ANNEXES

ANNEX 1

List of EMBL member states

Annex 2

Scientific Advisory Committee: most recent review panels

Structural & Computational Biology Programme 16 & 17 May 2002

External Reviewers:
Wolfgang Baumeister, MPI, Martinsried (DE)
Iain Campbell, University of Oxford (UK)
Richard Henderson, MRC (UK)
Dagmar Ringe, Brandeis University (US)
Gabriele Varani, University of Washington (US)
Gunnar Von Heijne, University of Stockholm (SE)
Cynthia Wolberger, Johns Hopkins University (US)

SAC Members:
Martino Bolognesi, Genova (IT)
Soeren Brunak, CBS (DN)
Antoine Danchin, Paris (FR)
David Eisenberg, UCLA (US), Chair
Hartmut Michel, MPI-Frankfurt (DE)
Dino Moras, University of Strasbourg (FR)

Observers:
Ulf Lange, on behalf of German Council Delegation
Fotis C. Kafatos, EMBL Director General
Iain Mattaj, EMBL Scientific Director
Cecille Hongslo, Council Member (NO)
Isabella Beretta, Council Member (CH)

EMBL Hamburg 23–25 March 2003

External Reviewers:
Christian Cambillau, Marseille (FR)
Maria Arménia Carrondo, Lisbon (PT)
Bauke Dijkstra, Groningen (NL)
Janos Hajdu, Uppsala (SE)
Keith Hodgson, Stanford (USA)
Christopher Kratky, Graz (AT)
Hartmut Michel, Frankfurt (DE)
Andrew Leslie, Cambridge (UK)
Jan Skov Pedersen, Aarhus (DK)
Jim Penner-Hahn, Ann Arbor (USA)
Joel Sussman, Weizmann (IL)
Alfred Wittinghofer, Dortmund (DE)

SAC Members:
Martino Bolognesi, Genova (IT), Chair
Dino Moras, Strasbourg (FR)

Observers: Anneliese Bohn, Council Member (DE)
Fotis C. Kafatos, EMBL Director General
Iain Mattaj, EMBL Scientific Coordinator

EMBL-EBI Hinxton 23 & 24 April 2003

External Reviewers: Rene Bernards, Netherlands Cancer Institute (NL)
Alfonso Valencia, CNB-CSIC (ES)

Eugene Koonin, NCBI-NLM-NIH (US)
Stephen Bryant, NCBI-NLM-NIH (US)
MartinVingron, MPI Molecular Genetics (DE)
Roland Eils, DKFZ (DE)
Anna Tramontano, Rome (IT)
David Lipman, NCBI-NLM-NIH (US)
Guy Dodson, York (UK)
William Taylor, NIMR (UK)
Jean Thomas, Cambridge (UK)

SAC Members: David Eisenberg, UCLA (USA) Chair
Soren Brunak, DTU (DK)

Observers: Anneliese Bohn, Council (DE)
Jean-Pierre Lafont, Council (FR)
Fotis C. Kafatos, EMBL Director General
Iain Mattaj, EMBL Scientific Director

Developmental Biology Programme 8 & 9 May 2003

External Reviewers: Norbert Perrimon, HHMI-Harvard Medical School (US)
Michael Bate, Cambridge (UK)
Trudi Schüpbach, HHMI Princeton (US)
Steve W. Wilson, London (UK)
Denis Duboule, Geneva (CH)

SAC Members: Carl-Henrik Heldin, LICR Uppsala (SE), Chair
Gines Morata, CBM Cantoblanco (ES)
Christiane Nüsslein-Volhard, MPI Tübingen (DE)
Ronald Plasterk, NIDB Utrecht (NL)

Observers: Anneliese Bohn, Council Member (DE)
Inger Madshus, Council Member (NO)
Fotis C. Kafatos, EMBL Director General
Iain Mattaj, EMBL Scientific Director

Gene Expression Programme 6 & 7 May 2004

External Reviewers:
Reinhard Lührmann, Göttingen (DE)
Angus Lamond, Dundee (UK)
Geneviève Almouzni, CNRS Paris (FR)
Bryan Turner, Birmingham (UK)
Bertil Daneholt, Karolinska Institutet (SE)
Robert Darnell, HHMI Rockefeller (US)

SAC Members:
Scott Fraser, Pasadena (US)
Dino Moras, Strasbourg (FR)
Paul Nurse, New York (US)
Ron Laskey, Cambridge (UK), Chair

Observers:
Fotis C. Kafatos, EMBL Director General
Eero Vuorio, Council Delegate (FI)

EMBL Monterotondo 23 & 24 September 2004

External Reviewers:
Mariano Barbacid, CNIO (ES)
Daniel Louvard, Institut Curie (FR)
Robin Lovell-Badge, NIMR (UK)
Roberto Di Lauro, University of Naples (IT)
Jacques Samarut, CNRS (FR)

SAC Members:
Scott Fraser, Pasadena (US), Chair
Allan Bradley, Hinxton (UK)

Observers:
Eero Vuorio, Council Delegate (FI)
Denis Duboule, Council Delegate (CH)
Glauco Tocchini-Valentini, Council Delegate (IT)
Fotis C. Kafatos, EMBL Director General
Iain Mattaj, EMBL Scientific Director

EMBL Grenoble 7 & 8 April 2005

External Reviewers:
Axel Brunger, Stanford (US)
Alfred Wittinghofer, Dortmund (DE)
Neil Isaacs, Glasgow (UK)
David Stuart , Oxford (UK)
Fritz Winkler, Paul Scherrer Institute (CH)

SAC Members:
Dino Moras, Strasbourg (FR), Chair
Werner Kühlbrandt, Frankfurt (DE)
Venki Ramakrishnan, Cambridge (UK)

Observers:
Fotis C. Kafatos, EMBL Director General
Iain Mattaj, EMBL Scientific Director & EMBL Director General Elect

Anna-Maria Frischauf, Council Delegate (AT)
Eero Vuorio, Council Delegate (FI)

Cell Biology and Biophysics Unit 12 & 13 May 2005

External Reviewers:
Francois Amblard, Institut Curie, Paris (FR)
Maria Carmo-Fonseca, IMM, Lisbon (PT)
Don Cleveland, University of California, San Diego (US)
Pascale Cossart, Institut Pasteur, Paris (FR)
David Drubin, Berkeley (US)
Benny Geiger, Weizmann, Rehovot (IL)
Jonathon Howard, MPI Dresden (DE)
Richard McIntosh, Colorado (US)
Gerrit van Meer, Utrecht (NL)
Kees Weijer, Dundee (UK)

SAC Members:
Scott Fraser, Pasadena (US), Chair
Christine Guthrie, San Francisco (US)
Paul Nurse, New York (US)

Observers:
Iain Mattaj, EMBL Director General
Marianne Sommarin, Council Delegate (SE)
Eero Vuorio, Council Delegate (FI)

Summary of most recent reviews of EMBL Units

2002

Structural and Computational Biology

2003

EMBL Hamburg
EMBL-EBI Hinxton
Developmental Biology Programme

2004

Gene Expression Programme
EMBL Monterotondo

2005

EMBL Grenoble
Cell Biology and Biophysics Unit

Structural & Computational Biology Programme 2002

Overview: The dual leadership of the SCB Programme

Since the tragic death last year of Matti Saraste, the coordination of the SCB unit has been the joint responsibility of Luis Serrano (Programme Coordinator) and Peer Bork (Associate Programme Coordinator). The review revealed that there is both broad and deep appreciation of their leadership. Group leaders and other scientists of SCB praised the way Serrano and Bork work together, as well as the way they work with the individual groups. They have infused new life and a strong sense of cohesion into the Programme. The reviewers have the strong impression that the various groups in the Programme maintain their individuality yet see their work in the light of a global vision where the structure of protein complexes is the most important common theme.

Although the model of dual leadership has worked exceptionally well under Serrano and Bork, the question needs to be carefully considered of whether the same model should be retained after a new coordinator is recruited to replace Serrano. In any case, we recommend that the new coordinator should be a broad-minded experimentalist who can continue to lead an integrated programme around protein complexes. We also recommend that this coordinator continue strong connections to bioinformatics, possibly continuing to enlist the enormous talents and energy of Dr. Bork as Associate Programme Coordinator.

The new focus on structures of cellular complexes has reshaped the vision for the future of the SCB Programme. All four of the central tools of the Programme – X-ray analysis, NMR, EM, and bioinformatics – will contribute to elucidation and interpretation of the protein complexes. Other frontier areas have been suggested for exploration in connection to protein complexes. These include systems biology, the large scale description, modelling and understanding of the complexes of the cell; tomography, the localisation of complexes with in the cell; and metabolomics, the study of small molecules within the cell. Some of the exceptionally strong members of the Programme are eager to participate in this vision, including Drs. Conti, Hoenger, Sattler and Russell. The extension of work to these new areas justifies the recruitment of scientists with new skills to SCB.

The general standing of the SCB Programme

The SCB (and EMBL in general) is one of the world's top institutions in building outstanding careers in molecular biology. It continues its virtually unique role in Europe in producing numerous midcareer scientists who are ready to assume scientific leadership at the finest institutions of higher learning and research. The SCB is also among the world's finest institutions in integrating biology with structural and computational biology. In specific areas of X-ray analysis, biological electron microscopy and biological NMR, individual investigators at other institutions have made discoveries that may be considered of greater importance. Yet these institutions do not in general match the SCB record of producing leaders, and there are few places that offer the intellectual environment of combined biology and structural and computational biology.

Overall, the reviewers found a picture of a vitalised and forward-looking Programme. This is a tribute both to the ground work of excellent recruitments laid by Dr. Matti Saraste, and to the leadership of the new Coordinator and Co-Coordinator. The Programme was also found to be less isolationist within EMBL than in earlier years. The reviewers noted a high level of coherence and mutual support among groups within the SCB, and with other groups at EMBL. It is hoped this trend will continue.

Balance of positions in SCB and relationships with the Outstations

The intended focus on the structures and functions of large complexes is a leitmotif that crosses all disciplines of the SCB. In order for this focus to be successful, the proper distribution of experimental and computational methods must be maintained, including NMR, EM, X-ray crystallography, bioinformatics and other applications of

computational biology. To couple this effort to the proposed new area of systems biology, some methodologies could use strengthening; these include NMR, tomography single molecule imaging, and aspects of computational biology related to tomography, and imaging. How to do so within the strict personnel limits faced by the Director-General is a challenge.

The frontier of biological research is moving increasingly to the interface with other disciplines. It is therefore natural that cross-talk between EMBL and Outstation programmes will grow. Signs of the increasingly interdisciplinary nature of the SCB research can be recognised in the application of locally developed computational methods to many projects, not necessarily of a structural nature, in the numerous collaborations between labs from different Programmes (e.g. Izaurralde, Mattaj, ...), and with the Hamburg outstation (e.g. Wilmanns, Svergun, ...). These collaborations have clearly developed since the last review. The onset of structural genomics in EU projects is fostering collaborations between SCB and both the Grenoble and Hamburg Outstations on high throughput protein expression, protein crystal growth, and protein structural analysis. A further aspect of the relationships among these programmes is provided by the organisation of courses, to which Outstation personnel frequently contribute. At present cross-talk between labs may be more substantial within SCB than between SCB and the Outstations, so there is still room for more extensive interactions.

As collaborations between SCB and the four Outstations develop, the Programme Coordinators need to make strong efforts for all groups to be aware of research in the distant units to support collaboration and exchange of information.

New directions for the SCB

Structural genomics

As noted above, the structural genomics of protein complexes is becoming a central pillar of the SCB programme. One of the main current trends in structural biology is the high throughput methodology necessary for structural genomics/proteomics. In this context, the SCB proposal to embark on a structural genomics project aimed at large macromolecular complexes appears aptly chosen. On one hand the proposal will present an opportunity for proposals to European granting agencies. On the other, it is directed towards one of the aspects of protein structure (i.e. formation of complexes) that is not yet well understood, despite the relevance to all cellular processes. Finally, given the know how and facilities available at EMBL and at the Outstations, it is clear that a project on protein complexes will offer valuable opportunities for deepening collaborations between different EMBL programmes and sites.

Systems biology

Under the lead of L. Serrano the SCB Programme has developed an interest in research in "systems biology" combining theoretical exploration with experimental validation. Preliminary experiments have substantiated that simple negative and positive regulatory loops can indeed be constructed *in vivo* and display the expected behaviour. The Programme proposes to further extend this trend, developed at other places in the world (particularly in Japan with the E-cell programme, and in Seattle at the Institute for Systems Biology set up by Lee Hood). While this appears to us to be timely and interesting, we must note that this project entirely rests on the personality of L. Serrano, combining experimental "wet" research with theoretical models that are constructed to be refuted by appropriately designed experiments. It is therefore somewhat difficult to consider further development in this domain without the identification of a successor for L. Serrano, a scientist who will be well versed in the conceptual ideas as well as in the intricacies of experiments at the bench. We note that L. Serrano considers that this subject should be attractive enough to recruit an external scientist to coordinate the Programme. If such a person were identified we think that this new trend could be an interesting asset at the EMBL, allowing the Programme to couple in an explicit way computational approaches with experiments, a notoriously difficult but much needed task. Perhaps most important, systems biology links well to the structural biology of complexes.

Metabolomics

The panel discussed the SCP proposal to use NMR to characterise metabolic networks. The plan is to develop in-house collaborations with Griffiths and Schultz and possibly hire a new Team Leader. The potential of the field will be tested by holding a small meeting of experts in June this year. The panel recognizes that metabolomics has considerable potential and encourages this exploratory approach. There was concern, however, that synergy between metabolomics and existing structural research programmes has not been demonstrated. There was also some concern that the existing NMR instruments might not be best suited to this new research programme. Overall the panel found the metabolomics proposal not well developed and in need of further planning and justification before going forward.

Tomography of cells

The very reasonable and ambitious plan to develop the capacity to study the structures of cells in 3D is endorsed by the panel. At the same time, the panel notes that the plan depends on future staffing and acquisition of equipment. Tomography will require aspects of biocomputing not presently practiced by the present bioinformatic staff, and will almost certainly necessitate a new scientific appointment. The work will be difficult to develop, but at the same time, will interact synergistically with the new efforts in the structural genomics of complexes and systems biology.

EMBL Hamburg 2003

User support

The Hamburg Outstation, over the past four years, has continued to provide an outstanding level of user support in all areas it serves. First, regarding protein crystallography, four members of the review Panel (Bolognesi, Carrondo, Leslie and Sussman) serve on the beam line priorities committee that is responsible for reviewing applications for beam time. They have been able to follow first-hand the improvement of all aspects of user support, from efficient "web-based" applications and user scheduling of beam time, to excellent on-site scientific support, especially for new users and users who come from a more biological rather than crystallographic background. The ability of the users to select their own dates for data collection has significantly improved the overall efficiency and is one of the strengths of the Outstation. It is particularly noteworthy that over a period when there has been a significant increase in provision of SR facilities within Europe, the number of project applications has remained at a constantly high level for PX, and has increased in both EXAFS and NCS. There continues to be an excellent relationship between the user community and the Outstation. The Head and Deputy Head of the Outstation, in particular, deserve enormous credit for continuing to maintain and improve the quality of user support.

During the past four years, most of the recommendations from the last review were implemented in terms of instrumentation upgrades. This is seen in particular in terms of the purchase of new CCD detectors and cryo systems and substantial refurbishment of some of the optical components in the older beam lines. These improvements have substantially improved the reliability of the end stations and thus significantly improved the experience of users coming to the Outstation. It is clear that the additional funds provided for improvement of instrumentation resulted in a significant improvement in performance. The Panel strongly supports the proposed purchase of additional CCD (or new technology) detectors, particularly for the new MAD beamline X12.

The development of the robot crystal sample changer is nearing the commissioning stage. Its elegant and simple design appear to be well suited for beamline BW7B and its use will not only speed up data collection, where sample mounting and demounting can be rate limiting steps, but also provide the basis for quickly surveying a series of

different crystals to "automatically" choose the best one for actual data collection. This should result in users leaving the Outstation with higher quality data.

The strong tradition of user support goes beyond the PX beamlines and includes the NCS and EXAFS areas. Both of these require much closer interaction between the Outstation scientists and users, as the scientific problems are, as a rule, more varied than for PX. Dmitri Svergun, in particular, deserves special recognition for his development of user-friendly programs that now work on many platforms. These have made it possible to do ab initio 3D structure determination (at low resolution) based on solution scattering patterns. The programs include both rigid body refinement and an effective molecular graphics interface. A number of users have chosen to come to the Outstation, even when the possibility existed to go to a 3rd generation synchrotron source, in large part due to the user support and possible collaboration with scientists at the Outstation.

Improvements in beam line control and overall reliability appear to have led to a reduction in the demands placed on the staff for support of the PX beamlines, but for the EXAFS and particularly the low angle scattering beam lines, the increasing size of the community has led to very heavy demands on the scientists.

Beamlines & instrumentation

There have been significant improvements in instrumentation at the Outstation over the last four years. In general, the beam lines are now well equipped, with the exception of X12, which is still awaiting its detector. The complete redevelopment of fan K, the introduction of automation for protein crystallography (the robot being in final development stages) and the developed beam line control software are very impressive. The detectors on the PX lines, while generally adequate to match the characteristics of the DORIS source, are not in all cases the best available in terms of size and readout time. It is important to keep this point in mind in defining the detector for X12 and recognizing that the effectiveness of the wiggler stations could also be improved by a more advanced detector. The EXAFS and SAXS beam lines are well equipped in terms of detectors, but continue to suffer somewhat from the age of the facility (for EXAFS, encoders are needed for several motors; for SAXS, beam motion causes significant – perhaps 2-fold – decrease in productivity).

What is particularly striking is the scope of the accomplishments, given the very low staffing levels that have been available, especially when benchmarking these levels against similar quality facilities worldwide. The instrumentation group has remained nearly the same size during the last review period and, importantly, has been understaffed in the critical staff scientist position for almost the entire period. Given this lack of staff, the accomplishments of the instrumentation group are truly outstanding and this reflects upon the superb leadership of this group by Hermes. It is unlikely that this productivity can continue, especially as efforts are made to plan for PETRA III beam lines. Lack of staff during the last review period has left little time for the instrumental innovations for which the Outstation was once famous. Even without the increased effort that will be required by constructing several beam lines for PETRA III, the instrumentation group needs additional manpower. When one adds in the tremendous effort that will be required to design and construct new beam lines, this need becomes truly acute. If a significant increase in funding is not possible, the Outstation faces the difficult choice of either forgoing development of one or more state-of-the-art beam lines at PETRA III, or curtailing its support for the existing DORIS beam lines. In this context, we strongly feel that the most effective strategy would be to augment the existing instrumentation group by adding appropriate new staff under the leadership of Hermes to enable a subgroup to focus on the important future development that will be done in close collaboration with the beam line development group at HASYLAB.

Future developments at DESY/PETRA/TESLA/XFEL

In the coming years Hamburg will become the focus of extraordinary developments in synchrotron- and accelerator-based light sources. These developments will have profound impact on a wide range of disciplines, including many aspects of biology. The first foreseen development concerns dedication of PETRA to synchrotron

radiation in late 2006, a development which could perhaps be described as a next step towards "the ultimate X-ray storage ring" with respect to energy and emittance parameters of the planned source. Additional and revolutionary opportunities will be offered by the free-electron laser facilities (the TESLA Test Facility II and the TESLA XFEL). Both developments, on different time scales, and on independent tracks, will offer unique opportunities for cutting edge research at the EMBL Outstation; the Panel strongly supports efforts by EMBL, and by future EMBL-DESY collaborations, to exploit such emerging opportunities, which would serve a broad user community. In view of the finite lifetime of DORIS III, involvement in PETRA III is considered essential for the future of the Outstation and its user community.

The conversion of PETRA has been approved by the Deutche Forschungsgemeinschaft with a budget of 120 MEu. The Panel strongly supports the involvement of EMBL in the commissioning of new beam lines. Although details have not been decided yet, a current provisional plan includes two or three protein crystallography beam lines, with extensive MAD capabilities, a dedicated SAXS beam line, and a shared beam line for the EXAFS activities. The exploitation of such an ambitious programme requires a regrouping of resources within EMBL as a whole, including recruitment of new staff. A recruitment plan should include the acquisition of new staff for the instrumentation group, which will allow the group to maintain the current stations at DORIS III (for the transition period), while finding new strength for the developments at PETRA III, likely through on-campus collaborations. The Panel notes that recruitment of even one leading scientist in synchrotron beam line design and construction may prove a potentially difficult task, despite the attractiveness of the scientific environment and of the new machine

The current SAXS research activities on macromolecular aggregates in solution are world leading and there is an increased demand from the user community for this type of measurements. In this context it should be mentioned that the current EMBL SAXS instrument at DORIS is 25 years old and has been in operation with only modest modifications in its lifetime. In order to preserve the SAXS activities, it would be strategic to have a dedicated beam line with an instrument for SAXS included in the PETRA III conversion. Such an instrument would be a dedicated instrument for macromolecular solution scattering due to the special demands concerning low background and the demand for covering a large range of scattering angles. The high brilliance will permit time-resolved measurement in the ms and sub-ms range to be carried out. The Panel recommends that one of the EMBL beam lines at PETRA III be used for such a dedicated SAXS beam line. It is important to note that the growing success of SAXS on macromolecular aggregates is closely linked to the development in software for analyzing the data and the Outstation has a world leading effort in this regard.

The benefits of high brilliance for macromolecular crystallography are well established and have been demonstrated to enable experiments at the very frontier of structural biology. In particular, this includes the ability to study very small samples (tens of microns) with very large unit cells containing complex and very large biomolecular assemblies. The high brightness and collimation allow data collection to atomic resolution in an increasing number of cases, resulting in a direct understanding of the chemical events during biological reactions. Biological function is a four-dimensional property and a basic understanding of function requires a synthesis of knowledge in four dimensions (x,y,z,t). Time-resolved X-ray scattering/diffraction studies on biological macromolecules represent a step in this direction. Studies in this area could benefit from the availability of a high brilliance beam line for general crystallography.

For EXAFS, the Panel recognizes that needs for biological and materials studies are rather similar and that a reasonable strategy would be to develop one state of the art, well instrumented and supported beam line to serve the needs of both these communities. If demand warrants, a further beam line could be developed in the future.

The Panel also wishes to stress the importance of an adequate level of staffing to be able to take maximum advantage of the capabilities of the high brightness PETRA III beam lines. A minimum of around four staff members per beam line is required based on experience at other 3rd generation sources like ESRF.

The longer term plans of EMBL should include participation in the TESLA XFEL project. Radiation from the XFEL is expected to have a strong impact in a wide range of scientific domains ranging from atomic and molecular physics, via plasma physics and condensed-matter physics to chemistry and structural biology. The extreme peak brightness and ultra-short duration of X-ray TESLA XFEL pulses will allow the investigation of dynamical properties, the resolution of time-dependent structural changes, and the investigation of structure of transient states in many systems, often for the first time. The coherence of XFEL radiation will allow use of new scattering and imaging techniques in the investigation of single particles, disordered matter, and of nano-structured materials. All this information is widely inaccessible at present. Due to its particular properties, XFEL radiation is regarded as a complementary source to synchrotron radiation and other X-ray sources used today. We recommend that EMBL develop plans for the exploitation of this source of radiation in biology, and suggest that such plans be a focus during the next review of the EMBL Outstation in 2007.

Structural proteomics

The Outstation has taken an active role in proposals for Structural Proteomics projects in Europe. It is a partner in the US consortium on *Mycobacterium tuberculosis*, and it participates in the EU-funded SPINE programme on Structural Genomics. A new proposal has just been submitted in the 6th Framework Programme. The head of the Outstation presented plans to set up an (externally funded) high-throughput crystallisation facility. This facility is one component of a planned pipeline, which should eventually go "from clone to structure". This would put the Outstation even more in a central position in Structural Biology research in Europe. The Panel endorses this vision.

There is a concern that these activities may draw resources from key-activities like beam line development, maintenance and user support. Given the external funding of the large-scale crystallisation facility the Panel welcomes this initiative and feels that a large-scale pipeline from "protein solution to diffraction data" is very timely and fits well into the Outstation's profile. Under the present restraints on resources, an extension of this pipeline to include cloning, expression and purification would require careful planning and a concentration on a suitable biological set of problems. The Panel recommends, that in view of the (at present) rather heterogeneous and small-scale approaches, such a concentration may further sharpen the scientific profile of the Outstation.

In house research

It has been the philosophy of the EMBL Outstation to supply an internationally recognised user facility for synchrotron research and, at the same time, perform high quality research, either by itself relying on internal resources, or in collaboration with external users and other groups. As has been noted in the Report and in the presentation by the Head of the Outstation, an internationally recognised research effort is an important requisite for recruiting new scientists at the Outstation. The research themes cover a wide area and range from methodology relating to the use of synchrotron radiation for biological research to its direct use for solving structures of biological macromolecules. Overall the research being performed at Hamburg is widely recognised as unique and of a high international standard.

Development of crystallographic tools at the Outstation

This section might be understood as including the beam lines themselves. The attention will be focused, however, only on the developments aimed at improving i) automation on beam lines, and ii) at streamlining the structure determination process from protein to structure.

i) Rendering the beam lines automated and even user-free is one of the major achievements expected in the near future. It will make it possible to optimize beam time allocation, since there will be no need to allocate several days or even full shifts, but shorter periods, like a few hours. The first step of automation is to implement a sample storage facility and a robotic sample changer at the beam line. Indeed several initiatives are under way elsewhere, either in operation (e.g. ALS and SSRL) or still in the process of

validation (FIP, ESRF). EMBL-HH has a working prototype (arm-type robot) which efficiently performs the function of crystal loading on the goniometer and unloading back to the carrousel. The Panel is aware of the mini-diffractometer/sample changer developed at EMBL-Grenoble and of possible duplication of effort. However, people in charge at EMBL-HH felt that due to differences in the physical construction of the end-stations, most synchrotrons cannot share a common technology for sample exchangers, hence their focus on the present development. However, standardisation of the container/carrousels, of the pin holders and of the bar-code identification system will be discussed and sought among European synchrotrons.. The Panel strongly recommends the implementation of the automated sample changer facilities on the EMBL lines.

Further downstream in the structure solution process, automation of data collection and implementation of decision-making software is envisaged and necessary. EMBL-HH is developing such a software integration approach with BEST. Again, similar approaches are being developed and implemented elsewhere, e.g. DNA at ESRF/SRS. Besides a possible common final development that could take place in the EU programmes SPINE or BIOXHIT, it should be stated that user interfaces (available through the web, ultimately) should be made compatible. It has been stated, however, that DNA and BEST are complementary and will be integrated. Efforts in this software integration process are strongly encouraged.

ii) From protein to crystals and from crystals to mounting loops. There have been tremendous improvements in HT crystallisation in the last 2-3 years. Large facilities have been set-up in the US, at prices (~6 M€) unaffordable in Europe. Medium scale facilities have been set-up in Europe, based on nano-drops dispensing and cabinet storage/visualisation systems. Nano-drop technology was a big step forward in making it possible to gain a factor of ~10 reduction in protein requirement (i.e., 1-2 mg at present for ~1000 experiments). Although cheaper, these facilities are not within reach of small/medium groups; their implementation is in the order of 300-500 k€. There is an opportunity to develop common facilities, e.g. at synchrotrons, for HT crystallisation. Protein would be sent to the site, the experiments performed, and the results would be available on the web (as for data collection). Crystal optimisation, varying precipitant concentration or pH in a matrix, or using additives, would result in several tens of crystals to test for the best diffraction. Ultimately, due to this large number of crystals, automatic mounting in loops should be established. Synchrotrons would then provide a quasi user-free process from protein solutions to the final (unrefined) X-ray structure. Concerning the crystallisation facility, the Panel supports EMBL-HH initiative, again emphasizing standards compatibility.

Software developments

Besides beam-line control and data collection strategy (BEST), a major programme development is conducted by Victor Lamzin (with Tassos Perrakis in Amsterdam) with ARP/wARP. ARP/wARP is now among the two most used software packages for automatic protein model building, probably the most popular. Recent improvements have resulted in its successful use at lower resolution (2.5 Å), obtaining larger percentages of assigned protein segments. This approach has had an enormous impact in protein crystallography making it possible for scientists to quickly get an initial, excellent, chain tracing from a reasonable quality map. This has made it possible for scientists to spend much more of their time on interpreting their 3D structure, rather than spending time on the tedious and very time consuming stage of chain tracing. Further improvements would still be valuable, since automatic building just after (or during) data collection would be the ultimate answer on whether useful data have been collected by users or not! This activity is enthusiastically encouraged by the Panel.

Biological crystallography

The research at the Hamburg Outstation always had a high profile, and the recruitment of Matthias Wilmanns as the New Outstation Head produced further boost in this area. He has guided several group or

team leaders into the area of protein crystallography on biologically relevant molecules. The other major development in terms of biological research is the establishment of a protein expression facility which is under the supervision of Young-Hwa Song. Most of the relevant expression systems are used in the laboratory and are available to all the groups. Room for improvement still exists. It is a general trend to use robots for several tasks along the line from cDNA to expression/solubility tests. Implementing such facilities would multiply the impact of this facility and would make it possible for independent scientists from the Outstation to get more support from the wet lab It is also worth mentioning that Matthias Wilmanns has initiated or is co-ordinator of a number of EU- und BMBF (Germany Ministry of Research) funded projects, centred on structural proteomics.

There are several groups/teams directly involved in solving 3D structures of biological molecules by X-ray crystallography, with a large number of structures solved and published and/or still in the pipeline. Dmitri Svergun is responsible for the biological projects carried out on small-angle X-ray scattering facility, which is one of the few synchrotron SAXS facilities in the world suited for solution scattering. There is no doubt that in the future many structural biologists will use this technique as a complement to high resolution X-ray crystallography or NMR. Due to his exceptional experience in the techniques, especially in software development and use, he is involved in several collaborations, with fascinating results that show the power of the method. Wolfram Meyer-Klaucke runs the EXAFS and XANES beam line and is involved in many collaborations on the analysis of metal-binding proteins. The three staff scientists Ehmke Pohl, Alexander Popov and Cristofer Enroth spend 50% of their time on user support, but all have additional protein crystallography projects with different outside and in house teams (M. Wilmanns). Manfred Weiss joined the Outstation 16 months ago. His main research project is concerned with developing new methods for solving the phase problem in protein crystallography, using longer wavelengths and naturally occurring elements such as sulfur, phosphor, metal ions and noble gases. Last but not least, the activity of Victor Lamzin with ultra-high resolution structures (<1 Å) is at the forefront of such activities in the world. It gives unique insights into the details of protein structure and catalytic mechanisms.

Training

The Outstation has been site of intensive training activities during the Review period. Altogether the site hosted 5 Workshops and 8 practical courses, funded by different sources, including EMBO. For the practical courses a high oversubscription ratio was always recorded (in one case about 10-fold). All these opportunities have been positively received by the user community, which, as a result of the dissemination of new concepts and information, has grown to include new labs which had come to Hamburg for the first time to attend these practical courses. This is particularly true for the NCS and EXAFS communities. The increased number of applications received in both these fields may also be related to the success of their training initiatives.

The Outstation has been a training site for the EU Marie Curie programme since 2001, with the award of 108 person-months for graduate student short term training (3 to 12 months). The programme has been administered by Paul Tucker, and, to date, 86 person-months have been allocated to 10 different students. The initiative has been positively rated at the Outstation. A new larger application, including 5 additional countries, and more generally oriented towards the different aspects of structural biology (expression, crystallisation, protein chemistry and biophysics …), will be filed on April 2003, and coordinated by Paul Tucker.

Main conclusions

The Panel congratulates the Outstation scientific staff for its impressive progress in the various fields of research currently under investigation at the Outstation. Especially noteworthy are the unique developments in new analysis methodologies represented by ARP/wARP and the small angle scattering data analysis suite.

We find that that the quality of the support of the user community in macromolecular crystallography, small angle

X-ray scattering and X-ray absorption spectroscopy has shown improvement over the past four years and is outstanding. There have also been innovative developments in software to facilitate user access and experimental data collection optimisation.

The Panel considers the opportunity to develop new beam lines on PETRA III as essential for the future of the Outstation. We most strongly endorse the engagement of EMBL in close cooperation with DESY to build a suite of beam lines that provide dedicated access for the biological crystallography and small angle scattering communities. We further encourage the development of a shared facility for the biological EXAFS community.

The Outstation should continue to play an active role in exploring the future uses of the XFEL in biological research. As one looks toward the future, the DESY site will be exceedingly well positioned to be a world leader in X-ray enabled science, and the biological community should be engaged now in this planning for the future. The presence of PETRA III and the XFEL will result in a substantial expansion in the scope of research that will be possible in Hamburg; an analysis of the expected impact on the operation of EMBL in Hamburg will have to be undertaken.

The Panel acknowledges the successful attempt using mainly external funding to establish structural proteomics projects at the Outstation and recommends that they be focused to enhance the impact of in-house research projects.

In addition to macromolecular crystallography, the Outstation has unique and excellent programs and facilities that enable the study of non-crystalline biological systems. These efforts in small angle X-ray scattering and X-ray absorption spectroscopy are not found in such an effective way at other synchrotrons in Europe. It is important that these activities be sustained now and be transferred to the future PETRA III beam lines.

EMBL-EBI Hinxton 2003

Overview/mission/vision

Overview and vision of the EBI, presented by Dr. Janet Thornton, Head of Outstation

Dr. Thornton stated her mission for the EBI as follows:

- To provide bioinformatics facilities and services
- To become a flagship laboratory for basic research
- To provide advanced bioinformatics training
- To help disseminate bioinformatics methods

Dr. Thornton emphasised that bioinformatics is at the heart of the new biology. Over the past few years, there has been an explosion of data, including new types of data: microarray data, proteomic data, metabolomic data, images, literature mining, and RNAi data. Bioinformatics has become important in molecular medicine, agriculture, food and environmental science. There has been a move from modeling molecules to modeling cells and organisms in the new field of systems biology, and a new emphasis on understanding the molecular basis of disease.

The role of bioinformatics is to support experimental biology; to collect and archive data; to provide a framework

and integration of data, and to give easy access to data, and to promote new discoveries based on data. All of this facilitates the application and exploitation of academic research in medicine, health, agriculture, and environmental science.

Dr. Thornton's vision of the structure of the EBI is that at its core are the standards and ontologies, including GO, MIAME, and MAGE, all of which have had an international impact.

Around this core are the Services: SWISS-PROT and TrEMBL protein sequence databases, EMBL nucleotide database, MSD, and Ensembl. Joining these are the new themes of the expression database, and database integration.

Surrounding the services are the research groups: Thornton (structural bioinformatics), Goldman (evolution), Ouzounis (computational genomics), Schuhmann (text mining), and Le Novère (neuroinformatics). At least one slot for an additional research group remains open. Since the previous review the research groups of Ashburner, Liisa Holm, and Shoshana Wodak have left the EBI, except that Ashburner continues an important collaboration on GO as a consultant.

In the outermost ring of the EBI structure are the affiliated experimental research groups from multiple institutions, for example including EMBL in Heidelberg, and the British Antarctic survey.

The data resource group performs research on tools. Paul Matthews is responsible for the industry programme, and for outreach. Various collaborations exist within the EBI and EMBL, the Sanger center, within Europe, within EU funded programmes, and globally through various formal international database collaborations;

At present the total EBI scientific staff numbers: 230 scientists, of whom 184 in services; 42 in research groups, and 8 in systems group; 4.5 administrators; 1 in the meetings office, 2 in the Directors' office, 1 in the industry programme, 1 in outreach, 1 in grants office

The nationalities of the staff span 23 countries of which the UK contributes 40% and Germany 12%. The staff has nearly doubled from 140 in 2000 to 240 today.

Funding has grown from €7 to 22 million this year. Of this, 68% goes to salaries; 12% to equipment; 13% to travel; and 7% to site charges and buildings.

The main achievements of the EBI to date are the core molecular biology data resources, plus 160 other tools. Some 236 papers have been published. Highlights include the ontologies; InterPro; Ensembl; ArrayExpress; MSD; SRS; and DALI.

Currently the number of page hits per day, excluding Ensembl exceeds 500,000. Ensembl contributes 1/5 as much.

Training programme: There have been more than 50 workshops. The number of postdocs is 12, and the number of Ph.D. students is 8. The EBI has held 4 international conferences.

Dr. Thornton's plan for the EBI over the next 5-10 years includes: an expanded center for data resources; integration of databases to give transparent and improved access; excellence in research and an expanded research programme. Training will be focused on specialists: it is training for trainers. The EBI will continue to support industry.

Dr. Thornton's goal is to continue to build the EBI as a European centre for biomolecular data; to continue to curate major molecular sequence and structure data resources; to improve data harvesting; and to improve functional

annotation. Plans for new databases include those for metabolomic data; proteome data; ortholog lists; human variations; molecular pathways/networks; toxicology data and perhaps chemo informatics.

Needs: The chief need is for additional space; also core funding for the information resources and research infrastructure needs to be increased. The EU funding based on 3 or 4 year cycles makes long range planning difficult. The aim is to enlarge the staff to about 400 in the next 5 years. The balance of research to service will be about 25:75 %.

Services

The exceedingly effective delivery of services to users of the EBI's databases is enormously to the credit of Graham Cameron, whose vision, energy and leadership remain essential to the Institute.

Biologists around the world access information resources at the EBI on a daily basis – creating and supporting these resources are core parts of the EBI mission. About 75% of the EBI staff is devoted to these services which include information resources for protein and DNA sequences, protein 3D structure, and gene expression. The EMBL DNA Data Library and SWISS-PROT/TREMBL and their associated information resources such as ENSEMBL must be considered as core activities. They predate the EBI, have been exponentially increasing in size since their inception, and their usage continues to grow. In addition, the successes of high-throughput sequencing have led to the need for dealing with genome sequences and polymorphisms adding new challenges to the task of building these resources.

Like the DNA and protein sequence data, for over two decades, protein 3D data have also been essential for biological research. The amount of protein structure data and its use by the community will broaden and continue to grow in the coming years. The success and growth of the Macromolecular Structure Database (MSD) is notable and MSD should also be considered among the core services at the EBI. For these core services in protein and DNA sequence information and protein 3D information, there is continued growth in data and usage, the associated tasks will broaden, and this situation is likely to hold over the next decade. Therefore stable and increasing support will be needed for these activities.

Along with these core resources, there are a number of new and potentially important resources including those associated with gene expression, protein pathways, protein-protein interactions, and ligand databases. The data associated with many of these resources are much more context-dependent than for sequence data and often have a lower signal to noise ratio; furthermore, the willingness of the community to submit to these databases has not yet been established. Consequently, at present, the usage of these resources is far lower than that of the core services. In most cases, these resources involve relatively small numbers of EBI staff, depend on collaboration and coordination with external groups, and are funded through separate grants. The microarray informatics team, though funded through an EU grant, is an important exception in that it has 24 staff members. Though a successful resource for microarray data faces the challenges mentioned above, it has the potential to make a significant impact on a broad range of users. It is fortunate that EBI was able to obtain sufficient funding to make a credible effort to surmount these challenges and at some point ArrayExpress may join SWISS-PROT/TREMBL, the EMBL DNA Data Library and the Macromolecular Structure Database as core services.

Sequence databases

Since the last review, the most important developments include the integration of the DNA and protein sequence database activities, in particular the InterPro resource for protein classification and analysis, and the ENSEMBL eukaryotic genome annotation pipeline and viewer. It is natural and appropriate to integrate the DNA and protein sequence resources both in terms of production and for access and navigation. Because of the ability to cross validate by comparative analyses, the accuracy of both the DNA and the protein sequence information will improve through integration of these production processes. There is considerable

overlap among many of the tools used by the sequence curators when dealing with DNA and protein sequence information, thus efficiencies can be gained there as well. Finally, cross-training of the curators will be expected to have additional benefits in terms of the quality of their work and in retention.

The benefits of integration are even more important to the users of the sequence databases. For example, it is impossible to make sense of alternative splice forms without making use of the genomic sequence, and the implications of alternative splicing for protein function requires an explicit mapping of these transcripts to the amino acid sequence. Appropriate querying and linking of this information will be critical for an increasing number of users.

The InterPro resource is an innovative development that integrates and streamlines the existing systems for protein classification and computational detection of protein domains. It is an excellent example of productive cooperation between several leading groups in computational biology resulting in major elimination of confusion between different resources.

The ENSEMBL genome annotation pipeline has been a critical part of the human, mouse, and *Anopheles* genome projects and is being further refined and applied to other recently sequenced genomes, including the rat genome. The associated genome browser is extensively used by the genome community and the innovative software design allowing remote installations has spread its use in a number of large laboratories and commercial facilities. The EBI/Sanger collaboration on ENSEMBL could be a model for other joint projects between these two centers.

Medical informatics

At present, the EBI lacks a concerted effort to meet the needs of the scientific community in the area of medical informatics. The EBI is well-positioned to provide such services, especially in the area of the molecular biological aspects of medical informatics. For instance, the current ArrayExpress program could be expanded to include a specific section on gene expression patterns in healthy versus diseased states, the Macromolecular Structure Database could include structures of disease-related proteins in their wild type and mutant states. There are also potential connections with the Sanger center in this respect. The recent appointment of Dietrich Schuhmann may present an opportunity to begin to build a medical informatics database. His plans to provide information extraction on special topics in Medicine, combined with his medical training, puts him in an ideal starting position to build a medical informatics portal at EBI. Strategic alliances will be essential to avoid duplication of efforts, especially in the more medically-oriented aspects of medical informatics.

Research

Research overview

The EBI has without doubt been highly successful in carrying out its research programme, with many seminal contributions to biology in the 1998-2003 period. EBI has increased significantly Europe's visibility in many of the recent breakthroughs in genomics, and has contributed at many different levels with new techniques and schemes for computational analysis of biological data. The overall impact is also evidenced by the high rate of citation for EBI research papers, with nearly 30 papers from the 1998-2003 period having already obtained more than 50 citations. The EBI research groups have constructed new tools for gene sequence analysis, analysis of gene expression data and their correlation to regulatory elements, powerful genome annotation tools for transfer of functional information from one gene to another (including the highly important development of biological ontologies), a wide range of powerful methods for protein structure analysis (for example those for analysis of the evolution of enzyme structure). In addition, EBI research groups have contributed to novel areas within protein-protein interactions for annotation of protein complexes, global analysis of interaction maps, and metabolic pathway analysis.

With the recruitment in 2001 of Janet Thornton as EBI Director, a new vision for the research has been put in place, where the research and service activities gradually will become much more actively interleaved. This vision is likely to increase significantly the standing of EBI as a research institution and make it even more attractive to new potential group leaders. While many local bioinformatics centres are doing service on the side mainly funded by research grants, the EBI is also to a large extent working the other way around by having a substantial amount of research carried out within infrastructure and database oriented EBI groups (based on grants for such purposes). Both models are quite common world-wide within bioinformatics owing to the nature of the work, while the bias in the funding model depends on national and regional opportunities for funding. This means that the formal EBI breakdown research/service does not accurately reflect the actual split, and cannot be used to characterize the EBI activity overall. In fact, the Birney and Brazma groups are good examples of this, where research of very high quality is carried out within projects which overall are classified as service and infrastructure. The Director's vision is likely to strengthen this type of exploitation of the resources allocated in new and creative ways.

Computational methods will play a much larger role within biology in the next decade, but also in relation to other (overlapping) scientific areas, such as chemistry (chemoinformatics) and medicine (medical informatics). The Director has initiated a process for the hiring of new young group leaders within areas complementary to those already in place (so far in evolutionary biology and the emerging fields of text mining and neuroinformatics). While the mission of the EBI suggests a broad research strategy, it is also important to select areas where the EBI will be able to carry out research at an excellent level. In areas where the EBI will not be able to establish a significant effort, the Institute must create links and strategic alliances with other institutions in Europe and elsewhere. So far, the EBI has focused on bioinformatics at the molecular level and has plans to increase the level of activity within *in silico* systems biology. Decisions will have to be made on the future scope in relation to human health and drug design. As the areas of research emphasis are progressively defined, exploratory activities will continue to keep the EBI flexible for the future.

Industry programme

The industry programme of the EBI was set up in 1996 as a forum for industry partners for training, research and the development of bioinformatics resources. Currently 18 international companies from both Europe and the USA are members of the industry programme.

The industry programme of the EBI is headed by Paul Matthews who was appointed in June 2002. Right after his start, he conducted a questionnaire to assess the perception of the present members of the industry programme. The results of this questionnaire were presented during the site visit to members of the review panel. The highlights of the questionnaire were the overall high level of satisfaction of the partners, in particular with services offered by the EBI including the training programme and the joint workshops between EBI and the industry partners. This high level of satisfaction is also reflected by the fact that some of the partners decided on three years rather than annual subscriptions to the programme. There were some criticisms on recent communication between EBI and the industrial partners, a problem that should have been overcome by the appointment of Paul Matthews and his activities towards improving the communication channels.

Future activities include a possible opening of the industry programme towards SMEs. In the questionnaire, serious concern was brought up by the larger companies about including SMEs in the programme. There is a meeting scheduled for the middle of May to discuss different options, so it remains an open question whether or not SMEs are included, or whether there is a separate programme. Although the review panel acknowledged a possible overhead and organisational problems involved in integrating SMEs, the majority of the panel recommends the invitation of SMEs to the industry programme.

The integration of research activities with the industry programme is highly effective. Together with Ewan Birney, Paul Matthews is presently developing a new programme, the Ensembl Associates programme. Within this

programme, companies can contribute to the development of Ensembl through funding research and development within the Ensembl project. The wish list of the companies will be prioritised in the development of Ensembl. Several companies have already indicated their interest in joining the Ensembl Associates programme.

EBI was extremely lucky to have attracted Paul Matthews to this position. Before his appointment, he was a senior bionformatician at SmithKlineBleecham and as such a partner in the industry programme. Paul Matthews is young, full of ideas and highly motivated.

The review panel considers the industry programme as outstanding. Highlights of the industry programme include the initial funding of the microarray (ArrayExpress) activities of the EBI. The industry programme has continued to stimulate new directions in R&D at EBI. The review panel strongly supports these new developments and encourages new activities within the industry programme.

Collaborations and communication

The EBI is developing its programme in close physical proximity to the Sanger center. The remarkable international activity of the Sanger center in sequencing and other genomics projects are extremely helpful for the development of the research and service activities of the EBI. During the reporting period, the initial connections have crystallised in a number of highly interesting and well-organised collaborative projects. The active engagement of Prof. Thornton, and her good scientific and personal contacts with the scientists at the Sanger (particularly Dr. Durbin) are good guaranties for the extension and consolidation of this collaboration in the future.

The ENSEMBL project is the best example of this cooperation. This project has been essential for the European participation in human genome (and oter metazoan) projects, and is one of the most visible activities of the EBI. We would like to ask the EMBL Director General to make all possible efforts to guarantee the continued participation of the EBI in this project, and to search for the best route for the renewal of the Wellcome Trust grant for the next period, taking into account particularly the difficulties that may arise as consequence of the changes in the internal structure of the Sanger Institute.

It was also clear to the panel that the very positive expansion of the Bioinformatics research activities at the Sanger would have to be followed by a symmetric development at the EBI to keep the current collaboration on balance.

The level of collaboration with Cambridge University and other institutions in the areahas also improved dramatically during the reporting period. The best example of this collaboration is the incorporation of the SCOP classification into the INTERPRO database. As in the case of the Sanger Institute, Dr. Thornton is the best guarantee for this connection at the personal and scientific levels. The plans of Dr. Thornton to share students with local institutes, particularly in experimental biology, will be an additional contribution to the integration of the Institute in the rich local scientific environment.

Financial and infrastructural matters

The EBI is a unique resource, world class and central to the future of modern biology in Europe. The Director has a clear vision for the future of the EBI, in which both research and service provision, and the synergy between them, will flourish. It involves considerable expansion in total staff numbers from the present 230 to around 400, of which about 1/3 will be involved in research (about 10 research groups of 10, some of which will be involved in the creation of new databases) and the rest mainly in service delivery (curation, development and integration of established databases). This expansion is justified – indeed it is an essential response to the explosion of information in modern biology, biomedicine and biotechnology. It presents an enormous challenge however, given that the financial constraints (the earliest that a bid could be made for a significantly increased EMBL contribution would be for the 2005 + funding period) but one that must succeed in the interests of the competitiveness of European biology.

The Panel's unanimous view is that a reasonable funding model for the future would be a three-way split between EMBL, the EU, and research funding agencies – all now important elements in the Institute's support. There is an obvious and urgent opportunity here for the EU to become a major player in this crucial component of future biology. That opportunity should be grasped. The Review Panel is unanimously of the view that continued and much enhanced support from the EU is essential beyond the present funding period.

An enhanced EU element of EBI funding in the future would provide an essential component of a stable research resource (DNA and Protein Sequence databases, 3D-structure database, and others in the future). There is a huge and growing demand amongst the European biomedical and biotechnology research communities for these, which are quite beyond the funding capabilities of any single country. Importantly it would ensure added value from the individual research grants from the EU to the community generally, equipping them to realise their full potential; the power of bioinformatics is both a platform and a sword. It would give Europe as a whole a competitive edge. As a funding portfolio for the Commission it would also create balance in providing essential core support in addition to project funding. We note that the US counterpart of the EBI, the NCBI, receives stable federal funding, ensuring more strategic planning and the opportunity for more concerted focus on the scientific enterprise.

We urge that the Commission be approached to see if they wish to grasp this opportunity of entering into partnership with the EMBL and other major funders, consistent with the spirit and aspirations of the European Research Area. We ask the Director General of EMBL and the Director of the EBI to take this forward with the European Commission as soon as possible, perhaps with the support of an expert advisory group representing several member states constituted for this purpose.

Training

The EBI has to play a leading role in bioinformatics training in Europe. This is currently addressed with PhD and postdoctoral fellowships, short-term visits and training courses. A distinct but related activity is the Industry Programme. The need for training bioinformaticians in Europe is very high and the demand is enormous. This is clearly recognised by the Director, who has clear ideas and plans to further extend activities in this area, particularly in the direction of "training trainers". The panel recognizes the importance and appropriateness of this approach and encourages the development of a scheme to achieve it, although it anticipates the difficulty of identifying and reaching trainers due to the present lack of coordinated efforts in bioinformatics training over Europe.

The recommendation of the panel is for the Director and colleagues to work in the direction of establishing the EBI as a training center providing the infrastructure and some of the resources for workshop based training, at the same time exploiting human resources from other European bioinformatics research groups. In the panel's view, it is very important in any plan for expansion to consider the establishment of appropriate facilities for high quality training.

The panel also recognised that the EBI is very/remarkably attractive as a site where scientists at various stages of their career might spend a few months, taking advantage of the environment and of the expertise available on site, and suggests to exploit this by structuring an organised programme for short-medium term visits of both young and more experienced scientists. This would serve a need of the community, increase its awareness of the EBI activities and, at the same time, stimulate the EBI research efforts.

The Industry Programme is an activity that has gained importance, efficacy and effectiveness and is already providing a valid model for the integration of other activities in the future.

Key service groups have developed schemes for providing training through visits of their personnel to European sites. This is a very important and needed activity which is indeed filling a gap created by the inadequacy of the EMBnet system.

Summary of main findings and recommendations

Overall Recommendation: It is the unanimous view of the Review Panel that the overall international status of the EBI is OUTSTANDING in Service, Research, and Training. In reaching this conclusion, the Review Panel notes that the Training programme is still limited and in a state of development. All three of these major missions of the EBI have been enhanced since the recruitment of Dr. Thornton, and she is to be commended on her focused and effective leadership.

Expansion Building for the EBI: Expansion space for the EBI is essential, if the EBI is to continue to be successful in its mission and international standing. The EBI is the central receiving, processing, archiving, and distribution institution in Europe for biological information, which started as a trickle in the 1960s and 1970s, and which grew to river in the 1980s and 1990s, is fast becoming a raging torrent, flooding into the EBI. Other European biological institutions may grow slowly, or remain at a level, or contract, but the torrent facing the EBI will continue to grow, and must be confronted. The leadership is up to the job, but space for expanded staff is essential if the EBI and European leadership in bioinformatics is not to drown

For this reason, the Review Panel goes strongly on record for the construction of an expansion building for the EBI. The Director General of EMBL and the Director of the EBI have taken important preliminary steps: EMBL has pledged a seed of €1M towards the construction; a footprint for the new building has been identified on the Hinxton campus; preliminary plans are in hand; provision has been made for interim emergency space the moment that construction of the new building begins.

The Review Panel is of the opinion that the original bid for the EBI submitted by the UK carries with it an implied commitment for essential expansion space. That is, the foresight of the UK was great in recruiting the EBI to its Hinxton site, and this foresight has been validated by the now widely-shared view that biology, including medicine and agriculture, has information at its core. In our view, the stakes are extremely high: the long term well being of European society cannot be separated from sustained scientific expansion, and a critical component in this is the effective management and analysis of biological information. The UK carries a major responsibility in this role for bioinformatics by assuring an expanded home for the EBI. Without the expanded home in Hinxton, the EBI would have to seek some other setting to carry out its mission.

Vision and Support for its Implementation: The Review Panel is impressed with the EBI Director's vision on the future of bioinformatics. The level of growth she suggests to 400 FTE in the next 5 years is not unreasonable. Support for this expansion will require a full plan, which we urge the Director to complete. Prior to this plan, the Panel is unable to make a numerical recommendation for the expansion.

Nevertheless, the essential nature of the Service programme is such that it requires a staff expansion, starting now. The Service programme currently involves the work of 184 FTE. The Panel is unanimous in recommending stable and continuous support for 200 EBI core service staff. Because this staff requires long term and continuing?ous support, the Panel recommends that every effort be taken to acquire substantial support from the EC, which is to us a proper source for this activity so critical to the future well being of the European scientific and industrial research community. Funding for additional new services, such as new databases and for research, is appropriately to be also sought from EMBL and other government and private sources.

Caution on Range of Services and Databases Offered: The vision of the EBI for future services included both expansion of the essential core services, and the addition of numerous new specialised biological and medical databases and LIMS systems. It is the unanimous opinion of the Panel that these should not be allowed to cut into delivery of the core services, which are so essential to European and world science. Some of the new activities, such as expression and protein interaction databases may be more labor intensive than anticipated. Some may develop better, at least for the moment, in more research-intensive or more specialised settings. More appropriate for the EBI is the setting of standards and formats, where the EBI has already taken leadership. In short, the alternative

distributed model should be considered for development of some of the specialised and secondary databases, with the EBI focusing on the most central, such as the new microarray database.

Alignment of MSD with PDB: The PDB has for over 30 years served the international structural community as a unified archive of the structures of biological molecules. In pursuing the excellent work of the EBI in adding value to the PDB with the MSD, it is essential that the international archive not be split in two, with the inevitable confusion and loss of confidence that would accompany such a development. For this reason, it is essential that both the PDB and the MSD redouble efforts for communication and agreement, and that the explanations of added features in the MSD be transparent. We recognize that the EBI is also aware of the need for a basic consistent data set, i.e. the PDB, and that differences in nomenclature and formats, such as different numbers for the same residues, are not acceptable, and will surely lead to a degradation of the literature of structural biology.

IT Matters: For future assessments of the service component of the EBI, usage numbers should be available.

Furthermore, we encourage development of a planning process, whereby service and research groups would communicate anticipated computer resource needs to the systems group. One possibility is that the head of the Systems/IT group would oversee this process.

Training: The Panel recommends that EBI discontinue its support for the EMBnet system, and replace it with direct EBI training, which seems a more effective training vehicle.

Developmental Biology Programme 2003

Overview

The Developmental Biology Programme was created in 1996 as an outgrowth from the Differentiation Programme, and has since 1998 had Stephen Cohen as the Programme Coordinator. It currently consists of 10 groups. Since the last review in 1999, four group leaders, i.e. Dirk Bohmann, Tewis Bouwmeester, Rüdiger Klein and Marek Mlodzik, have left to take up prestigious positions at academic institutions and at a company, and four other young, talented group or team leaders have been recruited, i.e. Detlev Arendt, Eileen Furlong, Carl Neumann and Mathias Treier.

Overall the Developmental Biology Programme at EMBL is doing very well, and is among the best of its kind in Europe and in the world. The Programme Coordinator is to be congratulated to have accomplished an excellent programme consisting of scientists who have developed into highly productive and internationally recognised authorities, as well as newly recruited young scientists among whom emerging stars in European developmental biology are likely to be present. The strength of the programme is based on the individual qualifications of the group leaders and their staff, as well as on the many collaborations and interactions between the groups in the programme and with other groups at EMBL. The extensive efforts made within the programme and at EMBL to promote interactions is to be commended. Continuation and extension of these efforts are to be encouraged.

There are several scientific highlights from the recent work within the programme, which have been well recognised in the scientific community. These include the demonstration that the Dpp and wingless morphogens establish both anterior-posterior and proximal-distal patterning of the *Drosophila* appendages, the identification of ligands, receptors and intracellular signalling pathways responsible for the migration of cells in the *Drosophila* ovary, the elucidation of the crystal structure of the Abl tyrosine kinase allowing insights into the mechanism of its regulation, and the realisation that there is a need for an exon-intron sequence for the proper intracellular localisation of the oskar mRNA.

The programme is particularly strong in studies of *Drosophila* with 4 groups mainly devoted to this model organism, but also include groups working on other model organism, such as the mouse, zebrafish, medaka and platynereis. The breath of the programme is an advantage in the sense that it provides opportunities for cross-fertilisations between different model systems. Without loosing its strength in *Drosophila*, it would be advisable that the next group leader appointment is made to a person working on a vertebrate system, to strengthen the balance in the programme.

It is notable that the programme has only one group fully devoted to mouse work. Given the importance of this model system to many groups at EMBL, also outside the Developmental Biology Programme, it would be important to take measures to avoid that the mouse work at EMBL becomes undercritical.

A major future emphasis of the work at EMBL will be Functional Genomics. The review panel feels that the Developmental Biology Programme is in an excellent position to make a strong contribution to this effort.

Gene Expression Programme 2004

Overview

The most compelling conclusion of the review is that there is an exceptionally high standard of highly interactive research, which would be a credit to any research institute in the world. Each of the individual groups contributes to this level of excellence. We congratulate the Programme Co-ordinator and the Director General on assembling this exceptional cohort of world-leading research.

There has been a remarkable level of turnover during the review period. Only four group leaders were here for the 2000 review (Mattaj, Henze, Izaurralde and Ellenberg). Wilm joined from the instrumentation programme and six new groups were recruited since 2001(Akhtar, Furlong, Ladurner, Muller, Schultz and Steinmetz).

Nevertheless, an exceptionally strong critical mass has formed again, with new emphasis on chromatin and epigenetics and on genome wide approaches to patterns of gene expression and their control. The change of direction has been even greater because pre-existing groups have developed important new avenues of research, as illustrated in their individual reports. The Programme is now back to full strength, with a distinctive and formidable research portfolio. One area for possible future recruitment is chemistry, to increase the critical mass in this important area, though this need not necessarily be within the Gene Expression Programme.

There is abundant evidence of effective collaborations, making full use of the exceptional technical and interactive environment that EMBL affords. This adds value to the resources invested. It also maximises the impact of EMBL throughout Europe as interactive networks of highly trained scientists continue to interact after staff leave and disperse to other countries.

We are concerned that EMBL's pre-eminent position can only be sustained if there are sufficient core facilities. Mass spectrometry and light microscopy are both resources that are strained at present. Measures to extend these crucial facilities should be considered. Similarly the building infrastructure is a growing cause for concern; for example building cooling is inadequate for the current thermal load. Staff of the Programme have organised no less than 15 meetings in the last four years and the quality of their research has been recognised by three major international or national awards and election of three programme members to EMBO. Former group leaders have all moved to senior research positions within Europe. A major strength of EMBL is its ability to attract outstanding

scientists, enable them to develop further, and then re-export them throughout Europe, to the advantage of all European science.

The previous review commented that two exceptional features of the Programme are the extent of its productive interactions with other parts of EMBL and the wide range of technologies that are deployed expertly. These points are equally valid for the current review. The increased use of joint appointments, held simultaneously in two Programmes within EMBL maximizes these benefits, for example by increasing access to structural biology as well as functional genomics.

As revealed by the detailed analyses that follow, the Gene Expression Programme continues to be a major force on the world scientific stage and of outstanding importance to European Molecular Biology.

EMBL Monterotondo 2004

Overview

The EMBL Monterotondo Mouse Biology Programme has developed rapidly. From its initiation in 1997 (opening in 1999) until 2001, the Programme was headed by Klaus Rajewsky on a part time basis, with the intention that he might move to take up full-time residence in Monterotondo on his retirement in Cologne. By 2001, when Rajewsky relocated his group to Harvard Medical School, two other groups had been established in Monterotondo. Nadia Rosenthal was recruited as the new Programme Coordinator, established her laboratory in 2001, and actively recruited new Group Leaders. Thus, in a relatively short period of time, the EMBL Monterotondo Mouse Biology Programme advanced from a relatively small unit of two group leaders and approximately one dozen researchers and staff, to its present size of six group leaders and approximately 80 researchers and staff.

The EMBL Monterotondo Mouse Biology Programme defines its mission as serving as a center of excellence in mouse biology, as well as catalyzing interactions between groups in Europe. It has established itself as a center with major strength in research themes relevant to molecular medicine. Furthermore, it has developed very strong graduate student and post-doctoral fellow programs, and has played leadership roles in EU-wide initiatives. Thus, the Programme offers to the research community both excellent science and an emerging role in service.

By all criteria, the EMBL Monterotondo Mouse Biology Programme can be viewed as a major success story. The review panel members were unanimous in their praise for the progress that has been made, and felt it was important to recognize those responsible. This progression was made possible by the recruitment of a dynamic and committed new Coordinator (Dr. Nadia Rosenthal); furthermore, it required the coordinated assistance from the EMBL leadership and its hosting institution, the CNR. Such a dramatic transformation of the Programme in a little more than three years is something about which the EMBL, the CNR, and the new Coordinator should be proud.

Tour of animal facility

The review panel members were given a tour of the new animal facilities. These have been constructed to a high quality and are clearly being managed extremely well. The Programme Coordinator and the CNR are to be congratulated on the planning and construction of such an efficient facility.

The facilities should be expected to be adequate for the needs of the Programme over the next few years. However, this will require careful monitoring of usage, and the adoption of routine sperm and embryo freezing techniques,

especially because all the research proposals rely on the creation of many new mutant and transgenic strains. In particular, studies on behaviour and on longevity, which are central to the research activities of several of the groups, require large cohorts of animals to be kept for long periods. In addition, genetic approaches to study complex disease processes inevitably require more and more animals to be maintained. It is highly likely, therefore, that the current space will become full very quickly. Recognizing the long lead times and different budget cycles of the organisations involved, the panel suggests that each of the groups concerned (perhaps EMBL Monterotondo, EMBL Heidelberg, the CNR and EMMA) meet at least every two years to ensure that the provision of animal accommodation will match future needs.

Conclusions

In the last three years Dr. Nadia Rosenthal has had to accomplish an enormous amount. She assumed significant responsibilities for rebuilding the scientific programmes at EMBL Monterotondo after the departure of Klaus Rajewsky. She has attracted an impressive group of young group leaders, designed & supervised the construction of new mouse facilities, and started many new programmes. She has been very active in raising external grants to bring extra resources to the outstation. At the same time, she has had to re-established her laboratory in Europe and make it productive. It is largely through her efforts that Monterotondo is now widely recognised as a significant venue in Europe for cutting edge mouse genetics. Her role as an ambassador for EMBL Monterotondo within Italy, the EMBL system and the rest of the World is impressive. In her role as programme coordinator Dr. Rosenthal enjoys huge respect from her scientific colleagues at Monterotondo, indeed many mentioned that they were only interested in joining the programme because she was the coordinator. She is to be congratulated for these achievements.

In a short time, the EMBL Monterotondo Mouse Biology Programme has established itself as an important node in the mouse research community. Notable interactions have been put in place to attack a number of important research goals or needs, including the following (listed with key network members):

- A mouse mutant for every human disease gene – EUCOMM
- Spatio-temporal gene control – Cre Zoo, FLPFLEX
- Integrated phenotyping capacity – EUMORPHIA
- In vivo imaging capability – EMBL/HD
- Proteomics structural capacity – EMBL/HD, Hamburg, Grenoble
- Pharmacogenetics – EMBL/HD
- Bioinformatic tools and platforms –EBI

This identification of key goals and partners is laudable, and the EMBL leadership should be receptive to proposals to facilitate needed interactions. For example, imaging capabilities in EMBL Heidelberg would be more easily employed by EMBL Monterotondo Mouse Biology Programme members if dedicated mouse-holding space were to be made available in Heidelberg. The panel suggests that the Programme formalise a list of needed actions and that the EMBL leadership be receptive to those requests that will allow the most cost effective use of resources between sites.

Although the EMBL Monterotondo Mouse Biology Programme can be considered a major success, it should also be viewed as vulnerable. Its critical mass could be jeopardised by the untimely departure of one or two group leaders, or by any delay in the recruiting of new group leaders as their natural turnover takes place. This argues strongly for enlarging the Programme by at least two groups. More importantly, there are areas of research that are not present in the current Programme, and that would synergize effectively with the current groups. The panel

could define at least three different areas that would add dramatically to the intellectual environment of the Programme (not listed here to avoid the appearance of micromanaging). The panel was pleased to learn that the Programme has been in active discussions concerning future areas of recruitment. The panel strongly recommends that these discussions be moved forward to formal proposals to the EMBL leadership, and that the EMBL leadership and Council take these suggestions seriously, approving a growth in programme size by two groups. Independent of any growth in group size or group number, the Programme requires more space for efficiency, safety and morale reasons.

The pre-doctoral and post-doctoral fellows showed notable insight in defining issues whose resolution would positively impact the Programme. These are detailed in the preceding pages, and the panel endorses each of them as noted. In particular, the panel wishes to emphasize the critical importance of expanded histology/phenotyping facilities, improved computer support, and selective investment in a solution to flow cytometry needs. In addition, a solution should be identified for shuttle service to/from the train station on off hours and weekends, before a safety or morale issue surfaces.

In summary, the panel was extremely impressed with the EMBL Monterotondo Mouse Biology Programme. The groups are each making notable progress, and the positive spirit of the Programme was tangible. As a result the panel found it enjoyed the review meeting more than any in our collective memory.

EMBL Grenoble 2005

Overview

The scientific standing of the Outstation and of its key personnel is excellent. The scientific output of the Outstation is high, with the Cusack and Muller groups especially being at the forefront internationally in their areas of science. Also of particular note are the studies of SM protein – SNARE interactions by Weissenhorn, the methodological developments on radiation damage by Ravelli, the micro-diffractometer developments by Cipriani, as well as the high-throughput expression efforts by Hart. The Outstation plays a key role in instrument development at the ESRF, thus serving the larger structural biology community that utilizes the ESRF. The Outstation also plays a central role in connecting the structural biology community at the ESRF by establishing interfaces to the new PSB, the IBS, the University J. Fourier, and SPINE. Scientific research and methods developments, and service contributions to the ESRF are properly balanced.

The panel felt that the major scientific accomplishments during the last four years are the studies of the signal recognition particle (SRP) by Cusack and of exportin responsible for the export of proteins bearing a nuclear export signal by Müller.

The Partnership for Structural Biology (PSB) was established in Nov 2002 as an agreement between EMBL, ESRF, ILL and IBS to promote interdisciplinary structural biology at an international standard in Grenoble. The construction of the PSB building adjacent to EMBL is well under way and the building is scheduled to open in September 2005. The mission of the PSB is to generate technical platforms for Structural Biology, primarily but not only for the local community, and to foster exchange of ideas and expertise. The Panel was very supportive of the fact that the various institutions with different cultures were willing to work together. It was also pleased to hear that many of the platforms such as the high throughput crystallisation facility in EMBL, the deuteration facility run by ILL/EMBL and the automated cloning facility in IBS were already successfully operating and waiting to be relocated to the new building. The panel was also impressed by the development of new technologies such as

ESPRIT pursued by Darren Hart. He has made excellent progress with HT technologies to find soluble fragment(s) of a protein in a totally unbiased randomised fashion. The panel supports the notion of Christoph Müller that fermentation technology should be available as an additional support platform for structural biology within the context of the PSB, with particular value for the production of native complexes in yeast.

The working relationship between the EMBL Instrumentation Group and the ESRF user support group has been inhibited by the need for obtaining formal contracts between the two bodies for new developments, e.g., design of the sample changer and electronics for the micro-diffractometers. There also appears a delay in obtaining funding from the ESRF for the implementation of the developments carried out by the EMBL Group. Concerns about the distribution of the burden incurred by the EMBL Group for providing general ESRF user support need to be addressed.

Apart from the support platforms for the structural biology laboratories the PSB is also involved, via the EU projects SPINE and BioXhit, in the construction of new state-of-the art beamline(s) for macromolecular crystallography at the ESRF and the establishment of an upgraded diffractometer for neutron crystallography. The EMBL outstation will greatly benefit from PSB by having easy access to state of the art NMR and EM equipment in the IBS and results from these collaborative efforts are now emerging.

Part of the new building (the Carl-Ivar Bränden building) will house the newly founded Institut de Virology Moleculaire et Structurale, IVMS. The panel believes that the already existing interaction between researchers at EMBL and IVMS will be strengthened and hopes that the interaction between IVMS can be formalised to the benefit of both EMBL and IVMS. The panel also strongly supports the intention of PSB and IVMS to operate an electron microscope able to perform cryo EM reconstructions of the various proteins and protein complexes that are investigated by the community. The panel is convinced that the PSB will become a training centre for European scientists and is excited to learn that the project has been strongly supported by a €1.73 million grant from the EU.

EMBL-Grenoble is one of the major partners in the Framework 5 Integrated Programme SPINE (Structural Proteomics in Europe). This was the first pan-European activity in "Structural Genomics", with a distinctive focus on bringing HTP methods to bear on protein targets of biomedical interest making it very appropriate to the focus of the outstation. This involvement has been a major motor for the establishment of the PSB and high-throughput platforms within EMBL-Grenoble. Building on this success the outstation is now part of two Framework 6 Integrated Programmes, BIOXHIT (synchrotron related structural biology developments for structural biology) and 3-D REPERTOIRE (analysis of yeast complexes). These activities give valuable financial support to the outstation and ensure that it has a significant presence on the European stage.

BM14 is currently run as a joint UK/EMBL CRG beamline at the ESRF. It is funded by UK funding councils, and EMBL contributes support in manpower and access to local facilities. An application to extend the current UK funding through 2008 is under review. The future of BM14 after that date is uncertain. The panel discussed the proposal that BM14 should become an EMBL beamline and saw both advantages and disadvantages in this. While no agreement was reached, the panel felt that the option should be kept under review with particular regard to future developments at ESRF and Hamburg and the resource implications to EMBL.

The Panel unanimously endorses the plan to appoint a group leader in cell biology, with an interest in using biophysical techniques such as imaging, as a replacement of Ruigrok, to complement the structural studies in Cusack and Müller's research groups. Weissenhorn will turn over in two to three years, and the intention is to replace him by another crystallographer.

There is a clear need for an appointment in cryo-EM within the context of the PSB, to relieve the pressure on Guy Schoen at the IVMS who is an excellent EM practitioner but who can be expected to increasingly develop his own independent research interests. The leadership's current plan is to make this appointment at the staff scientist level,

but given that the appointed person has to pursue his or her own strong research programme, as well as provide a service for the outstation, it may not be easy to find someone at this level. As the outstation does not intend to duplicate the EM facilities at EMBL Heidelberg and moreover does not have the space and resources to establish a cryo-EM facility of its own, access to instrumentation at IBS/IVMS needs to be considered carefully. In the context of the PSB this should not be a problem.

A group leader in cell biology is clearly the highest priority, followed by a scientist in the cryo-EM area. Weissenhorn's replacement by another crystallographer seems sensible. Among the other requests a 120 l fermenter facility would be an excellent addition to the PSB.

The Grenoble Outstation has strong and fruitful interactions with other parts of the EMBL system. We consider it important that they do not diminish because of the increased local interactions now established through the PSB. There are a number of very productive ongoing scientific collaborations with research groups at EMBL Heidelberg. The interaction with the Hamburg outstation is evolving very positively and the expertise on high-brilliance beamlines available at Grenoble should be extremely helpful for the establishment of the new EMBL beamlines at PETRA. Very importantly, the HT expression and crystallisation facility built up at Grenoble is heavily dependent on support in advanced data and information management systems to realize an effective, flexible and user-friendly LIMS system. The interactions already established with the EBI, Hinxton will be key to doing this successfully and we feel that the EBI should make a strong commitment to providing increased informatics support in these areas.

The current high throughput activities consist of three major areas: (i) high throughput handling and crystallography at beamlines, (ii) crystallisation, and (iii) high throughput methods to identify soluble domains. Of these the first is a well justified and obvious activity of the Grenoble outstation, especially in view of close collaboration with ESRF. Activities (ii) and (iii) will help the in-house research in the immediate future, and hopefully will have a wider effect on the structural biology community. These technologies should be made as widely available as possible to be of the broadest possible benefit to the structural biology community.

Historically, neutron scattering and crystallography have been supported by the EMBL Grenoble outstation since its inception and specifically the work of Dean Myles, whilst an EMBL team leader, was central to establishing the deuteration laboratory. With the advent of the PSB, it seems appropriate that the ILL, which is specifically committed to the use of neutrons, should now take the lead in the development of this technique, perhaps by hiring a group leader in neutron crystallography. Whilst reducing the resources it devotes to neutron science, the Outstation will continue to contribute valuable expertise and collaborate with the ILL as part of its partnership in PSB.

Cell Biology and Biophysics Unit 2005

The Cell Biology and Biophysics (CBB) Unit was established in 1998 from the fusion of two strong programs of the EMBL: Cell Biology and Biophysical Instrumentation. Given its strong ancestry, it should come as no surprise that CBB shows dramatic strength in research, training and technology development. Eric Karsenti has directed this Unit since its establishment, and has worked to create a cohesive programme that fosters active interactions between biology and physics. The research in the review period shows the power of this combined approach. Discussions with Group Leaders, Team Leaders, Graduate Students and Post-doctoral Fellows revealed that the CBB has done remarkably well at making researchers with a wide variety of backgrounds feel comfortable, valued and productive.

The Unit has continued its major role in technology development. New instrumentation for quantitative imaging of molecular interactions (Bastiaens) and for the imaging of embryonic structure (Stelzer) has been refined and is having significant impacts on research in the EMBL at large. New instrumentation for high-content screening via automated microscopy (Pepperkok) and software for the simulation of microtubule and motor assemblies (Nédélec) have been developed that have very significant potential for impact in many areas of research. Finally, the CBB has established facilities for supporting advanced light microscopy (Pepperkok) and electron microscopy (Antony). Thus, the CBB is both pushing the frontiers of new technology and providing robust technologies for general use at the EMBL. This argues that it would be a good choice to serve as the host for additional technology purchases, perhaps in the area of EM tomography at the cellular level.

The CBB has a strong interest in the cytoskeleton in general with a sharp focus on microtubule related issues. The Panel is sympathetic to the importance of focus, but suggest that the CBB will have a greater impact if it broadens its research programme.

Major equipment: electron tomography as an EMBL facility

An important question for the future is the potential to set up EM tomography at EMBL. This is a relatively new technique that is not yet well represented in the European cell biology community. The CBB has shown it has the ability to develop techniques and to support multi-user facilities. It would therefore be a logical home for development in this area. It will, however, be rather expensive to set up. The decision to invest in it should be made after consultation with scientists at EMBL to determine their interests in the technique. It might also be useful to assess interest in Europe outside EMBL to see if such a facility might be additionally useful as a Europe-wide resource. The decision to invest in the necessary microscope should be dependent upon the interest of other scientists and Claude's willingness to collaborate in making this imaging method available for multiple scientific groups.

Antony has suggested that several scientists at EMBL would be interested in the development of tomography. If a significant fraction of these potential users can be confirmed, this list should serve as ample justification for the major investment of establishing a facility in this area.

Annex 3

ISI bibliometric analysis 1992–2002, France Biotech study

World-Rankings in Molecular Biology & Genetics (1992-2002)
EMBL is the top Non US-Institution

Institution	(Citations) Rank	(Papers) Rank	(Citations/ Paper) Rank	(Highly Cited Papers) Rank	(% Highly Cited Papers) Rank
EMBL	*(81,699)* **14**	*(1,573)* **23**	*(51.94)* **11**	*(52)* **17**	*(3.31)* **11**
ICRF	*(74,688)* **17**	*(1,372)* **29**	*(54.55)* **8**	*(42)* **22**	*(3.06)* **14**
U. Cambridge	*(68,353)* **20**	*(2,106)* **14**	*(32.46)* **30**	*(41)* **23**	*(1.95)* **24**
U. Oxford	*(56,763)* **31**	*(1,832)* **18**	*(30.98)* **14**	*(22)* **33**	*(1.20)* **34**
I.Pasteur	*(56,001)* **32**	*(1,683)* **22**	*(32.27)* **28**	*(20)* **34**	*(1.19)* **35**
U. Tokyo	*(59,119)* **29**	*(1,158)* **32**	*(20.58)* **37**	*(20)* **34**	*(1.73)* **28**
U. Kyoto	*(50,383)* **36**	*(1,746)* **21**	*(28.86)* **35**	*(30)* **28**	*(1.72)* **30**
U. Toronto	*(67,459)* **21**	*(2,163)* **13**	*(31.19)* **32**	*(40)* **24**	*(1.85)* **27**
29 USA Institutions	*(368,130 to 50,078)* **1 37**	*(6,801 to 729)* **1 37**	*(82.66 to 26.94)* **1 36**	*(273 to 13)* **1 37**	*(7.82 to 0.69)* **1 37**

Source: ISI Science Indicator database

The Scientist

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DAILY NEWS

Life sciences centers compared

Index ranks Salk, EMBL, and MIT at the top, with biotech clusters linked to excellence

By **Stephen Pincock**

A French study comparing the excellence of research at biomedical research institutes in the United States and Europe has highlighted the symbiotic relationship between basic research and a thriving biotech industry.

Philippe Pouletty, president of France Biotech, presented results from a preliminary study into leading institutes at a conference organized by Fondation pour l'Innovation Politique in Paris last week (June 3).

For 27 different centers, he and colleagues calculated a "Life Sciences Excellence Index," based on the number of articles published in journals with an impact factor of more than 20, divided by the total number of papers, and expressed as a percentage.

"The goal is to have a simple objective index which can be looked at for various institutions independently of their size, overall output, structure, and so on," Pouletty told *The Scientist*.

By this measure, the top 10 institutes were: the Salk Institute (12.4%), the European Molecular Biology Laboratory (7.8%), Massachusetts Institute of Technology (MIT) (6.5%), Scripps Research Institute (5.1%), University of California at Berkley (4.5%), Stanford University (3.9%), Harvard University (3.8%), Germany's Max Planck Institute (3.8%), the United Kingdom's Medical Research Council (MRC) (3.3%), and the University of Cambridge (2.8%).

The first point that becomes clear is the close correlation between institutions with a high excellence index and those at the centers of leading biotechnology clusters, Pouletty said.

"In other words, it's certainly not a coincidence that Silicon Valley is the number one biotech cluster, with Stanford, Berkley, and UCSF, that the second is Boston, with MIT and Harvard, and the third is southern California with the Salk institute, the University of California, San Diego, and Scripps Research Institute," Pouletty said, "and that the UK hosts the strongest biotech industry in Europe."

"Our conclusion—which we suspected—is that excellent basic research in life sciences is a driving factor in the emergence of a strong biotechnology industry," Pouletty said.

Pouletty stressed that his aim wasn't necessarily to criticize particular institutes for not being up to scratch. "In this study, you're comparing Jaguars with Ferraris and BMWs," he said. "I want to insist that for all these listed, you're talking of high-level research worldwide."

Instead, the main aim was to figure out how Europe could compete better with the United States, which

currently outstrips it by a dramatic margin.

Biotech investment in the European Union is only a fraction of that spent in the United States, and the gap is widening, Pouletty said. "Driving Europe toward a better position will certainly involve investing more in basic sciences and also pushing a number of institutes toward a greater level of excellence."

Roberto Solari, chief executive of MRC Technology, the Medical Research Council's technology transfer company, said the translation of basic research into patented products was among the agency's key successes.

"Two of the UK's largest biotech companies, Celltech and Cambridge Antibody Technology, originated as MRC start-ups," Solari told *The Scientist*. "And in the last 4 years alone, the MRC has earned over £60 million in licensing income and entered into 150 licensing agreements with industry."

Figuring out which factors make an impact on research excellence is up for debate, Pouletty said. They probably include things like modes of evaluation and funding, policies for attracting and hiring academic staff, the competitive environment, and the existence of critical mass of researchers at one location.

Analysis of these kinds of parameters should be the basis for reforms of academic research in France and Europe, Pouletty said in his presentation. "Furthermore, we propose that the Excellence Index used in this study as well as other standardized performance indexes become part of a regular European and international academic research evaluation to monitor trends and help academic institutions progress," he said.

But Anthony van Raan, professor of quantitative studies of science at Leiden University in The Netherlands, and editor of the journal *Research Evaluation* said developing bibliometric measurements of research value was best left up to experts.

Although van Raan noted that he didn't have full details of the French methodology, he told *The Scientist*, "In general, it is unwise that people without experience in bibliometric measurements publish 'quick' surveys that should act as a 'simple objective index' for scientific excellence."

"Particularly the use of the ISI journal impact factors is methodologically not very sophisticated, to put it mildly," said van Raan, whose group has produced reports on the subject for the European Commission. "Of course, the top institutes in the US always come first. Their 'power' in scientific input and impact, reinforced by some US bias in the worldwide 'citation traffic,' is such that even with very crude measures, you always find something that looks OK."

For the assessment of European institutes, a much more advanced evaluation of scientific excellence is needed, van Raan said.

Links for this article

Philippe Pouletty http://www.biotechnica.de/top-38138.html?x=1

European Research: Towards Excellence and Economic Growth, Paris, France, June 3, 2004 http://www.france-biotech.org/TEMPLATES/TemplateGenerique.asp?ID_DOC=723

"New MRCT CEO," MRC Network, Spring 2004. http://www.mrc.ac.uk/pdf-mrc_network_004.pdf

Anthony F.J. van Raan http://www.cwts.nl/TvR/

ANNEX 4

EMBL faculty members by Unit

*(*indicates person has a joint appointment)*

Cell Biology and Biophysics

Group Leaders	Philippe Bastiaens	Damian Brunner*
	Darren Gilmour*	Gareth Griffiths
	Eric Karsenti	Michael Knop
	François Nédélec*	Ernst Stelzer
Team Leaders	Claude Antony*	Thomas Surrey
	Rainer Pepperkok	

Developmental Biology

Group Leaders	Stephen Cohen	Anne Ephrussi
	Eileen Furlong*	Carl Neumann
	Pernille Rørth*	Mathias Treier*
	Jochen Wittbrodt	
Team Leaders	Detlev Arendt	

Gene Expression

Group Leaders	Asifa Akhtar	Jan Ellenberg*
	Matthias Hentze*	Elisa Izaurralde
	Andreas Ladurner*	Jürg Müller*
	Carsten Schultz*	Lars Steinmetz*
	Matthias Wilm	

Structural and Computational Biology

Group Leaders	Peer Bork	Bettina Böttcher
	Elena Conti*	Achilleas Frangakis
	Andreas Hoenger*	Michael Sattler*
	Luis Serrano	Dietrich Suck
Team Leaders	Klaus Scheffzek*	Anne-Claude Gavin
	Toby Gibson	Robert Russell*
	Reinhard Schneider	

Directors' Research

Group Leaders	Frank Gannon	
	Iain Mattaj	

EMBL-EBI Hinxton

Group Leaders	Graham Cameron	Nick Goldman
	Wolfgang Huber*	Nicolas Le Novère
	Nicholas Luscombe*	Dietrich Rebholz-Schuhmann
	Peter Stoehr	Janet Thornton
Team Leaders	Rolf Apweiler	Ewan Birney
	Alvis Brazma	Kim Henrick
	Henning Hermjakob	Petteri Jokinen
	Rodrigo Lopez-Serrano	Nicola Mulder
	Peter Rice	Weimin Zhu

EMBL Grenoble

Group Leaders	Stephen Cusack*	Christoph Müller*
	Winfried Weissenhorn*	
Team Leaders	Florent Cipriani	Darren Hart
	Raimond Ravelli	José Márquez

EMBL Hamburg

Group Leaders	Christoph Hermes	Michel Koch
	Victor Lamzin	Dmitri Svergun
	Paul Tucker	Matthias Wilmanns
Team Leaders	Wolfram Meyer-Klaucke	Jochen Müller-Dieckmann
	Manfred Weiss	

EMBL Monterotondo

Group Leaders	Cornelius Gross*	Claus Nerlov*
	Manolis Pasparakis*	Nadia Rosenthal*
	Walter Witke*	
Team Leaders	Liliana Minichiello*	

ANNEX 5

A selection of EMBL research highlights

Organismal biology

- The identification of many of the genes responsible for establishing the body plan of insect embryos, carried out in the 1970s, was the first attempt to analyse such a complex function on a genome-wide scale. It was recognised by the Nobel Prize awarded to C. Nüsslein-Volhard and E. Wieschaus in 1995.
- A series of studies by T. Graf, B. Vennström, D. Bohmann, E. Wagner, R. Muller and others identified the cellular counterparts of oncogenes and analysed the mechanisms of oncogenesis.
- Cell signalling in morphogenesis was studied by S. Cohen and others, who demonstrated that gradients of secreted signalling proteins provide positional information that organises the body plan.
- The importance of cell polarity in underpinning the cell–cell interactions that guide development, from the establishment of embryonic axes to the organisation of epithelial tissues was established by A. Ephrussi, M. Mlodzik, S. Eaton, K. Simons and others.
- R. Klein, L. Minichiello and others contributed the discovery of bidirectional signalling complexes and their role in axon guidance to the field of mouse neurogenetics.
- RNAi-based functional genomic screens for cell division mutants in *C. elegans* by A.Hyman, C. Echeverri, P. Gönczy and others were among the first functional screens that made use of a metazoan genomic sequence and provided insights into cell polarity, nuclear assembly etc.
- The identification of a micro-RNA with a critical role in development, specifically in regulating organism size, and the identification of many more micro-RNAs and their target genes in *Drosophila* by S. Cohen, R. Russell and others.

Structural biology

- K. Holmes and others at the Hamburg Outstation pioneered the use of synchrotron radiation for X-ray analysis of biological samples. X-ray detector devices for synchrotrons for automatic, rapid collection of X-ray diffraction data in digital form were developed by C. Boulin, A. Gabriel, M. Koch. J. Hendrix and K. Wilson. One of the latest developments to come from the 30-year history of synchrotron-based structural biology at EMBL is the world-leading software package ARP/wARP, developed by V. Lamzin, A. Perrakis and others that helped automate the process of turning X-ray diffraction data into a protein structure model.
- Microdiffractometer and end-stations for high-intensity X-ray beamlines were developed in Grenoble by A. Thompson, F. Cipriani & others. They and others were also active in the design and construction of automated sample changers, and other equipment to enable higher sample throughput.
- Cryoelectron microscopy was significantly advanced by J. Dubochet, who developed vitrification methods that allow the study of unfixed biological samples. Later, W. Kühlbrandt and colleagues solved the structure of the photosynthetic reaction centre using high-resolution electron microscopy.
- L. Serrano developed the only intensively tested automatic protein design algorithm currently available.
- Structural analysis of RNA metabolism by S. Cusack, M. Sattler, E. Conti and others illuminated the molecular basis for translational fidelity and aspects of RNA recognition and surveillance.

- Titin sequence, function and structure was studied by S. Labeit, M. Gautel, K. Leonard, M. Wilmanns and A. Pastore in an interdisciplinary effort to characterise the function of Titin, the largest human protein, that forms the "third filament" of sacromeres in muscle cells.
- Determination of the structure of receptors that mediate nuclear import and export of macromolecules in work that involved E. Conti, C. Müller, P. Bork, E. Izaurralde, I. Mattaj, D. Svergun and others illuminated how the directionality of transport is achieved.

Cell biology

- EMBL was THE European centre for molecular cell biology between the 70's and 90's. Outstanding work on membrane trafficking from a number of people such as K. Simons, A. Helenius, B. Dobberstein, G. Warren, D. Louvard and M. Zerial formed the core of this effort.
- Important insights into the dynamics of cytoskeletal organisation were obtained through a combination of computational modelling and detailed experimentation by E. Karsenti, F. Nedelec, T. Surrey and others.
- One of the first confocal microscopes was developed by E. Stelzer, who later went on with J. Huisken and others to develop the SPIM microscope that enables the analysis of thick specimens at high resolution in the light microscope.
- The development of light microscopy and computational methods that allow 4-dimensional analysis of cells and cellular processes such as signal transduction, secretion or chromosome segregation by P. Bastiaens, R. Pepperkok, J. Ellenberg and others allowed unprecedented insight into where and how these processes occur.

Gene expression

- Early "EMBL" vectors that were in universal use for genetic engineering were developed by K. Murray, G. Cesareni, R. Cortese, H. Lehrach and others.
- The Pharmacia line of DNA Sequencers was developed by W. Ansorge, as was an automated device for microinjection into individual cells that was commercialised by Eppendorf.
- EMBL became Europe's major centre for the study of post-transcriptional steps in gene expression thanks to the work of M. Hentze, A. Lamond, I. Mattaj, D. Tollervey, B. Seraphin, J. Valcarcel, R. Lebermann, S. Cusack and others.
- The Tandem Affinity Puification tag method for rapid, non-invasive purification of macromolecular complexes was developed by B. Seraphin. This, combined with novel mass spectrometry techniques developed by M. Mann and M. Wilm, made EMBL one of the leading centres for proteomics and was the technology behind the development of EMBL's spin-off company Cellzome AG.
- Modified RNA oligonucleotide tools (A. Lamond, B. Sproat). Development and synthesis of chemical tools that are widely used in analysis of RNA metabolism both *in vivo* and *in vitro*.
- RNA metabolism (M. Hentze, A. Lamond, I. Mattaj, D. Tollervey and others). Extensive, diverse studies on the mechanisms and regulation of post-transcriptional steps in gene expression.
- Receptors that mediate transport between the nucleus and cytoplasm were identified and their mechanisms of action elucidated by A. Lamond, E. Izaurralde, I. Mattaj and others.
- Mechanisms and regulators of mitotic nuclear breakdown and reassembly were characterised by J. Ellenberg, I. Mattaj and others.
- P. Becker and others developed *in vitro* systems that faithfully assembled chromatin templates and used them to characterise chromatin remodelling and modification complexes.
- The first whole genome tiling array, which allows identification and study of all the expressed regions of the

genome, was developed and used in an international collaboration whose EMBL participants included L. Steinmetz and W. Huber.

Bioinformatics

- The first public DNA databases, which are now part of the definitive international collection of DNA sequences, were developed at EMBL in the early 1980s by G. Hamm, G. Cameron and others. Today, the EMBL-EBI is the European node for globally coordinated efforts to collect and disseminate a wide range of biological data, including:
    - DNA and RNA sequences (EMBL-Bank, R. Apweiler and other members of the International Sequence Database Collaboration)
    - Genomes (Ensembl, E. Birney in collaboration with the Wellcome Trust Sanger Institute)
    - Microarray-based data (ArrayExpress, A. Brazma)
    - Protein sequences (UniProt, R. Apweiler and other members of the UniProt Consortium)
    - Macromolecular structures (MSD, K. Henrick and other members of the wwPDB)
    - Protein domains, families and motifs (InterPro, N. Mulder)
    - Protein–protein interactions (IntAct, H. Hermjakob and other members of the IMEx Consortium)
    - Pathways (Reactome, E. Birney in collaboration with Cold Spring Harbor Laboratory.
- The EMBL-EBI has perhaps done more than any other organisation in the world to develop data standards and controlled vocabularies, and promote their adoption. This is crucial for effective data mining and data sharing. For example:
    - M. Ashburner was a founder member of the Gene Ontology Consortium; controlled vocabularies that he developed in collaboration with many of the model organism database teams set the standard for the Open Biological Ontologies, a collection of controlled vocabularies describing many different aspects of biology.
    - A. Brazma was the founding chair of the Microarray Gene Expression Data Society, whose standards for microarray data have gained wide acceptance and have laid the foundations for the development of many newer data standards.
    - H. Hermjakob coordinates HUPO's Proteomics Standards Initiative (PSI), which is developing data standards for protein–protein interactions, mass spectrometry, and general proteomics.
    - N. Le Novère is a key player in the development of standards for modelling biological systems; his group has contributed to the development of Systems Biology Markup Language (SBML).
- SRS, a system developed by T. Etzold, is used to navigate between various databases and was one of the technologies on which Lion Biosciences, an EMBL spin-off company, was founded.
- Many widely used software tools for computational biology have been developed at EMBL, including:
    - GenQuiz, the first automatic gene annotation system (C. Sander)
    - STRING, a tool that combines many different types of information to predict protein function (P. Bork)
    - DALI, a tool for comparing protein structures (L. Holm, C. Sander)

  - Clustal, a programme that produces alignments of multiple sequences (D. Higgins, T. Gibson)
  - AGADIR, an algorithm to predict the helical content of proteins (L. Serrano)
  - GeneWise and PromoterWise, methods to find genes and regulatory regions in newly sequenced genomes (E. Birney)
  - A wide range of tools for automatically annotating protein sequences (R. Apweiler and others) and protein structures (K. Henrick and others)
  - ProFunc, a pipeline of methods, many of them based on three-dimensional templates, to predict protein function from structure (J.M. Thornton and others)
  - Contributions to BioConductor, a user-friendly suite of tools, based on the R package, for statistical analysis of microarray data (W. Huber and others)
  - TribeMCL, a method for clustering proteins into protein families.

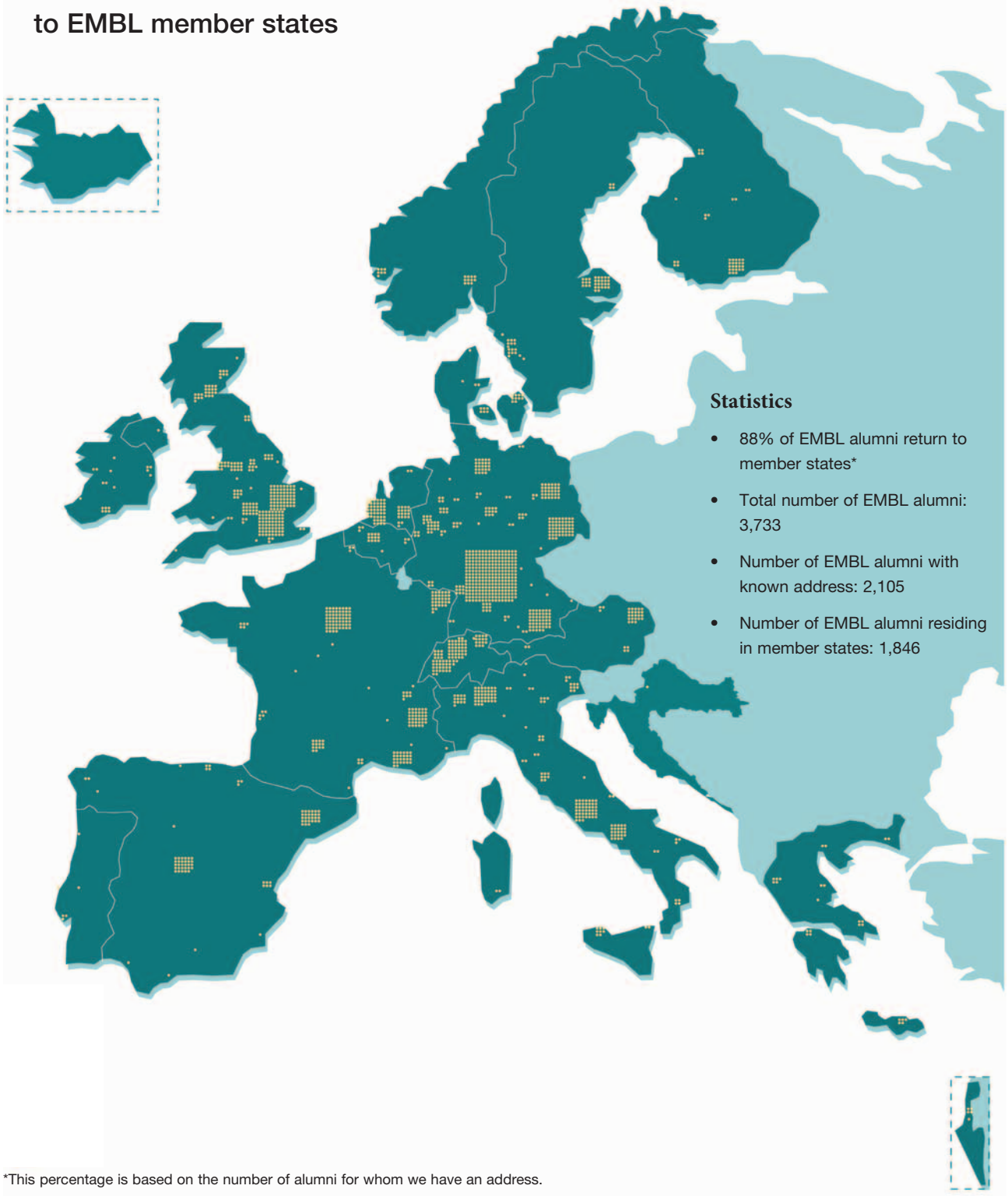
- Advances in comparative genomics include:
  - Analysis of the malaria vector, *Anopheles* (P. Bork, F.C. Kafatos), improving our understanding of how the malaria parasite interacts with its host.
  - Using the mouse sequence to build a more complete gene set in humans (E. Birney).
  - Using the chicken sequence to identify highly conserved regions of non-coding DNA (E. Birney).
  - The first genuine genome-wide multiple alignments over the full set of mammalian and bird genomes (E. Birney).

- New resources that are at an advanced stage of development include:
  - PANDIT – a database of nucleic acid sequence alignments (N. Goldman).
  - BioModels – a new data resource for biological models started this year (N. Le Novère).
  - MACiE – a database of catalytic mechanisms (J.M. Thornton and others).
  - EBIMed and Protein Corral: text-mining tools that that combine information retrieval and information extraction. (D. Rebholz-Schuhmann).

ANNEX 6

EMBL alumni: knowledge transfer

1. EMBL alumni returning to EMBL member states



*This percentage is based on the number of alumni for whom we have an address.

2. Mobility between member states

Current residence

Nationality	A	B	CH	D	DK	E	F	G	HR	ICE	IRE	ISR	IT	N	NL	P	S	SF	UK	EUR	OTHER	TOTAL
A	**14**			10		1									1		2		6		4	38
B		**12**		4	1		3								1		2		4		1	28
CH			**18**	3													1		5		7	34
D	10	1	23	**348**	2	2	12						5	1	3		1	1	21		64	494
DK			2	1	**12**	1	1				1										7	25
E			4	9		**74**	2						3		1			1	8		15	117
F		2	13	18		2	**156**				1		2		4		3	1	9	1	10	222
G			3	4		1	1	**24**					1		3				4	1	7	49
HR									**1**													1
ICE										**0**									1			1
IRE				4			2	1			**16**								6		5	34
ISR		1										**7**									3	11
IT	2		3	17			11	1					**168**		2		1		9		14	228
N													1	**17**			1				1	20
NL		1	4	13	1		2						3		**48**		1	1	3		3	80
P				4												**5**					4	13
S	1		2	4													**38**				6	51
SF			1	7										1	1		5	**34**	1		1	51
UK	3	1	11	49	3	2	10						5		1		2		**154**		41	282
EUR	2	1	3	9	2		3						1			1			1	22	22	67
OTHER	1		3	39		3	6						4		2		1	1	23		176	259
TOTAL	33	19	90	543	21	86	209	26	1	0	18	7	193	19	67	6	58	39	255	24	391	2105

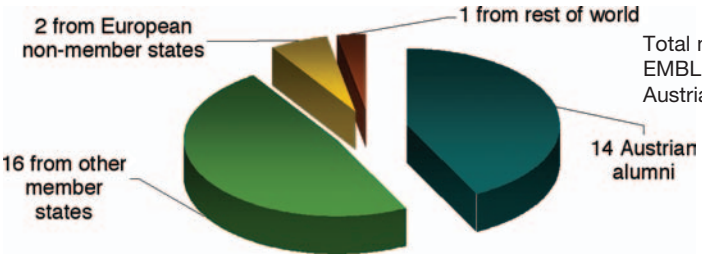
Figures are based on the 2,105 alumni for whom we have an address (of about 3,733 alumni in total). 1,846 of those are currently in EMBL member states, which represents 88% of EMBL alumni.

Please contact Mehrnoosh Rayner (alumni@embl.de) if you would like to receive detailed information for EMBL alumni in your country.

A – Austria, B – Belgium, CH – Switzerland, D – Germany, DK – Denmark, E – Spain, F – France, G – Greece, HR – Croatia, ICE – Iceland, IRE – Ireland, ISR – Israel, IT – Italy, N – Norway, NL – Netherlands, P – Portugal, S – Sweden, SF – Finland, UK – United Kingdom, EUR – Europe, OTHER – Rest of the world.

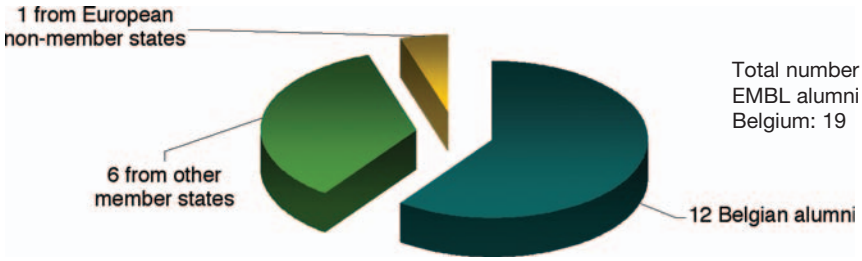
3. EMBL alumni working in EMBL member states

Austria



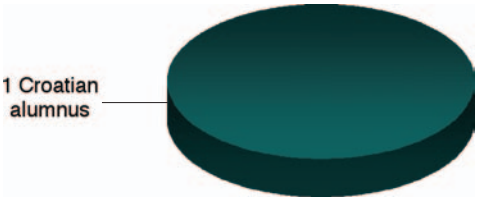
Total number of EMBL alumni in Austria: 33

Belgium



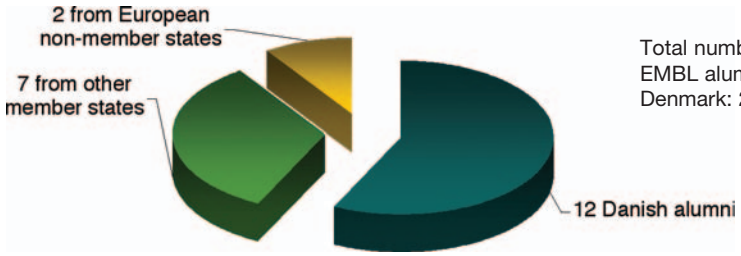
Total number of EMBL alumni in Belgium: 19

Croatia



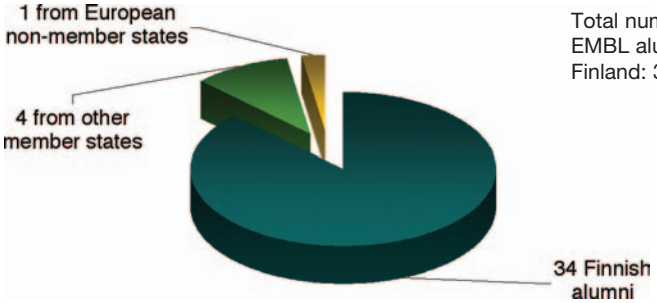
Total number of EMBL alumni in Croatia: 1

Denmark



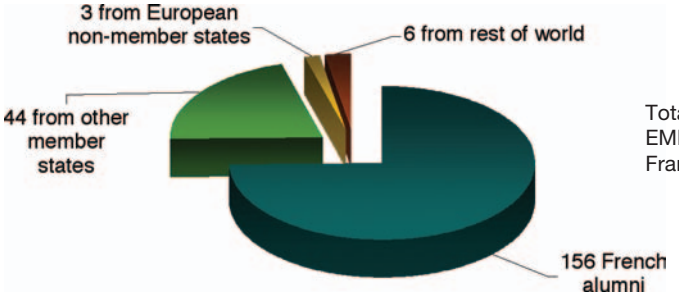
Total number of EMBL alumni in Denmark: 21

Finland



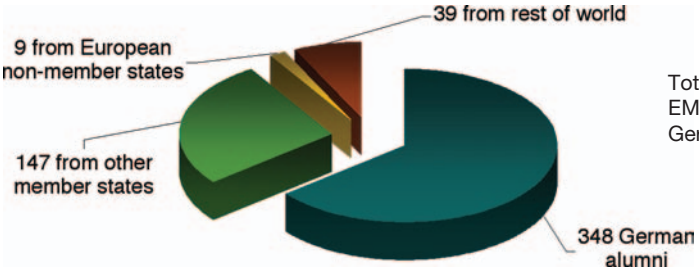
Total number of EMBL alumni in Finland: 39

France



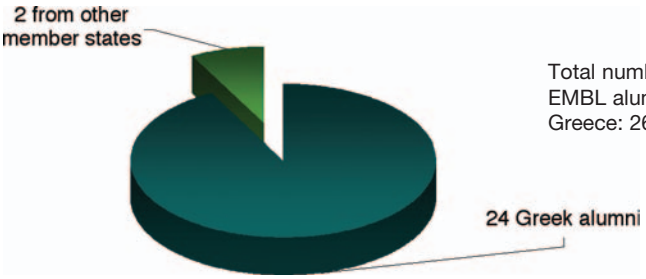
Total number of EMBL alumni in France: 209

Germany



Total number of EMBL alumni in Germany: 543

Greece

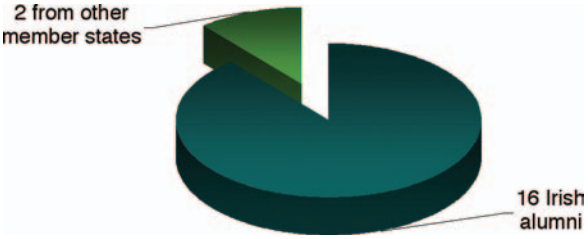


Total number of EMBL alumni in Greece: 26

Iceland

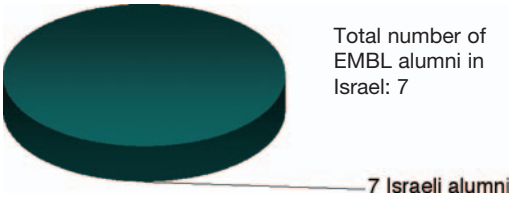
No alumni working in Iceland.

Ireland

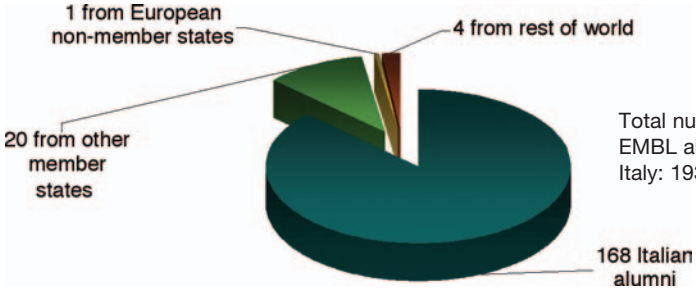


Total number of EMBL alumni in Ireland: 18

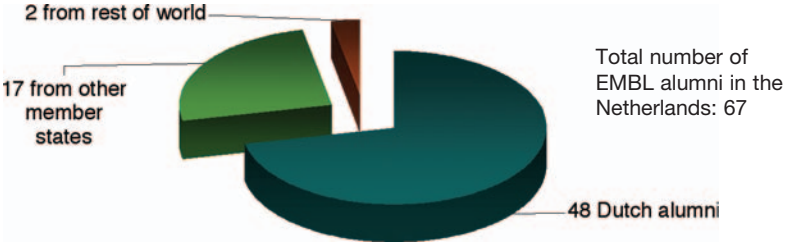
Israel



Italy



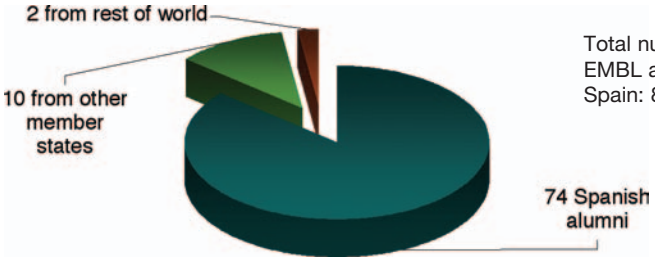
Netherlands



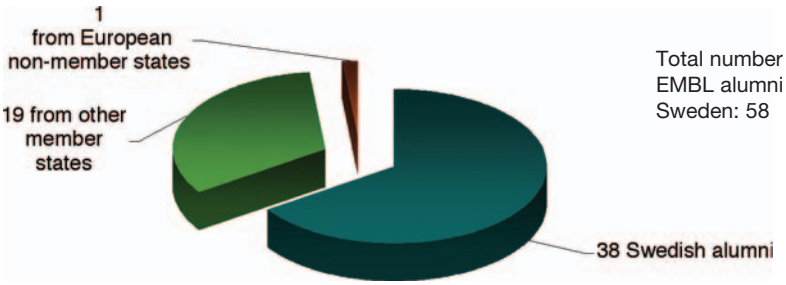
Norway

Portugal

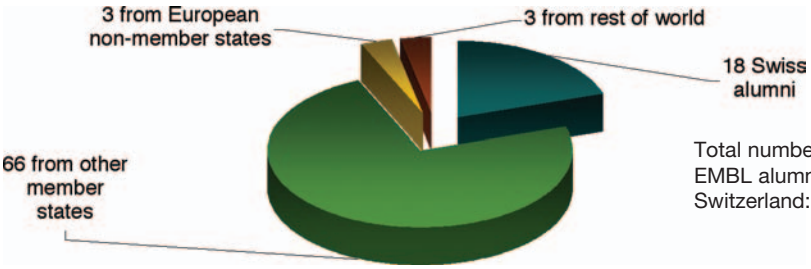
Spain



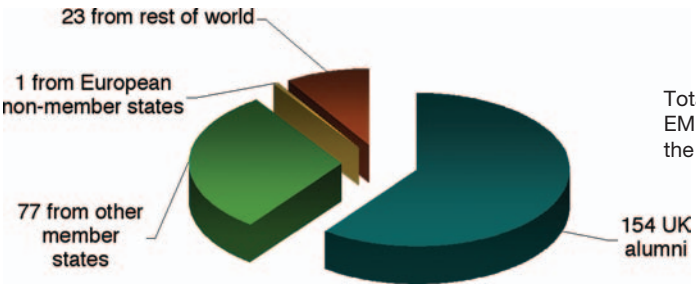
Sweden



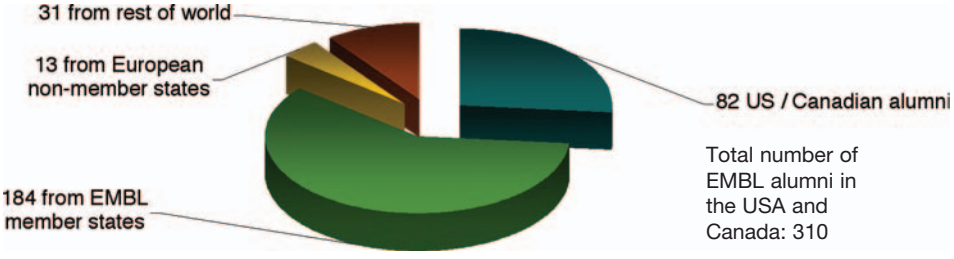
Switzerland



UK



USA and Canada (not EMBL member states)



Full Name	Current Position	Institution, City	Country
Ruben Abagyan	Professor	Scripps Research Institute, La Jolla, CA	United States
Marc Adrian		Université de Lausanne	Switzerland
Hilary Anderson			Canada
Patrick Argos	Retired		Germany
Michael Ashburner	Professor of Biology	University of Cambridge	United Kingdom
Keith Ashman	Principal Scientist	MDS Sciex, Concord, ON	Canada
David W. Banner		F. Hoffmann-La Roche Ltd., Basel	Switzerland
John Barrington-Leigh			Canada
Klaus -Sören Bartels	Software Development	X-ray Research GmbH, Norderstedt	Germany
Geoffrey John Barton	Professor of Bioinformatics	University of Dundee	United Kingdom
Hans Dieter Bartunik	Senior Research Scientist & Group Leader	MPG, Hamburg	Germany
Ursula Bassemir		Universitaet Landau	Germany
Thomas Bastian	Trials Manager/Technical Architect for Carrier IP Services	Nortel Networks, Frankfurt	Germany
Florence Baudin	Staff Scientist	IVMS, Grenoble	France
Peter B. Becker	Professor & Head of Department	Adolf-Butenandt-Institut, Munich	Germany
Barbro Beijer	Scientist		
Graham Arthur Bentley	Head of Unit	Institut Pasteur, Paris	France
Carmen Berthet-Colominas			France
Christian Betzel	Professor	Institut für Biochemie und Lebensmittelchemie, Hamburg	Germany
Hartmut Beug	Senior Scientist	IMP, Vienna	Austria
Marco E. Bianchi	Associate Professor	DIBIT, Milan	Italy
Howard Bilofsky	Director, Knowledge & Information Technology and Alliances	Glaxo SmithKline Beecham, King of Prussia, PA	United States
Michael Böhm			Germany
Dirk Bohmann	Professor of Genetics	University of Rochester	United States
Joan Bordas	Director	Laboratori de Llum de Sincrotró (LLS), Bellaterra, Barcelona	Spain
Francesco Borras-Cuesta		Universidad di Navarra, Pamplona	Spain
Heinz E. Bosshard	Advanced Technology Engineer	Brookhaven Natl. Lab., Upton, NY	United States
Tewis Bouwmeester	Senior scientist	CellZome, Heidelberg	Germany
Rodrigo Bravo	Senior Director, Pharmacology/Oncology	Pharmacia & Upjohn AB, Nerviano, Milan	Italy

Frédéric Briquet-Laugier			France
Leonardo Brizuela	Assoc. Director of Development	Harvard Medical School, Boston, MA	United States
Richard Bryan	Director of Computing	University of Oxford	United Kingdom
Jean Burckhardt	Senior Researcher	Swiss Tropical Institute, Basel	Switzerland
Brian Burke	Associate Professor	University of Florida, Gainesville, FL	United States
Christopher Carlson			
Giovanni Cesareni	Professor of Genetics	Università di Roma "Tor Vergata"	Italy
Thomas Ceska	Head of Crystallography	Celltech Chiroscience, Slough	United Kingdom
Jean Chamayou		Université Paul Sabatier, Toulouse	France
Patrick Charnay	Director of Unit	Ecole Normale Superieure, Paris	France
Andrei Chevchenko		MPI for Molecular Cell Biology and Genetics, Dresden	Germany
Denis Chrétien	Group Leader	Université de Rennes 1	France
Jadwiga Chroboczek		IBS, Grenoble	France
Gennaro Ciliberto	Executive Director: Head of Biology	I.R.B.M. P. Angeletti, Pomezia	Italy
Elisabeth Cistac			
Peter Clout	Company President	Vista Control Systems, Inc., Los Alamos, NM	United States
Bernard A. Connolly		University of Newcastle upon Tyne	United Kingdom
Riccardo Cortese	President	IRBM, Pomezia	Italy
Sara A. Courtneidge	Deputy Dir. of the Van Andel Research Institute	Van Andel Research Institute, Grand Rapids, MI	United States
Thomas Edwin Creighton	Retired		Switzerland
Marek Cyrklaff	Group Leader	MPI fuer Biochemie, Martinsried	Germany
Diana M. Dainton		University of Liverpool	United Kingdom
Nigel J. Darby	Vice President R&D	GE Healthcare, Uppsala	Sweden
Zbigniew Dauter	Chief, Synchrotron Radiation	Argonne National Laboratory, IL	United States
Jean Davoust			
José-Luis de la Pompa	Investigator	National Center for Biotechnology, Madrid	Spain
Leo C.M. de Maeyer	Group Leader	MPI für Biophysikalische Chemie, Göttingen	Germany
Jan De Mey	Professor and Group Leader	Université Louis Pasteur – ESBS, Illkirch	France
Vicenzo De Simone	Professor of Mol. Biol.	Università di Napoli Federico II, Naples	Italy
Hajo Delius	Retired		Germany
Roberto Di Lauro	Professor	Università di Napoli Federico II, Naples	Italy
Pietropaolo Di Nocera		Università di Napoli, Naples	Italy

Fernando J. Díaz Benjumea	Group Leader	CSIC, Cantoblanco	Spain
Elisabeth Dicapua			France
John Dickson			Germany
Kristina Djinovic Carugo	Professor	University of Vienna	Austria
Bernhard Dobberstein	Professor	Universität Heidelberg	Germany
Hans Doebbeling	General Manager	Dante, Cambridge	United Kingdom
Carlos Dotti	Professor	Università di Torino	Italy
Mark Douglas			
Vincenzo Dovi	Scientific Adviser	Italian Embassy in Berlin	Germany
Giulio F. Draetta	Director	Cancer Research, Boston, MA	United States
Jacques Dubochet	Full Professor / Director	Université de Lausanne	Switzerland
Denis Duboule	Full Professor / Chairman	Université de Genève	Switzerland
Ashley R. Dunn	Professor/Associate Director		
Suzanne Eaton	Group Leader	MPI for Molecular Cell Biology and Genetics, Dresden	Germany
Christopher Eavis			
Jan-Erik Edström	Research Associate - Professor Emeritus	Karolinska Institutet, Stockholm	Sweden
Hindrik Elema			
David Emmert	Scientific Database Programmer	Harvard University, Cambridge, MA	United States
Christoph Enroth		Karo Bio AB	Sweden
Ramon Eritja	Group Leader	Centro de Investigacion y Desarrollo Jordi Girona, Barcelona	Spain
Thure Etzold	President LION Bioscience Ltd., UK	LION Bioscience AG	United Kingdom
Ottavio Fasano			Italy
Dominic Fédronic			
Ingeborg Feil		Structural GenomX, San Diego, CA	United States
Alan G. Fowler		Liverpool Polytechnic	United Kingdom
Jon Frampton	Senior Research Fellow & Honorary Reader	University of Birmingham	United Kingdom
Rainer Frank			Germany
Robert Freeman		ESRF, Grenoble	France
Anna-Marie Frischauf	Professor of Genetics	Universität Salzburg	Austria
Rainer Fuchs	Vice President, Research Informatics	Biogen, Inc., Cambridge, MA	United States
Masao Fujinaga	Research Associate		Canada
Stephen Fuller	Professor	University of Oxford	United Kingdom
Hans Fürst			

André Gabriel	Retired		France
Henrik Garoff	Professor	Karolinska Institutet, Huddinge	Sweden
Heinrich Gausepohl	CEO	INTAVIS Bioanalytical Instruments AG, Cologne	Germany
Fatima Gebauer	Group Leader	Centre de Regulacio Genomica, Barcelona	Spain
Gadi Geiger	Research Scientist	MIT, Cambridge, MA	United States
Spyros D. Georgatos	Professor	University of Ioannina	Greece
Hans-Hermann Gerdes	Principal Investigator	University of Bergen	Norway
Erich Gilberg		Fachhochschule, Frankfurt am Main	Germany
Peter Gill			
Jürgen Glöckner			Germany
Xavier Gomis-Rüth	Research Scientist	CSIC, Barcelona	Spain
Cayetano González	Group Leader	Institute of Biomedical Research, Barcelona	Spain
Ana González	Staff scientist	Stanford Synchrotron Radiation Laboratory, Menlo Park, CA	United States
Fotini Gounari	Assistant Professor	Molecular Oncology Research Institute, Boston, MA	United States
Thomas Graf	Professor, Programme Coordinator	Albert Einstein College of Medicine, Bronx, NY	United States
Cornelius J.P. Grimmelikhuijzen	Professor and Chairman	University of Copenhagen	Denmark
Jean Gruenberg	Professor	University of Geneva	Switzerland
Konrad Güth			
Matthias Hage		Merck KGaA, Darmstadt	Germany
Maximilian Haider	Managing Director	CEOS, Heidelberg	Germany
Alan Hamill			United Kingdom
Gregory Hamm	VP, Corporate Integration	GPC Biotech, Inc., Princeton, NJ	United States
Arnold Harmsen			Germany
Bernt Hartfiel	Manager	IT-med GmbH, Usingen	Germany
Norbert Hassler	Retired		Germany
David Hazledine			
Ari Helenius	Professor	Swiss Federal Institute of Technology, Zurich	Switzerland
Jules Hendrix	CEO/Director	X-ray Research GmbH, Norderstedt	Germany
Patrick Herde	Computer scientist/Oracle database specialist/ System architect		Germany
Jaap Heringa	Professor of Bioinformatics	Free University Amsterdam	Netherlands
Richard F. L. Herzog	Research Staff	FASTLITE, Palaiseau	France
Desmond Higgins	Professor	University College Dublin	Ireland

Bernard Hoflack	Professor	Technical University Dresden	Germany
Michelle Hollecker	Maitre de Conferences	CNRS, Orléans	France
Liisa Holm	Group Leader	University of Helsinki	Finland
Kenneth C. Holmes	Director	MPI für medizinische Forschung, Heidelberg	Germany
Jean-Claude Homo			France
Ulrich Hopfer		Case Western Reserve Univ., Cleveland, OH	United States
Heinrich Hörber		Wayne State University, Detroit, MI	United States
Kathryn E. Howell	Professor	University of Colorado	United States
Ed Hurt	Professor	Universität Heidelberg	Germany
Wieland B. Huttner	Director	MPI für Molecular Cell Biology and Genetics, Dresden	Germany
Joanna Hybel			Poland
Anthony Hyman	Group Leader & Director	MPI for Molecular Cell Biology and Genetics, Dresden	Germany
Adolfo M. Iribarren	Investigador Adjunto	Ingebi-Conicet, Buenos Aires	Argentina
Dennis Iversen			
Herbert Jäckle	Director	MPI für Biophysikalische Chemie, Göttingen	Germany
Bernard Jacrot	Retired		France
Jean-Claude Jésior	Scientist	Institut Albert Bonniot, La Tronche	France
Brigitte M. Jockusch	Professor	TU Braunschweig	Germany
Arthur V. Jones	Retired		Australia
Erich Jost		Justus-Liebig-Universität, Giessen	Germany
Vivien Junker	Data Curator	Swiss Institute of Bioinformatics, Geneva	Switzerland
Fotis C. Kafatos	Department Chair and Chair of ERC Scientific Council	Imperial College London	United Kingdom
Patricia Kahn	Associate Editor	IAVI, Nyack, NY	United States
Ulrich Kalinke	Head of Dept./Professor	Paul-Ehrlich Institut, Langen	Germany
Roland Kellner	Research Scientist	Merck KGaA, Darmstadt	Germany
Johan Kemmink	Assistant Professor	University of Utrecht	Netherlands
Richard Kempf			
John Kenney	Guest Lecturer	University of Aarhus	
Jahanshah Khazaie			Germany
Lock-Song Kim	Professor	Chinese Academy of Sciences, Beijing	China
Rüdiger Klein	Director & Scientific Member	Max-Planck-Institut für Neurobiologie, Martinsried	Germany
Geoff G. Kneale		University of Portsmouth	United Kingdom
Claudia Koch-Brandt	Professor	Johannes Gutenberg Universität, Mainz	Germany

Barbara Koller			Germany
Jean Kübler			France
Werner Kühlbrandt	Director	MPI für Biophysik, Frankfurt am Main	Germany
Sune Kvist			Sweden
Patrick Labouesse			
Jane E. Ladner			United States
Robert C. Ladner		Protein Engineering Corporation, Rockville, MD	United States
Camille Lagerberg			
Peter Laggner	Director of Inst. Biophysics and X-ray Structure Research	Austrian Academy of Sciences, Graz	Austria
Jeremy H. Lakey	Professor	University of Newcastle	United Kingdom
Angus I. Lamond	Professor of Biochemistry, Principal Investigator	University of Dundee	United Kingdom
Jörg Langowski	Head of Division	DKFZ, Heidelberg	Germany
Kjeld Larsen	Senior Scientist	Zealand Pharmaceuticals A/S, Glostrup	Denmark
Reuben Leberman	Retired		New Zealand
Hans Lehrach	Director	MPI für Molekulare Genetik, Berlin	Germany
Kevin Leonard	Retired		United Kingdom
Jean Lepault		CNRS, Gif-sur-Yvette	France
Arthur M. Lesk	Senior Research Associate	University of Cambridge	United Kingdom
Achim Leutz	Full Professor	Humboldt Universität zu Berlin	Germany
Elena Levashina	Charge de Recherche	Institut de Biologie Moleculaire et Cellulaire (IBMC), Strasbourg	France
Anita Lewit-Bentley	Research Director	Centre Universitaire Paris-Sud	France
Philippe Leyendecker			
Hugh Lindley			United Kingdom
Manuela Lopez de la Paz	Group Leader		Germany
Daniel Louvard	Director	Institut Curie, Paris	France
Maria Macias Hernandez	Group Leader	Parc Cientific de Barcelona	Spain
Yuichiro Maeda	Chief Scientist	RIKEN Harima Inst., Kouto, Sayo, Hyogo	Japan
Matthias Mann	Director	MPI für Biochemie, München	Denmark
Herman Marsman			Germany
Don A. Marvin			United Kingdom
Beate Marx			Germany
Karl S. Matlin		Harvard Medical School, Charlestown, MA	United States

Olga Mayans	Assistant Professor	Biozentrum Basel	Switzerland
Sean Michael McSweeney		ESRF, Grenoble	France
Peter McCaldon	Retired		
Marialuisa Melli	Professor	Università di Bologna	Italy
Peter Metcalf	Associate Professor	University of Auckland	New Zealand
David I. Meyer	Vice-President for Research	Cedars-Sinai Medical Center, Los Angeles, CA	United States
Marco Milán	Group Leader	ICREA, Barcelona	Spain
Jürgen Milde		Universität Köln	Germany
Andrew Miller	Principal/Vice Chancellor	Royal Society of Edinburgh	United Kingdom
Marek Mlodzik	Professor	Mount Sinai School of Medicine, New York, NY	United States
Paolo Monaci	Group Leader	IRBM, Pomezia	Italy
Michael Moody		University of London	United Kingdom
Ali Moussavi			
Juha Muilu		University of Helsinki	Finland
Hans-Michael Müller	Research Associate	ZMBH, Heidelberg	Germany
Rolf Müller	Professor	Universität Marburg	Germany
Noreen Murray	Professor Emeritus	University of Edinburgh	United Kingdom
Sir Kenneth Murray		University of Edinburgh	United Kingdom
Dominique Nalis			Germany
Dick R. Nässel	Professor	Stockholm University	Sweden
Colin Nave	CCLRC Fellow	CCLRC Daresbury Laboratory, Warrington	United Kingdom
Angel R. Nebreda	Principal Investigator and Group Leader	CNIO, Madrid	Spain
Ulrike Nentwig			
Scott A. Ness	Associate Professor, Co-Director	University of New Mexico, Albuquerque, NM	United States
Grigore-Constantin Nicolae		Vision System GmbH, Norderstedt	Germany
Michael Nilges	Group Leader	Institut Pasteur, Paris	France
Tommy Nilsson	Professor	Goeteborgs University	Sweden
Hans-Friedrich Nolting	Retired		Germany
Christiane Nüsslein-Volhard	Director	MPI für Entwicklungsbiologie, Tübingen	Germany
Laerte Oliveira			
Jean Christophe Olivo-Marin	Group Leader	Institut Pasteur, Paris	France
Roy A. Omond	IT Consultant (managing director of own company)	Blue Bubble Ltd., Essex	United Kingdom
Hartmut Oschkinat	Head of NMR-supported Structural Biology Dept.	Forschungsinstitut f. Mol. Pharmakologie, Berlin	Germany
Christos Ouzounis		National Center for Research and Technology	Greece

Gour Pada Pal			
Giovanni Paolella	Professor of Biochemistry	University of Molise – CEINGE Napoli	Italy
Athanasios Papavassiliou	Professor and Head	University of Patras	Greece
Michael William Parker	Associate Director	St. Vincents Inst. of Med. Res., Fitzroy, Victoria	Australia
Robert G. Parton	Associate Professor	University of Queensland	Australia
Annalisa Pastore	Group Leader	MRC, London	United Kingdom
Franc Pattus	Head of Brussels Office	CNRS, Brussels	Belgium
Anastassis Perrakis	Group Leader	Netherlands Cancer Institute, Amsterdam	Netherlands
Kyriacos Petratos	Researcher	IMBB-FORTH, Heraklion	Greece
Robert Pettifer	Senior Lecturer	University of Warwick	United Kingdom
Steven E. Pfeiffer	Professor	University of Connecticut, Farmington, CT	United States
Lennart Philipson	Professor Emeritus	Karolinska Institute, Stockholm	Sweden
James Phillips	Senior Applications Scientist	Bruker AXS Inc., Madison, WI	United States
Vincenzo Pirrotta	Professor	Université de Genève	Switzerland
Tony Pitt			United Kingdom
Ulrich Plagens			Germany
Pierfrancesco Plastina			
Anne-Ruth Plück-Becklas	Head of Mouse Engineering Facility	Universität Köln	Germany
Stephen W. Provencher	President		Canada
Paul S. Quinn			United Kingdom
Klaus Rajewsky	Senior Investigator/Professor	Harvard University, Boston, MA	United States
Gert Jürgen Rapp			Germany
Bjarne Finn Rasmussen			Denmark
Nicole Redaschi	Team Leader	Swiss Institute of Bioinformatics, Geneva	Switzerland
Thomas A. Reed			Germany
Hubert Reggio		Université de Montpellier II	France
Zofia Rek		Stanford University, Menlo Park, CA	United States
Manfred Renz	Co-Founder/ Co-Director	Inst. Immunol. and Mol. Genetics, Karlsruhe	Germany
Adam Richman	Assistant Professor	University of Maryland, MD	United States
Isolde Riede-Kainrath			
Bernd Röchert		Swiss Institute of Bioinformatics, Geneva	Switzerland
Lucia Rodriguez-Monge			
Patricia Rodriguez-Tomé	Bioinformatician	CRS4, Sardinia	Italy
Eugeniusz Rokita	Professor/Head of the Dept	Jagiellonian University, Kraków	Poland

Gerd Rosenbaum	Senior Beamline Scientist	Argonne National Laboratory, Chicago, IL	United States
Jürg P. Rosenbusch	Professor/ Group Leader	Universität Basel	Switzerland
H. Ruf			
Rob Ruigrok	Director	IVMS, Grenoble	France
Ulrich Rüther	Head	Universität Düsseldorf	Germany
Lucas Sanchez	Staff Scientist	Centro de Investigaciones Biologicas, Madrid	Spain
Chris Sander	Head, Computational Biology Center	Memorial Sloan-Kettering Cancer Ctr., New York, NY	United States
Zehra Sayers	Professor	Sabanci University, Istanbul	Turkey
Hildegard Chica Schaller	Professor	Universität Hamburg	Germany
Claudio Schneider	Full Professor & Director LNCIB	ICGEB, Trieste	Italy
Hans Robert Schöler	Director	MPI für molekulare Biomedizin, Münster	Germany
Bernardus Schoot		LaboRAtoires Galderma S.A., La Défense	France
Johan Schultz	Senior Scientist		Sweden
Bertrand Séraphin	Director of Research	CNRS, Gif-sur-Yvette	France
Ramon Miguel Serrano	Professor	Universidad Politecnica CSIC, Valencia	Spain
Michael Sieweke	Research Director	CNRS, Marseille	France
Kai L. Simons	Director	MPI for Molecular Cell Biology and Genetics	Germany
Karl Simpson	Consultant and owner of Benezech-Simpson		France
Irmgard Sinning	Head of Department & Professor	Universität Heidelberg	Germany
J. Smith			
Graham Smith			
Vicente Armando Solé		ESRF, Grenoble	France
Vicenzo Sorrentino	Professor/Director, Molecular Medicine Section	Università di Siena	Italy
Brian S. Sproat	Scientist		Belgium
Keith K. Stanley	Director of Research	St. Vincents Inst. of Med. Res., Sydney, NSW	Australia
Thomas Stefany			Germany
Pieter Sterk	Bioinformatician	University of Amsterdam	Netherlands
Francis Adrian Stewart	Professor	Technical University Dresden	Germany
Colin Stewart	Chief, Cancer & Developmental Biology Laboratory	NCI, Frederick, MD	United States
Clemens Storz	Instrumentation Engineer	Max-Planck-Institut für Astronomie, Heidelberg	Germany
Günter Stösser			Germany
Nick J. Strausfeld	Regent's Professor	University of Arizona	United States
Herman Struve			

Kurt Stüber		Max Planck Institut for Züchtungsforschung, Cologne	Germany
Heinrich B. Stuhrmann	Professor and Group Leader	IBS, Grenoble	France
Henk Stunnenberg	Head Dept. Molecular Biology	University of Nijmegen	Netherlands
Giulio Superti-Furga	Director	CeMM, Vienna	Austria
Robert M. Tanguay			
Philip Taylor			
Alexey Teplyakov	Research Associate	University of Maryland, MD	United States
Defendente Tocchetti			
David Tollervey	Professor	University of Edinburgh	United Kingdom
John Tooze	Director Research Services ICRF	Imperial Cancer Research Fund, London	United Kingdom
James Torbet			
Anna Tramontano	Comp. Biol. and Chem. Dept Director	Università di Roma “La Sapienza”	Italy
Demetrius Tsernoglou	Professor	Università di Roma “La Sapienza”	Italy
Akira Tsugita	Director	Proteomics Research Laboratory, Tsukuba	Japan
Stephan Uhlemann			
Brian M. Unitt			
Juan Valcárcel	Group Leader	Centre de Regulacio Genomica, Barcelona	Spain
Gerrit Van Meer	Professor	University of Utrecht	Netherlands
Roelof G. van Silfhout	Lecturer	University of Manchester	United Kingdom
David J. Vaux	Professor	University of Oxford	United Kingdom
Björn Vennström	Professor and Group Leader	Karolinska Institute, Stockholm	Sweden
Isabelle Vernos	Group Leader	Centre de Regulació Genòmica (CRG), Barcelona	Spain
Jaak Vilo			Estonia
Robert H. Vogel	Global Head Regulatory Submissions	F. Hoffmann-La Roche, Ltd., Basel	Switzerland
Gerhard Vogt	Director Bioinformatics	Axaron Bioscience AG, Heidelberg	Germany
Constantinos Vorgias			Germany
Hartmut Voss		LION Bioscience AG, Heidelberg	Germany
Gert Vriend	Professor	CMBI, Nijmegen	Netherlands
Rebecca Wade	Group Leader	European Media Laboratory GmbH, Heidelberg	Germany
Erwin F. Wagner	Senior Scientist and Deputy Director	IMP, Vienna	Austria
H.-J. Wagner			
Jochen Wallach			
Clive Walter	Retired		Germany
Da Neng Wang	Associate Professor	New York University Medical Center, NY	United States

Graham Warren	Professor	Yale University, New Haven, CT	United States
Michael Way	Senior Scientist	Cancer Research UK, London	United Kingdom
Nicholas Webster			
Hanns Weiss	Professor	Heinrich-Heine-Universität, Düsseldorf	Germany
Rik Wierenga	Professor	University of Oulu	Finland
Eric Wieschaus	Professor	Princeton University, NJ	United States
Roelof Wijnandts van Resandt	President and CEO	Mikrotechnik GmbH, Heidelberg	Germany
David Wild			United States
Clive Wilkinson			United Kingdom
David Will			
Lindsay Robert Williams			Australia
Keith S. Wilson	Professor	University of York	United Kingdom
Paul T. Wingfield	Chief Protein Expression Laboratory	NIH, Bethesda, MD	United States
Fritz K. Winkler	Departmental Head	Paul Scherrer Institute, Villigen	Switzerland
Shoshana Wodak	Scientific Director, Professor	Université Libre de Bruxelles	Belgium
Fiona Wylie			
Marc Zabeau	Director Strategic Planning	VIB Flemish Interuniversity, Gent	Belgium
Joachim Zach	Managing Director	CEOS GmbH, Heidelberg	Germany
Paolo Zanella	Professor		Switzerland
Margherita Zanetti-Schneider			
Rolf Zeller	Professor & Head of Department	University of Basel	Switzerland
Martin Zenke	Professor	Institut für Boimedizinische Technologie, Aachen	Germany
Marino Zerial	Group Leader and Director	MPI für Molecular Cell Biology and Genetics, Dresden	Germany
Liang Biao Zheng	Associate Professor	Yale University, New Haven, CT	United States
Martin R. Zulauf			
Lawrence J. Zwiebel	Professor	Vanderbilt University, Nashville, TN	United States

ANNEX 7

Courses, conferences and workshops at EMBL Heidelberg 2002–2005

2002

EMBO YIP Meeting
10 Apr 02 to 12 Apr 02
G. Wallon

EMBO Media Workshop
13 Apr 02
A. Moore

EMBO Fellow's Meeting
14 Apr 02 to 16 Apr 02
A. Moore

EMBL/Salk/EMBO Conference on Oncogenes and Growth Control: "Signalling and cancer"
20 Apr 02 to 23 Apr 02
C. Marshall, M. Bienz, D. Bohmann, H. Land, G. Superti-Furga, A. Nebreda

Prokaryotes in the Third Millenium: Actions and Effects of Molecular Machines
26 Apr 02 to 30 Apr 02
A. Toussaint, D. Holden

Light Microscopy of Live Specimens
5 May 02 to 18 May 02
E.H.K. Stelzer, R. Pepperkok, M. Carmo-Fonseca, B. Geiger

Automated Macromolecular Structure Solution
9 May 02 to 16 May 02
A. Perrakis, V. Lamzin, E. Conti, K. Scheffzek

A day on High-Throughput Techniques in Structural Biology
17 May 02
A. Perrakis, E. Conti, K. Scheffzek, V. Lamzin

Signalling Domains and Membrane Proteins – a Symposium in Memory of Matti Saraste
18 May 02
K. Scheffzek, J. Ylänne

Electron Microscopy, Immunocytochemistry and Stereology for Cell Biology
22 May 02 to 1 Jun 02
G. Griffiths, H. Schwarz, P. Webster

Microarray Technologies: from Genome to Proteome
1 Jun 02 to 8 Jun 02
W. Ansorge, A. Brazma, J. Hoheisel, J. Quackenbush, A. Ansorge, C. Schwager, M. Wagner-Ecker

EMBL Minisymposium: Metabolic networks – experimental and computational approaches
4 Jun 02
P. Bork, M. Sattler, L. Serrano

EMBO Teachers Workshop
5 Jul 02 to 6 Jul 02
A. Moore

German-Israeli Foundation: Challenges in Genomic Research
8 Jul 02 to 10 Jul 02
GIF

Molecular and Genetic Tools for the Analysis of Medaka and Zebrafish Development
21 Jul 02 to 31 Jul 02
J. Wittbrodt, M. Schartl, A. Schima, W. Driever, M. Westerfield

Cryo-Electron Microscopy and 3-D Image Reconstruction
11 Aug 02 to 21 Aug 02
B. Böttcher, S. Fuller, A. Hoenger, W. Kühlbrandt

Transcription Meeting
24 Aug 02 to 28 Aug 02
H. Stunnenberg, T. Jenuwein, C. Hill

EMBO YIP PhD Course
29 Aug 02 to 4 Sep 02
G. Wallon

Centrosomes and Spindle Pole Bodies
14 Sep 02 to 17 Sep 02
C. Gonzalez, E. Karsenti, K. Sluder, M. Winey

EMBL/EMBO Symposium: "Functional Genomics: the Future of Biology"
13 Oct 02 to 16 Oct 02
I. Mattaj, W. Ansorge, P. Bork, M. Hentze, C. Mueller, N. Rosenthal, L. Serrano, M. Wilmanns.

EMBL/EMBO Science & Society Conference 2002 "Infectious Diseases: Challenges, Threats and Responsibilities"
8 Nov 02 to 9 Nov 02
H. Stefánsson, S. Sherwood, F.C. Kafatos, A. Moore, A. Bendiscioli, F. Gannon, M. Osborne, D. Barlow, M. Boutros, F. Frischknecht, H.-G. Kraeusslich

EMBL PhD Student Symposium "Life within Boundaries – Membranes and Compartments in Biology"
14 Nov 02 to 16 Nov 02
EMBL PhD Students

4th EMBL Minisymposium on Molecular Medicine: "Molecular Medicine at EMBL"
16 Dec 02
M.W. Hentze

2003

Science in School
16 Mar 03 to 20 Mar 03
A. Manaia, A. Picker

Crystallography Course
4 Apr 03
K. Scheffzek

Mechanisms of Cell Migration
2 May 03 to 5 May 03
P. Rørth, F. Gertler, K. Weijer

Mini-Symposium on the Functional Organisation of the Nucleus
14 May 03 to 15 May 03
J. Ellenberg

EMBO Fellows
16 May 03 to 19 May 03
J. Taplick

EMBO YIP Meeting
14 May 03 to 16 May 03
G. Wallon

Protein Crystallography
17 May 03 to 31 May 03
K. Scheffzek

EMBO Teachers Workshop
23 May 03 to 24 May 03
S. Bendiscioli, A Moore

Microinjection and Detection of Probes in Cells
25 May 03 to 31 May 03
W. Ansorge, G. Neuhaus, R. Pepperkok, R. Saffrich, K. Vintersten, M. Trendelenburg

Microarray Technology: from Genome to Proteome
31 May 03 to 7 Jun 03
W. Ansorge, J. Quackenbush, A. Brazma, C. Schwager, M. Wagner-Ecker, U. Wirkner, F. de Masi, A. Ansorge

Chromatin and Epigenetics
19 Jun 03 to 22 Jun 03
G. Almouzni, A. Akhtar, P. Becker, E. Heard, J. Müller

ELLS Teaching Lab Course
7 Jul 03 to 9 Jul 03
A. Manaia, A. Picker

Crystallography Course
11 Aug 03 to 22 Aug 03
K. Scheffzek

Mouse Molecular Genetics Meeting
3 Sep 03 to 7 Sep 03
J. Rossant, F. Guillemot, H. Hamada, T. Magnuson, M. Treier

EMBO YIP PhD Course
8 Sep 03 to 9 Sep 03
G. Wallon

Structure Determination of Biological Macromolecules by Solution NMR
10 Sep 03 to 17 Sep 03
S. Grzesiek, M. Nilges, M. Sattler

Course: Modern Methods in Cell Biology
24 Sep 03 to 4 Oct 03
M. Knop, G. Griffiths

EMBL/EMBO Minisymposium on "Modern Methods in Cell Biology"
1 Oct 03 to 4 Oct 03
M. Knop, G. Griffiths

ELLS
22 Oct 03 to 24 Oct 03
A. Manaia

6th EMBL Minisymposium on Molecular Medicine: "Defects of Secretion in Cystic Fibrosis and other Diseases"
7 Nov 03 to 8 Nov 03
C. Schultz, F.-M. Müller

4th EMBO/EMBL Science and Society Conference: "Genetics, determinism and human freedom"
14 Nov 03 to 15 Nov 03
F. Gannon, F. Kafatos, A. Moore, H. Stefánsson, A. Bendiscioli

4th EMBL International PhD Student Symposium: A life of Encounters: Recognition in Biology
20 Nov 03 to 22 Nov 03
PhD Students Committee

2004

Crystallography Course
20 Jan 04 to 22 Jan 04
K. Scheffzek

ELLS
3 Mar 04 to 5 Mar 04
A. Manaia

Protein Crystallography Spring Course
13 Mar 04 to 2 Apr 04
K. Scheffzek

Expression profiling with CodeLink system
5 Apr 04 to 8 Apr 04
V. Benes (EMBL), H. Gersdorf (Amersham), E. Hunter (Silicon Genetics)

EMBL/EMBO/SALK Conference on Oncogenes and Growth Control
17 Apr 04 to 20 Apr 04
M. Bienz, G. Evan, C. Marshall, A. Nebreda, R. Treisman

EMBO Conference on Exploring Prokaryotic Diversity
22 Apr 04 to 26 Apr 04
V. de Lorenzo, A. Toussaint, R. Bernander

EMBO Practical Course on Gene quantification by real-time qPCR
9 May 04 to 13 May 04
V. Benes, S.A. Bustin, M.W. Pfaffl, T. Nolan, G. Reid, J. Zimmermann

EMBL Symposium on Lipid binding domains and signalling
14 May 04 to 15 May 04
M. Gautel, C. Schultz, M. Sattler

EMBO Teachers Workshop
21 May 04 to 22 May 04
A. Moore

EMBO Practical Course on Microarray Technology: Genome-Proteome-Function
29 May 04 to 5 Jun 04
W. Ansorge, A. Brazma, J. Quackenbush, C. Schwager, M. Wagner-Ecker, U. Wirkner, F. de Masi, A. Ansorge

EMBL Mini-Symposium "Life Sciences and the developing world – How much do we care?"
4 Jun 04
H. Stefánsson

EMBO YIP Symposium Chemistry meets Biology "Chemical approaches to the study of Biology"
5 Jun 04 to 6 Jun 04
G. Wallon

EMBO Practical Course on Microinjection and Detection of Probes in Cells
7 Jun 04 to 12 Jun 04
W. Ansorge, C. Klasen, R. Pepperkok, R. Saffrich, M.F. Trendelenburg

EMBO YIP Symposium Chemistry meets Biology: "Membrane Proteins and Trafficking"
7 Jun 04
G. Wallon

EMBO Fellows Meeting
8 Jun 04 to 14 Jun 04
J. Taplick

ELLS
7 Jul 04 to 9 Jul 04
A. Manaia

Protein Crystallography: Advanced methods
23 Jul 04 to 6 Aug 04
K. Scheffzek

6th EMBL Transcription Meeting
28 Aug 04 to 1 Sep 04
H. Stunnenberg, A. Akhtar, M. Timmers, T. Kouzarides

EMBO Practical Course on Cryo-Electron Microscopy and 3-D Image Analysis
5 Sep 04 to 14 Sep 04
A. Hoenger, B. Boettcher, S. Fuller, V. Unger

Expression profiling with CodeLink system
20 Sep 04 to 24 Sep 04
V. Benes (EMBL), J. George (GE Healthcare), E. Hunter (Silicon Genetics)

EMBO Workshop on the Cell Biology of Virus Infection
25 Sep 04 to 29 Sep 04
J. Krijnse Locker, B. Sodeik, M. Suomalainen

From Molecules to Organisms
30 Sep 04 to 2 Oct 04
European Learning Laboratory for the Life Sciences (ELLS)/EMBL

EMBL/EMBO Functional Genomics Conference II: Exploring the Edges of Omics
16 Oct 04 to 19 Oct 04
E. Furlong, N. Barkai, F. Holstege, M. Vidal, L. Steinmetz, P. Bork, M. Hentze, I. Mattaj, C. Müller, M. Wilmanns

Interdisciplinary Conference On Science And Society: Time And Aging – Mechanisms And Meanings
5 Nov 04 to 6 Nov 04
H. Stefánsson, A. Moore

EMBO Conference on Structures in Biology
10 Nov 04 to 13 Nov 04
D. Suck, B. Boettcher, E. Conti, R. Russell, M. Sattler, K. Scheffzek

Yesterday, Today and Tomorrow: The First EMBL Alumni Association Reunion
26 Nov 04 to 28 Nov 04
EMBL Alumni Association Board

5th International EMBL PhD Students' Symposium: Design of Life: Learning from Nature
2 Dec 04 to 4 Dec 04
PhD Students' Committee

2005

Mini-Symposium on "Systems Biology"
11 Feb 05 to 12 Feb 05
L. Serrano

First Annual BioMalPar Conference on the Biology and Pathology of the Malaria Parasite
2 Mar 05 to 4 Mar 05
F. C. Kafatos, M. Lanzer, A. Scherf

7th Minisymposium on Molecular Medicine: Proteins and Drug Targets in Genetic Diseases
29 Apr 05 to 30 Apr 05
K. Scheffzek, C. Schultz

EMBO Teachers Workshop
13 May 05 to 14 May 05
A. Moore

Alan Wolffe EMBO Conference on Chromatin and Epigenetics
19 May 05 to 22 May 05
A. Akhtar, G. Almouzni, V. Colot, W. Reik

EMBO Practical Course on Quantification of Gene Expression by real-time qRT-PCR
28 May 05 to 2 Jun 05
V. Benes, T. Nolan, S.A. Bustin, M.W. Pfaffl, M. Kubista, G. Reid, J. Vandesompele

Symposium on Insect Genomics: Immunity and Disease Models
4 Jun 05 to 5 Jun 05
T. Hsu, L. Zwiebel

A joint EMBL-GE Healthcare – Agilent practical course on Expression profiling with CodeLink TM system and data mining with GeneSpring TM
6 Jun 05 to 10 Jun 05
V. Benes, J. George, E. Hunter

EMBO Practical Course on Microinjection and Detection of Probes in Cells
13 Jun 05 to 19 Jun 05
R. Pepperkok, R. Saffrich, M.F. Trendelenburg

EMBO YIP Meeting
17 Jun 05 to 27 Jun 05
G. Wallon

EMBO Practical Course on Microarray Technology: from Production to Systems Biology
19 Jun 05 to 25 Jun 05
C. Schwager, J. Quackenbush, A. Brazma, U. Wirkner, P. Huber, A. Abdollahi, H. Friess

OIPA Intl. Summer School
20 Jul 05 to 21 Jul 05
J. Willingale-Theune

EMBO Practical Course on Modern Methods in Cell Biology: from Single Molecule to Complex Systems Analysis
23 Aug 05 to 2 Sep 05
D. Brunner, T. Surrey

EMBO Conference on Protein Synthesis and Translational Control
14 Sep 05 to 18 Sep 05
M. Hentze, A. Ephrussi, V. Ramakrishnan, A. Hinnebusch

ELLS
19 Sep 05 to 21 Sep 05
A. Manaia

EMBO Workshop on Centrosomes and Spindle Bodies
23 Sep 05 to 27 Sep 05
M. Knop, M. Bornens, S.J. Doxsey, J. Raff

6th EMBL Mouse Meeting
28 Sep 05 to 2 Oct 05
M. Treier, J. Rossant, F. Guillermot, T. Magnuson

4th International Symposium of the VW foundation on "Conformational Control of Biomolecular Function"
6 Oct 05 to 8 Oct 05
C. Schultz

EMBO/EMBL Interdisciplinary Conference on Science and Society: Science and Security
28 Oct 05 to 29 Oct 05
A. Moore, H. Stefánsson

7th International Predoc Symposium: "Biology at Work"
1 Dec 05 to 3 Dec 05
PhD Students' Committee

ANNEX 8

EMBL faculty members assigned to research areas

The following lists detail the faculty members, their assigned Units/Outstations and in which one of EMBL's major research themes they are involved. *(*indicates person has a joint appointment)*

Structural Biology

Group Leaders	**Unit**
Stephen Cusack*	EMBL Grenoble
Christoph Müller*	EMBL Grenoble
Winfried Weissenhorn*	EMBL Grenoble
Christoph Hermes	EMBL Hamburg
Michel Koch	EMBL Hamburg
Victor Lamzin	EMBL Hamburg
Dmitri Svergun	EMBL Hamburg
Paul Tucker	EMBL Hamburg
Matthias Wilmanns	EMBL Hamburg
Bettina Böttcher	Structural & Computational Biology
Elena Conti*	Structural & Computational Biology
Achilleas Frangakis	Structural & Computational Biology
Andreas Hoenger*	Structural & Computational Biology
Michael Sattler*	Structural & Computational Biology
Luis Serrano	Structural & Computational Biology
Dietrich Suck	Structural & Computational Biology
Team Leaders	
Florent Cipriani	EMBL Grenoble
Darren Hart	EMBL Grenoble
Raimond Ravelli	EMBL Grenoble
Wolfram Meyer-Klaucke	EMBL Hamburg
Jochen Müller-Dieckmann	EMBL Hamburg
Manfred Weiss	EMBL Hamburg
Klaus Scheffzek*	Structural & Computational Biology

Molecular, Cellular and Organismal Biology

Group Leaders	**Unit**
Philippe Bastiaens	Cell Biology & Biophysics
Damian Brunner*	Cell Biology & Biophysics
Darren Gilmour*	Cell Biology & Biophysics
Gareth Griffiths	Cell Biology & Biophysics
Eric Karsenti	Cell Biology & Biophysics
Michael Knop	Cell Biology & Biophysics
François Nédélec*	Cell Biology & Biophysics
Ernst Stelzer	Cell Biology & Biophysics
Stephen Cohen	Developmental Biology
Anne Ephrussi	Developmental Biology
Eileen Furlong*	Developmental Biology

Carl Neumann	Developmental Biology
Pernille Rørth*	Developmental Biology
Mathias Treier*	Developmental Biology
Jochen Wittbrodt	Developmental Biology
Asifa Akhtar	Gene Expression
Jan Ellenberg*	Gene Expression
Matthias Hentze*	Gene Expression
Elisa Izaurralde	Gene Expression
Andreas Ladurner*	Gene Expression
Jürg Müller*	Gene Expression
Carsten Schultz*	Gene Expression
Lars Steinmetz*	Gene Expression
Matthias Wilm	Gene Expression
Cornelius Gross*	EMBL Monterotondo
Claus Nerlov*	EMBL Monterotondo
Manolis Pasparakis*	EMBL Monterotondo
Nadia Rosenthal*	EMBL Monterotondo
Walter Witke*	EMBL Monterotondo
Team Leaders	
Thomas Surrey	Cell Biology & Biophysics
Claude Antony*	Cell Biology & Biophysics
Rainer Pepperkok	Cell Biology & Biophysics
Detlev Arendt	Developmental Biology
Liliana Minichiello*	EMBL Monterotondo

Bioinformatics and Computational Biology

Group Leaders	**Unit**
Graham Cameron	EMBL-EBI Hinxton
Nick Goldman	EMBL-EBI Hinxton
Wolfgang Huber*	EMBL-EBI Hinxton
Nicolas Le Novère	EMBL-EBI Hinxton
Nicholas Luscombe*	EMBL-EBI Hinxton
Dietrich Rebholz-Schuhmann	EMBL-EBI Hinxton
Peter Stoehr	EMBL-EBI Hinxton
Janet Thornton	EMBL-EBI Hinxton
Peer Bork	Structural & Computational Biology
Team Leaders	
Rolf Apweiler	EMBL-EBI Hinxton
Ewan Birney	EMBL-EBI Hinxton
Alvis Brazma	EMBL-EBI Hinxton
Kim Henrick	EMBL-EBI Hinxton
Henning Hermjakob	EMBL-EBI Hinxton
Petteri Jokinen	EMBL-EBI Hinxton
Rodrigo Lopez-Serrano	EMBL-EBI Hinxton
Nicola Mulder	EMBL-EBI Hinxton
Peter Rice	EMBL-EBI Hinxton
Weimin Zhu	EMBL-EBI Hinxton
Anne-Claude Gavin	Structural & Computational Biology
Toby Gibson	Structural & Computational Biology
Robert Russell*	Structural & Computational Biology
Reinhard Schneider	Structural & Computational Biology

ANNEX 9

EMBL faculty joint appointments

Group Leaders	Primary Appointment Unit	Secondary Appointment Unit
Stephen Cusack	EMBL Grenoble	Gene Expression
Christoph Müller	EMBL Grenoble	Gene Expression
Winfried Weissenhorn	EMBL Grenoble	Cell Biology & Biophysics
Elena Conti	Structural & Computational Biology	Gene Expression
Andreas Hoenger	Structural & Computational Biology	Cell Biology & Biophysics
Robert Russell	Structural & Computational Biology	EMBL-EBI
Michael Sattler	Structural & Computational Biology	Gene Expression
Klaus Scheffzek	Structural & Computational Biology	Developmental Biology
Damian Brunner	Cell Biology & Biophysics	Developmental Biology
Darren Gilmour	Cell Biology & Biophysics	Developmental Biology
François Nédélec	Cell Biology & Biophysics	Structural & Computational Biology
Eileen Furlong	Developmental Biology	Gene Expression
Pernille Rørth	Developmental Biology	Cell Biology & Biophysics
Mathias Treier	Developmental Biology	EMBL Monterotondo
Jan Ellenberg	Gene Expression	Cell Biology & Biophysics
Matthias Hentze	Gene Expression	Molecular Medicine Partnership Unit
Andreas Ladurner	Gene Expression	Structural & Computational Biology
Jürg Müller	Gene Expression	Developmental Biology
Lars Steinmetz	Gene Expression	Developmental Biology
Cornelius Gross	EMBL Monterotondo	Developmental Biology
Claus Nerlov	EMBL Monterotondo	Gene Expression
Manolis Pasparakis	EMBL Monterotondo	Developmental Biology
Nadia Rosenthal	EMBL Monterotondo	Developmental Biology
Walter Witke	EMBL Monterotondo	Cell Biology & Biophysics
Liliana Minichiello	EMBL Monterotondo	Developmental Biology
Wolfgang Huber	EMBL-EBI	Gene Expression
Nicholas Luscombe	EMBL-EBI	Gene Expression
Claude Antony	Core Facilities	Cell Biology & Biophysics

ANNEX 10

European Union Framework Programme Six projects coordinated by EMBL or with EMBL participation

Coordinated by EMBL

Type	Name	Period	Acronym	Title
IP	V. Lamzin/K. Henrick/ R. Ravelli	01.01.2004–31.12.2007	BIOXHIT	Biocrystallography (X) on a Highly Integrated Technology Platform for European Structural Genomics
NoE	J. Thornton/P. Bork	01.01.2004–31.12.2008	BioSapiens	A European Network for Integrated Genome Annotation
IF	S. Cusack	05.03.2004–04.03.2008	CISB	The Centre for Integrated Structural Biology
STREP	L. Serrano/I. Vernos/ F. Nedelec	01.03.2004–31.08.2007	COMBIO	An integrative approach to cellular signalling and control processes: bringing computational biology to the bench
NoE	G. Cameron/T. Gibson	01.02.2005–31.01.2010	EMBRACE	A European Model for Bioinformatics Research and Community Education
NoE	E. Birney/J. Ellenberg	15.11.2005–15.11.2010	Enfin	European rat tools for functional genomics
STREP	N. Rosenthal	01.07.2005–30.06.2008	FLPFLEX	A flexible toolkit for controlling gene expression in the mouse
NEST	L. Serrano	01.03.2005–28.02.2008	NETSENSOR	Design and engineering of gene networks to respond to and correct alterations in signal transduction pathways
SSA	D. Svergun	01.12.2005–31.11.2009	Saxier	Small-angle X-ray scattering at high brillance European synchrotrons for bio- and nano-technology
RTN	T. Surrey	01.01.2005–31.12.2008	Spindle Dynamics	Understanding the dynamics of cell division
SSA	G. Cameron	01.05.2005–31.10.2006	SYMBIOmatics	Synergies in Medical Informatics and Bioinformatics

IP	L. Serrano/ M. Wilmanns/C. Müller	01.02.2005–31.07.2009	3D Repertoire	A multidisciplinary approach to determine the structures of protein complexes in a model organism

With EMBL participation

Type	Name	Period	Acronym	Title
STREP	T. Surrey/F. Nedelec	01.05.2005–30.04.2008	ACTIVE BIOMICS	Active Biometric Systems
IP	P. Bork	01.06.2005–31.05.2010	ADIT	Design of small molecule therapeutics for the treatment of Alzheimer's disease based on the discovery of innovative drug targets
STREP	F. Gannon	01.03.2004–28.02.2007	Anabanos	Molecular mechanisms of bone formation an anabolism
IP	L. Serrano	01.01.2004–31.12.2006	Apopis	APOPIS – Abnormal proteins in the pathogenesis of neurodegenerative disorders
STREP	P. Bork/A. Thanaraj	01.03.2004–28.02.2007	ATD	The Alternate Transcript Diversity project
NoE	F. Kafatos	01.01.2004–31.12.2009	BIOMALPAR	Biology and pathology of the malaria parasite
IP	F. Gannon	01.03.2006–28.02.2011	Crescendo	Consortium for research into nuclear receptors in development and ageing
STREP	M. Treier	01.01.2004–31.12.2008	Diabesity	Novel molecular drug targets of obesity and type 2 diabetes
IP	N. le Novère	01.05.2004–30.04.2009	E-MEP	The European Membrane Protein consortium
IF	E. Birney	01.07.2004–30.06.2008	EMMAINF	The European Mouse Mutant Archive Infrastructure
STREP	E. Birney	01.01.2004–31.12.2006	EMI-CD	European Modelling Initiative combating Complex Diseases
NoE	A. Akhtar	01.06.2004–31.05.2009	Epigenomenet	Epigenetic plasticity of the genome

SSA	S. Schumacher	01.11.2004–31.10.2008	ESTI	EIROforum European Science Teachers Initiative
IP	N. Rosenthal	01.01.2006–31.12.2008	EUComm	The European Mouse Genome Mutagenesis Program
IP	P. Bork	01.07.2004–30.06.2008	Eumitocombat	Rational treatment strategies combating mitochondrial oxidative phosphorylation (OXPHOS) disorders
SSA	K. Henrick	01.04.2005–31.03.2009	EurocarbDB	Design studies related to the development of distributed, web-based European carbohydrate databases
NoE	P. Stoehr	01.01.2005–31.12.2009	EuroFIR	European Food Information Resource Network
IP	C. Nerlov	01.01.2004–31.12.2008	Eurostemcell	European Consortium for Stem Cell Research
STREP	A. Brazma	01.01.2005–31.12.2007	DIAMONDS	Dedicated Integration And Modelling Of Novel Data and prior knowledge to enable Systems biology
STREP	M. Sattler	01.07.2004–31.12.2007	FSG-V-RNA	Functional and Structural Genomics of Viral RNA
STREP	L. Serrano/P. Bork	01.03.2004–28.02.2007	Genefun	*In silico* prediction of gene function
STREP	W. Weissenhorn	01.01.2005–31.12.2006	HIV-Virosome	Development of a new vaccine against HIV: virosomes incorporating HIV proteins
NEST	J. Wittbrodt	01.01.2005–31.12.2007	HYGEIA	Hybrid systems for biochemical network modelling and analysis
IF	S. Cusack/M. Wilmanns	01.03.2004–28.02.2009	IA SFS	Integrating activity on synchrotron and free electron laser science
STREP	N. Rosenthal	01.02.2004–31.01.2007	IDI Stem Cells	Application and process optimisation of human stem cells for myocardium repair
RTN	M. Pasparakis	01.06.2005–31.05.2009	IMDEMI	Innovative mouse models for functional genomics in immunology
IP	L. Serrano/P. Bastiaens	01.01.2004–31.12.2008	Interactive Proteome	Functional proteomics: towards defining the interaction proteome

NoE	R. Apweiler	01.01.2004–31.12.2008	Leukemianet	Strengthen and develop scientific and technological excellence in research and therapy of leukaemia (CML, AML, ALL, CLL, MDS, CMPD) by integration of the leading national leukaemia networks and their interdisciplinary partner groups in Europe
NoE	P. Rørth/J. Wittbrodt	01.01.2004–31.12.2007	MAIN*	Targeting cell migration in chronic inflammation
NoE	D. Arendt	01.03.2004–28.02.2008	Marine Genomics	Implementation of high-throughput genomic approaches to investigate the functioning of marine ecosystems and the biology of marine organisms
IDS	V. Lamzin	01.12.2004–31.12.2008	MAX-INF 2	European Macromolecular Crystallography Infrastructure Network 2
IP	J. Ellenberg	01.04.2004–31.03.2008	Mitocheck	Regulation of mitosis by phosphorylation – a combined functional genomics, proteomics and chemical biology approach
IP	A. Brazma	01.10.2004–30.09.2008	MOIPAGE	Molecular Phenotyping to Accelerate Genomic Epidemiology
IP	C. Schultz	01.01.2004–31.12.2008	Molecular Imaging	Integrated technologies for *in vivo* molecular imaging
NoE	M. Pasparakis/ A. Brazma	01.01.2005–31.12.2009	MUGEN	Integrated functional genomics in mutant mouse models as tools to investigate the complexity of human immunological disease
NoE	N. Rosenthal/E. Furlong	01.01.2005–30.06.2006	MYORES	Multi-organismic approach to study normal and aberrant muscle development, function and repair
IF	S. Cusack	01.01.2004–30.06.2008	NM13	Integrated infrastructure initiative for neutron scattering and muon spectroscopy
NoE	A. Brazma	01.01.2004–31.12.2009	NUGO	European nutrigenomics organisation – linking genomics, nutrition and health research
STREP	M. Wilmanns	01.06.2005–31.05.2007	scrIN-SILICO	Finding promising drug candidates against tuberculosis with multidisciplinary protocol based non-conventional search

NoE	D. Schuhmann	01.02.2004–31.01.2007	Semantic Mining	Semantic interoperability and data mining in biomedicine
NoE	E. Birney	01.01.2005–31.12.2006	STAR	A SNP and haplo-type map for the rat
NoE	A. Hoenger/K. Henrick	01.03.2004–28.02.2009	3-DEM	New electron microscopy approaches for studying protein complexes and cellular supramolecular architecture
NoE	R. Apweiler	01.06.2004–31.05.2008	TRANSFOG	Translational and functional onco-genomics: from cancer-oriented genomic screenings to new diagnostic tools and improved cancer treatment
STREP	N. Rosenthal	01.07.2005–30.07.2008	Ulcer Therapy	Gene transfer in skin equivalents and stem cells: Novel strategies for chronic ulcer repair and tissue regeneration
IP	P. Tucker	01.11.2004–31.10.2008	VIZIER	Comparative structural genomics of Viral Enzymes Involved in Replication
RTN	D. Arendt	01.01.2005–31.12.2008	ZOONET	Development and evolution of animal form: training modern comparative zoologists

ANNEX 11

EMBL Centres and organisers

Centre for Computational Biology

Peer Bork
Victor Lamzin
Janet Thornton

Centre for Disease Mechanisms

Matthias Hentze
Manolis Pasparakis
Nadia Rosenthal
Carsten Schultz

Centre for High-Throughput Functional Genomics

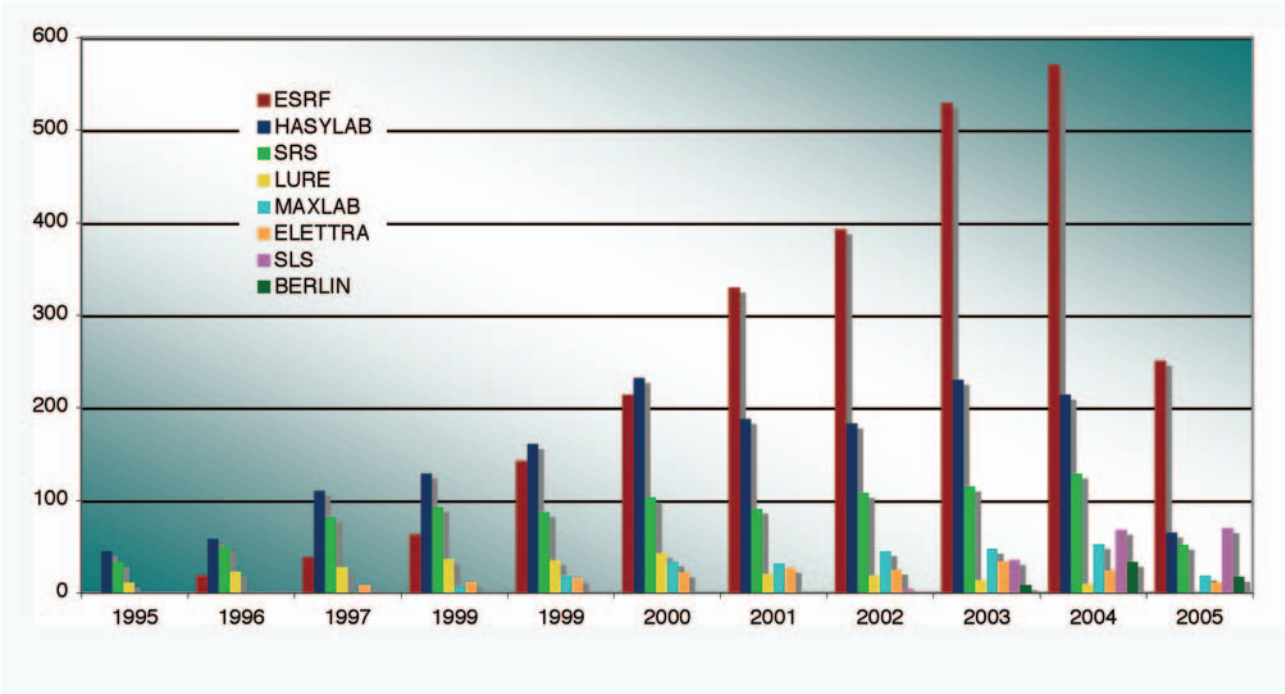
Eileen Furlong
Lars Steinmetz

Centre for Molecular and Cellular Imaging

Jan Ellenberg
Matthias Wilmanns

Annex 12

Protein database depositions acknowledging use of European synchrotrons as of 21 Sept 05



ESRF	European Synchrotron Radiation Facility in Grenoble. EMBL operates several beamlines jointly with ESRF and one beamline (BM14) together with the MRC
HASYLAB	the Hamburg synchrotron radiation laboratory at DESY, Germany. EMBL is operating seven beamlines for structural biology
SRS	Daresbury Laboratory, UK
LURE	is operated by CNRS/CEA in Orsay, France
MAXLAB	is run by the University of Lund, Sweden
ELETTRA	is a national Italian facility near Trieste
SLS	is the Swiss Light Source at the Paul-Scherrer Institute in Villingen, Switzerland
BERLIN	is the BESSY synchrotron in Berlin, Germany

Source: http://asdp.bnl.gov/asda/Libraries/pdb_statis/latest/bml/EURO.html

ANNEX 13

EMBL Grenoble facility users, publications and protein database depositions in 2004

EMBL is involved in the maintenance, development and operation of the seven ESRF MX beamlines that are in routine operation (ID14-EH1,2,3,4, ID29, ID23-1, BM14) and an eighth, ID23-2, that is currently being commissioned. EMBL is a partner with the UK in running BM14 as a CRG. The EMBL staff that are most closely involved include Raimond Ravelli and Andrew McCarthy as 1st and 2nd beamline scientist on ID14-4, David Flot as 1st beamline scientist on ID23-2 and Florent Cipriani and his team for instrumentation and maintenance. Hassan Belrhali is the 2nd beamline scientist on BM14.

More than 2000 scientists used the Grenoble facilities in 2004:

	1,821	Joint EMBL/ESRF Beamline users
	258	BM 14 users
	30	ICC Neutron DB 20 LADI users
	30	EMBL facility users (EMBL visitors database)
TOTAL	**2,139**	

A total of 318 publications and 427 PDB depositions in 2004 acknowledge ESRF beamlines that are operated by the Joint Structural Biology Group (JSBG).

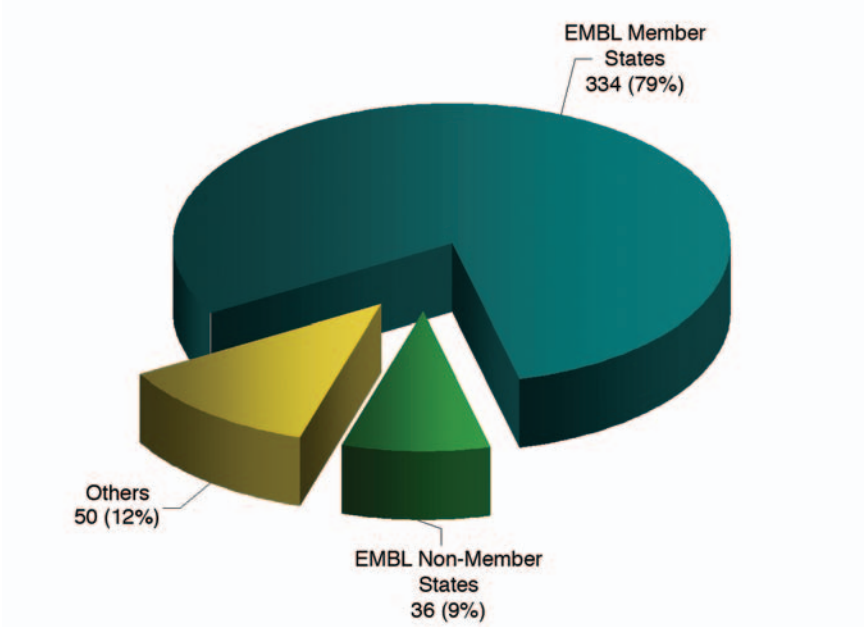
Beamline	Publications	PDB depositions
ID14-1	98	114
ID14-2	98	97
ID14-3	15	22
ID14-4	107	109
ID29	77	85
Total JSBG	**318**	**427**

The UK-EMBL CRG beamline BM14 had 81 publications and 64 PDB depositions in 2004.

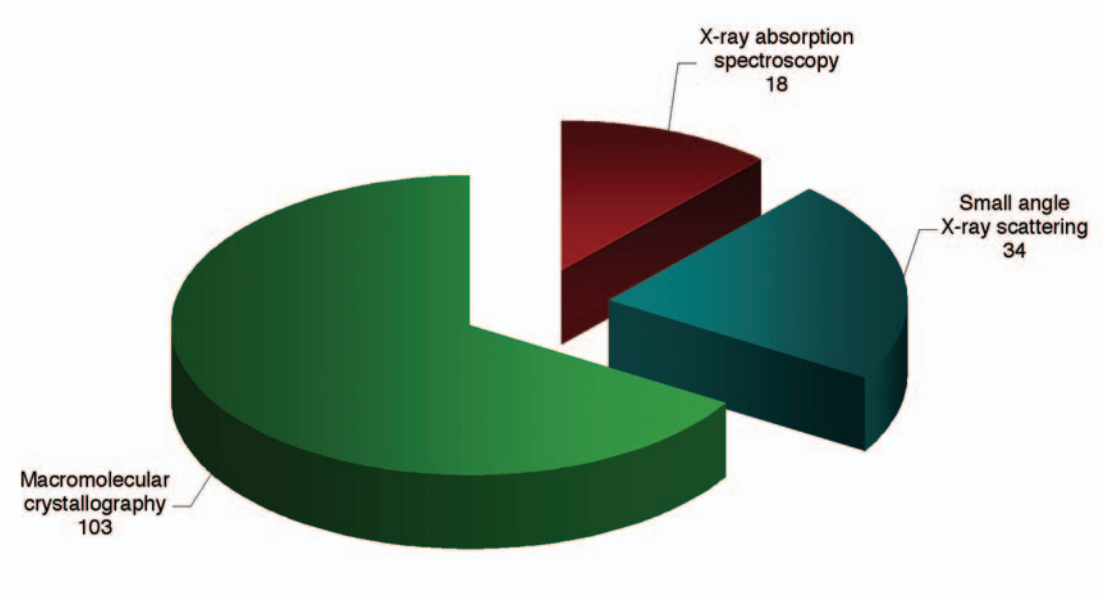
EMBL is also very closely involved with all biology experiments on the ILL instruments DB21 and LADI. These are not high-throughput beamlines and the user community is very small. The ILL instruments DB21 and LADI had 2 and 7 publications in 2004.

Annex 14

EMBL Hamburg facility users in 2004 by nationality



Publications in 2004 acknowledging EMBL Hamburg beamlines



144 protein database despositions have been made in 2004. Owing to delays in data processing and release of information this number should be considered preliminary. The same applies to Annex 13.

Annex 15

Survey of the future needs of EMBL Hamburg beamline users

159 external research groups were surveyed in 2004.

Access category	*Specific Applications*	*Past / present applications*	*Future interest*
MX		**112 (70%)**	**128 (81%)**
	Energy tuneability	Currently unavailable	111 (70%)
	Microfocusing	Currently unavailable	117 (74%)
	High throughput	Currently unavailable	49 (31%)
SAXS		**53 (33%)**	**79 (50%)**
XAS		**31 (19%)**	**40 (25%)**
Sample preparation		**17 (10%)**	**120 (75%)**
	Expression, purification	Currently unavailable	19 (12%)
	Sample characterisation	Currently unavailable	53 (33%)
	HTP crystallisation	Currently unavailable	52 (32%)
Data processing and interpretation		Currently unavailable	**128 (81%)**
	Online facilities at EMBL Hamburg	Currently unavailable	119 (75%)
Remote accessibility		Currently unavailable	**97 (61%)**
Advanced training			**134 (84%)**

ANNEX 16

Report on the 2004 review of the EMBL Hamburg proposal for synchrotron radiation beamline facilities at PETRA-III

Introduction

The Review took place in Hamburg on September 14–15, 2004

The Review Panel consisted of:

SAC Members: David Eisenberg, Los Angeles (USA)
Dino Moras, Illkirch (F)

External Reviewers: Joel L. Sussman, Rehovot, Chairing the Review (IL)
Martino Bolognesi, Milan (I)
Mariusz Jaskólski, Poznan (PL)
Louise Johnson, Oxford (UK) (Unable to participate, but sent written comments)
Sine Larsen, Grenoble (F)
Andrew Leslie, Cambridge (UK)
Reinhard Luhrmann, Göttingen (D)
Ken Holmes, Heidelberg (D)
James Penner-Hahn, Ann Arbor (USA)
Clemens Schulze-Briese, Villigen (CH)
Andrew Thompson, Saint-Aubin (F)
Patrice Vachette, Orsay (F)
Soichi Wakatsuki Tsukuba (JP)

Observers: Iain Mattaj, EMBL Scientific Director

Executive Summary

The panel endorses the overall proposal for an Integrated Life Science Center at PETRA-III as strongly as possible. The suggestions we have made here are primarily addressing some aspects of how the project should be achieved.

The EMBL-Hamburg Outstation operates at a synchrotron site, which in a few years time shall witness a leap in the X-ray generation technology building one of the first X-ray Free Electron Lasers in the world. This will create an unprecedented opportunity and challenge for the use of X-rays in structural biology sciences. The development of the new beam lines at the 3rd generation synchrotron, PETRA-III, is an intermediate step and a timely preparation for the X-FEL leap.

Based on this the panel wants to make the following recommendations:

1) We strongly support the integrated aspect of this proposal combining three synchrotron based experimental methods for structural biology
2) We recommend that there should be two MX, one SAXS and as a minimum 1/2 an endstation for BioXAS.
3) We also find that the integrated sample preparation represents a strong asset of the project

The Review included the following.

Background material

About two weeks before the review in Hamburg, each member of the Review Panel received written material, which included (1) Technical Design Report for PETRA III (prepared by DESY) and Proposal by EMBL-Hamburg for an Integrated Life Science Centre at PETRA-III.

The Review Panel met with Iain Mattaj and Matthias Wilmanns on 14-Sep at 13:30 to discuss the review and Dr. Mattaj asked the panel to specifically consider a list of seven questions

Oral presentations

In the afternoon of September 14th, there was initially a closed session with the EMBL Scientific Director and the Head of the Outstation, where the overall purpose of the review was discussed. Following this, short presentations were given by Director of DESY, Prof. Jochen R. Schneider and the head of the PETRA-III project, Dr. Edgar Weckert. Details of the plans for the EMBL were then presented in five talks:

- Matthias Wilmanns – Integrated concept for PETRA-III life science facilities
- Christoph Hermes – Concepts for the construction of PETRA-III beamline facilities
- Victor Lamzin – Proposal for MX beamlines
- Dmitri Svergun – Proposal for SAXS beamline
- Wolfram Meyer-Klaucke – Proposal for XAS endstation

The sections below outline the resulting evaluations.

1. Is there a requirement in the structural biology community for these new facilities?

PETRA is a large ring (2.306 km circumference) presently used as an injector for the high energy physics experiments on HERA. These experiments will be discontinued in 2007. DESY has decided to rebuild PETRA as the brightest synchrotron source in the world. Furthermore, plans for the European X-ray free electron laser are now in a final form. This facility will be operational in 2011. This will be a unique hard X-ray laser facility producing coherent beams in very short pulses of extremely high intensity. Given the long history of very successful collaboration of EMBL with DESY it seems to us imperative that EMBL has a continued presence on the DESY site in order to partake of these unique facilities.

EMBL have responded by proposing a new facility to make optimum use of the new PETRA facility. This is a very convincing proposal that makes a strong case for life sciences beam lines on the new PETRA ring. The authors provide figures that substantiate the need for X-ray crystallography beam lines particularly for micro-focus and wide energy-range beam lines. A strong element in the proposal is the plan for an integrated facility that would offer support to users extending from specimen preparation to data evaluation.

There is a strong need for state-of-the-art structural biology beam lines in Hamburg. The PETRA III project provides an ideal opportunity for European structural biology community to have access to synchrotron beam lines with unprecedented qualities for cutting edge structural biology research: extremely low emittance, high brilliance, and integration of high-throughput experimental facilities. Although it is not easy to predict the exact needs of beam lines from 5 to 10 years from now, based on the recent trend in PDB deposition the community is expected to grow even larger in the near future. First, the focus of structural biology research is rapidly moving from solving structures of individual protein/domains to large complexes and there will be an exponential growth in the number of targets since they include protein-protein, protein-nucleic acid, protein-carbohydrate interactions, often with posttranslational modifications. Second, the acceleration will be even more dramatic when high-throughput technologies of the structural genomics projects world wide will become widely available for studies of large multi-component assemblies and integral membrane complexes, which will encourage biologists to apply structural biology techniques to their research, either in collaboration with structural biologists or even by becoming one with proper training.

Over the past 30 years, the EMBL Hamburg Outstation has developed a unique combination of strong on-site structural biology groups and synchrotron beam lines for macromolecular crystallography (MX), small angle X-ray scattering (SAXS) and X-ray absorption spectroscopy (XAS). It has the critical mass necessary to stay abreast in the field and is ideally situated at a site where the PETRA III upgrade and X-FEL projects are being pursued. Similar approaches are found in other synchrotron facilities but EMBL has the advantage of being one institution that provides integrated user services to European structural biology community. This is particularly important because structure-based functional studies of biological molecules at cellular levels require multiple structural biology techniques, MX, SAX, XAS and sample characterisation combined. The excellent synergism between EMBL and DESY that has existed since the inception of the outstation presents a rare opportunity for an extraordinarily cost effective way to build a integrated structural biology center around a 3rd generation synchrotron. The proposed upgrade of the EMBL beam lines and user facilities is strongly supported with the following recommendations.

2. Focus on an integrated set of beamlines for X-ray diffraction, SAXS and XAS

The proposed creation of an integrated center to provide X-ray diffraction, small-angle scattering, and X-ray absorption is the ideal approach for understanding the structure and function of biological macromolecules and points in the right direction for systems biology approaches. For many of these systems, crystallography, either on the intact system or on isolated subunits, will provide high resolution structures, the starting point for understanding biological function at the atomic level. Small-angle scattering provides critical information about the arrangement of subunits within large complexes and is able to provide a direct comparison between the structure of the molecules that are crystallised and the structures of the ensemble of molecules that exist in solution. X-ray absorption provides high-resolution, high-accuracy, information about metal active sites. For the ~30% of proteins that contain metal sites, X-ray absorption provides bond-length information with sufficient accuracy to distinguish between possible chemical mechanisms. The combined whole, with all three methods, will be much greater than the sum of the parts.

It is difficult to predict with confidence the future demand for beam time for the three techniques. The proposed beam lines will provide much higher brilliance, lower emittance and better automation, thus allowing experiments that are performed currently to be completed much more quickly. However, in each case, the PETRA-3 lines will permit experiments that are presently impossible to be undertaken (e.g., smaller crystals and larger unit cells for MX, time resolved and more dilute solutions for SAXS, spatially resolved XAS and high-resolution X-ray fluorescence for spectroscopy). For MX, the increase in capability and the projected increase in demand may be roughly in balance. For SAXS, the PETRA-3 facilities will permit studies of smaller sample volumes of more dilute solutions, thus greatly expanding the range of samples that can be productively studied. The addition of time resolved capabilities will permit qualitatively new experiments. The projected developments should allow EMBL Hamburg to become the leading center for biological SAXS.

3. Sample preparation and on-line data processing facilities

The plan to include facilities for sample preparation and on-line data processing is particularly popular among potential users, as indicated by the EMBL questionnaire respondents

X-ray diffraction data processing at beam lines has become standard, in recent years, at most SR sites. As an extension of this trend, the Hamburg Outstation will provide crystallographic computing support, allowing users to log on and process their crystallographic data (e.g. in phasing or refinement) entirely on the Outstation computer network. This capacity is valuable, offering access to state of the art software, based on the Outstation experience within the EU ongoing projects on methods development. It also has a broad training value.

Preparation of biological samples (specifically, protein crystals) is a known limiting factor. The idea of providing sample preparation/storage facilities to SR users at the Outstation is a new one, well received by the user community. It has the potential to provide higher probability of crystal growth as well as of yielding better X-ray diffraction data. The sample preparation facility will also impact the quality of the SAXS and the XAS experiments, based on fresh samples prepared under specific experimental conditions difficult to maintain for long times (e.g. association equilibria, redox processes, etc.). In addition, the proposed facility will increase the accessibility of SR to cell-, developmental-, and systems-biologists.

We are unaware of other European user facilities which currently offer a "cradle-to-grave" service for sample preparation and characterisation, although others are moving in that direction elsewhere in the world.

The idea of complementing the PETRA III beamline developments with both data-processing and sample preparation support is forward looking, and in line with the strong tradition of the Outstation to develop structural biology methods. It is appreciated that such important developments will occur at almost no cost for the physical buildup of PETRA III EMBL beamlines.

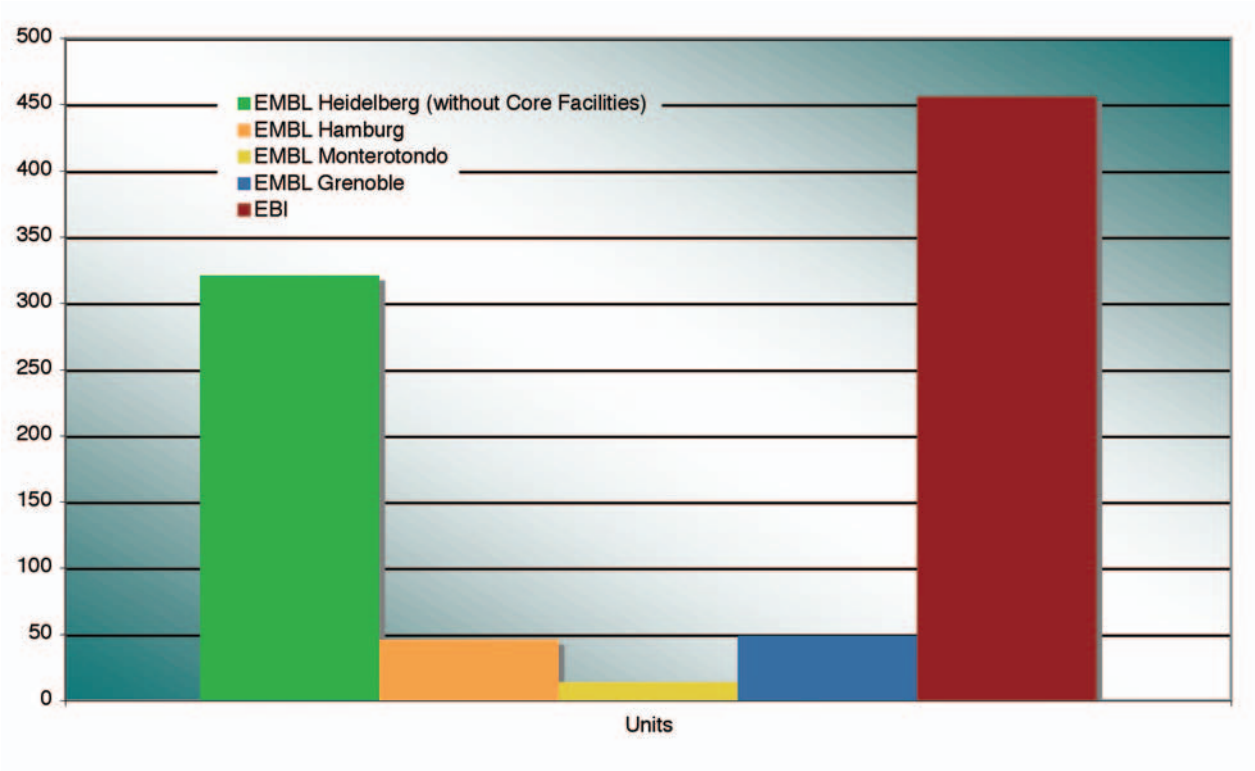
4. Collaborations

Regarding the question of whether the EMBL-Hamburg Outstation should be prepared to work together with other research organisations to further improve the ability of the site to carry out cutting-edge research in Life Sciences, the panel is of the opinion that the answer is, obviously, not only positive, but that the unique opportunity of strengthening and enlarging the research infrastructure through the development of the new facilities at PETRA III, should be exploited further to create a Centre for Structural Biology in Hamburg which would become a unique site of integration and promotion of the Life Sciences in Europe.

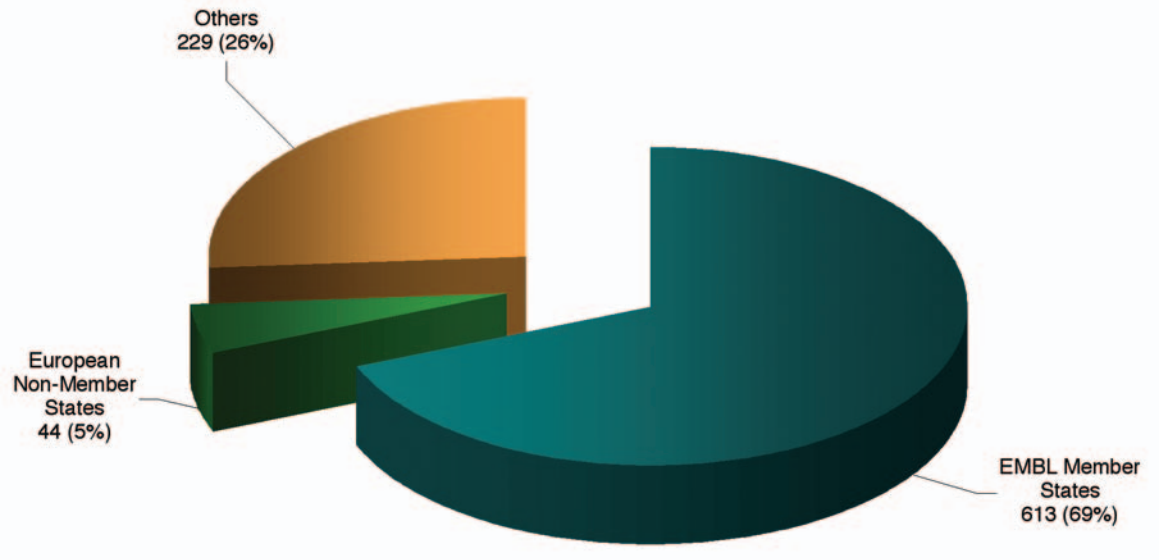
ANNEX 17

Visitors Programme statistics

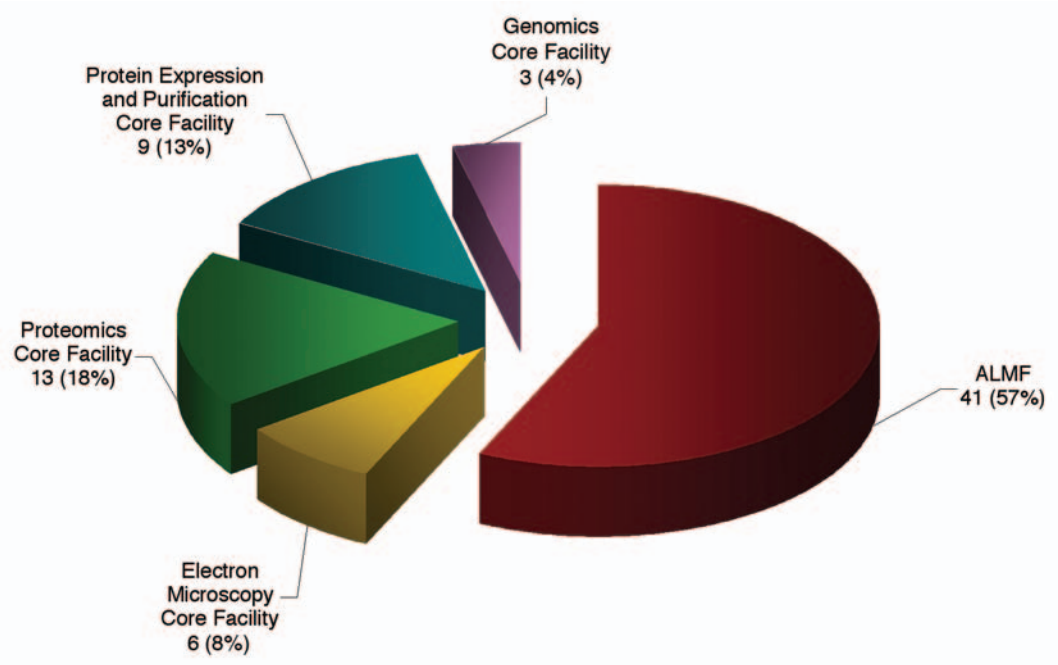
EMBL visitors in 2004 (without facility users)



Nationalities of EMBL visitors in 2004 (without facility users)



Number of external visitors to the core facilities in 2004



Please see Annexes 13 and 14 for facility user statistics for EMBL Grenoble and EMBL Hamburg.

ANNEX 18

EMBL spin-off companies, patent portfolio and licensing

Name	*Phase*
Lion Bioscience AG (1997)	Post IPO
Cenix BioScience GmbH (1999)	2nd Round
Anadys Pharmaceuticals, Inc. (2000)	Post IPO
Cellzome AG (2000)	4th Round
Gene Bridges GmbH (2000)	-
ENVIVO Pharmaceuticals, Inc. (2001)	2nd Round
Hybricore GmbH (2002)	Seed
SLS GmbH (2002)	-

Patents and licences 2000–2005

	Patent applications	*Granted Patents*	*Licences*
2000	1	13	-
2001	-	15	-
2002	6	16	55
2003	6	14	72
2004	11	8	106
2005	9	6	131
Total	**23**	**66**	**233**

Annex 19

EMBL International PhD Programme partner universities

Belgium	Katholieke Universiteit Leuven	Document signed on 24 September 2004
Denmark	University of Copenhagen	Document signed on 18 February 2004
	Technical University of Denmark	Document signed on 18 March 2004
Finland	University of Helsinki	Document signed on 12 August 2004
France	Université Joseph Fourier de Grenoble	Document signed on 13 November 1999
	Université de Strasbourg	Document signed on 26 September 2001
	Université Paris 7 – Denis Diderot	Document signed on 10 September 2004
	Université Paris 6 – Pierre et Marie Curie	Document signed on 24 January 2005
Germany	University of Heidelberg	Document signed on 16 December 2002
Greece	University of Crete	Document signed on 16 April 1999
Hungary	Eötvös Loránd University	Document signed on 27 November 2000
Iceland	University of Iceland	Document signed on 16 March 2005
Ireland	University College Cork	Document signed on 18 August 2005
Italy	University of Milano	Document signed on 4 January 2005
Netherlands	Radboud University Nijmegen	Document signed on 3 October 2000
Norway	University of Bergen	Document signed on 19 June 2003
	University of Oslo	Document signed on 19 May 2004
Portugal	Universidade Nova de Lisboa	Document signed on 15 May 2000
	Universidade de Lisboa	Document signed on 20 June 2002
Russia	Lomonosov Moscow State University	Document signed on 6 September 2004
Spain	Universidad Autonoma de Madrid	Document signed on 12 July 2001
Sweden	University of Stockholm	Document signed on 15 September 2004
	Karolinska Institutet	Document signed on 22 October 2004
United Kingdom	University of Dundee	Document signed on 5 December 2002

ANNEX 20

OIPA publications

Annual publications

EMBL Annual Report includes:

- the Director General's Annual Report (an official statement of the status of the Laboratory);
- the Scientific Report (containing highlights of our scientific work, written in an accessible, journalistic style);
- the "Laboratory Notebook" (important EMBL news and events that are not strictly scientific);
- key facts and figures, statistics.

Research Reports are the official report from each scientific group regarding its accomplishments and publications.

EMBL newsletter

EMBL&cetera, a bi-monthly newsletter for the wider EMBL community, including staff, Council and alumni. The newsletter currently contains information about major events and accomplishments at all five sites, service announcements, awards and honours, etc., and is a key mechanism for communication with EMBL alumni.

EMBL brochures and publicity

- EMBL Overview brochure and fact sheet
- EMBL International PhD Programme Brochure
- Core facilities information leaflets
- Flyer "Opportunities for Young Scientists"
- EMBL Healthcare Plan Brochure
- EBI Overview brochure (published by EBI)
- EBI sheets for databases and services (published by EBI)
- Posters for scientific conferences, the PhD Programme, Science & Society
- EMBL exhibition stand

ANNEX 21

EMBL press releases 2004–2005 and media coverage

Links to the full press releases are available from http://www.embl.org/aboutus/news/press.html

2004

In 2004 30 press releases were published by EMBL. 10 press releases covered scientific findings at EMBL, 13 were news and events announcements, 4 announced new technologies and services at EBI and 3 reported on funding that was awarded to EMBL scientists and projects.

20 out of 30 press releases were covered by the general media. For details see below.

1. Thursday, 23 January 2004
European Virtual Institute for Genome Annotation receives €12million
The Commission of the European Union has awarded 12,000,000 Euro to 24 bioinformatics groups based in 14 countries throughout Europe to create a panEuropean BioSapiens Network of Excellence in Bioinformatics. The network aims to address the current fragmentation of European bioinformatics by creating a virtual research institute and by organizing a European school for training in bioinformatics
Press release was covered in FAZ, 2.2.

2. Thursday, 29 January 2004
EMBL: A leading example of innovation in European Science
EMBL's innovative research and dynamic spirit provide scientific advisors with an excellent example of what is needed to boost European research capabilities.
Senior representatives from the European Molecular Biology Lab, including the Director-General Prof. Fotis C. Kafatos, will meet an international group of key scientific advisors at the Italian Embassy in Berlin on Thursday, January 29. As a top internationally-recognised research institution in molecular biology, EMBL is at the forefront of efforts to make the European Union a leading knowledge-based society
Press release was covered in Il Messaggero, 3.2., Bresciaoggi, 3.2.

3. Thursday, 4 February 2004
Making new muscle: Researchers in Rome produce a mouse that can regenerate its tissues
Researchers at the European Molecular Biology Laboratory (EMBL) and the University of Rome "La Sapienza" have found a way to restore some of the "regenerative" ability of tissues, which happens naturally in animals at the embryonic stage of development, but is lost shortly after birth. The scientists' work, published this week in PNAS, gives new insight into how stem cells can be mobilised across the body, and how they take on specialised functions in tissue.

4. Thursday, 12 February 2004
European researchers launch €10million collaborative technology project
EMBL Hamburg coordinates a four-year integrated research project within the 6th Framework Programme of the European Commission.
The European Commission has given Europe a huge boost in the field of Structural Genomics, awarding the European Molecular Biology Laboratory (EMBL) and its partners €10 million for an integrated project called "BIOXHIT". The project aims to create a common platform throughout Europe for researchers working in the field of "biological crystallography".
Press release was covered in RNZ, 14./15.02, Stuttgarter Zeitung, 18.02.

5. Friday, 13 February 2004
***In Silico* Research: First German Center for Modeling and Simulation in the Life Sciences Established in Heidelberg**
Klaus Tschira Foundation provides €2.5 million for joint project involving Heidelberg research institutions, the University, and the state of Baden–Württemberg.
The first German center for modeling and simulation in the life sciences (BIOMS) opens today in Heidelberg. In international terms, Heidelberg is already an outstanding location for the life sciences and scientific computing.

6. Wednesday, 18 February 2004
EMBL researchers discover key molecular "switch" in eye development of medaka fish
New molecular interaction found by EMBL scientists featured in Nature.
Researchers at the European Molecular Biology Laboratory (EMBL) in Heidelberg have discovered a molecular "switch" that guides the development of the eye in a fish called medaka. The interaction of two proteins determines whether cells divide or specialize at a key moment as the eye forms.
Press release was covered in Informationsdienst Wissenschaft, 17.03., Ärzte Zeitung, 22.03.

7. Wednesday, 17 March 2004
EMBL and DKFZ jointly open one-of-a-kind screening facility
The European Molecular Biology Laboratory (EMBL) and the DKFZ (German Cancer Research Centre) will open the doors of the new "Chemical Genomics Facility", one of the first academic small molecule screening facilities in Europe. The opening ceremony will take place at EMBL Heidelberg from 1 to 2 pm on Thursday, March 18.
Press release was covered in BioVenture View, 30.03

8. Thursday, 25 March 2004
Building the whole cell from pieces
Researchers tackle the cell jigsaw puzzle
Scientists have taken a significant leap forward in understanding the complex ways that molecules work together in cells. The work of the Structural and Computational Programme at EMBL Heidelberg, in collaboration with Cellzome AG, appears in the current issue of the journal *Science* (March 26, 2004).
Press release was covered in Hannoversche Allgemeine Zeitung, 10.5., Kreiszeitung Syker Zeitung, 26.5., Westdeutsche Allgemeine Zeitung, 19.6., Focus, June 2004, Hannoversche Allgemeine Zeitung, 19.7.

9. Thursday, 25 March 2004
Mosquitoes vs. Malaria: How we can win the fight
Researchers at EMBL publish breakthrough studies that could lead to a new means of combating the deadly disease.
EMBL scientists have identified four mosquito proteins that affect the ability of the malaria parasite (*Plasmodium*) to survive and develop in the malaria-carrier mosquito (*Anopheles*). This breakthrough, featured in recent issues of *Cell* (March 5, 2004) and *Science* (March 26, 2004), could be used to block the transmission of malaria from mosquitoes to humans
Press release was covered in European Pharmaceutical Review, Issue 1 2004

10. Tuesday, 13 April 2004
EBI's microarray database reaches 5,000 hybridisations
ArrayExpress, the EBI's repository for microarray-based gene-expression data, has grown almost 100-fold in the past year, exceeding 5,000 hybridisations on April 2, 2004. Microarrays, also known as gene chips, allow scientists to get a bird's-eye view of the activity of all the genes in a particular cell type, tissue or organism.

11. Sunday, 18 April 2004
Hemochromatosis, inflammation and anemia
Researchers Discover a Surprising Link
Patients with inflammatory diseases such as arthritis, chronic infections and some types of cancer, often become anemic – a condition called anemia of chronic disease (ACD). While ACD rarely kills patients, it can make their lives miserable.

12. Monday, 10 May 2004
EBI launches Genome Reviews: A new resource for genome research
Today the EBI launches Genome Reviews, a comprehensive and standardised resource for completely sequenced genomes. Version 1.0 contains 256 chromosomes and plasmids, representing the complete genomes of 153 prokaryotic organisms. Since the first viral genomes were sequenced 20 years ago, technological advances have made it feasible to decipher the complete DNA sequences of hundreds of organisms.
Press release was covered in Informationsdienst Wissenschaft, 19.5., pro-physik online, 19.5.

13. Wednesday, 19 May 2004
EMBL and DESY continue their 30-year cooperation into 2015
The European Molecular Biology Laboratory (EMBL) and the Deutsches Elektronen-Synchrotron (DESY) today announce a new interdisciplinary partnership formed between the two institutions. Building on their 30-year track record of successful cooperation, DESY and EMBL now formalize their partnership for the future – looking to provide new generations of top quality infrastructures for life science applications.
Press release was covered in de Volkskrant, 29.5., Neues Deutschland, 29.5.

14. Wednesday, 26 May 2004
Are bacteria turning our own weapons against us?
Researchers reveal that microbes have stolen some of our genes
Scientists have identified what may be a completely new way in which bacteria defend themselves against their hosts. The bacteria have stolen a key defensive gene from the very animals that they are invading – and are now using it against them.
Press release was covered in Rhein-Neckar-Zeitung, 3.6., Express (Greece), 23.6., Informationsdienst Wissenschaft, 2.6., Drug Discovery Today, 15.7.

15. Wednesday, 2 June 2004
EMBL Director-General receives high German honour: the Bundesverdienstkreuz 1. Klasse
The Director-General of the European Molecular Biology Laboratory (EMBL), Professor Fotis C. Kafatos, today is awarded the prestigious German civil medal of honour, the Bundesverdienstkreuz 1. Klasse. The honour is given in recognition of his significant contributions to Germany and Europe – encouraging and stimulating top quality scientific research in the life sciences during his years as leader of EMBL.

16. Wednesday, 2 June 2004
International consortium launches new web-based tool: Reactome provides map of human biological pathways
A partnership between Cold Spring Harbor Laboratory (CSHL) and the European Molecular Biology Laboratory's European Bioinformatics Institute (EBI) has publicly released Reactome, a curated database of biological processes in humans. This database, available at www.reactome.org, is a dual-purpose project that can be used by general biologists as an online textbook of biology, or by bioinformaticians to make discoveries about biological pathways.

17. Wednesday, 2 June 2004
Cutting out the non-sense
Scientists uncover a new way in which cells deal with flawed molecules
Sometimes DNA mutations give rise to proteins that would be too short to function properly – a serious problem considering that proteins carry out some of the cell's main functions. But cells have evolved ways to make sure that

these shortened proteins are never produced, and researchers at EMBL have shed light on a novel and important step in this cell "surveillance" system (Nature, June 3, 2004).
Press release was covered in Nature Biotechnology, July 04, Cordis News, 10.6., Mensuel, Juli 04

18. Tuesday, 8 June 2004
New European Centre of Excellence will tackle fundamental research problems related to human health
The Partnership for Structural Biology begins construction on new facility in Grenoble, France
Today the institutions forming the Partnership for Structural Biology (PSB) are pleased to announce the construction of a new 3600m 2 facility for a European Centre of Excellence for Structural Biology. The founding members of PSB include three pan-European institutes: the Grenoble Outstation of the EMBL, a world-wide leader in molecular biology research; the ESRF, one of the world's foremost synchrotron X-ray sources; the ILL, the world's leading centre for neutron research; and the IBS, a leading French structural biology laboratory.
Press release was covered in Nature, 8.7., The Scientists, 6.7.

19. Tuesday, 29 June 2004
New Director General named to head EMBL
Dr. Iain Mattaj, FRS, FRSE, will be the next Director General of the European Molecular Biology Laboratory (EMBL), a renowned basic research and training institute with headquarters in Heidelberg, Germany. The decision was reached and announced at a meeting of EMBL's governing Council, held in Rome on June 29. Dr. Mattaj will take office starting in May 2005, when the term of the current Director General Fotis C. Kafatos ends.

20. Wednesday, 7 July 2004
EBI launches integrated genome and proteome browser
Today the EBI launches Integr8, a new browser that allows biologists to fully exploit the wealth of information available in completely sequenced genomes and their predicted proteomes.
Press release was covered in Cancer Drug News, 21.7., Nature, 22.7., innovationsreport online, 15.7.

21. Heidelberg, Thursday, 15 July 2004
European researchers tackle mitosis
EMBL and partners begin MitoCheck, a multinational research project on cell cycle regulation
Scientists at the European Molecular Biology Laboratory (EMBL) join forces with top scientists from eleven research institutes in Austria, Germany, Italy, France and the United Kingdom for "MitoCheck" – the largest integrated research project on cell cycle control within the European Commission's 6th Framework Programme (FP6).

22. Hinxton, Tuesday, 27 July 2004
EBI launches ChEBI: A database of small molecules
Today the EBI launches ChEBI, a freely available dictionary of small molecular entities. ChEBI contains both naturally occurring and synthetic molecules. It links the protein world with the world of small molecules, and has many applications, from basic biology to drug discovery and agricultural research.
Press release was covered in The New York Times, 17.8., Mannheimer Morgen, 13.8., Rüsselsheimer Echo, 19.8., Badische Neueste Nachrichten, 21.8., Darmstädter Echo, 19.8., Ruhr-Nachrichten, 18.8., Dresdner Neueste Nachrichten, 18.8., Neue Züricher Zeitung, 25.8., Financial Times Deutschland, 12.8., RNZ, 10.8., Hamburger Abendblatt, 16.8., Die Welt 14.8., Nordsee-Zeitung, 14.8., Ludwigsburger Kreiszeitung, 14.8. Reutlinger Generalanzeiger, 14.8, Heilbronner Stimme, 16.8., Berliner Zeitung, 13.8., Science online, 305, NZZ online, 25.8., echo online 17.8., sciencedaily online, 16.8., The Scientist online, 13.8., Wissenschaft online, 16.8., Hamburger Morgenpost online, 13.8., Nordseezeitung online, 16.8., Reutlinger Generalanzeiger, online, Schwäbische Zeitung online, 16.8., (+ 47 x mostly dpa text in various online newspapers), Photonik, 5/2004, Spektrum der Wissenschaft, 10/05, Bioworld, 26.11.

23. Heidelberg, 12 August 2004
Shedding new light on biology
New microscope gives scientists unparalleled, 3D views of living organisms
EMBL physicists have developed a state-of-the-art microscope that will undoubtedly become a standard fixture in modern biology labs.
Press release was covered in Ärztezeitung online, 14.9.

24. Monterotondo, 6 September 2004
How do you mend a broken heart?
EMBL scientists and collaborators receive US$6 million to study cardiac selfrepair
Prof. Nadia Rosenthal, Head of EMBL Monterotondo (near Rome, Italy), and international collaborators have been awarded a US$6 million grant for cardiovascular research.

25. Hamburg, 13 September 2004
30 years of discovery at EMBL Hamburg
Scientists in Hamburg were the first to use synchrotron radiation to decipher the complicated structures of biological molecules more than 30 years ago. Their pioneering discoveries led to the foundation of EMBL's first Outstation in Hamburg in 1974.
Press release was covered in Nature online, 28.10., heise online, 31.10., separationsnow online, 3.11., Lauterbacher Anzeiger online, 3.11., Gießener Anzeiger online, 3.11., Kreis-Anzeiger online, 3.11., Informationsdienst Wissenschaft online, 29.10. (+ 4 x in various online newspapers), Berliner Zeitung, 30.10. The Daily Telegraph, 24.11., Kölner Stadtanzeiger, 30.11.

26. Heidelberg, 28 October 2004
Darwin's greatest challenge tackled: the mystery of eye evolution
Researchers provide concrete evidence about how the human eye evolved
When Darwin's skeptics attack his theory of evolution, they often focus on the eye. Darwin himself confessed that it was "absurd" to propose that the human eye, an "organ of extreme perfection and complication" evolved through spontaneous mutation and natural selection.
Press release was covered in Mannheimer Morgen, 15.11., RNZ, 12.11., Mannheimer Morgen, 16.11., Mannheimer Morgen, 17.11., RNZ, 17.11.

27. Heidelberg, 10 November 2004
A milestone in the history of three partners
EMBO, EMBC and EMBL celebrate their anniversaries
Three leading European life science organisations based in Heidelberg, Germany will celebrate important anniversaries at a joint event on November 15. The European Molecular Biology Organization (EMBO) was established 40 years ago, the European Molecular Biology Conference (EMBC) is 35 years old, and the European Molecular Biology Laboratory (EMBL) turns 30.
Press release was covered in RNZ, 8.12., Mannheimer Morgen, 8.12., Lehdistöosuma, 6/04,

28. Heidelberg, Reykjavik, 7 December 2004
Iceland becomes EMBL's 18th Member State
Iceland has officially joined the European Molecular Biology Laboratory (EMBL) to become the organisation's 18th Member State. The EMBL council accepted Iceland's application for membership during a council meeting last month in Heidelberg. The new membership will begin on January 1, 2005.
Press release was covered in El Comercio, 9.12., Ideal (Spanish), 9.12., The Guardian Weekly, 17.12., Berliner Morgenpost, 12.12., Die Welt, 9.12., El Correo Espanol, 9.12., BBC online, 9.12., Berliner Morgenpost, 12.12., Hoy de Extremadura, 9.12., jornal publico online 9.12., Nature online, 8.12., news 24, 8.12., Discovery channel online, 8.12., Times of Oman online, 9.12. (+ 6 x in various online newspapers)

29. Hinxton, Heidelberg, 8 December 2004
Chicken genome gives insights into the human genome
Draft sequence of chicken genome completed
The draft sequence of the wild chicken, *Gallus gallus*, is published today in the journal *Nature*. The analysis of this genome is not just about getting bigger eggs and tastier chicken – it's giving scientists surprising insights into the human genome.
Press release was covered in News-Medical, 21.12.

30. Hinxton, 16 December 2004
Ensembl gives human geneticists a Christmas present
Linkage disequilibrium viewer provides a new perspective on disease susceptibility
Human geneticists can now see which variations on the human genome are inherited together, thanks to a new way of viewing genetic variations in the latest release of the Ensembl genome browser (a joint project between EMBL's EBI and the Wellcome Trust Sanger Institute).

2005

In 2005 32 press releases have been published by EMBL. 15 press releases covered scientific findings at EMBL, 3 were news and event announcements, 7 announced new technologies and services and 7 reported on funding that was awarded to EMBL scientists and projects.

25 out of 32 press releases were covered by the general media; for details see below.

1. Monterotondo, Tuesday, 25 January 2005
How do cells travel through our bodies?
Scientists gain ground in understanding cell motility
One of the most basic yet least understood processes in our bodies is how cells crawl along tissues. This behavior is essential to the formation of an embryo and other processes, but it must be tightly controlled. A disturbance can lead to the spread of cancer cells or diseases like Spina bifida and Lissencephaly, in which cells fail to reach their proper destinations. Scientists from the European Molecular Biology Laboratory (EMBL) in Monterotondo have now made a significant step forward in understanding cell motility.
Press release was covered in Kemivärlden (Sweden), 25.2.05, Journal Med, 21.1.05, Innovations Report, 21.1.05, Yahoo Nachrichten, 21.1.05

2. Hinxton, Tuesday, 1 February 2005
European bioinformatics grid receives 8 million Euro
The Commission of the European Union has awarded 8.3 million Euro to a pan-European task force who will improve access to biological information for scientists throughout and beyond Europe. The EMBRACE Network of Excellence, which encompasses computational biologists from 17 institutes in 11 countries and is coordinated by the European Bioinformatics Institute's Associate Director Graham Cameron, will use these funds to simplify and standardize the way in which biological information is served to the researchers who use it.
Press release was covered in Kemivärlden Biotech (Sweden), 24.2.05

3. Heidelberg, Copenhagen, Thursday, 3 February 2005
Biology in four dimensions
The factor of time gives scientists insight into cellular machines
Most things that happen in the cell are the work of "molecular machines" – complexes of proteins that carry out important cellular functions. Until now, scientists didn't have a clear idea of when proteins form these machines – are these complexes pre-fabricated or put together on the spot for each specific job? Researchers at the European Molecular Biology Laboratory (EMBL), working closely with scientists from the Technical University of Denmark

(DTU), have now answered that question by drawing together many types of data in a fascinating new model. The work is published in this week's edition of *Science*.
Press release was covered in Medical News Today, 4.2.05

4. Hinxton, Monday, 28 February 2005
Double recognition of EBI scientists by the ISCB
The International Society for Computational Biology has named two scientists from the European Bioinformatics Institute as the winners of its awards for 2005. Janet Thornton wins the Senior Scientist Accomplishment Award while the Overton Prize goes to Ewan Birney.
Press release was covered in PR Newswire

5. Hinxton, Wednesday 2 March 2005
A core set of human genes
Researchers at the EBI, the Wellcome Trust Sanger Institute, the US National Center for Biotechnology Information and the University of California, Santa Cruz, have released a core set of validated human protein-coding genes with unique and stable identifiers, making it much easier to locate and identify genes on the human genome.

6. Heidelberg, Jena, Thursday,31 March 2005
The transparent organism: EMBLEM and Carl Zeiss give labs a unique look at life
A novel high-tech microscope will be brought to the marketplace, giving laboratories everywhere fascinating new insights into living organisms. EMBLEM Technology Transfer GmbH (EMBLEM), the commercial entity of the European Molecular Biology Laboratory (EMBL), announced today that it has signed a licensing deal with technological leader Carl Zeiss to commercialize a new technology called SPIM (Selective Plane Illumination Microscopy).
Press release was covered in Rhein-Neckar Zeitung (Germany), 2.4.05, Campus TV, 3.3.05, physorg.com, 31.3.05, regioweb, 1.4.05, OE Magazine, 1.4.05, Innovations Report, 1.4.05, Research Research, 5.4.05, bionity.com, 7.4.

7. Hinxton, Pasadena, Monday, 11 April 2005
A new way to share models of biological systems
Today sees the launch of BioModels, the world's first database of annotated biological models. BioModels is the result of a collaboration led by the European Bioinformatics Institute (UK) and the SBML Team, an international group that develops opensource standards to describe biological systems. Other contributors include the Keck Graduate Institute (USA), the Systems Biology Institute (Japan) and Stellenbosch University (South Africa).
Press release was covered in Trade and Technical, April 2005, Nature Feature, 5.5.05, Scientific Computing World, May-June 2005

8. Heidelberg, Thursday, 21 April 2005
Whale bones and farm soil: Sequencing biodiversity
Scientists use metagenomics to characterize the invisible life in various environments
Instead of sequencing the genome of one organism, why not sequence a drop of sea water, a gram of farm soil or even a sunken whale skeleton? Scientists at the European Molecular Biology Laboratory (EMBL) in Heidelberg and their US collaborators have done just that, and the result is a new appreciation for the rich diversity of life that exists in the most unlikely places (*Science*, April 22, 2005).
Press release was covered in the European Commission Research Magazine, April 2005, Financial Times Deutschland, 22.4.05

9. Heidelberg, Sunday, 1 May 2005
EMBL's fourth Director-General, Dr Iain Mattaj, takes office
Dr. Iain Mattaj today took over the leadership of the European Molecular Biology Laboratory (EMBL), a prominent basic research and training institute with laboratories in France, Germany, Italy and the UK.

Press release was covered in Mannheimer Morgen (Germany), 2.5.05, Trade and Technical, 11.5.05, Current Biology feature, Volume 15 No3, Kemivärlden (Sweden), 10.6.05

10. Hinxton, Monday, 13 May 2005

EMBL-EBI expansion goes ahead with help from The Wellcome Trust and UK Research Councils

The European Bioinformatics Institute (EMBL-EBI) has received a big boost from The Wellcome Trust, the Medical Research Council (MRC) and the Biotechnology and Biological Sciences Research Council (BBSRC), who have given funds to expand the EBI site in Hinxton, Cambridgeshire, UK. The new development will provide 1,500 square metres of space which, together with their existing 3,000 square metre building, will provide the space to house over 400 staff, an expansion needed for the EBI to stay at the forefront of bioinformatics in the coming years.
Press release was covered in Business Weekly, 17.5.05, Trade and Technical, 5.5.05, Business Weekly, 16.5.05, Research Fortnight 8.6.05

11. Heidelberg, Sunday 19 June 2005

A link between our body's energy levels and a protein that wraps our DNA?

Scientists discover a connection between a histone and a metabolite

Living organisms need to sense the amount of energy that is available to them and regulate the activity of their genes accordingly. Scientists have made the unexpected finding that a histone protein, which wraps DNA into tight bundles and regulates gene activity, can bind a small molecule produced in our cells. This novel finding in itself was a breakthrough for researchers at the European Molecular Biology Laboratory (EMBL), but what made it more interesting was which specific molecule it binds – one from a pathway known to be linked to obesity and aging.

12. Hinxton, Friday 1 July 2005

Trees, vines and nets: microbial evolution changes its face

EBI researchers have changed our view of 4 billion years of microbial evolution. Christos Ouzounis and colleagues have gained intriguing quantitative insights into how gene families are transferred, not only "vertically" through passage from one organism to its progeny, but also "horizontally" through the exchange of genetic material between distantly related organisms. This new view of the tree of life could help us to better understand how disease-causing bacteria manage to stay one step ahead of us in our battle to tackle antibiotic resistance.

13. Hinxton, Monday 11 July 2005

Pathway information for 160 organisms now available through BioCyc

Researchers at the EBI and SRI International have significantly expanded the BioCyc collection of pathway/genome databases. The BioCyc collection has grown from 18 to 160 completely sequenced organisms. These include many disease-causing microbes as well as important targets for environmental remediation.

14. Heidelberg, Tuesday 12 July 2005

Hunt for human genes involved in cell division under way

EMBL starts screening genome-wide siRNA library in EU project MitoCheck

A systematic search through human genes has begun at the European Molecular Biology Laboratory (EMBL) in Heidelberg, Germany. Working within the MitoCheck consortium that includes 10 other institutes throughout Europe, the EMBL scientists will silence all human genes, one-by-one, to find those involved in cell division (mitosis) and to answer fundamental questions of how cell division is regulated.
Press release was covered in Technology for functional genomics, 15.7.05

15. Heidelberg, Wednesday 13 July 2005

Actin moves chromosomes: fundamental thinking

Scientists first to show that microtubules are not solely responsible for chromosome movement in egg cells

Microtubules need a helping hand to find chromosomes in dividing egg cells, scientists have discovered. Although it was generally accepted that microtubules act alone as the cellular ropes to pull chromosomes into place, a new study by researchers at the European Molecular Biology Laboratory (EMBL) shows that this is not the case. They

found that in large cells such as animal eggs, something else is needed to move the chromosomes into the correct location – fibres of the cytoskeletal molecule actin (*Nature*, 13 July 2005)
Press release was covered in Rhein-Neckar Zeitung, 12.8.05, L'express (France), 18.7.05, Neue Züricher Zeitung (Switzerland), 20.7.05, Diario Medico (Spain), 14.7.05, Frankfurter Allgemeine Zeitung (Germany), 20.7.05

16. Heidelberg, Monday 18 July 2005
Molecular Medicine Partnership Unit initiates second phase
The first rate research from the Molecular Medicine Partnership Unit (MMPU) is now set to continue for the long-term. The European Molecular Biology Laboratory (EMBL) and the Medical Faculty of University of Heidelberg, who formed the joint venture in 2002, have announced their plans to initiate a second phase of the MMPU. The Unit has always combined the strengths of medical science with that of molecular biology. In this second phase, the links between the institutions will be strengthened. There will be an increased focus on recruiting additional research groups from each organisation as well as intensifying activities in post-graduate training.
Press release was covered in Mannheimer Morgen (Germany), 19.7.05, Århus Stiftstidende Søndag (Denmark), 24.7.05

17. Hinxton, Monday 22 August 2005
Public collections of DNA and RNA sequence reach 100 gigabases
The world's three leading public repositories for DNA and RNA sequence information have reached 100 gigabases (100,000,000,000 bases; the "letters" of the genetic code) of sequence. Thanks to their data exchange policy, which has paved the way for the global exchange of many types of biological information, the three members of the International Nucleotide Sequence Database Collaboration (INSDC, www.insdc.org) – EMBL Bank (Hinxton, UK), GenBank (Bethesda, USA) and the DNA Data Bank of Japan (Mishima, Japan) all reached this milestone together.
Press release was covered in Physorg.com, Cordis news, 25.8.05, Monsters and Critics.com, 23.8.05, Biofutur, November 05

18. Heidelberg, Thursday 25 August 2005
A double punch for female survival
Achieving equality between the sexes can be a challenge even for single cells. Since evolution began removing bits of male DNA to create the "Y" chromosome, males have had a single copy of certain key genes on the X chromosome, whereas females have two. Normally this would lead females to produce twice the amount of some proteins, which could be fatal, but cells have developed ways to prevent this. Researchers at the European Molecular Biology Laboratory (EMBL) in Heidelberg have now made a breakthrough in understanding how this balance, called "dosage compensation", is maintained. They have discovered a unique double-locking mechanism which prevents the production of a molecule that would be fatal for female cells; their work is reported in the current issue of *Cell*.
Press release was covered in Frankfurter Allgemeine Zeitung (Germany), 21.9.05, M&C Science and Nature, 15.8.05

19. Munich, Monday 29 August 2005
EBI and Ghent University launch PRIDE: an open source database of protein identifications
The EBI and Flanders Interuniversity Institute for Biotechnology (VIB)-Ghent University have launched the PRoteomics IDEntifications database (PRIDE). PRIDE allows researchers who work in the field of proteomics to share information much more readily than was previously possible, paving the way towards new predictive and diagnostic methods in medicine.
Press release was covered in Trade and Technical, 9.9.05, Innovations Report, 29.8.05

20. Munich, Monday 29 August 2005
IMEx consortium provides new mechanism for improving access to molecular interaction data
The executive teams of five major molecular interaction databases announced today the signing of an agreement to share curation efforts and exchange completed records through a mechanism known as the International Molecular Exchange (IMEx) consortium.

21. Heidelberg, Sunday 4 September 2005

A new link between stem cells and tumors

Scientists at the European Molecular Biology Laboratory (EMBL) in Heidelberg and the Institute of Biomedical Research of the Parc Científic de Barcelona (IRB-PCB) have now added key evidence to claims that some types of cancer originate with defects in stem cells. The study, reported this week in the on-line edition of *Nature Genetics* (September 4) shows that if key molecules aren't placed in the right locations within stem cells before they divide, the result can be deadly tumors.

Press release was covered in Taurun Sanomat (Finland), 6.9.05, Siete Dias Medicos (Spain), 23.9.05, Diario de Mallorca (Spain), 23.9.05, Diario del Campo de Gibraltar (Spain), 6.9.05, El Dia (Tenerife), 6.9.05, ABC (Edicion nacional, Madrid), 5.9.05, La voz de Aviles (Spain), 6.9.05, Presencia (Spain), 28.10.05, News Telegraph, 5.9.05, Brestcancer.net, 5.9.05, bionity.com, 6.9.05, PG news, 14.9.05, Cancer Drug News, 14.9.05, TO BHMA (Greece), 9.10.05

22. Hinxton, Monday 12 September 2005

European Commission funds EBI to do new research on synergies between bioinformatics and medical informatics

The European Commission has selected the EBI to coordinate a project that will stimulate and explore synergies between bioinformatics (the science of storing, retrieving and analysing large amounts of biological information) and medical informatics (the science of processing, sharing and using large amounts of medical information). The SYMBiomatics project will culminate in a White Paper that will inform the Commission's funding policy on the synergy between these two rapidly growing areas. The aim is to facilitate and accelerate biomedical research and innovation, with the ultimate goal of improving Europe's efficiency at developing better tools and systems for disease prevention, diagnosis and treatment.

Press release was covered in Medical News Today, 13.9.05, Trade and Technical, 16.9.05, Business Weekly, 16.9.05

23. Heidelberg, Thursday 6 October 2005

Defusing dangerous mutations

Scientists discover a new way by which cells control genetic errors

Mutations in genes are the basis of evolution, so we owe our existence to them. Most mutations are harmful, however, because they cause cells to build defective proteins. So cells have evolved quality control mechanisms that recognize and counteract genetic mistakes. Now scientists of the Molecular Medicine Partnership Unit (MMPU), a laboratory operated jointly by the European Molecular Biology Laboratory (EMBL) and the University of Heidelberg, have discovered new features of a key quality-control mechanism in our cells. These insights into Nonsense-Mediated Decay (NMD), a process by which cells destroy potentially harmful molecules, promise to clarify our understanding of how some mutations lead to disease. The work appears in the October issue of *Molecular Cell.*

Press release was covered in Medical News Today, 7.10.05, Nature News Feature, 7.12.05, press relations, 6.10.05, Journal Med, 4.10.05, geoscience online, 10.10.05, medlexicon.com, 7.10.05, hospitalworldwide.com, 7.10.05

24. Hinxton and London, Tuesday 11 October 2005

EuroFIR: working towards a European food information resource

Researchers from 20 different European countries launch EuroFIR - an EU-funded Network of Excellence designed to build and disseminate a databank providing a single, authoritative source of food composition data in Europe for nutrients and newly emerging phytochemicals that might have potential health benefits. The EMBL-EBI is collaborating in the internet development and deployment of EuroFIR databank systems.

25. Hinxton, Monday 31 October 2005

ENFIN! Computational systems biology comes to a lab bench near you

The Commission of the European Union has awarded EUR 9 million over five years for a new Network of Excellence that will make computational systems biology accessible to bench scientists throughout Europe and beyond. ENFIN, which stands for "Experimental Network for Functional INtegration", brings together some of

Europe's best computational and experimental biology labs – 20 groups across 17 institutions in 13 countries – to build a virtual institute that will put Europe at the centre of the systems biology revolution.
Press release was covered in Innovations Report, 1.11.05, Informationsdienst Wissenschaft, 1.11.05, Bio-IT World.com, 1.11.05, juraforum.de, 1.11.05

26. Monterotondo, Heidelberg, Ulm, Sunday 13 November 2005
Limiting the damage in stroke
A cellular signal may determine life or death for damaged brain cells
Scientists at the Universities of Heidelberg and Ulm and a unit of the European Molecular Biology Laboratory (EMBL) in Monterotondo, Italy, have discovered that a specific signal within brain cells may determine whether they live or die after a stroke. Their study, published online (November 13) by *Nature Medicine*, strongly suggests that new therapies for victims of strokes could be developed by controlling a molecule involved in passing the signal.
Press release was covered in Der Spiegel (Germany), 14.11.05, Diario Medico (Spain), 14.11.05, Rhein-Neckar Zeitung (Germany), 15.11.05, El Pais (Spain), 16.11.05, SAT1 News, 14.11.05, Yahoo! Nachrichten, 14.11.05, Netzeitung.de, 14.11.05, Journal Med, 15.11.05 and 21.11.05, italiasalute.it, 22.11.05

27. Heidelberg, Tuesday 15 November 2005
Many needles, many haystacks
A new method to discover links between cellular machines
Most of what happens in cells is the work of machines that contain dozens of molecules, chiefly proteins. With the completion of human and other genomes, researchers now have a nearly complete "parts list" of such machines; what's lacking is the manual telling where all the pieces go. A new study by scientists at the European Molecular Biology Laboratory (EMBL) promises to answer this question for some of the smallest and trickiest components in the cellular toolbox. Their work appears in the current issue of the Public Library of Science's on-line journal, *PLoS Biology*.

28. Hamburg, Wednesday 16 November 2005
New high-throughput crystallisation facility at EMBL Hamburg to give boost to structural biology community
Today the European Molecular Biology Laboratory (EMBL) opens a new highthroughput crystallisation facility at its Outstation located on the campus of the German Synchrotron Radiation Facility (DESY) in Hamburg, Germany. The facility, made possible by major funds from the German Ministry for Science and Education (BMBF), will combine technological advances in new ways to transform proteins into crystals, a key step in efforts to automate the process of analyzing protein structures. "We're very grateful to the BMBF and the European Union for supporting the initiative, and thus providing an important service to the European life sciences community," says EMBL Director General Iain Mattaj.
Press release was covered in Hamburger Abendblatt (Germany), 17.11.05

29. Heidelberg, Thursday 24 November 2005
The earliest animals had human-like genes
Species evolve at very different rates, and the evolutionary line that produced humans seems to be among the slowest. The result, according to a new study by scientists at the European Molecular Biology Laboratory (EMBL), is that our species has retained characteristics of a very ancient ancestor that have been lost in more quickly-evolving animals. This overturns a commonly-held view of the nature of genes in the first animals. The work appears in the current issue of the journal *Science*.
Press release was covered in molecularlab.it, Science Daily, 25.11.05, El Correo Español, 30.11.05, El Pais, 30.11.05, News-Medical.net, 7.12.05

30. Hinxton, Friday 2 December 2005
What to sequence next: Pick one species at a time
After humans, mice, chickens and others what genomes should scientists sequence next? In a paper published today

in PLoS Genetics, Fabio Pardi and Nick Goldman of the EMBL-European Bioinformatics Institute present a way to decide. Surprisingly, they show that always choosing the next best single species is just as effective as planning to sequence several genomes in advance.
Press release was covered in Trade and Technical, December, Science Daily, 9.12.05, molecularlab.it

31. Hinxton, Tuesday 6 December 2005
Setting the standard for computer models of life
In the December 6 issue of *Nature Biotechnology*, scientists from 14 different organisations around the world, including the EMBL-European Bioinformatics Institute, propose a new quality standard for biochemical models.
Press release was covered in Science Daily, 6.12.05, Innovations Report, 6.12.05, Bioscience Technology, 7.12.05

32. Grenoble, December 21, 2005
A key that opens cells to the deadly malaria parasite
Researchers at the International Centre for Genetic Engineering and Biotechnology (ICGEB) in India and a unit of the European Molecular Biology Laboratory (EMBL) in France have made a key discovery about a molecule that helps the malaria parasite infect human cells. India is one of the countries most affected by this disease, which has infected 300 million people across the world and leads to over one million fatalities per year. The breakthrough, which was achieved at the European Synchrotron Radiation Facility (ESRF) in Grenoble, may represent an important step towards finding new therapies. The study appears in this week's online edition of *Nature* (December 21).
Press release was covered in two radio shows of the BBC world service, BBC soir on BBC Afrique, 21.12.05, and BBC 18:00 News on BBC UK, Science Daily 24.1.2.05, lightsource.org, 21.12.05, Innovations Report, 22.12.05, Allafrica.com, 22.12.05, webindia.com, 23.12.05, xagena.it, molecularlab.it, 27.12.05

EMBL Programme 2007–2011

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