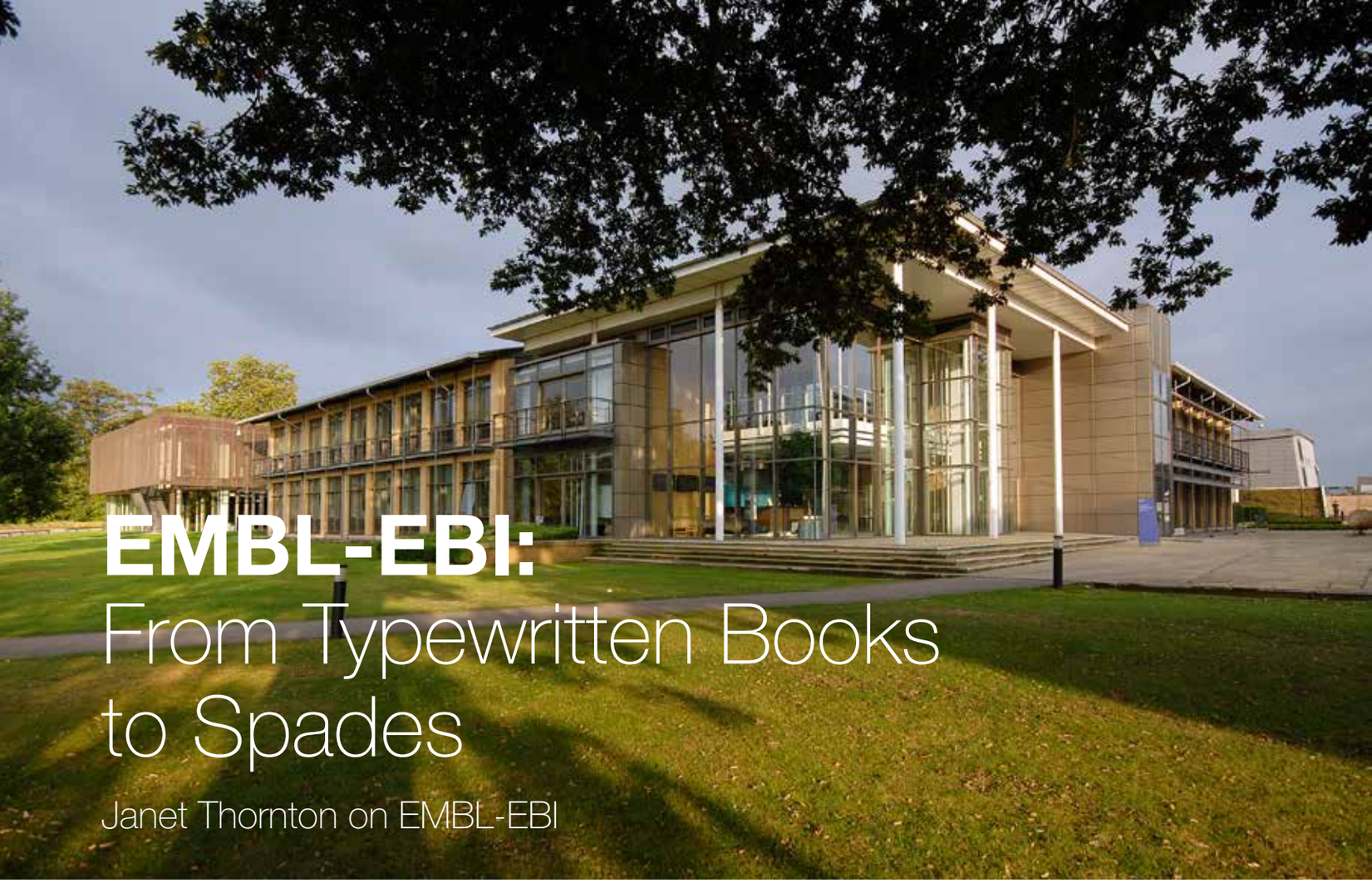
ELENA: What do you think is the future of structural biology and the role of the Grenoble Outstation?

STEPHEN: This is not quite so obvious as it might have been 10 years ago. For me the future of structural biology is moving it into the cell in order to get high resolution structures in the cellular context. This is critical for many systems that only really exist in a cell and for this the technologies are being developed: super-resolution microscopy, very big advances in cryo-electron tomography, *in situ* NMR. We need to be involved. However, the Grenoble Outstation is a small place that at the moment is most focused on using synchrotron radiation. My hope is that now the French National Structural Biology Institute (IBS) has moved on to the same EPN campus (European Photon & Neutron science campus) as the international organisations EMBL, ESRF and ILL (Institut Laue-Langevin), we can establish some kind of campus imaging centre, which will cover atomic resolution imaging, super-resolution microscopy and electron microscopy. This would be the goal for me in the next five to ten years.

Stephen Cusack, Head of EMBL Grenoble, 1977-present

Elena Conti, Director of the Max Planck Institute of Biochemistry, Munich

EMBL Group Leader, 1999-2007, Structural and Computational Biology



EMBL-EBI: From Typewritten Books to Spades

Janet Thornton on EMBL-EBI

ANGUS: Would the field of bioinformatics today have been very different if it hadn't been for EMBL?

JANET: As we know, science often advances simultaneously in different places around the world and EMBL was a critical part of developing organised data resources, starting from the DNA sequence data library in Heidelberg. Computational biology is now very well embedded in the broadest scientific research programmes. EMBL-EBI started out as the data library for nucleotide sequences and then the whole Outstation had to develop because of the rapidly increasing scope of the task. EMBL-EBI was established in response to the need to develop these very large scale data resources. These resources make the data openly accessible for researchers worldwide and this aspect has probably had the largest single impact, in terms of empowering research across the globe. It is very clear that the world would be a different place had EMBL-EBI not been established.

ANGUS: So, do all molecular biologists now need to be code writers?

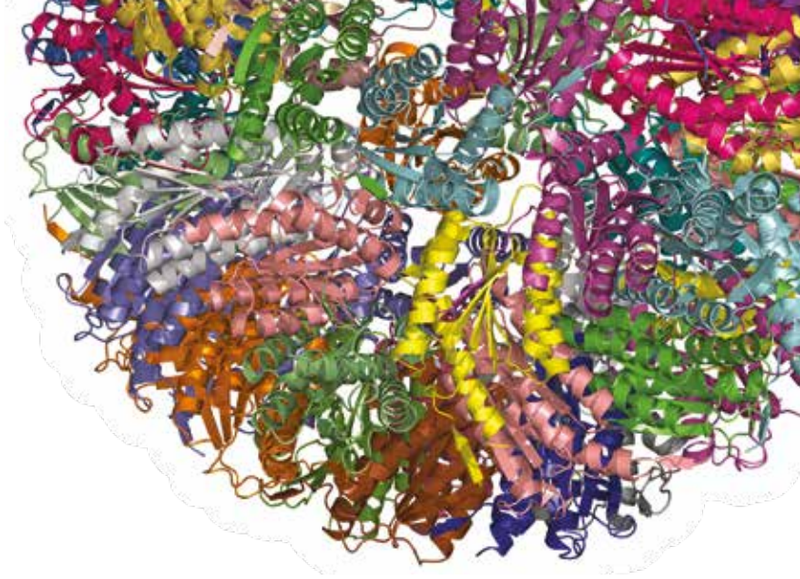
JANET: I don't believe that all molecular biologists need to be programmers but I do think that most molecular biologists at the forefront of research will also have to be relatively expert in data handling and interpretation. The research leaders of the future will combine both aspects.

ANGUS: Do we need to find new ways of training people to make sure that they have backgrounds in both disciplines?

JANET: Yes, but I'm very wary of making scientists jacks-of-all-trades and masters of none. Because now it's so much easier to generate very large amounts of data, the time needed to interpret that data is often longer than the time needed to capture the data, and so the balance between experimental and computational work is changing rapidly.

ANGUS: How do you balance research activity with service provision?

Interview by **ANGUS LAMOND**



JANET: EMBL-EBI is very proud to have both and this is key to our success. Our general principle is that we provide data services for the world. In parallel we require that there are people within the institute who are using these data for research. Several of the service teams also have a research component, which often also includes really novel technologies, methods and discoveries.

ANGUS: What are the pros and cons of EMBL-EBI now being a bit isolated geographically from what you call wet lab researches?

JANET: Our isolation has allowed us to develop a very positive services culture and this allows us to interact with many experimental biologists and with multiple labs around Europe. We have become totally outward facing in the way that we think and operate.

ANGUS: How do you cope with the many different demands that the EMBL-EBI must get from all the different funders and governments?

JANET: There are a lot of demands, the largest of which over the last seven years has been setting up ELIXIR.

ANGUS: Has EMBL-EBI become a state monopoly, or do you feel that you really do respond to your consumers – biologists out there doing research?

JANET: We do walk a tightrope because to develop good robust services really demands expert software testing that cannot be achieved overnight. The planning, the strategising, the thinking has to be done well in advance. The demand is enormous. We could be twice as big and still not fulfill the requests that we receive. Every service has an international advisory committee that meets once a year. We have about 30 advisory committees in total. While we do our best to engage with our users, it always remains a challenge to respond as they would want us to.

ANGUS: How much variation do you feel there is across the member states of Europe?

Janet: The situation in the different member states with respect to biological data and biological research is incredibly varied, but we also have ELIXIR forging a federated infrastructure around Europe. ELIXIR encourages each of the member states to look at its own provision of infrastructure for biological data and work out what its priorities are. The goal for ELIXIR is to join all of this up in a complimentary way, so that we are actually helping each other by specialising in those areas that we want to specialise in.

ANGUS: What EMBL-EBI achievements are you most proud of?

JANET: It gives me pleasure to think of all the people who came to us, did excellent science and have gone on to really help build science around Europe. I'm proud of the scientific research and discoveries that have been made in individual groups within the EMBL-EBI. I'm also proud of ELIXIR. It's got to prove itself now, to become a force not just in Europe but in the world.

ANGUS: How does big data impact on EMBL-EBI and can you cope with it?

JANET: We really do have big data. We have 46 petabytes of storage. Transferring data around at this scale is a major technological challenge, so we have had to develop novel tools, building on progress made by others to do so. I think that the new algorithms that are being developed in multiple different spheres of life will be applicable to some of the biological data and will have an impact in the future.

ANGUS: How do you see the role of the EMBL-EBI in the larger context of bioinformatics throughout the scientific world?

JANET: We see ourselves as part of the global ecosystem of data resources. Almost all of our big data resources are part of international consortia. We see a role for EMBL-EBI as storing the public reference data (in a sense, the encyclopedia of life), which for example will help clinicians interpret the genome of their patient. Capturing that knowledge and making it available to everyone is our strategy and the role of the EMBL-EBI going forward.

Janet Thornton, EMBL-EBI Director, 1994-present

Angus Lamond, Professor, Dundee University

EMBL Group Leader, 1987-1995, Genome Biology

EMBL Monterotondo: Organismal Biology – Human Disease Models

Philip Avner on EMBL Monterotondo

Interview by **ANNA TRAMONTANO**

Photo from Walter Witke

Move from Heidelberg to EMBL Monterotondo, 1998.

Opening of the EMBL Monterotondo Mouse Facility, 2003. From left: Fotis Kafatos, Nadia Rosenthal, Christian Boulin.

ANNA: You started as a yeast geneticist. How did you go from yeast to a mouse, to be the Head of the mouse biology Unit?

PHIL: I actually started off studying agricultural botany, and working on chloroplast biology. I then switched for my PhD to studying oxidative phosphorylation and mitochondrial metabolism and my professor had the insight to encourage me to move to using a genetics approach in yeast. After a first post-doc on yeast genetics, I had a second postdoc opportunity with François Jacob at the Institut Pasteur and switched this time into mammalian developmental biology and mouse developmental genetics.

This itinerary sensitised me to the variety and complexity of different systems because there is obviously a lot of difference between studying mitochondrial genetics in yeast and non-mitochondrial genetics in humans and mice. So my career has been quite diverse in switching at least in part from the study of monogenic genetic traits to polygenic traits and more recently epigenetics.

ANNA: And then you became the Head of Outstation, which means you have other roles besides that of doing fantastic science. How do you feel about that?

PHIL: I'm here because I wanted to be here, and hopefully the EMBL are happy for me to be here. While I was still at the Institut Pasteur, I became Head of Department, a role I held for six years. I liked the idea of being able to use more widely the insights that I'd gained at Pasteur to motivate people and to participate in strategic planning in another context. And I was interested to experience another administrative system, another type of scientific institute.

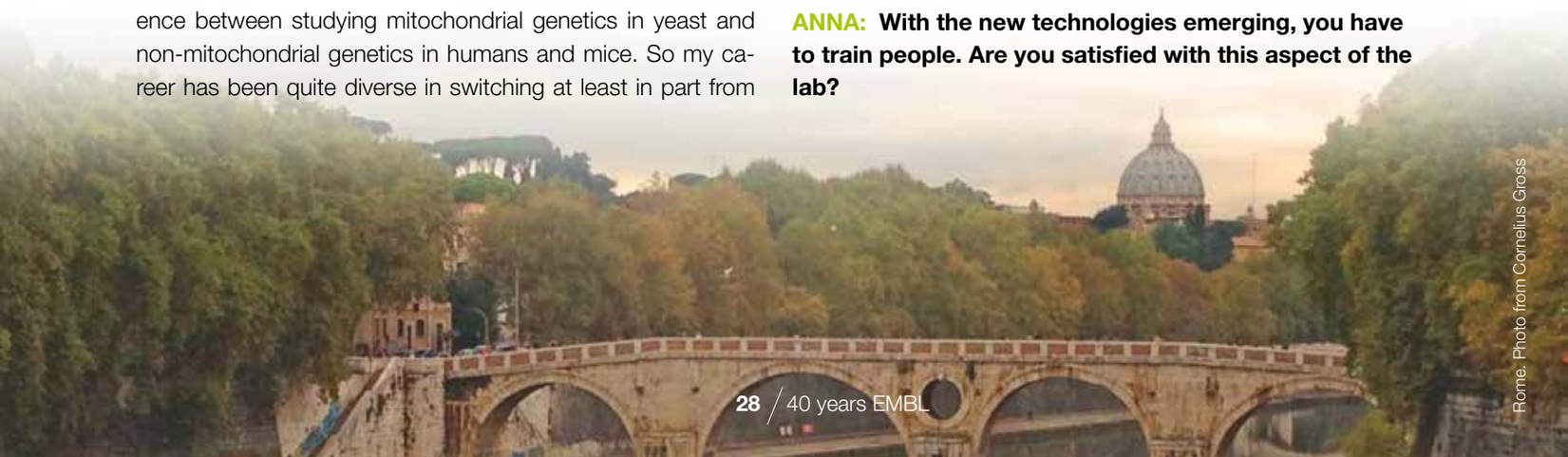
ANNA: What are the achievements of the labs since you have been here?

PHIL: I took over a working Outstation from Nadia Rosenthal. Nadia did a very good job to build the Outstation up to what it was. When I took over, a lot of the research groups were starting to come to maturity, and this is reflected in the increased number of ERC awards and publications

ANNA: One of the challenges is that you have a very diverse Outstation, from gene expression, to behaviour, perception and development. How do you make sure people talk to each other here?

PHIL: Monterotondo is some 30-odd kilometres outside of Rome and therefore a little isolated. That has however a major upside in that it means people tend to talk to each other because they have nowhere else to go! It has led to a very cohesive, very interactive set of Group Leaders. The PhDs and Postdocs who come have been receptive to that atmosphere. We are very collaborative, very flexible and dynamic in our approaches and I try to capitalise on this natural tendency.

ANNA: With the new technologies emerging, you have to train people. Are you satisfied with this aspect of the lab?



Rome. Photo from Cornelius Gross

PHIL: We benefit from the fact that EMBL has excellent cutting-edge core facilities and a remarkable training / conference programme. We have however to be realistic about what high technologies we can implement on site and what we should do remotely. So we know that most live imaging has to be done on site, but that sequencing for example doesn't have to be. Being well integrated and profiting from EMBL is not enough though. There are several very interesting cutting-edge technology centres in Italy and building links to them would be of considerable interest both in terms of technology implementation and in enriching our external collaborations.

ANNA: Do you have many collaborations in Italy?

PHIL: There are a certain number, but certainly not as many as I would like. I've made it a goal for the Outstation to try and improve that situation. We're putting in place PhD programmes with Italian universities, for example with La Sapienza in Rome. We are also setting up joint seminar programmes in Rome and elsewhere in order to reinforce our local networks.

ANNA: Nowadays there is this push for scientists to engage with the public. Do you, the Outstation in particular, make an effort to engage with people especially on the topic of experimental animals?

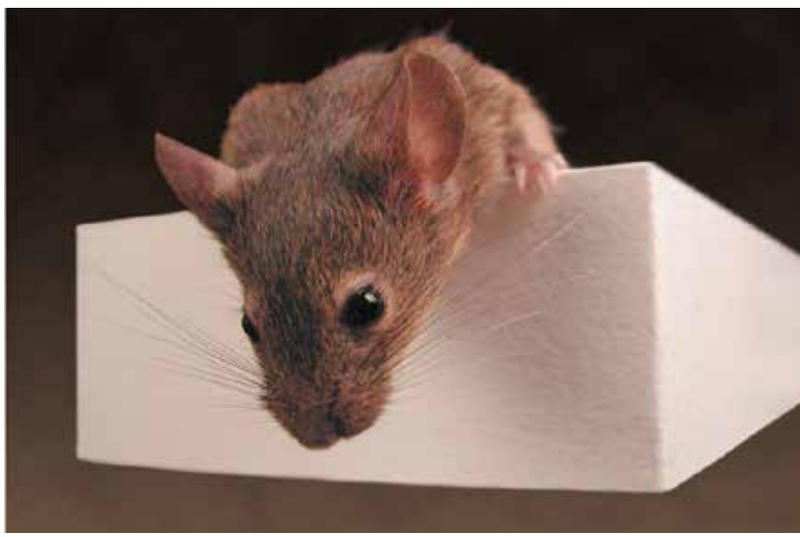
PHIL: Our large experimental animal facility is both critical to research at Monterotondo and an area that is both politically and socially extremely sensitive. We hold seminars to sensitise our collaborators to the subject and to provide them with the tools to engage in discussions with the community. This involves being honest, acknowledging that we do experiments on animals, explaining however that we have the best possible conditions, enrichment processes, health and sanitary status and that we do our maximum to restrict our animal use.

ANNA: So you mentioned being a bit isolated out of Rome. Is this a problem for your visiting students?

PHIL: We have a large number of trainees and a good representation of PhDs and Postdocs. Our position a little outside of Rome is not perceived as negative by the students, and we do not appear to suffer in terms of their recruitment. I think the challenge is more in terms of day-to-day interactions with non-EMBL scientists. I would like to feel that my PhD students and more generally the science personnel on site had a richer daily environment with more opportunities to interact aimlessly over a beer or coffee – which is when a lot of interesting science gets done.

ANNA: Would you apply to be a PhD student at this place today?

PHIL: Certainly, I would apply with pleasure. It's a really happy community. Monterotondo, benefits from a very good scientific environment: in terms of available experimental systems and core facilities, in terms of day to day stimulation and in terms of its various seminar programmes. I think it is exceptional.



Philip Avner, Head of EMBL-Monterotondo, 2012-present

Anna Tramontano, Professor of Biochemical Sciences, Sapienza University, Rome

EMBL Staff Scientist, 1988-1991, Structural and Computational Biology

EICAT –The Torch of Knowledge

For nearly four decades EMBL has organised practical courses and conferences for scientists in its member states and worldwide, many of them funded by EMBO. Initially, a small group of dedicated staff worked together with scientists to organise these very popular events on a relatively informal basis. Some events were recurrent – such as the Transcription Meeting or the Mouse Meeting – which made EMBL the biannual gathering place of different international scientific communities, whilst some were spontaneous. For more than 30 years, EMBL has also been the home of the EMBL International PhD Programme, under whose auspices bright students from Europe and beyond aspire to carry out their graduate studies in the laboratory of a group leader at one of the EMBL sites. Both Internal Training, such as the EMBL International PhD Programme (EIPP), as well as External Training, organised mainly by the EMBL Courses and Conferences Office (CCO) and the Training Programme at EMBL-EBI, have long been hallmarks of EMBL.

EICAT – the EMBL International Centre for Advanced Training – is the showcase for EMBL training, both Internal and External. EICAT was born in 2005 from the desire to integrate scientific training activities and thereby promote mutual cross-fertilisation and sharing of best practices in training at EMBL. With the creation of EICAT, EMBL recognised the need for a home to host its training activities. With the generous gifts of the Klaus Tschira Foundation, the German Government and EMBL Council, a spectacular venue – the Advanced Training Centre (ATC) – opened its doors in 2010, and the stage was set for EMBL's External Training in Heidelberg to reach a new dimension and secure EMBL's reputation as the European equivalent to Cold Spring Harbor.

Matthias Hentze, EMBL Director, 2012-present; Associate Director, 2005-2012. At EMBL since 1989

Anne Ephrussi, Head of EICAT, 2005-present; Head of Developmental Biology, 2007-present. At EMBL since 1992.

External Training

Community building through training

A main aim of EICAT is to promote, organise and coordinate training activities at EMBL across its five sites. EICAT's Courses and Conferences Office, together with the EMBL Courses and Conferences Committee, strives to offer an exciting and diverse palette of courses and conferences at the forefront of the life sciences to researchers, in particular those at an early stage of their career. EMBL's first officially recorded practical course took place in 1977. EMBL now welcomes thousands of attendees each year to its five sites and many more through off-site courses and workshops.

The newly built ATC, with its double-helical architecture, houses a spacious yet convivial auditorium, and its spiralling and lofty poster area is a highly sought venue for EICAT training activities in Heidelberg. Since 2010, external training events have been held in the ATC. The new venue, together with the highly professional staff of the Courses and Conferences Office, has allowed EMBL to expand its programme to include newly emerging and important topics beyond those currently represented by EMBL research.

At the end of 2013, the opening of the EMBL-EBI south building on the Wellcome Trust Genome Campus in Hinxton heralded a new era for their contribution to the EMBL Courses and Conferences Programme. The new purpose-built training and media facilities significantly increase EMBL-EBI's training capacity and will streamline the development of its online courses, helping EMBL meet increasing demand for bioinformatics training.

In addition, EICAT's External Training team manages the Visitors and Scholars Programme, which allows scientists from all over the world to collaborate and pursue their research at EMBL for a limited period of time and thus benefit from the expertise of the host labs.

Jürgen Deka, EMBL Scientific Coordinator, EICAT, 2013-present

Internal Training

Trend-setting innovators: EMBL's graduate training and its students

EMBL's 40th anniversary follows on the heels of the 30th anniversary of the EMBL International PhD Programme (EIPP), which was started in 1983. In these early days, it could hardly be foreseen that the still relatively informal departure from individually hiring PhD students by group leaders to a concerted recruitment with international emphasis would become a model of how a large and increasing number of research institutes and graduate schools throughout Europe conduct their graduate education. Dedicated, individualised mentoring, a thesis advisory committee for every student, a core course that introduces new students to the science at EMBL and fosters community building of each new class were gradually introduced, often first at EMBL and then mirrored at other institutions. By its 15th birthday, EIPP had become the first non-University PhD programme with the right to award its own PhD degree. Following its tradition of taking non-obvious steps to connect with the research communities in Europe, the EMBL stand-alone PhD degree has not been awarded a single time since, but became the cornerstone of 25 partnerships for joint PhD degrees with top universities across the continent and beyond. Equal to the leadership of EIPP, its students have been trend-setting innovators, first and foremost through the EMBL PhD Student Symposium, initiated in 2000. This entirely student-organised conference attracts world-leaders in cutting edge research fields year after year, and is now in the company of cousins organised by other international PhD programmes.

Because post-doctoral training is inherently even more geared towards independence than doctoral training, the introduction of a Postdoctoral Programme seemed counter-intuitive for many years. However, the benefits of concerted recruitment, individual mentoring and access to additional skills training were so clearly demonstrated by EIPP that EMBL introduced a more organised Postdoctoral Programme about a decade ago. A hallmark of EMBL's faculty are its young (and often still little known) group leaders, which makes it harder to recruit the best postdocs who typically seek out the world leaders in their fields of interest. EMBL's solution to this challenge were the EIPODS, EMBL Interdisciplinary Postdocs, named to sound like the most fashionable Apple product of those days. Building on the EMBL strength of interdisciplinarity, two group leaders from different disciplines would offer postdoctoral projects co-mentored by both. What started as an experiment has again developed into a highly successful, and now widely known way to conduct postdoctoral training, and has inspired similar programmes at leading institutions throughout Europe and beyond.

Dynamics and creativity permeate all aspects of EMBL life. Just like its science, training at EMBL continues to strive for the best and most innovative ways to help its constituents realise their potential and find their place in the world.

Helke Hillebrand, Academic Coordinator and Dean of Graduate Studies, EICAT, 2008-present

How to get involved in EMBL training

If you would like to hold a course or conference at EMBL, EICAT will work with you to develop the concept, apply for funding and organise the activity. With the EICAT support network, organising courses and conferences is easy and enjoyable, as you don't have to worry about the non-scientific organisation and budget handling. To discuss in more detail, contact juergen.deka@embl.de

Organising courses and conferences really helped establish my external scientific profile early in my independent career. Courses in particular are also great fun because the participants develop team spirit. I can only recommend to young group leaders to use this channel to build rewarding connections and start fruitful collaborations. At EMBL we offer a diverse training programme for scientists at all levels to develop their careers.

Iain Mattaj, EMBL Director General

ELLS – Bridging the Gap between Research and Schools

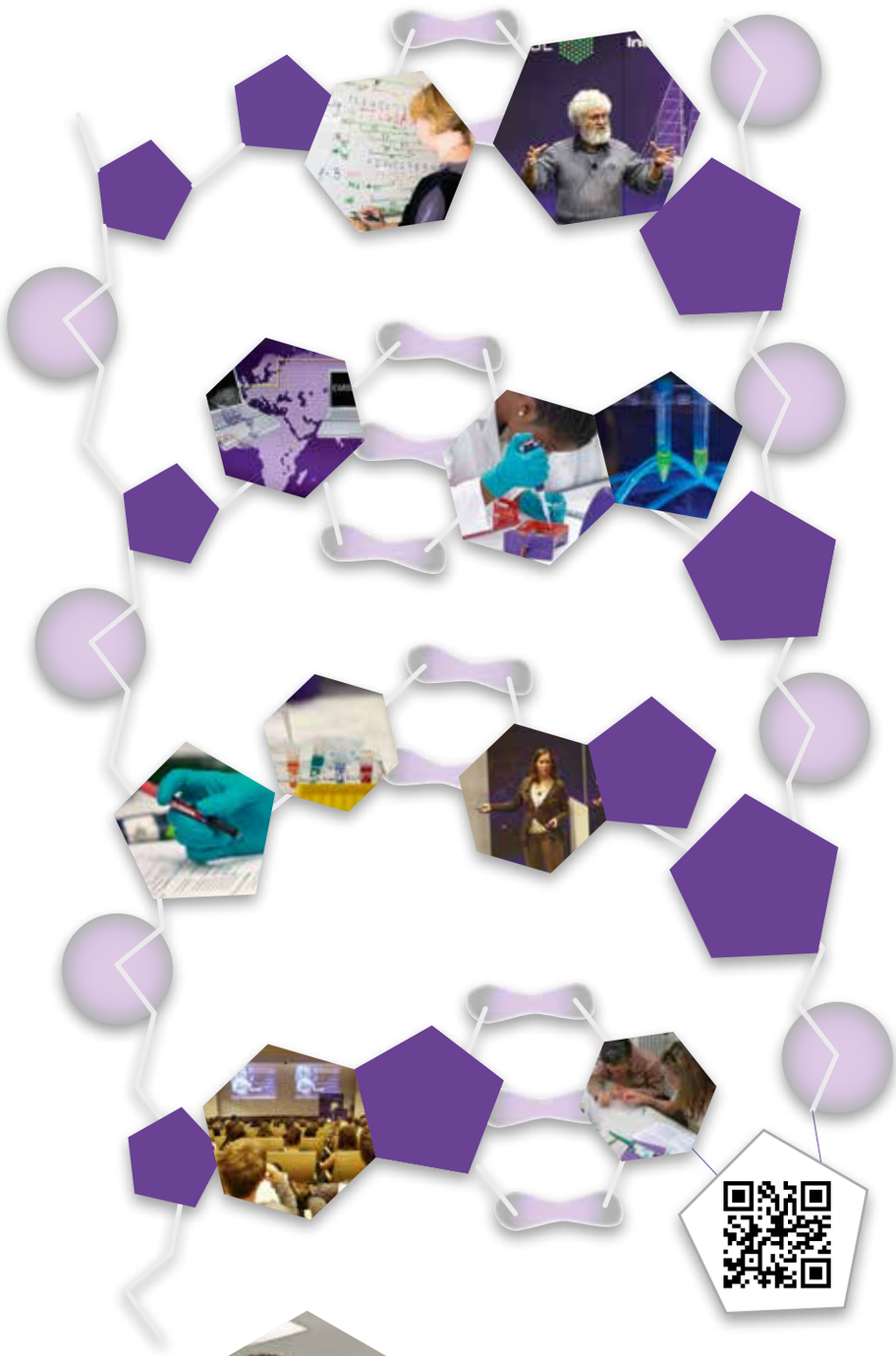
Research in the modern life sciences is moving forward at a tremendous pace and is generating massive amounts of data and new insights into the molecular principles of life. More than ever it is essential for science teachers to stay up-to-date and to refresh their knowledge continuously. Representing an important professional group that can directly spark young people's interest in science, teachers can take the role of door openers for a huge pool of talented future scientists and help to better prepare the general public for the decisions that it needs to take.

EMBL launched the European Learning Laboratory for the Life Sciences (ELLS) in 2003 to address the demand for continuing professional development of secondary school science teachers. ELLS aims to bring teachers and students into the research lab, providing exciting hands-on encounters with state-of-the-art molecular biology techniques and bioinformatics resources. Engaging teachers with contemporary science and bringing them in contact with the research scientists pursuing their investigations at the forefront of science is a hallmark of ELLS' actions.

ELLS organises a wide range of training opportunities to bring modern life science concepts into the classroom. High school science teachers are supported to further develop their hands-on expertise and to refresh their content knowledge during the *ELLS LearningLABs*. These multi-day workshops for international groups of teachers bring the participants in contact with the institute's vibrant scientific environment with a blend of practical experiments, presentations by EMBL scientists and visits to world-class research facilities. The ELLS team closely observes newly emerging research areas and is continuously exploring ways to include them in the training portfolio.

In addition to face-to-face training courses, ELLS offers training via the internet. The *ELLS Webinars,* for example, are online seminars presented in the ELLS virtual auditorium, where EMBL scientists share research results in clear and engaging presentations. A similar format is offered to students via the interactive *ELLS Science Chats*.

The full portfolio of ELLS activities and the latest news on science education-related topics is available on the ELLS teachers' portal **EMBLog** (www.embl.org/ells).



Philipp Gebhardt, EMBL Head of ELLS, 2008-present

Eva Haas, EMBL Junior Education Officer, ELLS, 2013-present

Making Sense of the Life **Sciences** and their Impact on **Society**

During the last quarter of the twentieth century, an important increase in interest in molecular biology and a change in its perception by the public took place. With the advent of the new biotechnologies and their application to food production, pharmaceuticals, and biomedicine during the 1970s, '80s, and '90s, common knowledge of molecular biology spread far beyond academic boundaries. In the process, biology became semantically invested with a panoply of socio-economic, regulatory, and, ultimately, moral significance. New forms of knowledge about the workings of biology, ranging from plain supermarket wisdom to highly sophisticated inter-disciplinary think-tank expertise developed and spread throughout society.

Faced with such growing public involvement and exposure, the number of scientists who became engaged in promoting a better understanding of science among the public, dialoguing and debating about how science can best serve society, increased. As flagship scientific organisations and training institutions in Europe, EMBL and its sister organisation, EMBO, have been at the forefront, actively incorporating these important concerns within their institutional frameworks. As a leading European research laboratory, EMBL recognises its obligation to expose its scientists to the evolving social concerns and ethical debates relating to applications developing from the life sciences. EMBL sees the importance of engaging scientists to reflect seriously and participate effectively in science/society interactions.

To this end, the Science and Society Programme was launched at EMBL in 1998 and it has become an integral part of scientific life in the Laboratory. A variety of activities and events organised at the different EMBL sites bring together members of the life science community, scholars of other disciplines, as well as members of the public, for discussion and communication extending beyond professional boundaries[1]. Some of the EMBL Science and Society activities are targeted exclusively at the EMBL research community, while others are directed towards a broader audience and are open to the general public.

The EMBL Science and Society Programme has initiated highly successful collaborations, primarily with EMBO, but also with other leading life science and cultural institutes in the area, jointly organising thematic symposia and yearly interdisciplinary conferences[2]. In 2001, EMBL Heidelberg, the Deutsches Krebsforschungszentrum (DKFZ), and the University of Heidelberg launched a public seminar series, 'Heidelberg Forum – Biosciences and Society', aimed at informing and engaging local audiences[3]. The EMBL Science and Society Programme has edited and produced several special issues dedicated to Science and Society published by high-quality journals, promoting its communication at large and reaching broad audiences. These are freely accessible to the public via the internet[4].

The life sciences have enormous potential for further development and practical application. However, a popular consensus needs to be developed as to how to assess and deal with the diverse repercussions of such development. More than ever, in the years ahead, there will be a need for interdisciplinary dialogue to inspire synthetic insights and a common world view. The new ways in which science is now being applied for the production of knowledge and economic wealth must be carefully adjusted to public interests and the value systems across Europe. It is the common responsibility of all, scientists as well as non-scientists, to engage in an ongoing process of carving out a shared understanding of science. The EMBL Science and Society Programme will continue to work towards that important goal.

Halldór Stefánsson,
EMBL Programme Manager, Science & Society, 1998-present

1 http://www.embl.de/aboutus/science_society/index.html
2 http://www.embl.org/aboutus/sciencesociety/conferences.html
3 http://www.embl.de/aboutus/science_society/hd_forum/index.html
4 http://www.embl.org/aboutus/sciencesociety/publications.html

EMBLEM Technology Transfer 15 Years Innovation Works™

The technology transfer activities of EMBL are carried out exclusively by EMBLEM Technology Transfer GmbH, the wholly owned limited liability company of the institute. Established in 1999, EMBLEM is celebrating its 15th anniversary this year with a strong track record of successes and achievements. We identify, protect and commercialise intellectual property developed in the EMBL world, from EMBL alumni and from third parties including the Life Science Faculties of the University of Heidelberg. EMBLEM's pro-active technology transfer approach ensures the rapid commercial development of promising innovations while concomitantly securing the free dissemination of knowledge for basic research purposes. Together with our associated venture capital fund, managed by EMBL Ventures, we help in the creation and financing of start-ups in the life sciences.

The success of the technology transfer activities is reflected both in the broad engagement of scientific staff. Over 500 EMBL scientists are on record as inventors with nearly 700 invention records, as well as in the more than 250 satisfied commercial licensees of EMBL technologies, more than half of whom are recurring customers interested in establishing a long-term relationship with EMBL and EMBLEM. EMBLEM manages a portfolio of more than 200 granted patents and patent applications, 120 copyrights and trademarks and 16 spin-out companies.

EMBLEM Technology Transfer in numbers (1999-2013)

	Total 1999-2013
Invention Disclosures	689
No. of EMBL Inventors on Record	503
Income to date	52.5 m €
License & Collaboration Contracts Concluded	>2,500
Priority Patent Applications Filed	282
Copyrights	98
Patents Granted	>150
Number of Commercial Licensees	>250
Start-Ups Created	16

Gábor M. Lamm, Managing Director, EMBLEM, Heidelberg

EMBL predoc, 1989-1994, Genome Biology

EMBL **Ventures**

EMBL Ventures is the venture vehicle of EMBL. Established in 2001, we currently manage two Funds with a total of €68 million on behalf of private and institutional investors. An element that sets us apart from other venture investors is our strong ties with our funding cornerstone investor EMBL and its technology transfer organisation EMBLEM, one of the leading technology transfer organisations in Europe.

Clockwise: Juliane Gassert, Office Management; Jan Adams, Managing Director; Peter Pack, Managing Director

Stefan Herr, Managing Director

EMBL predoc, 1989-1993, Biochemical Instrumentation

At EMBL Ventures we originate, build and finance companies based on technologies with game changer potential developed at EMBL, by EMBL alumni and by third parties in Europe. Areas of interest are drug development and technology platforms in general but also diagnostics and medical devices. Inflammation, Immune Therapy, Oncolytic Viruses and Anti-infectives are of particular interest.

We invest up to €8 million, initially typically €2-4 million. The capital invested comes along with our expertise and the active engagement of the team. To date, EMBL Ventures has invested in sixteen companies that received at total financing of more than €200 million and that have generated a transaction volume of more than €1.5 billion in risk-sharing deals with pharma partners.

We all have a scientific education and share a common history of several years of venture investing and a passion for building successful ventures from the core. We are recognised in the community as a dedicated and incisive investor delivering results. Please come and see us to talk about your ideas at any time.

EMBL Core Facilities – per aspera ad astra

The Scientific Core Facilities Unit was founded in 2001 under the leadership of Christian Boulin who sadly passed away earlier this year. It is based on the successful model of the successful model of the Advanced Light Microscopy Facility (ALMF), which was launched in 1998. Today the Unit offers cutting-edge services in protein expression and purification, proteomics, genomics, electron microscopy, flow cytometry, advanced light microscopy and chemical biology.

The Unit's role is not restricted to providing an outstanding service to EMBL researchers, but also supports visiting scientists coming either from EMBL member and associate member states, via the EMBO young investigator programme or other EMBL partnerships. EMBL's Core Facilities serve on average 1000 users annually, of which about 350 are external visitors from 25 different countries. Many ambitious scientific projects are achieving their goals with significant contributions of the state-of-the-art instrumentation and expertise available in the Core Facilities. This invaluable input provided by Core Facilities during the 13 years of their existence has been explicitly acknowledged in hundreds of articles in high-impact scientific journals.

In order to stay at the cutting edge with the technologies offered, the Core Facilities collaborate closely with leading industrial partners operating in the respective fields. These collaborations enable Core Facilities and their users to access the latest developments on the market, sometimes before they become commercially available.

The Core Facilities are committed to the training programmes offered to the visitors, students and young researchers working at EMBL. They are also a strong component of EMBL's outreach since they interact with many other laboratories from the member states and beyond. They have been the driving forces and active partners of technology-specific international core facility networks such as the Protein Production and Purification Partnership for Europe (P4U), the European Cytometry Network (ECN) or the European Light Microscopy Initiative (ELMI).

Core Facilities members from left to right: Rainer Pepperkok, Vladimir Benes, Jeroen Krijgsveld, Yannick Schwab, Joe Lewis, Alexis Perez Gonzalez, Huseyin Besir.

Rainer Pepperkok, Head of Core Facilities and Scientific Services. Head of Advanced Light Microscopy Core Facility. At EMBL since 1998

A Long-standing **Partnership**

It is a pleasure to write this appreciation of the European Molecular Biology Laboratory (EMBL) on the occasion of its 40th anniversary. EMBL and EMBO have a shared history that includes many achievements. Confusion sometimes exists in the external scientific community about our roles but our relationship is strong and long may it continue.

When EMBO officially acquired legal status on 12 July 1964, one of the objectives was to develop an environment conducive to the creation of a central laboratory for molecular biology. Establishing the Laboratory was challenging as documented in other contributions here but this goal was achieved in 1974. Since its foundation, the growth and achievements of EMBL have been spectacular. It has become a world-class Laboratory for interdisciplinary research, a jewel in the crown for European science. In addition to outstanding science and the provision of much needed scientific services, it has helped to promote the mobility of excellent young scientists to other leading laboratories throughout the world.

I would like to thank EMBL Director General Iain Mattaj personally for all the assistance he has provided to EMBO over the years. I wish EMBL continued success and I look forward to further collaboration to advance the life sciences in Europe and beyond.

Maria Leptin, EMBO Director, 2010-present

Memories of EMBL's former Directors General

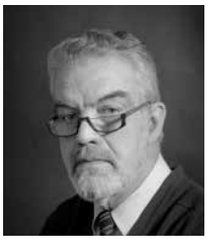
John Kendrew, Project Leader and EMBL Director General, 1974-1982

Sir John was the first Director General (DG) of EMBL (1975-1982). He was the only one who could bring the EMBL project to fruition and persuade the governments to participate because he had the political clout through his Nobel Prize and position as scientific advisor to the British Defense Ministry.

Sir John had a clear vision of how the EMBL should be structured. He did not want any large research groups. Most senior scientists rejected his offer – if they received one – because Sir John promised them almost nothing. EMBL was populated by eager young scientists with small groups and this was what Sir John had in mind. He also wanted the scientists to be located almost at random in the Labs with the hope that unsuspected cross-overs and talks could lead to breakthroughs.

During Sir John's reign, synchrotron radiation was introduced into structural biology, vitrification invented as a method for cryo-electron microscopy, Janni Nüsslein-Vollhard and Eric Wieschaus did their pioneering work on genetic regulation of morphogenesis and cell biology became molecular at EMBL.

Even though staff did not see much of Sir John for his travels and work, he had an eye on all the on-goings in the Laboratory. In the evenings he would inspect the Labs. Once he noticed that name signs with titles were appearing on office doors, he had them removed. Sir John never spoke German during his time as Director General, but surprised everybody – also the cleaning ladies – by speaking fluently during a later visit when he was no longer Director General.

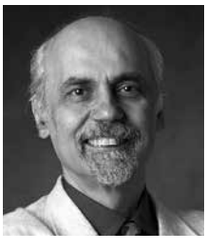


Lennart Philipson, EMBL Director General, 1982-1993

When Lennart became the Director General (1982-1993), EMBL was in full swing. The successes achieved during Sir John's time were not yet visibly acknowledged by the European molecular biology community. Recognition came later. So Lennart had to act to build up the reputation of the EMBL, which was constantly under fire from the member states.

Lennart introduced the programmes – Cell Biology, Gene Expression, Differentiation and Structures – that became a big success. He also introduced Biocomputing as a new programme and this became the focal point for bioinformatics in Europe and the precursor of the EMBL Outstation, the European Bioinformatics Institute in Hinxton (EMBL-EBI). Lennart also organised the career structure for group leaders with fixed term contracts up to nine years and rolling tenure, as well as the very successful EMBL PhD programme.

Lennart had a completely different personality from Sir John. He was constantly moving around in the Labs, and could suddenly appear at your office door. This was a bit scary because of his impressive stature – the Viking with a pipe in his mouth. He also talked with everyone, from scientists to the gardeners, the workshop staff, and the cleaning ladies. He usually had lunch in the canteen, and chose his table and lunch companions seemingly randomly. When Sir John had made a decision, it was final, and you could not argue. With Lennart it was different. He loved to argue, and would listen carefully to counter arguments which could change his decision, if he were convinced.



Fotis Kafatos, EMBL Director General, 1993-2005

As the first Southern European Director General, Fotis Kafatos was a dynamic new influence at EMBL. He dived into the job with his typical enthusiasm, overseeing the reconfiguration of EMBL bioinformatics and data services as the EBI Outstation on the Sanger Genome Campus in Hinxton, and establishing a new Mouse Biology Programme at Monterotondo near Rome. As a developmental biologist, he put an unapologetically embryonic spin on the Differentiation Programme at Heidelberg, renamed the Development Unit, whilst maintaining his own active research on the malaria mosquito.

His passionate involvement in European science politics was an integral part of his outreach mission at EMBL. He was instrumental in setting up the European Research Council, and acted as its first President and Chairman of its Scientific Council after his departure from EMBL.

Fotis brought a Mediterranean flair to the Laboratory, and like all good leaders, was secure in his opinions, whilst cautiously open to suggestion. Despite being more hierarchical in his leadership style than Lennart, he was warm and informal in his personal interactions. Who can forget the pitter-patter sound of those signature clogs in the halls of Meyerhofstrasse, or his infectious giggles, or his admonitions not to succumb to the "atmospherics" of an argument.

Kai Simons, Director Emeritus, Max Planck Institute of Molecular Cell Biology and Genetics, Dresden
EMBL Details: 1975-2000, Head of Unit, Cell Biology and Biophysics

Nadia Rosenthal, Director, EMBL Australia, Melbourne
Head of EMBL Monterotondo, 2001-2013

Oddi Neofilism 2010
Artists: The Tissue Culture & Art Project (Oron Catts & Ionat Zurr)
Commissioned for '21st Century: Art in the First Decade'
Images courtesy: Queensland Art Gallery / Gallery of Modern Art
Photography: Natasha Harth

Science and **Archives**

There is often a gulf between science and archives. Many scientists only think about preserving their published output in journals, while few archivists come to the profession with a scientific background. For the history of science to be properly recorded scientists need to think about their records and archivists need to broaden the range of their collections. EMBL's decision to employ an archivist during its 40th anniversary year will certainly help to bridge that divide.

Working as an archivist, I've encountered many people and organisations who have talked about preserving their heritage, but few have embraced it with the enthusiasm or commitment of EMBL. For an organisation that strives to provide world-leading scientific training to its researchers, this decision to care for its history offers the opportunity for those who pass through its doors to develop record-keeping skills.

Since the early twentieth century the Wellcome Library has been collecting material related to health and medicine. What and how we collect has evolved over the years as we've tried to address areas of concern or respond to changing circumstances to ensure our collections remain relevant. In the late 1970s this involved the formation of a centre dedicated to collecting contemporary medical material from organisations and individuals. Today, we have a strategy to help transform the Library from a physical resource into a ground-breaking digital library by focusing on core activities.

One of these core activities is targeted collecting; an attempt to make us more proactive and strategic in how we acquire new material. As part of this strand of work we launched the Human Genome Archive Project in January 2012 to preserve the documentary heritage of the UK's contribution to the Human Genome Project. This has changed what we collect in an attempt to not just preserve collections of Nobel Prize winners, but people who contributed at all levels to the sequencing of the human genome.

However targeted collecting, and even initiatives like the Human Genome Archive Project, can only take us so far. As a collecting repository our work is always going to be piecemeal. We are able to preserve collections from individuals and small organisations, but there is far more beyond that. Scientific institutions risk leaving a huge gap in the history of science by not preserving their heritage. Traditionally, the physics laboratories have been more proactive in managing their records and preserving their heritage with CERN being a notable example. But biomedical laboratories are starting to catch up. The Laboratory of Molecular Biology in Cambridge, UK (LMB) employed its first full-time archivist in 2001 and now EMBL has joined the club.

Jenny Shaw, Project Manager, Collecting Genomics, Wellcome Library, London

Breathing life into the past

An archive is a collection of recorded things that keeps our memory fresh and alive. It anchors knowledge to the vividness of people's lives and makes it tangible, closer, and breathable. For the past several decades archives have become an ever more valuable source of memory and reference among scholars in scientific institutions and research centers. In life sciences, such memory not only expresses itself in the collection of material objects like imaging techniques, tissues, samples, instruments, and experiment protocols but also in life histories of scientists who, through thick and thin, have become a part of the world they explore and reconstruct at the same time. Thus archives not only aim to keep the record of the scientific and institutional production in text and image in proper, but they also create a space for storing scientists' individualities through their personal stories, anecdotes and voices. In an archive, a rich and multifaceted domain is put together for next generations who can now situate and interpret their work and its transformation in the light of other's experiences summed over a long period of time, across continents, and beyond social, political, economic, institutional and disciplinary transformations. With such evocative qualities, archives help us see people, objects, and processes in their complex yet accessible nature.

Aslihan Sanal, Anthropologist in Residence, EMBL Hamburg, 2012-present

Saving the **Past**, Documenting the **Present**

To capture its own history and keep track of the heritage of molecular biology, the European Molecular Biology Laboratory (EMBL) launches an archive website to invite its staff and alumni for their contributions.

"Let's not wait until memories have faded and papers be discarded at the end of a career before deciding to save our heritage," wrote Sydney Brenner in 2007, in a letter announcing the donation of his papers to the Cold Spring Harbor Laboratory. The letter was a key document that gave rise to a new project at EMBL, the EMBL Archive. The community project, initiated by the EMBL Alumni Association Chair, Giulio Superti-Furga, is being rolled out in 2014 on EMBL's 40th Anniversary. At www.embl.org/archive, past and present staff from EMBL's five sites can now make valuable contributions such as letters, documents, pictures, lab books, diaries, and donations to support the processing costs of incoming collections.

"One mission of the archive is to safeguard EMBL's history in the face of its fast turnover," says Mehrnoosh Rayner, EMBL Head of Alumni Relations and project leader for this initiative. "While EMBL short-term contracts ensure that great minds return to their countries, they also mean that they take with them small chunks of EMBL history – their own stories. We would like to engage the community to help us piece this back together."

The archive will eventually offer a unique repository for molecular biologists, historians and philosophers of science to mine and explore the primary sources and original records of past research processes. "The discovery process is never as smooth as it appears in papers," comments Giulio Superti-Furga. "The interesting twists and turns, the characters and ideas that helped along the way may never be known unless somebody records it."

The first objective will be to systematically reconstruct the full picture of the past decades at EMBL: historical documents relating to the foundation of the institute and the establishment of the units, the most important scientific achievements along with the accompanying figures and records, personal correspondence between the main players, emails, perhaps even tweets.

The donations from the community will go towards sorting, cataloguing and digitising the material contributions, with the aim of making these available online in three years time. The project is being developed with the advice of archivists Jenny Haynes and Jenny Shaw from the Wellcome Library.

EMBL is in good company. Its archive will complement other existing molecular biology archives like those belonging to the MRC Laboratory of Molecular Biology, Cold Spring Harbor and the Weizmann Institute. What makes the EMBL archive unique however is its focus on the pan-European life sciences and the Laboratory's international approach to scientific collaborations.

Yvonne Kaul, Press Officer, EMBO, 2008 – present

Alumni Networking to the Benefit of All

EMBL's 6000 international alumni are a body of highly trained scientists, communicators and administrators, based predominantly in Europe, and connected to the Lab and one another through a lifelong network of friends and collaborators. More than one-third hold senior positions as professors, directors, group leaders and managers.

"We are ambassadors for the Lab and play a major role in its reputation, growth and continued success," says alumnus Giulio Superti-Furga, who combines his commitments as Scientific Director and CEO of CeMM in Vienna, with chairmanship of the EMBL Alumni Association board. "And as ambassadors we carry out critical objectives for EMBL in passing on our knowledge and expertise, and exporting concepts of the EMBL model and culture to our institutes."

EMBL and its Alumni Association work together to highlight the impact alumni are having worldwide via EMBL news channels, online resources, events and prizes.

EMBL staff share with us the role and value of alumni to them:

Alumni mean many things to me, both personally and as Director General. Every science or policy meeting I attend I meet alumni, friends and former colleagues who share the EMBL spirit and culture and with whom instant contact and understanding is possible. Many senior alumni also act as "national amassadors" for EMBL, spreading the EMBL model, explaining the activities and benefits of the Lab to policy makers and, crucially, supporting the essential EMBL turnover system by mentoring newly-arrived alumni and helping them acclimatise to and succeed in their new environment.

Iain Mattaj EMBL Director General

"EMBL alumni are a large group of friends who we never knew we had, and who can play a critical role in our life after EMBL."

Ramesh Pillai, Group Leader, EMBL Grenoble

"EMBL alumni are key to EMBL's reputation as an inspiring and great place to work. Passing on experience and knowledge of EMBL to their employers is as important as providing us with input and building networks for exchange on different Human Resources-related areas."

Elke Jagomast, Interim Head of Human Resources

"EMBL alumni are invaluable organisers and speakers at our conferences and courses, and many also contribute as participants. We very much enjoy this mutual relationship and hope to extend our reach deeper into the alumni network in the future."

Jürgen Deka, EMBL Scientific Coordinator

"Alumni are a great source of inspiration to me, especially when it comes to individual mentoring, tailored career advice and networking across Europe. I am very grateful for the EMBL alumni community's standing invitation to connect, and I feel honored about the opportunity to contribute to the careers of current EMBL fellows – our future alumni."

Helke Hillebrand, EMBL Academic Coordinator and Dean of Graduate Studies

"Our alumni are the extended EMBL community, a target audience for all our Science and Society activities. Ideally, the alumni, dispersed as they are throughout Europe and beyond, should serve as a channel to reach people in our member states to enhance their consciousness about the nature and impact of the life sciences."

Halldór Stefánsson, EMBL Science & Society Programme Manager

"Having been an EMBL alumnus myself (from 2005-07, when I was a postdoc at Yale), I was able to experience first hand the advantages of interactions between former EMBL scientists. Together with Peer Bork (my former group leader) and his alumni, we organised several EMBO practical courses at that time to train young scientists and to initiate new collaborations."

Jan Korbel, EMBL Group Leader, 2008-present.
EMBL predoc, 2001-2005, Bork Group, Structural and Computational Biology

"EMBL alumni are becoming increasingly important for us as we are very often organising teacher training courses directly in the EMBL member states. Alumni are welcome to contribute to our courses in many ways, e.g. as speakers. Many of them let us access their strong local networks and support us in sustaining our actions."

Philipp Gebhardt, EMBL Head of ELLS

"As the people who made EMBL what it is today, statements of continued support from alumni are most meaningful. They impart an important message of credibility and commitment to potential supporters who do not know EMBL from the inside."

Astrid von Soosten, EMBL Head of Resource Development

All EMBL **Alumni**: 6220

Map shows 3834 alumni whose whereabouts we know

No. of alumni per country:

- +200
- 51-200
- 2-50
- 1
- 0

○ No. of alumni per continent

www.embl.org/alumni – Figures from 2014

EMBL 40 YEARS

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