MINISTÈRE DE L'ENSEIGNEMENT SUPÉRIEUR ET DE LA RECHERCHE

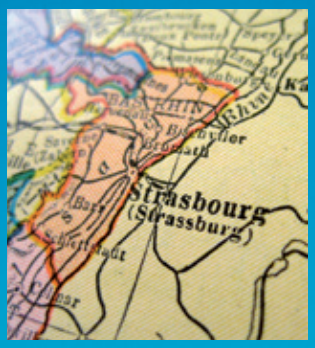
EUROPEAN SCIENCE FOUNDATION

SIXTH FRAMEWORK PROGRAMME

EuroBioFund: Conference Report

EuroBioForum III
Connecting Life Sciences

17 - 19 September 2008, Strasbourg, France



Strasbourg

Région Alsace

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European Science Foundation

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EuroBioForum

EuroBioForum is an annual forum where researchers, funding organisations and other stakeholders throughout Europe meet to discuss future life sciences priorities. Identification of these life sciences topics is based on ideas put forward by the life sciences community and by public and private funding organisations across Europe via a Call for Expressions of Interest. Following a selection by an international Steering Committee, the programme for each workshop is then defined in close collaboration with the proposers of the selected topic. The objectives of the workshop could be any or a combination of the following: i) to outline the plan for a new research programme; ii) to define a common strategic research agenda; or iii) to update current funders and sponsors and inform potential new ones.
The workshops are organised in the frame of the EuroBioForum, which also features lectures on trends in life sciences and policy, by high-level speakers from science and industry. In 2008, EuroBioForum III, an official event of the French Presidency of the European Union, was held on 17-19 September, in Strasbourg, France, in association with the French Ministry of Research and Higher Education. In 2007, EuroBioForum II was held on 5-7 December, in Lisbon, Portugal, in association with the Portuguese Foundation for Science and Technology (FCT) and the Portuguese Ministry of Science, Technology and Higher Education (MCTES).

EuroBioForum III was organised by EuroBioFund, an ESF-led initiative that aims to support the coordination of life sciences research funding in Europe. It is funded by the European Commission's Sixth Framework Programme (FP6) as a Specific Support Action under contract number LSSG-CT-2005-019009 (2006-2008).

Cover: Images clockwise from top left: Strasbourg Cathedral, Map of Strasbourg, European Parliament and La Petite France (Courtesy of iStockphoto, www.istockphoto.com)

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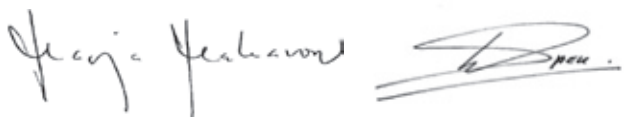
Foreword

On behalf of EuroBioFund and the European Science Foundation, we are very pleased to present the report of the EuroBioForum 2008. This report presents the discussions and outcomes of this third EuroBioForum, which took place from 17 to 19 September 2008 under the French Presidency of the European Union, with support from the French Ministry of Higher Education and Research, the Région Alsace, the City of Strasbourg, and the European Commission through the Sixth Framework Programme.

EuroBioForum aims to address challenges in life sciences by providing a networking forum to initiate and facilitate alliances between researchers and funders (public and private) on selected life sciences topics in Europe. During the two days of EuroBioForum 2008, six research topics were the focus of individual workshops with the aim of exploring how to coordinate the development and implementation of large-scale research programmes for these specific areas. The selected topics for 2008 ranged from alternative sources of energy to using DNA barcoding as a tool to understand and monitor biodiversity.

As the current EuroBioFund project is ending, it is timely to examine the experiences learned, and explore how to carry the concept forward. In line with this, a survey of the participants and speakers of the past three EuroBioFora was conducted and the outcome is also summarised in this report.

We are pleased to inform you that there has been positive progress in the development of the research topics presented here and during EuroBioForum 2007 in Lisbon, with strong indications of support from several funders in Europe. We hope that the report of this third and final conference will be useful in discussions on how to address challenges in life sciences funding in Europe and stimulate future action among researchers and research funders.



Professor Marja Makarow
Chief Executive,
European Science Foundation

Dr. Wouter Spek
Director,
EuroBioFund

1. Introduction

The 2008 EuroBioForum was the third such conference to be organised by EuroBioFund, a Specific Support Action of the European Commission's Sixth Framework Programme (FP6), in cooperation with the French Ministry of Higher Education and Research. Held in Strasbourg, France from 17 to 19 September 2008, EuroBioForum attracted more than 120 participants from across Europe and beyond. Among the participants were representatives from national and intergovernmental research-funding organisations, leading research scientists, policy makers and representatives from foundations, industry and patient organisations.

The primary aim of the EuroBioForum is to bring together selected research topics with potentially interested funders to define the next steps to move forward any topics that require a coordinated European effort. In 2008 in Strasbourg, the groups presenting were: Harnessing (Cyano-)Bacteria for Energy Production; Metagenomics of the Human Intestinal Tract for Health; A European Resource of Affinity Reagents for Analysis of the Human Proteome; European Profiles of Structural and Sequence Variation of the Human Genome and Disease; Molecular Biology of Survival; Calibrating Europe's Biodiversity using DNA Barcodes. There were short plenary presentations given by a representative from each research topic, followed by dedicated parallel workshops.

During the opening session there were presentations by Professor Marja Makarow, Chief Executive, European Science Foundation; Dr. Jacques Remacle, Scientific Officer, Genomics and Systems Biology, DG Research, European Commission; and Dr. Wouter Spek, Director, EuroBioFund. There was a high-level roundtable discussion entitled "Driving Research and Innovation" with: Dr. Patrick Chaussepied, Coordinator, Department of Biology and Health, French National Research Agency (ANR), France; Mr. Volker Rieke, Director of Life Sciences, Federal Ministry of Education and Research (BMBF), Germany; Mr. Hans van den Berg, R&D Coordination, Executive Director, NV Organon, The Netherlands; Professor Eero Vuorio, Chancellor, University of Turku, Finland; Mr. Nicolas Carboni, Director General, Alsace BioValley, France.

This report summarises the contributions of the speakers, the discussions within the parallel workshops, and the conclusions from the third EuroBioForum.

The presentations can be downloaded from the website, together with the abstracts, conference programme and participants list at **www.esf.org/eurobiofund/strasbourg.**

Steering Committee

Marja Makarow (Chair), Chief Executive, ESF
Charles Buys, Vice-Chairman, Netherlands Organisation for Scientific Research (NWO)
Manuel Hallen, Director of Health, DG Research, EC
Carlos Martínez-A., Secretary of State for Research, Ministry of Science and Innovation, Spain
Zdena Palková, Charles University of Prague
Jacques Remacle (Observer), Scientific Officer, DG Research, EC
Wouter Spek, Director, EuroBioFund
Luc van Dyck, Executive Coordinator, European Life Sciences Forum

Organising Team

Fiona Kernan, Science Officer, EuroBioFund
Anne Blondeel-Oman, Conference Officer, ESF

2. Opening Session


Marja Makarow


Eero Vuorio


Jacques Remacle


Wouter Spek

Opening Session

Chair: **Eero Vuorio**, University of Turku

Marja Makarow, European Science Foundation, Opening and Welcome
Jacques Remacle, European Commission, European Research Area: Challenges and Perspectives
Wouter Spek, EuroBioFund, Connecting Europe's Unmet Needs

To help coordinate the efforts of life sciences research funders, EuroBioForum contributes to the development of the European Research Area (ERA). EuroBioForum III, the third and final conference under the current project, was organised as an event under the French Presidency of the European Union.

Professor Marja Makarow, Chief Executive of the ESF, welcomed the participants, thanking both the Région Alsace for the prestigious conference venue and the City of Strasbourg for hosting the welcome reception. Describing EuroBioFund as a "successful experiment" in terms of linking funders, researchers and policy makers together, she outlined several of the successes including that of the research consortium ASAT – Assuring Safety without Animal Testing. This initiative, which was presented at EuroBioForum II involves an innovative approach in assessing risks posed by human exposure to chemicals, which will replace animal testing for generating the necessary data for risk assessments, in line with the new proposed EC Directive on the use of animals for experimental and other scientific purposes. Four workshops were held in 2008 and it can be reported that they have received support of 1.2 M€ from the Dutch Ministry of Health, Welfare and Sports.

She acknowledged that there were many challenges to setting up large pan-European ad hoc research consortia including legal and administrative barriers. For example, public funding agencies, by their very nature, lack the necessary flexibility to support such initiatives and large foundations are often limited in their ability to allocate funds outside national borders. Furthermore, the research presented at EuroBioForum was often too pre-competitive for industry. Nevertheless, the consortia that the researchers formed are very valuable and should be seen as a true accomplishment of the programme. EuroBioFund has certainly addressed the need in the life sciences in Europe to create a bridge between research and finance. The events have also served as a platform for policy makers to discuss major life sciences topics.

"EuroBioFund has been a successful experiment"

Professor Marja Makarow

However, Professor Makarow also posed the question to the audience if a forum such as EuroBioForum is the best route to achieve such consortia. She also encouraged the audience to voice their opinions and recommendations in a EuroBioFund survey – to be launched in early October – and so provide valuable information for the EC, the ESF and other stakeholders on future steps to be taken. Professor Makarow ended by wishing everyone a successful conference, acknowledging the outstanding work of EuroBioFund's Steering Committee, Dr. Wouter Spek, and Dr. Fiona Kernan before handing over to Professor Eero Vuorio, who acted as Chair for the remainder of the morning session.

Dr. Jacques Remacle, representing Dr. Manuel Hallen, Director of Health, DG Research, EC, presented an overview of the development of the European Research Area (ERA), summarising current and planned initiatives to further its development. To assess the

progress made since the endorsement of the ERA at the European Council in Lisbon 2000, the EC issued an ERA Green Paper in 2007[1], followed by a public consultation on the Paper (1 May 2007 to 31 August 2007). Notably, one of the papers and reports to emerge from this consultation was the EUROHORCs' and ESF's comments in the form of a Science Policy Briefing[2]. Since the launch of the ERA, there has been significant progress including the development of the ERA-NET scheme and the agreement by the Council of Ministers on four Joint Technology Initiatives (JTIs), including one on Innovative Medicine (IMI). IMI forms a public-private partnership between the EC and the European Federation of Pharmaceutical Industries Associations and its first call, with a budget of 172.5 M€, was launched on 30 April 2008. Furthermore, the development of the ERA was supported through the funding of other Framework Programme projects such as EuroBioFund and structural funds can now be used for investment in research capacities.

"Future actions should help Member States in creating cross-border synergies for tackling ambitious research challenges in Europe"

Dr. Jacques Remacle

Dr. Remacle then described the barriers that remain to the full realisation of the ERA, namely:

- Barriers in research career and mobility;
- Lack of legal structures for the creation of appropriate partnerships for pan-European research infrastructures;
- Difficulties in cooperation between industry and public institutions, particularly across national borders;
- Diversity of the patent systems, no European patent;
- National and regional research funding remains largely uncoordinated (unnecessary duplication, dispersion of resources, failure to play a global role, difficulties in addressing major global challenges);
- Reforms undertaken at national level often lack a true European perspective and transnational coherence.

While these challenges were acknowledged and explored in the ERA Green Paper and subsequent consultation, the aim was also to discuss future orientations. In terms of importance, "knowledge sharing" and "infrastructures" were identified as being key, and it was recognised that there were strong interdependencies between ERA objectives, in particular crucial interactions of research with education and innovation. The introduction of rather flexible, voluntary and bottom-up cooperation schemes, networking and exchange of best practices – except for pension rights and infrastructures – were favoured in place of binding legislative actions at the EU level.

Taking into account the results of the ERA Green Paper consultation, five new ERA initiatives will be launched in 2008-2009:

- A European researchers' passport for mobility and career development;
- A legal framework for pan-European research infrastructures;
- Management of intellectual property rights (IPR) in public research organisations;
- Move towards more joint programming and programmes;
- A policy framework for international science and technology cooperation.

Of these new initiatives, it is "joint programming" which has perhaps received the most attention. It involves Member States voluntarily engaging in the definition, development and implementation of common research strategies, strategic collaboration between existing national programmes or jointly planning and setting up new ones. By so doing, it aims to increase and improve cross-border collaboration, coordination and integration of Member States' publicly-funded research programmes in a limited number of strategic areas[3].

Dr. Remacle ended this presentation with a summary of the EuroBioFund project: why it was set up; what were the achievements; and the future perspectives. He was positive in his comments, while acknowledging that no joint research initiative was yet running, but perhaps 36 months is too short a timeframe. He ended by saying that "a consultation of the stakeholders should help in defining the format and objectives of future actions like EuroBioFund".

The first session was closed by **Dr. Wouter Spek**, Director of EuroBioFund, who spoke about the background to EuroBioFund and its key objectives. EuroBioFund developed from a key recommendation of a 2004 European Commission conference (Funding Basic Research in the Life Sciences: Exploring Opportunities for European Synergies), which urged that an annual funders' forum be established to discuss the new challenges in the life sciences with the scientific community in order to agree on the best funding strategies

1. The European Research Area: New Perspectives COM(2007) 161 http://ec.europa.eu/research/era/pdf/era_gp_final_en.pdf
2. EUROHORCs' and ESF's comments on the EC's Green Paper: The European Research Area: New Perspectives. Science Policy Briefing 29, December 2007. www.esf.org/publications
3. Towards Joint Programming in Research COM(2008) 468 http://ec.europa.eu/research/press/2008/pdf/com_2008_468_en.pdf

to address them. This is precisely what EuroBioFund has been striving to do with the annual EuroBioForum in the life sciences area for the past three years.

> *"EuroBioFund has taken steps to bridge the gap between research and finance in the domain of life sciences"*
>
> Dr. Wouter Spek

EuroBioForum's activities can be divided into two stages: the first is scouting for research topics with a European dimension and, once those topics are selected, working with the proposer to establish a network of stakeholders from research and finance: the second stage is the workshop session, when the options for bringing the topic forward are debated and explored. EuroBioForum is one step in a long process and developing large-scale research consortia is a challenge. Citing the examples of the Structural Genomics Consortium (SGC)[4] and the more recently set-up International Cancer Genomics Consortium (ICGC)[5], Dr. Spek commented that among the key drivers for such a consortium are leadership, involvement of all relevant stakeholders, a science breakthrough and a political will.

In conclusion, Dr. Spek encouraged participants to actively participate in the workshops and so take the first steps in initiating and facilitating strategic alliances to develop joint strategic research agendas and activities in these key areas of life sciences research.

4. www.thesgc.com
5. http://icgc.org/

3. Roundtable Discussion


Nicolas Carboni


Volker Rieke


Patrick Chaussepied


Hans van den Berg

Opening Session

Chair: **Nicolas Carboni**, Alsace BioValley, France

Patrick Chaussepied, Coordinator, Department of Biology and Health, French National Research Agency – ANR, France
Volker Rieke, Director of Life Sciences, Federal Ministry of Education and Research – BMBF, Germany
Hans van den Berg, R&D Coordination, Executive Director, NV Organon, The Netherlands
Eero Vuorio, Chancellor, University of Turku, Finland

One of the highlights of the morning session was a high-level roundtable discussion entitled "Driving Research and Innovation in Life Sciences" moderated by **Mr. Nicolas Carboni,** Director of Alsace BioValley. There were representatives from the key research funding actors in Europe, namely national funding agencies, ministries, industry and academia, who engaged in a lively debate on several key questions related to life sciences in the context of the European Research Area (ERA).

In considering the instruments that had been developed to drive the development of the ERA, the ERA-NET scheme was discussed. Launched in 2002 as part of the Sixth Framework Programme the aim was "to step up the cooperation and coordination of research activities carried out at national and regional level in the Member States and Associated States, through the networking of research activities, including their mutual opening and development of joint activities[6]". Although there has been a high level of interest and participation across the Member States, the level of funding involved remains small. Dr. Remacle (EC) pointed out that it represents just 1% of the total national research budgets which, together with the Framework Programme funding (5%), means that approximately 6% is spent on European collaboration. It was also highlighted in a working document accompanying the ERA Green Paper that those involved in managing national and regional programmes were slow in restructuring them to allow the development of meaningful joint programmes[7]. However, these criticisms aside, there was strong support expressed for the instrument by **Mr. Volker Rieke**; indeed Germany leads the way in participation in ERA-NETs, having contributed to 61 of the 71 full programmes with the greatest number of representatives per ERA-NET[6]. He commented that it was important to consider how to optimise current instruments rather than introducing new ones, which may not necessarily provide solutions. Examining other available programmes for European-wide collaboration, the ESF's EUROCORES scheme was also highlighted. Now in its fifth year of operation, the scheme provides a framework to bring together national research funding organisations and supports interdisciplinary research, thereby opening new horizons in science[8].

One critical issue related to innovation that was debated was intellectual property rights (IPR). It is widely acknowledged that there is a lack of consistency and adequacy of rules and approaches to managing IPR from public funding. For projects funded through FPs, it is often necessary for owners to drop patents due to an inability to license the IP. Given the significant amount of funding provided through the FPs, a concerted effort should be made to capitalise on the investments made by facilitating the generation of IP, critical for the devel-

6. ERA-NET Review 2006, The Report of the Expert Review Group, December 2006 – ftp://ftp.cordis.europa.eu/pub/coordination/docs/era_net_review_report_dec2006_en.pdf

7. European Commission Staff Working Document Accompanying The Green Paper SEC(407) 412/2 http://ec.europa.eu/research/era/pdf/era_swp_final.pdf

8. www.esf.org/eurocores

opment of new products and services. At the European level, several steps have been taken to promote the sharing of knowledge and "knowledge sharing" is one of the five specific issues identified in 2008 as being critical to supporting the ERA. For example in April 2008, the EC adopted a recommendation on the management of Intellectual Property Rights in knowledge transfer activities and a Code of Practice for universities and other public research organisations[9]. Stating that "effectively exploiting publicly-funded research results depends on the proper management of IP, on the development of an entrepreneurial culture and …. on better communication and interaction between the public and private sector", this recommendation aims to improve the way that public research organisations manage IP and knowledge transfer.

Of course, another one of the five ERA initiatives that has gained a considerable amount of publicity is "joint programming", which will focus on public research programmes. This distinguishes it from the joint technology initiatives (JTIs), which are public-private partnerships, managed within dedicated structures based on Article 171 of the EC treaty[10]. One of the most recent JTIs to be launched was Fuel Cells and Hydrogen, adopted as a regulation on 30 May 2008. There was general support expressed by the panel for joint programming, although with some concern at the introduction of another instrument into the ERA. At the moment, possible areas that are being discussed as pilot projects (as published after an informal competitiveness meeting of the French Presidency of the EU[11]) for Joint Programming are: 1) neurodegenerative disorders (Alzheimer's); 2) implementation of the European Strategic Energy Plan (SET Plan); adapting farming methods to climate change and food security; and managing embedded computing and future developments of the internet.

It was also noted that innovation in Europe has been boosted with the launch of the European Institute of Innovation and Technology (EIT)[12]. Based in Budapest, the EIT recently held the first meeting of its Governing Board in September 2008. The EIT will be implemented through the establishment of "Knowledge and Innovation Communities (KICS)", which will be excellence-driven partnerships between universities, research organisations, companies and other innovation stakeholders. It could be envisaged that once these KICs are established, links would be made with existing regional clusters. Their importance was highlighted by Mr. Carboni, who is head of a bioscience cluster, Alsace Biovalley, one of three clusters together with South Baden in Germany and Northwest Switzerland. It was agreed that clusters such as these played a vital role in bridging the gap between industry and research. The Capacities Programme of FP7 is providing specific funding for regions of knowledge and regional research-driven clusters to the total amount of 126 M€ over the course of FP7.

During the discussion, several important issues related to innovation in the life sciences were considered including IPR, available instruments for funding and research-driven regional clusters. There was some disagreement as to the advantage of introducing new instruments, as the benefits of existing instruments may take longer to emerge than a five- to eight-year time frame; six for the case of ERA-NETs. The consultation process on the ERA during 2007, culminating in the "Ljubljana Process", adopted on 30 May 2008[13], has invigorated the debates surrounding the ERA. The enhancement of the overall governance of ERA should ensure the momentum of driving innovation in life sciences and other areas of science is continued. Mr. Carboni concluded the roundtable discussion by thanking the participants.

9. Commission Recommendation on the management of intellectual property in knowledge transfer activities and Code of Practice for universities and other public research organisations C(2008) 1329 http://ec.europa.eu/invest-in-research/pdf/ip_recommendation_en.pdf
10. http://cordis.europa.eu/fp7/jtis/
11. www.ue2008.fr/PFUE/lang/en/accueil/PFUE-07_2008/PFUE-17.07.2008/resultats_de_la_reunion_informelle_competitivite__journee_recherche
12. http://ec.europa.eu/eit/
13. Council Conclusions on the launch of the "Ljubljana Process" – towards full realisation of ERA http://register.consilium.europa.eu/pdf/en/08/st09/st09076.en08.pdf

4. Brokerage Sessions

Plenary and Brokerage Sessions

Plenary Chair: **Wouter Spek**, EuroBioFund

Matthias Rögner, *Harnessing (Cyano-) Bacteria for Energy Production*
S. Dusko Ehrlich, *Metagenomics of the Human Intestinal Tract for Health*
Michael Taussig, *A European Resource of Affinity Reagents for Analysis of the Human Proteome*
Xavier Estivill, *European Profiles of Structural and Sequence Variation of the Human Genome and Disease*
Miroslav Radman, *Molecular Biology of Survival*
Pedro W. Crous, *Calibrating Europe's Biodiversity using DNA Barcodes*

Rapporteurs:
Fiona Kernan, **Marjanne Slot**, **Veronique Blanc**, **Oda Stoevesandt**

The central focus of the EuroBioForum was the presentation of six research topics that were first introduced in a plenary session to the EuroBioForum participants and developed further in dedicated parallel workshops. Each workshop was attended by between 15 and 35 representatives from research-funding organisations, industry, academic research institutions and government ministries.

4.1 Harnessing (Cyano-)Bacteria for Energy Production

The first speaker of the afternoon session was **Professor Matthias Rögner**, Department of Plant Biochemistry, Ruhr-University Bochum, Germany, who introduced the timely proposal of CyanoBioEnergy – Harnessing (Cyano-) Bacteria for Energy Production. In this era of increasing global demand for energy, depleting reserves of oil and gas, unstable energy prices and rising emissions of greenhouse gases, rapid progress must be made toward ensuring the security and stability of Europe's energy system. One element of this is developing new ways to produce energy, including renewable hydrogen (H_2). H_2 is an ideal alternative energy carrier — provided it can be produced in a regenerative way, in particular from the abundant supply of water and sunlight. Nature has already done it: harnessing of solar energy has been optimised for several billion years in cyanobacteria by the natural process of photosynthesis, resulting in the light-dependent splitting of water into electrons, protons

Matthias Rögner

and oxygen. In parallel, some bacteria and green algae species have optimised another natural catalyst, the hydrogenase enzyme, which produces hydrogen gas from protons and electrons. The aim of the proposed CyanoBioEnergy project is the combination of both mechanisms in one novel natural system, which is able to generate H_2 directly from water using solar energy.

In his opening presentation Professor Rögner explained that both mechanisms do not cooperate efficiently in any cell in nature, as the systems evolved this way. The solution lies in: 1) optimising the catalysts to enhance stability and O_2 tolerance; 2) inserting the designed catalysts in a model host cell and; 3) design and optimisation of mass culture facilities. He emphasised that it was important for Europe to invest in this type of research as it had world-leading expertise in biohydrogen-related research with a high density of groups working in this sector and it was supported by current EU policy[14]. Professor Rögner ended his plenary presentation by inviting participants to join him in the workshop for further discussions.

Attended by approximately thirty participants, the workshop was opened with a presentation by **Professor Peter Lindblad**, Department of Photochemistry and Molecular Science, Uppsala University, Sweden, a colleague of Professor Rögner. He provided a broader perspective on the use of cyanobacteria to generate renewable hydrogen by referring to a number of papers including a White Paper on "Harnessing Solar Energy for the Production of Clean Fuels" produced after an ESF-sponsored international conference in Regensburg,

14. European Commission – A European Strategic Energy Technology Plan (SET-PLAN) "Towards a low carbon future", COM(2007)723 final

Germany in 2006[15]. More recently, the ESF published a Science Policy Briefing on this topic and one of the key recommendations was "to capitalise on the capability of existing photosynthetic microorganisms to catalyse the light-driven oxidation of water and evolution of hydrogen and carbon-based fuels to develop a sustainable infrastructure for the efficient production of primary biofuels independent of the use of arable land mass"[16]. Furthermore, in May 2008 the European Parliament gave its support to the EU's Joint Technology Initiative on Fuel Cells and Hydrogen (JTI-FCH), which will facilitate and accelerate the development of hydrogen and fuel cell-based energy systems with a budget of 1 billion € (2008-2017)[17]. These papers, supported by high-level researchers and institutions in Europe and new EU initiatives such as the JTI-FCH, show that CyanoBioEnergy fits very well into the current research landscape.

As Professor Lindblad outlined, there are national programmes/projects in the area of solar energy and biofuels, together with pan-European initiatives such as Bio-H2 (Nordic Energy Agency)[18] and SOLAR-H2 (FP7 funded under "Energy"), a follow-on from the SOLAR-H (FP6-funded NEST project)[19]. However, there needed to be more funding and support for start-up companies, to allow Europe to develop the equivalent of companies such as GreenFuel in the US[20].

At the moment researchers in this area were developing collaborations with companies in the US, as the possibility to do so in Europe was limited. While many of these companies are currently focused on sequestration and recycling of carbon dioxide using algae, the existing technology could be modified and applied to the generation of bio-hydrogen.

Professor Rögner then gave a presentation expanding on the project goals that were outlined in his plenary presentation. Among the milestones envisaged in the first five years is development of the first design organism to demonstrate proof of principle, in parallel with improvement of the catalysts and development of the photobioreactors. One proposed organisation model is a foundation with a board of trustees with representatives from science, industry and policy and a steering committee with representatives from each participating country.

During the discussions, there were questions raised on various technical, funding and organisational aspects of the proposal. The efficiency of hydrogen production from cyanobacteria was discussed, along with the possibility of searching for more efficient catalysts. Professor Rögner commented that the efficiency of production was currently only a few percent, but that there was, as he had outlined in his presentation, a potential to increase it, and so make it a viable energy alternative in the long-term. "It is time for us in Europe to develop this competence (bio-hydrogen production) through basic R&D if we want to reach high production of hydrogen", he said.

The issue of attracting funding from large energy companies was also debated. Although companies such as E.ON expressed interest in this type of research and attended seminars hosted by Professor Rögner, this had yet to translate into financial support. It may be too soon in the R&D phase, but an effort would be made after the workshop to inform more companies on the activities proposed. On a related note, large car manufacturers, although funding hydrogen fuel cell development, had little interest for the moment in funding research into hydrogen production.

It was also acknowledged that solutions for handling the biomass created from these large cyanobacteria bioreactors would have to be developed, also considering that they would be genetically engineered cells, and so would have to be destroyed.

The issue of intellectual property rights (IPR) was discussed and this was acknowledged to be a significant challenge in setting up partnerships with companies both in Europe and the US. Finally on the proposed organisation, Professor Rögner said that they would consider preparing a business plan, pursuing further contact with companies and concluded by announcing a second workshop in February 2009 at the Max-Planck Institute for Bioorganic Chemistry in Mülheim, Germany.

What are cyanobacteria?

Cyanobacteria are a group (phyla) of prokaryotic bacteria also known as blue-green algae or blue-green bacteria. Obtaining their energy through photosynthesis, it is estimated that they produce over 50% of global oxygen and about 40% of global biomass. They are adapted to extreme environments such as hot springs, desert sands and permafrost zones. Cyanobacteria are also ancient, with the first fossils dating from 2.8 billion years ago and they played an important role in converting the early Earth's atmosphere from a reducing to an oxidising one, which set the stage for the evolution of eukaryotes. There are over 10 000 species known with an estimated 100 000 species yet to be discovered.

15. www.ssnmr.leidenuniv.nl/content_docs/cleansolarfuels.pdf
16. ESF Science Policy Briefing 34, Harnessing Solar Energy for the Production of Clean Fuel, September 2008, www.esf.org/publications
17. http://cordis.europa.eu/fp7/jtis/
18. www.nordicenergy.net/section.cfm?id=1-0&path=3,23
19. www.fotomol.uu.se/Forskning/Biomimetics/solarh/Solar-H_brochure.pdf
20. www.greenfuelonline.com/index.html

S. Dusko Ehrlich

Willem de Vos

4.2 Metagenomics of the Human Intestinal Tract for Health

The second topic on Thursday focused on the exciting and emerging field of metagenomics. Broadly defined as the comprehensive examination of the DNA of microbial communities, there has been much interest among the international research community specifically on the examination of microbial organisms that live in and on the human body (the human microbiome). **Dr. Dusko Ehrlich**, Microbial Genetics Unit, French National Institute for Agricultural Research (INRA), France, presented MetaHIT Health (Metagenomics of the Human Intestinal Tract for Health) to the audience at EuroBioForum. Building on a recently launched FP7 Integrated Project known as MetaHIT, the aim of this proposal is to enable the modulation of the microbial populations of the human intestinal tract in order to optimise human health and well-being[21].

It is estimated that there are about 10 trillion microbial cells living in the intestinal tract, which outnumber human cells by a factor of 10 to 1. Remarkably, very little has been known until now about the impact that these microbes have on human health and illness. This was largely due to the lack of technological know-how required to sequence millions of microbial genomes at one time, which is no longer the case. As this type of high-throughput analysis is now possible, there has been a significant worldwide investment in human microbiome projects, of which MetaHIT is part. Launched in January 2008 and running for four years, MetaHIT involves 13 partners from academia and industry from a total of eight countries, with a budget of 20 M€ (11.4 M€ coming from the EC). Among its activities are: creation of a reference set of genes and genomes of intestinal microbes; creation of generic tools to study the variation of human gut microbiota; and the study of genes correlated with diseases. MetaHIT forms part of a larger international consortium, the International Human Microbiome Consortium, which includes many of the current large-scale microbiome projects worldwide. By far the largest project is the Human Microbiome Project in the US (115 M$) launched by the US National Institutes of Health[22] in December 2007. Over a period of five years, researchers will initially sequence up to 600 microbial genomes, characterising the complexity of microbial communities in the gut, oral cavity and skin. Other projects include Meta-GUT in China (1.5 M$) and MicroObes in France (3 M$)[23].

Given this overview of the worldwide scene and that there is funding available for MetaHIT, the question is why further support should be sought for European research: the answer is to maintain a competitive edge in Europe. Currently the partners come from seven EU countries, so there is scope to increase this number. As Dr. Ehrlich remarked, “metagenomics is in its infancy and Europe must create the necessary knowledge, technology and infrastructure base to capitalise on the potential output”.

During the workshop there were presentations by other members of the consortium including **Professor Willem de Vos**, Laboratory of Microbiology at WU Agrotechnology and Food Sciences, The Netherlands. Professor de Vos is responsible for the work package “function pillar” of MetaHIT, together with Dr. Joël Doré (Ecology and Physiology of the Digestive System, INRA, France). The aim of this work package is to explore host-

21. www.metahit.eu/index.php?id=239

22. http://nihroadmap.nih.gov/hmp/
23. Mullard A. The Inside Story. *Nature* 453(70195): 578-80, 2008

microbe interactions and signalling relevant to health at the molecular level. It is aimed at opening up avenues to develop new bioactive compounds, targeting in particular immunomodulation, cell proliferation and rational modulation of the microbiota. Professor de Vos presented on the key issues of intestinal microbiota and phenotypes, including defining a healthy intestine, determining the dynamics and link to human genomics, and developing tools for understanding the interactions.

Dr. Peer Bork, Structural and Computational Biology Unit, EMBL, spoke about the bioinformatic challenges of a metagenome study. This includes practical aspects such as development of the necessary infrastructure to store and exchange the massive amounts of information generated. As Dr. Bork explained, there are significant limitations with the current web-based system for transferring data, necessitating the use of CDs or flash drives. Another aspect is developing the software to organise, interpret and present the information in a form useful to the final user. Indeed, both of these challenges are the focus of the MetaHIT work package for which Dr. Bork is responsible.

In terms of the next steps to be taken for MetaHIT Health, two avenues will be pursued. One will be the preparation of a white paper on the potential of metagenomics in human health, and the second, organisation of a meeting with a stakeholders' platform early in 2009.

The first will most likely be a joint initiative under the umbrella of the International Human Microbiome Consortia (IHMC). This informal organisation, formally set up on 18 October 2008, is working on forming links between all ongoing initiatives in the human metagenomics field worldwide. To this end, it will seek to establish rules for data exchange and release, as well as working groups on standard operating procedures, data analysis, and will explore venues for future collaborations.

The second initiative (stakeholders' platform) will be organised under the umbrella of the EU-funded project MetaHIT, to develop interactions with organisations and companies who may be interested in the existing MetaHIT consortium. As far as public partners are concerned, relations will be developed more specifically through the IHMC (see above). For private partners, links will first have to be set up for information exchange and trust will have to be built, before projects can be developed.

Dr. Ehrlich concluded by saying that the EuroBioForum meeting was the first occasion to start building the platform and interact with stakeholders outside of the MetaHIT project and existing collaborations. He added that contacts would be maintained through regular newsletters as well as updates through the web site.

4.3 A European Resource of Affinity Reagents for Analysis of the Human Proteome

The third proposal to be presented during the afternoon session was EURAFFIN, A European Resource of Affinity Reagents for Analysis of the Human Proteome. As **Dr. Michael Taussig**, The Babraham Institute, Cambridge, United Kingdom, explained, the aim of this proposal is two-fold: 1) to establish a European resource of quality-controlled affinity binding reagents for detection of all human proteins; and 2) to provide binder-based tools to explore protein expression and function in health and disease. This is important for both basic research: understanding underlying mechanisms of disease, systems biology and pathway mapping; and applied research: diagnostics (biomarkers), biotech and life sciences companies (tools) and the pharmaceutical industry (novel drug targets, targeted therapies, personalised medicine). Currently only a minor fraction of the human proteome is covered by existing binders and, as new binders will be needed in very large numbers, the proposed project resembles the human genome sequencing in scale and significance. On the issue of quality control, the quality and success rate of reagents commercially available today is highly variable with a resulting loss of resources both in terms of personnel time and funding. It is notable that the worldwide annual market for research antibodies is 0.5 – 1 billion US$, mainly bought by public funding.

During the workshop, Dr. Taussig expanded on the EURAFFIN proposal with an introduction to the FP6 Research Infrastructure Coordination Action, ProteomeBinders[24]. Started in 2006 and linking 26 EU partners together with two partners from the United States, ProteomeBinders has done the theoretical groundwork for the practical implementation of an affinity binders resource (funding for this type of FP6 project is for dissemination, networking and management activities but not R&D). Among the partners, there is transferable experience from the German Antibody Factory, a phage-display based platform for the development of high-throughput binder selection, funded by the BMBF (German Federal Ministry of Education and Research)[25]. The major cost item identified in binder selection is the target antigen, in particular for characterisation of resulting binders. On recombinant binders, Dr. Taussig predicted that they would play an increasing role in a future resource, as they are replenishable, highly amenable to automation, inexpensive to produce, and adaptable to various tasks post-production, such as intracellular knockdown.

24. www.proteomebinders.org
25. www.bbt.tu-bs.de/Biotech/antibody-factory/

Michael Taussig

There were also two further presentations on the research theme, with the first by **Professor Fritz Herberg**, Department of Biochemistry, University of Kassel, Germany, who reiterated the complexity of the human proteome compared to the human genome. Comparing binder-based analysis of the estimated one million protein complexes to the method of mass spectroscopy, binder-based analysis has several advantages. Among these are: capability to identify protein surface interactions (i.e. novel drug targets); general applicability *in vivo* and *in vitro*; and generating interaction networks (i.e. pathway mapping). Following this presentation, **Dr. Michael Sundström**, The Novo Nordisk Foundation for Protein Research, Copenhagen, Denmark, introduced a pilot project of the Structural Genomics Consortium (SGC) for the generation of renewable affinity reagents, which developed from an SGC workshop in Stockholm in 2008, and receives no dedicated funding. The aim of the study is to compare efficiency of reagent generation and quality of resulting reagents across different technology platforms. Focusing on one type of protein binding domain (SH2) due to their presence in many proteins of significant biological importance and their small and robust nature, this is a global effort with contributions from China (Beijing Genomics Institute), Germany (Technical University of Braunschweig), Sweden (Karolinska Institute), United Kingdom (University of Cambridge and The Babraham Research Institute) and United States (University of Chicago). Twenty-two targets were chosen from the human genome and two types of antigens and several types of renewable binders are being produced. The SH2 binders will be intensively evaluated from October 2008-February 2009 and presented at a summary meeting in Austria on 22-26 March 2009. This pilot project should demonstrate the value and feasibility of a larger-scale programme to create binders for the entire human proteome.

During the discussion, among the questions raised were "how to select and prioritise targets from among all the proteins of the human proteome" and "given the scope of the proposal would two binders per target be feasible". Dr. Sundström advocated a pragmatic approach of starting with targets which are readily available now, for example through intensifying links with the SGC as a provider of target proteins and protein expression expertise[26]. Dr. Taussig also pointed out that paired reagents would have the added value of mutual validation. Among those targets selected, another factor to be considered is post-translational modification of the target such as structural changes (cleavage) or addition of functional groups (acetylation). Dr. Sundström commented that developing reagents for the recognition of specific post-translational modifications would begin with representative examples, like for instance those defined by the human annotated genome (Sanger Centre). **Professor Stefan Dübel**, Department of Biotechnology, Technical University of Braunschweig, Germany, underlined the technical capability of phage display to select binders against allosteric variants (i.e. different versions of a protein that changes structure when moving from inactive to active state based on the binding of an allosteric regulator). There was general agreement among the funding agency representatives present that the proposed resource would be of significant value to the life sciences research community as a whole. One participant commented that the generation of a proteome-wide binder resource was a clear necessity as a post genomic follow-on and recommended emphasising the argument that this resource would increase research quality through better reagents.

Dr. Taussig concluded the workshop with the information that they would be preparing a proposal for the FP7 Call of Health-2009-1.1-3 which states: *Tools, technologies and resources for the characterisation of protein functions. The projects should aim at generating a large resource of molecules that bind to proteins in order to characterise the proteome and/or developing innovative tools and technologies that facilitate structure/function characterisation of protein complexes. Open-access to the resources generated within the project should be encouraged*[27].

4.4 European Profiles of Structural and Sequence Variation of the Human Genome in Disease

The first presentation of Friday morning was by **Professor Xavier Estivill**, Centre for Genomic Regulation, Barcelona, Spain, on European Profiles of Structural and

26. www.thesgc.com/
27. http://cordis.europa.eu/fp7/dc/index.cfm?fuseaction=UserSite.CooperationDetailsCallPage&call_id=141

Sequence Variation of the Human Genome in Disease (gEUVADIS). gEUVADIS aims to study the variability of European populations at the sequence and structural levels, and to establish the relationship between genomic architecture (genomic variability) and phenotype (health and disease). It was initially estimated that the differences between two human genomes was less than 0.1%, but recent findings of structural variation indicate that this variability is 10 to 100 times that figure. There are many types of genetic variation but copy number variants (CNVs) have been shown to be one of the most significant[28]. The reason for using the "European population" is its long history with different disease prevalence and phenotypes, providing a valuable cohort for studying genetic variability in health and disease.

Worldwide, several large-scale genotyping projects have been initiated to explore the relationship between selected genetic variants and disease predisposition, diagnosis and drug response. These include the Wellcome Trust Case Control Consortium[29] in the UK, KoraGen[30] in Germany and GAIN[31] in the US. Despite successful identifications of genetic variants associated with common disorders such as asthma, hypertension and prostate cancer, it is clear that this approach provides only a small proportion of the genomic contribution to diseases and phenotypes. As a result, international consortia have been set up to extract the complete sequence information of the genome in the general population (the 1000 Genomes Project[32]) and in disease state (International Cancer Genomics Consortium[33]). Professor Estivill explained that comparable programmes were lacking in Europe and that there was a lack of coordination of the existing infrastructures and resources.

The vision of gEUVADIS is to obtain a comprehensive description of genomic change in disorders with clinical and social importance in Europe and among those to be tackled will be Alzheimer's, depression, schizophrenia and multiple sclerosis. In addition to this, it will seek to coordinate the efforts of funding agencies and in genomic research in common disorders and make the data available to the entire research community to accelerate research into the causes and control of common diseases.

During the workshop, Professor Estivill presented further details on the implementation and financial model of gEUVADIS. It is envisaged the consortium will be managed by eight committees among which will be: the Steering Committee, the Scientific Committee, the Sample Selection Committee, the Data Analysis Committee, the Epidemiological and Clinical Committee and the Ethical, Legal and Social Issue Committee.

Xavier Estivill

One of the key points raised was the importance of linking gEUVADIS to ongoing research infrastructure initiatives, namely BBMRI (Biobanking and Biomolecular Resources Research Infrastructure)[34] and ELIXIR (European Sciences Infrastructure for Biological Information)[35]. **Professor Eero Vuorio**, the Executive Manager of BBRMI, added that governments are currently setting aside funding for research infrastructures and that demonstration of harmonisation would be essential in securing the necessary political support for gEUVADIS. On this point, **Dr. Jacques Remacle**, DG Research, European Commission, added that it would beneficial to prepare a position paper describing the health and societal benefits of the proposed research, possibly in collaboration with a communication expert, for discussions with politicians.

On the possible implementation structure it was agreed that for speed, current funding instruments should be used, while developing new ones in parallel together with the funding organisations. **Dr. Peter Klatt,** Ministry of Science and Innovation, Spain, said that it was essential that too much time was not spent deciding on the possible implementation model, otherwise Europe would find itself lagging behind its counterparts in the US and China. **Professor Stylianos Antonarakis**, Division of Medical Genetics, University of Geneva Medical School, Switzerland, asked why there was no European Genome Office like Genome Canada, explaining that this would be a means of supporting and coordinating

28. A CNV is a segment of DNA of 1kb or larger that is present at variable copy number in comparison to a reference genome. Redon R. et al., Global Variation in copy number in the human genome. Nature 444(7118), pg 444-54, 2006.
29. www.wtccc.org.uk/
30. http://epi.gsf.de/kora-gen/index_e.php
31. http://fnih.org/index.php?option=com_content&task=view&id=338&Itemid=454
32. www.1000genomes.org/page.php
33. www.icgc.org/
34. www.bbmri.eu
35. www.elixir-europe.org/page.php?page=home

top-down large-scale genomics projects. It was agreed that this was an idea worth considering but in the short term the focus for gEUVADIS had to be on coordination of existing institutions and infrastructures rather than creating new ones.

With regard to the study design, there were several comments and questions on the number of genomes to be studied for each disease, namely 1000, and whether this should be higher or lower. **Dr. Joris Veltman**, Department of Human Genetics, Nijmegen Centre for Molecular Life Sciences, The Netherlands, explained that, based on the current scientific knowledge, this was chosen as the best estimate but as the results were generated this number could of course change. Collaboration with other ongoing initiatives would also help in focusing on certain genomic regions. **Dr. Alan Schafer**, The Wellcome Trust, United Kingdom, pointed out the difficulties will not be in sequencing but rather in analysing the data and translating it to clinical application.

Coming from industry, **Professor Hans Hofstraat**, Philips Research, Eindhoven, The Netherlands, remarked that to involve companies, it was essential to demonstrate results quickly and move forward as rapidly as possible. Public funding should take the lead, but support could also be sought from the European Investment Bank (EIB) and pharma/biotech companies, with an effective business model emphasising the relevance and societal impact of the proposed research. This was supported by **Dr. Jordi Quintana**, Drug Discovery Platform, Barcelona, Spain, who pointed to the example of the public-private partnership of the Innovative Medicines Initiative[36].

Professor Estivill ended the meeting by thanking the participants for the valuable discussion and outlining the actions for the rest of 2008 and 2009, which include a Consortium Strategic Meeting on 11 December 2008 in Barcelona, Spain, followed by a Science Strategic Meeting on 19 February 2009. There are also plans to launch a gEUVADIS portal online at www.gEUVADIS.eu with publication of the first quarterly newsletter in May 2009.

4.5 Molecular Biology of Survival

The next proposal to be presented focused on the issue of ageing which, together with the benefit of a longer life span, will bring significant challenges for Europe. Life expectancy has been increasing worldwide for the past 200 years. During the 19th and early 20th centuries this was due to improvements in sanitation, housing and education, which caused a decline in early and mid-life

36. http://imi.europa.eu/index_en.html

Miroslav Radman

mortality but the continued increase in life expectancy that is observed today is due to a decline in late life mortality. It was expected that a ceiling would be reached or at least a slow-down would be observed but this has not happened[37]. To ensure that these extra years are healthy ones, significant research is necessary to understand key questions such as:

- Why does ageing occur?
- Is there a limit to the human life span?
- Does increasing longevity mean an inevitable population explosion?
- Do longer lives mean more diseases?
- Can we afford increasing life spans?
- Will a greater focus on ageing harm the interests of the young?

To understand more about the molecular basis of ageing, **Professor Miroslav Radman**, Evolutive and Medical Molecular Genetics (Inserm), Université Paris Descartes, France, presented the proposal Molecular Biology of Survival. In nature, there are examples of organisms that can recover from extreme stresses, such as ionising radiation and desiccation, which produce massive oxidative stress. In basic terms, oxidative stress can be caused by the production of reactive oxygen species (ROS), which are highly damaging to cells unless neutralised by anti-oxidant enzymes. Significantly, oxidative stress has been shown to be involved in many human diseases such as Alzheimer's disease, Parkinson's disease, cancer and ageing. By exploring, through a multi-disciplinary collaboration, the molecular basis of the robustness of life, the long-term objective of the proposal is to identify the common causes of ageing and discover effective protection against it. The molecular

37. Oeppen J., Vaupel J.W. Broken Limits to Life Expectancy. Science (296), pg 1029-31, 2002.

basis of ageing is just one component of addressing the ageing process, so this research needs to be undertaken in collaboration with understanding how other factors such as lifestyle, environment, nutrition and socioeconomic factors impact on healthy ageing.

During the workshop, there were presentations and discussions on ageing research in other countries, to explore how a collaborative research programme could be developed. To provide a perspective on the ongoing work in The Netherlands, **Dr. Menno Kok**, Department of Research Policy, Erasmus MC, The Netherlands, presented the Netherlands Institute for Health Ageing, also known as Ti-GO[38]. Its partners include most university medical centres in The Netherlands, research and health care institutes such as NIVEL (Netherlands Institute for Health Services Research), as well as key R&D departments of multinationals such as Unilever and Philips. Ti-GO aims to: develop effective ways of monitoring the ageing process; prevent and delay the onset of disability and disease due to ageing; and obtain an evidence base for the mechanisms of intrinsic ageing. It will also take a multidisciplinary approach to understanding the many aspects of healthy ageing. Dr. Kok illustrated this point with the example of falling in the elderly, which required research on various factors including circulation, cognition, medication, life-style factors and sociophysiological well-being. Finally, he commented that Ti-GO could serve as a model or first step in the process of setting up a Foundation for the Endurance of Life.

Dr. James Goodwin, Help the Aged, United Kingdom, spoke about the UK Age Research Forum (UKARF)[39], to highlight the challenges of developing a coordinated approach even within one nation. The UKARF took eight years to bring to fruition and involves charities, government departments and funding agencies, each with their own mission and priorities, but with goodwill and patience, it was proving effective. He added that "getting our strategy coordinated in Europe is not an easy task".

During the discussion, one of the items mentioned was that of Intellectual Property (IP). In response, **Professor Jan Hoeijmakers**, Department of Genetics, Erasmus MC, The Netherlands, working with Professor Radman, gave a brief overview of the company that he was involved in founding, DNage[40]. Set up in 2005 as a spin-off from the Erasmus MC Department of Genetics, DNage develops therapeutic and prophylactic products, based on research on DNA damage and repair. DNage was taken over by the Dutch pharmaceutical company Pharming in 2006. He added that this was an essential element of the research being proposed, as it had to

38. www.ti-go.nl/home
39. www.ukarf.org.uk/1.html
40. www.dnage.nl/

Hans van den Berg

be considered how the knowledge generated would be used in the market place, firstly to help the aged and secondly to attract funding from industry.

On the issue of funding, **Dr. Arja Kallio**, Head of the Life, Earth and Environmental Sciences, ESF, described the relevant funding opportunities at ESF, namely Research Networking Programmes[41] and the EUROCORES Scheme[41]. **Dr. John Marks** added that while it was evident that funding for ageing was available, the challenge was how to use what is available in a more effective and coordinated manner. Professor Radman replied that what was needed was pre-seed investment, so that scientific leaders, whom he listed during his presentation, could begin to lay the groundwork for this large multi-disciplinary project.

4.6 Calibrating Europe's Biodiversity using DNA Barcodes

The final plenary presentation on Friday morning was by **Professor Pedro Crous**, CBS Fungal Biodiversity Centre, Utrecht, The Netherlands, who introduced the audience to ECBOL — Calibrating Europe's Biodiversity using DNA Barcodes. ECBOL aims to establish a Network of Leading European Laboratories (NELL) among major biodiversity resource centres to barcode specimens from existing natural history collections and specimens or from targeted taxonomic sampling.

Why is this necessary? The total number of species estimated to exist varies from 3 M to 50 M and to date more than 1.6 M have been described. However, the task of species recognition has become more complex, as it is now necessary to integrate new evidence such as DNA sequence divergence, which may not be apparent

41. www.esf.org

Pedro Crous

to the naked eye. Since 2003, the technique of DNA barcoding (species identification based on short DNA sequences) has drawn considerable attention from the international scientific community, government agencies, and the public. Large-scale investigations have demonstrated its effectiveness in a wide variety of applications including: measuring environmental change; identifying invasive organisms; controlling agricultural pests; and protection of endangered species.

ECBOL aims to promote DNA barcoding as a global standard for species identification, coordinate and integrate European barcoding activities and contribute towards the establishment of a global DNA barcoding library, incorporating Europe's vast biodiversity and biological collections. It will achieve this through establishment of a European Network of Leading Laboratories, formalisation of national DNA barcoding campaigns and establishment of new projects and campaigns, functioning as the European node for international initiatives.

To place ECBOL in context, there were three presentations on ongoing barcoding research in Canada and Europe, and the first was by **Dr. Paul Hébert**, Biodiversity Institute of Ontario, University of Guelph, Canada, who presented the International Barcode of Life Project (iBOL)[42]. Since its inception in 2003, iBOL has been an initiative focused on the construction of a comprehensive DNA barcode library for eukaryotic life. Researchers from 25 nations have indicated their support for this project and the first phase is envisaged as a five-year project, which will result in the acquisition of DNA barcode records for 5 M specimens representing 500 k species. iBOL is currently being developed under the guidelines of Genome Canada's International Consortium Initiative (ICI) and will be established as a not-for-profit corporation. A structural model has been proposed with three levels of participation linked to funding commitments: Central Nodes (Canada, US, European Union; >25 M$), Regional Nodes (India, Korea, Mexico; >5 M$), and National Nodes (Argentina, Columbia; >1 M$). iBOL expects to secure 50 M$ in Canada with potential sources including Genome Canada, provincial governments and regional genome centres, with an additional 100 M$ raised from other countries, including those listed above. The formal activation of iBOL is envisaged by July 2009. ECBOL aims to function as the European Node for iBOL.

Dr. Christian Burks, Ontario Genomics Institute, Canada, then gave a short overview of genomics research in Canada, supported largely by Genome Canada[43]. Set up in February 2000, the Government of Canada has invested 840 M$ in Genome Canada, to which has been added close to 1.0 billion $ in partnered co-funding and interest earnings. With six national centres, Canada is now positioned among the world leaders in large-scale genomics and proteomics research projects. Outlining the various funding mechanisms of support, Dr. Burks focused on the International Consortium Initiative (ICI), used in the implementation of iBOL. In being selected, iBOL met a number of criteria including: a clear international visibility; significant involvement of Canadian researcher(s); funding of 50 M$ over three years with other partners committing at least 75% of total costs; and involvement in an international consortium. Another ICI that Europe is very involved in is the Structural Genomics Consortium (SGC). Both of these presentations provided an insight into the successful implementation of large-scale consortia, which serve as an example to researchers and policy makers in Europe.

> *"DNA barcoding will allow us to get a better understanding of life and a better appreciation of life"*
>
> Professor Pedro Crous

Reviewing the barcoding activities in Europe, **Professor Simon Tillier**, French National Museum of Natural History, France, presented CETAF (Consortium of European Taxonomic Facilities)[44] and the Framework Six Programme EDIT (European Distributed Institute of Taxonomy)[45]. CETAF is a networked consortium of scientific institutions in Europe formed to integrate taxonomic research strategies, promote the training of researchers and improve the conservation of collections. EDIT is a

42. www.dnabarcoding.org/index.html

43. www.genomecanada.ca/en/
44. www.cetaf.org/
45. www.e-taxonomy.eu/

Network of Excellence, developed through CETAF, which aims at the integration of taxonomic institutions including the most important natural history museums and botanical gardens. EDIT's objectives are the coordination of taxonomy in Europe, the optimisation of CETAF facilities and the dissemination of results with all major international initiatives, including iBOL as described above. Speaking from the perspective of France, Professor Tillier explained that in a first phase, barcoding needed to be integrated first at a national level, possibly through the Fondation pour la Recherche sur la Biodiversité[46], and in a second phase, with other national programmes, into ECBOL and iBOL to create a global platform.

During the discussion a number of questions were addressed including the optimal structure for implementation, the finance required and the next steps to be taken. On implementation, ECBOL aims at having member organisations/contractors (natural history museums, botanical gardens, university departments, private biotech companies and policy-directed bodies) from as many European countries as possible. Each institution will be represented in the Steering Committee and Board of Directors (an advisory body). There will be a Joint Programme of Activities (JPA), which will be subdivided into Work Packages (WP) to be executed by one or more of the contractors. It is estimated that approximately 125 M€ would be required to cover the costs of DNA extraction and biobanking for each of the laboratories, training and education, and the extraction of ancient DNA from the various European collections. On future plans, Professor Crous summarised that there will be a quarterly newsletter, establishment of national barcoding campaigns, the setting up of a dynamic roadmap and a second DNA Barcoding in Europe meeting in July 2009.

46. www.fondationbiodiversite.fr/Accueil.html

5. Concluding Session

Matthias Rögner

Closing Session

John Marks

Concluding Session

Plenary Chair: **Wouter Spek**, EuroBioFund

Matthias Rögner, *Harnessing (Cyano-)Bacteria for Energy Production*
Michael Taussig, *A European Resource of Affinity Reagents for Analysis of the Human Proteome*
Xavier Estivill, *European Profiles of Structural and Sequence Variation of the Human Genome in Disease*
Miroslav Radman, *Molecular Biology of Survival*
Pedro W. Crous, *Calibrating Europe's Biodiversity using DNA Barcodes*
John Marks, European Science Foundation

The concluding session provided an opportunity for the leaders from each research topic to give feedback on the brokerage sessions to all conference participants and short summaries of the envisaged follow-up activities in the short term.

Professor Matthias Rögner (Harnessing (Cyano-) Bacteria for Energy Production) commented that the workshop had been productive, with discussions of both the scientific content and the proposed organisational structure. A business plan will be prepared and he ended by announcing that there will also be a follow-up workshop in February 2009 at the Max-Planck Institute for Bioorganic Chemistry in Mülheim, Germany.

Dr. Dusko Ehrlich (Metagenomics of the Human Intestinal Tract for Health) could not attend the final session, but reported to Dr. Wouter Spek that the workshop had stimulated interesting discussions. He anticipated that the contacts made would promote further collaborations with the ongoing FP7 programme MetaHIT. Dr. Ehrlich has also recently been appointed co-chair of the International Human Microbiome Consortium for 2009, together with Dr. Christian Desaintes (EC)[47].

Reporting back from the third workshop of Thursday 18 September (A European Resource of Affinity Reagents for Analysis of the Human Proteome), Dr. Michael Taussig remarked that the workshop had been beneficial for preparing future proposals and that they will prepare and submit a proposal for a two-stage FP7 call in December 2008. On 22-26 March 2009 there will be a Structural Genomics Consortium (SGC) workshop to present the results of the pilot project focused on SH2 protein binders.

The leader of European Profiles of Structural and Sequence Variation of the Human Genome in Disease, Professor Xavier Estivill, commented that the workshop had been well attended with interesting discussions. Among the planned follow-up actions was a strategic consortium meeting in December 2008, followed by a scientific strategic meeting in February 2009 to set up different committees focused on topics including, among others, epidemiology and the clinic, and data production and technology.

Professor Miroslav Radman (Molecular Biology of Survival) concluded by saying that the workshop had been a good opportunity to exchange views on the crucial issue of ageing, but acknowledged that setting up consortia was a labour-intensive task requiring a great deal of commitment. The next steps will involve further discussions with potential partners on the routes forward, including the setting up of a "foundation for the endurance of life".

The final research proposal was Calibrating Europe's Biodiversity using DNA Barcodes and Professor Pedro Crous reported that since its launch in October 2007,

47. www.nih.gov/news/health/oct2008/nhgri-16.htm

5. Concluding Session

ECBOL had been gaining momentum, and the workshop at EuroBioForum served as another step in the process of its establishment. With the involvement of other members of the consortium, a quarterly newsletter will continue to be published, a dynamic roadmap will be developed and a further campaign meeting of ECBOL will be held in November 2008.

Dr. John Marks concluded the session with a short presentation reviewing the start of EuroBioFund – noted in a January 2006 editorial in *Nature*, which stated that "the EuroBioFund is a positive sign of the Commission's willingness to generate ideas for the European Research Area and serve as a catalyst"[48]. The three years of the project had been a fruitful and interesting exploration of the challenge of bringing researchers and funding organisations together to discuss life sciences issues of mutual interest. It was now time to consider the next steps to be taken and the survey that the ESF CEO, Professor Makarow, had mentioned on the first day would serve as a means of feeding information back to the ESF and the EC to decide this. He ended by thanking the contributors and the participants.

48. Editorial, *Nature* 2006, Jan 19;439(7074):244

6. EuroBioFund Survey Results

Introduction and Methodology

As part of the evaluation of the three-year EuroBioFund project, an anonymous survey of all participants in the three EuroBioForum conferences was conducted during the months of October and November 2008. The survey was designed with input from the Steering Committee and Project Management Team of EuroBioFund and – for reasons of efficiency and cost effectiveness – an online survey tool was used[49].

Profile of the Respondents

A total of 323 respondents were contacted, of which 101 persons participated in the survey, giving a response rate of just over 30%[50].

Participants from all three conferences responded, but not surprisingly the highest response rate was from those who had attended the most recent conference in Strasbourg on 17-19 September 2008, with 59 persons falling into this category. Respondents who attended the 2006 and 2007 conferences were 22 and 34 persons respectively. The survey yielded good response rates from the speakers (90%; 18 out of a possible total of 20) and members of the research groups (50%; 17 out of a possible total of 34).

A wide range of organisations were represented at the conferences including academies, foundations, government departments, industry, national research organisations and research. An analysis showed that the top three categories represented were university-based researchers (30.6%), national research organisations (13.9%) and government departments (12.9%).

More than 90% of respondents received information on EuroBioForum either through ESF (website/post) or direct contact from the EuroBioFund Management Team.

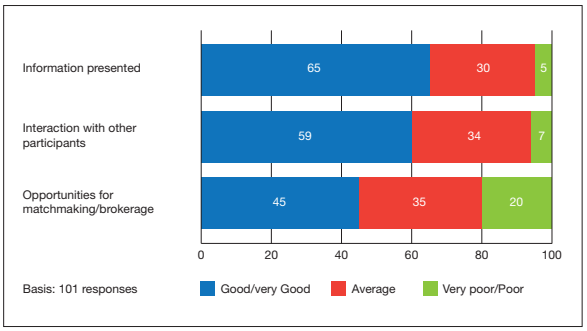
Respondents' Opinion on Past EuroBioForum Conferences

In response to the question of how they would rate two aspects of EuroBioForum, namely information presented and interaction with other participants, a majority of respondents (65% and 59%) rated them as good or very good. On the aspect of opportunities for matchmaking or brokerage, 45% of respondents rated this as either good or very good (**Chart 1**).

Examining the responses of those researchers selected from the Call of Expressions of Interest, the results were similar, with 64.7% rating the information presented as either good or very good, 41.2% rating the opportunities for matchmaking or brokerage and the interaction with other participants as good.

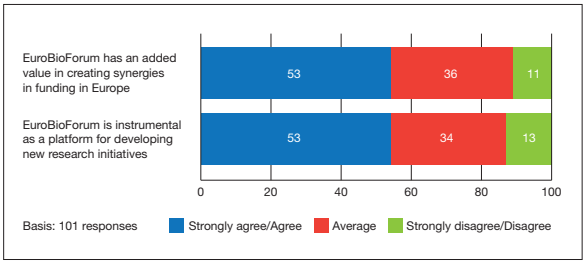
In the survey, the respondents were also asked to provide their views on the role and added value of EuroBioForum.

Chart 1: Rating of selected aspects of EuroBioForum (percentage)



Question: EuroBioForum is aimed at sharing information on a policy level and promoting matchmaking activities on research themes with a European added value. How do you rate the following aspects of EuroBioForum on a scale of 1 (very poor) to 5 (very good)? Here: 1, 2 and 4, 5 are combined.

Chart 2: Perceived added value of EuroBioForum (percentage)



Question: To which extent do you agree or disagree with the following statements. On a scale 1 (strongly disagree) to 5 (strongly agree). Here: 1,2 and 4,5 are combined.

Chart 2 shows that over 50% of the respondents see an added value of EuroBioForum in creating synergies in funding and feel that it has been instrumental as a platform in developing new research initiatives.

Respondents were further asked to provide their comments on EuroBioForum and its role in catalysing European research initiatives and to share their views on what can be improved to make EuroBioForum one of the key European policy events for life sciences research in Europe.

Overall, the 60 replies collected were positive, with some criticisms and recommendations on how to improve the format and implementation. While there was general agreement on the value of the EuroBioForum in

49. www.surveymonkey.com
50. From a total of 345 e-mailed participants, 23 of the addresses were inactive.

bringing together various funders and researchers, the visibility among public/private funding organisations and researchers needed to be improved, which would in turn enhance the workshop sessions. One criticism mentioned was the lack of direct funding for research projects and given the complex funding situation in Europe, it was considered that EuroBioForum could play an important role in sustaining future pathways for funding research projects.

The comments on improvements addressed various aspects including workshop preparation, dissemination/promotion of the event and follow-up. It was suggested that a future event should be organised as a satellite event to a larger conference and held in an easily accessible venue over two days, which would also reduce participants' travel costs. Several respondents commented on the absence of representatives from certain funding organisations and that the impact of EuroBioForum would increase if more organisations were involved.

Considering the topics presented, some respondents felt that their scope did not fit with the objectives of some participants, particularly those from industry. Involvement of industry and representatives of funding organisations in topic selection, thereby strengthening their commitment, could be considered for the future. Among topics suggested for the future were research oriented to potential translation or application to public health issues, like for example environmental health safety.

Follow-up was also an issue that was raised several times. Within the project plan of EuroBioFund, resources allocated to follow-up, for example for a workshop or travel costs of the research coordinator to meet with potential partners, were limited. There was a suggestion for the setting-up of a start-up fund, possibly in conjunction with the European Investment Bank. Preparation beforehand was also mentioned and among the suggestions were the use of newsletters or having an interactive website where participants could share ideas before the meeting.

Future Events/Activities

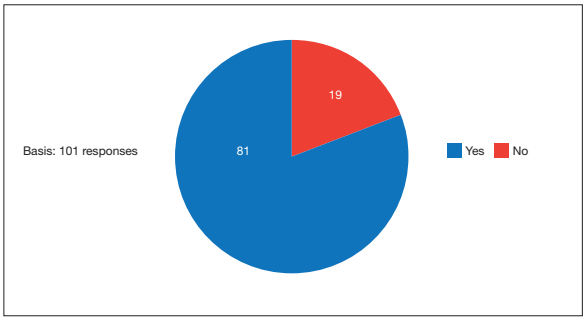
The purpose of the survey was also to assess the follow-up activities or initiatives that had been stimulated as a result of EuroBioForum. Of the 37 who replied to the question on whether their organisation was involved in specific actions initiated at one or more of the EuroBioForum conferences, 23 had been involved in workshop organisation and 13 in business plan development. Other actions included workshop preparation and applications to calls including Framework Programme 7.

Overall Assessment

The survey included a question on whether the respondents would recommend a colleague to attend a EuroBioForum conference.

A majority of 81% would recommend EuroBioForum to a colleague while 19% would not. Some of the reasons that were given were that it was not the best route for securing funding and that smaller meetings were more beneficial for networking.

Chart 3: Recommendation to a colleague to attend EuroBioForum (percentage)



Question: Would you recommend a colleague to attend EuroBioForum?

Appendices

Appendix I – Abstracts

Harnessing (Cyano-)Bacteria for Energy Production

Rögner M.

Plant Biochemistry, Faculty of Biology and Biotechnology, Ruhr-University Bochum, DE

The increasing demand for energy, the world's dependence on fossil resources (fuels), and the correlation of both with the world-wide climate change, requires the development of environmentally friendly, sustainable sources of energy. Hydrogen (H_2) is an ideal alternative energy carrier – provided it can be produced in a regenerative way, in particular from the abundant supply of water and sunlight. Nature has already done it: harnessing of solar energy has been optimised for several billion years in cyanobacteria by the natural process of photosynthesis, resulting in the light-dependent splitting of water into electrons, protons and oxygen. In parallel, some bacteria and green algae species have optimised another natural catalyst, the hydrogenase enzyme, which produces hydrogen gas from protons and electrons.

The aim of the proposed project is the combination of both mechanisms in one novel natural system, which is able to generate H_2 directly from water using solar energy. Up to now, an organism which couples these two principal processes with an efficiency high enough for competitive hydrogen production does not exist. Europe has world-wide the leading expertise in the field of biohydrogen-related research – moreover, the EU hosts the highest density of groups working in the biohydrogen sector. By integration of the already established national and European-wide networks of biologists, biochemists, biophysicists and engineers we are aiming to systematically investigate and improve the natural key components of this process (especially the water splitting photosystem, the hydrogenase and the associated metabolism) by directed and random approaches. In a second step, the designed components will be assembled within a cyanobacterial host, which finally produces H_2 in a light dependent manner under a broad range of environmental conditions. By exploiting the unusual potential and removing the energetic barriers of the cyanobacterial metabolism, the designed organism has the potential for up to 100-fold higher hydrogen production rate than the most efficient photosynthetic H_2 producer known so far. The advantages are three-fold: (i) CO_2 is being used up for producing biomass, (ii) oxygen evolves, and (iii) the biological system allows self-reproduction and self-repair at extremely low costs – which may be an important step towards renewable and CO_2 neutral energy generation. Furthermore, in parallel, simple and cost-effective photobioreactors will be developed for this new organism, thus enabling growth in continuous cultures with sunlight – and upscaling towards mass culture conditions in the future. In short, this project aims at establishing a European project which will design and generate a cyanobacterial cell producing the future renewable energy carrier hydrogen (H_2) from solar energy and water. In addition, operational photobioreactors for large scale H_2 production will be constructed. This major R&D initiative is based on the world-leading European expertise on cyanobacterial-based H_2-production. Together with selected private industries and governmental agencies, it will match and challenge the very strong recent boom on microalgal-based biofuel production in the USA and Asia. In addition, the outlined project is in full agreement with the recently launched EU Joint Technology Initiative on Hydrogen & Fuel Cells.

Metagenomics of the Human Intestinal Tract for Health

Ehrlich S. D.

Microbial Genetics Unit, National Institute for Agricultural Research (INRA), FR

Microorganisms associated with humans, denoted collectively the human microbiome, reside on many sites of the human body. The highest numbers are present in our intestinal tract, which may contain over 1 000 bacterial species and encode 100 times more genes than our own genome. In view of the rapidly increasing evidence that human microbiome affects greatly our health and the appalling lack of knowledge about its composition, a concerted international effort aiming to characterise it was initiated at a round table meeting organised by INRA in 2005. As a consequence, the EC and the US National Institutes of Health (NIH) have implemented programmes to address this question (MetaHIT, a large integrated project funded by the EC and coordinated by INRA; the Human Microbiome Roadmap Program, instituted by NIH is about to begin) and an International Human Microbiome Consortium is being constructed to coordinate research in the field. The main components of the nascent IHMC are the EC and NIH projects, as well as the Sino-French project Micro-obes, funded by the French Agence Nationale de la Recherche and different Chinese agencies (Ministry of Research and Technology and Chinese Academy of Sciences, among others). It is expected that countries that participate in the construction of the IHMC (including Australia, Canada, Japan and Singapore) will implement programmes that will also join the IHMC. Clearly, we witness the emergence of a new, important and exciting field of research. The existing or already anticipated projects have a scope which will allow them to begin unraveling the intricacies of the human microbiome and its impact on human health. The present proposal expands the scope greatly, as it aims to enable the modulation of the microbial populations of the human intestinal tract in order to optimise our health and well-being.

A European Resource of Affinity Reagents for Analysis of the Human Proteome

Taussig M.

Babraham Bioscience Technologies, Cambridge, UK

In order to explore the full complexity and function of the human proteome, it is essential to establish a comprehensive, characterised and standardised collection of specific binding molecules (“binders”; primarily antibodies but including alternatives such as scaffolds) directed against all individual human proteins, including variant forms and modifications. Primed with the knowledge of the human genome, such a systematic bank of affinity reagents would be a crucial precompetitive European resource to understand and exploit the proteome. Yet, while affinity reagents are undeniably of central importance for proteomics, they currently cover only a very small fraction of the proteome and while there are many antibodies against some targets (e.g. >900 anti-p53 antibodies), there are none against the vast majority of proteins. Moreover, widely accepted standards for binder characterisation are virtually nonexistent. Commercially available antibodies do not perform as advertised in at least 50% of the cases, leading to a costly trial-and-error process for any researcher wishing to identify a reagent for their task. Taking into account the ubiquitous use of binders as essential research reagents in publicly-funded academic laboratories across Europe, this amounts to a huge waste of public money. Currently there is no pan-European platform for the systematic development and quality control for these essential reagents. Establishing a binder collection will not be an end in itself, but must be accompanied by development of high-throughput assay systems and new generation protein detection technologies.

The benefits of a comprehensive binder infrastructure would include cost-effective reagent production and access, together with improved inter-laboratory reproducibility, and will impact throughout basic research and medicine as well as the biotechnology and pharmaceutical industries.

Appendix I – Abstracts

European Profiles of Structural and Sequence Variation of the Human Genome in Disease

Estivill X.

Centre for Genomic Regulation (CRG) and Pompeu, Fabra University (UPF), Barcelona, ES

The variability of the human genome sequence and structure has been found to be between 10 and 100 fold higher than initial estimations. The concept of a unique human genome structure has been proved to be wrong and the challenge is now to determine the complete structural variability and organisation of the human genome in several populations, and to establish their relationships with human diseases and common traits. The "European population" has a long history, is extremely rich in genetic variability, and has left many marks in its diverse geographic regions, which results in different disease prevalence and phenotypes. The aims of this programme are to study the structural variability of European citizens at the sequence level, with a special focus on common human disorders and traits and with an integration of epidemiology and preventive measures. This goal will be achieved by a) the integration of population/geographic data; b) the analysis of epidemiological aspects of human disease and common traits; c) the use of high-throughput-omic technologies to dissect the human genome of 1 000 subjects for ten common human disorders at the sequence level; d) the evaluation of the phenotypic consequences of structural and sequence changes of the human genome; and e) the integration of biological data of medical conditions for prevention, diagnosis and treatment of common human diseases. The programme will bring together academic, pharmaceutical and biotech stakeholders fostering the development and implementation of genomic medicine at the individual and collective levels.

Molecular Biology of Survival

Radman M.

Evolutive and Medical Molecular Genetics, (Inserm 571), Faculty of Medicine, Hospital Necker, Université Paris-Descartes, Paris, FR.

The aim of this proposal is to establish a new branch of biology, the biology of robustness (i.e. resilience or life's endurance), by studying the molecular biology of some "freaks of nature" - organisms capable of resuscitating after exposure to extreme acute or chronic lethal stresses. Examples of such "freaks" are bacteria of the genus Deinococcus (radiodurans, geothermalis, etc.) and eukaryotes such as bdelloid rotifers, arthropod-like tardigrada and plants such as the rose of Jericho (or resurrection plant) and mosses. They all share resistance to severe dehydration (desiccation) and, with possible exception of plants (not tested), to very high doses of ionising radiation. Both desiccation and ionising radiation produce massive oxidative stress that might be the predominant cause of their lethal effect in all organisms. On the other hand, water is the milieu of life: proteins fold and function in aqueous environments. Yet, very little is known about the limits of cellular life upon water loss. The study of organisms resistant to extreme stresses that, at much lower exposures, cause ageing or disease in humans (e.g. oxidative and other metabolic stresses, DNA damage and protein mis-folding) is of potential interest for public health and medicine. Through a truly multidisciplinary collaboration, the long-term objective of the proposed research project is to explore the molecular basis of the robustness of life and, in particular, the mechanism and processes of what appears as a reversible transition between life and death. There are cases of extreme robustness in all kingdoms of life, and methodologies exist for measuring three principal sources, and levels, of cellular damage (DNA and RNA damage, protein damage, generation of ROS, and oxidation of biological macromolecules). By studying mechanisms of extreme resistance, we are likely to discover effective protection against ageing and identify the common causes of ageing in all organisms, i.e. the chemistry of the somatic biological clock.

Calibrating Europe's Biodiversity using DNA Barcodes

Crous P. W.
CBS Fungal Biodiversity Centre, Utrecht, NL

Genomics research arose from the need to know and understand the role of gene sequences, the basic building blocks of biological development, physiology and regulation. The same need exists at the level of the entire biosphere: we cannot hope to understand evolution, ecological processes, or ecosystem functions until we know the basic building blocks – species. Just as the human genome project was enabled by advances in DNA sequencing technology, the new field of DNA barcoding has emerged as a global "horizontal genomics" initiative (i.e. one that is spread across many taxa rather than focusing on one species in great depth). DNA barcoding is based on the observation that species can be distinguished and identified using a short gene sequence, standardised for each of the main branches of life. In the short span of four years, barcoding has mushroomed into a global enterprise that has already produced barcode sequences for approximately 50 000 species, with many practical applications including protection of endangered species, monitoring environmental quality and tackling disease vectors.

Europe is well positioned to assume a leadership role in the DNA barcoding movement and to reap its benefits. Europe's natural history museums, herbaria, and botanical gardens, taken collectively, are the world's greatest repository of biological specimens. Calibrating Europe's Biodiversity using DNA Barcodes is a large-infrastructure proposal driven by a European consortium, the European Consortium for the Barcode of Life (ECBOL). ECBOL envisages a network of "leading labs" for DNA barcoding across Europe. These high-throughput labs will barcode specimens from existing European natural history collections and specimens acquired by ATBIs (all taxa biodiversity initiatives) or from targeted taxonomic sampling. A centralised bioinformatics hub is planned to make information present in national databases (i.e. collection databases, taxonomic resources, sequence repositories) available through a single, integrated interface. DNA barcoding related applications will be developed in dialogue with stakeholder needs and with CBOL's (Consortium for the Barcode of Life) working groups. ECBOL also aims to represent the European central node of the international Barcode of Life (iBOL) initiative, which aims to barcode 5 M specimens representing 500 k species within 5 years.

Appendix II – Conference Programme

Wednesday September 17

19:00-21:00
Welcome Reception/Registration
Art Café, Museum of Modern and Contemporary Art, 1, place Hans-Jean Arp, Strasbourg (sponsored by the City of Strasbourg)

Thursday September 18

Plenary Sessions

8:30-9:30
Registration

9:30-10:00
Opening and Welcome
Marja Makarow, Chief Executive, ESF (Session Chair)

10:00-10:30
European Research Area: Challenges and Perspectives
Jacques Remacle, Senior Scientific Officer, DG Research, European Commission

10:30-10:45
EuroBioFund
Wouter Spek, Director, EuroBioFund

10.45-11.15
Coffee Break

11:15-12:30
Roundtable Discussion
Driving Research & Innovation in Life Sciences
(Dr. Patrick Chaussepied, Coordinator, Department of Biology and Health, National Research Agency [ANR], FR; Mr. Volker Rieke, Director of Life Sciences, Federal Ministry of Education and Research [BMBF], DE; Mr. Hans van den Berg, R&D Coordination, Executive Director, NV Organon, NL; Professor Eero Vuorio, Chancellor, University of Turku, FI; Dr. Nicolas Carboni, Director General, Alsace BioValley, FR).

12:30-13:45
Lunch

13:45-14:45
Introduction to Brokerage Session Topics
Wouter Spek (Session Chair)

1. Harnessing (Cyano-)Bacteria for Energy Production (CyanoBioEnergy)
Presented by Professor Dr. Matthias Rögner, Plant Biochemistry, Faculty of Biology and Biotechnology, Ruhr-University Bochum, DE

With total energy consumption being predicted to at least double by the year 2050, there is a need to develop alternative sources of energy. One solution to the challenge of creating sustainable long-term solutions for global energy needs is solar driven production of environmentally friendly fuels like hydrogen. Harnessing solar energy can be done through a number of systems, including microorganisms such as cyanobacteria, which can generate hydrogen directly from water using sunlight. CyanoBioEnergy proposes a programme to understand and considerably improve the process of photosynthesis coupled to the H_2O evolving enzyme hydrogenase including the exploration how cyanobacteria can, using a systems biology approach, produce renewable and CO_2 neutral sources of energy.

2. Metagenomics of the Human Intestinal Tract for Health (MetaHIT Health)
Presented by Dr. S. Dusko Ehrlich, Microbial Genetics Unit, National Institute for Agricultural Research (INRA), FR

Metagenomics is an exciting and emerging field, where the DNA of entire communities of microbes are studied directly from their natural environments. Within one environment, the human intestinal tract, there are perhaps over 100 bacterial species, which remarkably, we know very little about. Given the increasing evidence of the role these microbes play in our health and disease, it is important to characterise them and use this knowledge to prevent, diagnose and treat a wide range of conditions. MetaHITHealth aims to address this key issue by expanding the scope of a newly established international consortium and strengthening the European base.

3. A European Resource of Affinity Reagents for Analysis of the Human Proteome (EURAFFIN)
Presented by Dr. Michael Taussig, The Babraham Institute, Babraham Bioscience Technologies, Cambridge, UK

While the human genome has approximately 24 000 genes, it is estimated that the number of proteins could be in the region of 10-100 times this. To fully understand the complexity and function of the human proteome, it is essential to have a comprehensive and standardised collection of antibodies and other specific binding molecules directed against all known proteins. Currently, antibodies only exist for a small fraction of proteins and often, commercially available antibodies are of a varying standard. EURAFFIN aims to develop a pan-European platform for the systematic development and quality control of these essential reagents, which will impact throughout basic research and medicine, as well as the biotechnology and pharmaceutical industries.

Parallel Sessions

15:00-17:30
Session I
Harnessing (Cyano-)Bacteria for Energy Production (CyanoBioEnergy)

Session II
Metagenomics of the Human Intestinal Tract for Health (MetaHIT Health)

Session III
A European Resource of Affinity Reagents for Analysis of the Human Proteome (EURAFFIN)

18:15
Buses leave from Maison Région Alsace to Château de l'Ile

18:45-21:00
Conference Dinner at the Château de l'Ile
Transport by bus will be provided to and from hotels

Friday September 19

Plenary Sessions

9:15-10:15
Introduction to Brokerage Session Topics
Wouter Spek (Session Chair)

4. European Profiles of Structural and Sequence Variation of the Human Genome in Disease (EUVADIS)
Presented by Professor Xavier Estivill, Centre for Genomic Regulation (CRG) and Pompeu Fabra University (UPF), Barcelona, ES

The "European population" is extremely rich in genetic variability, with different disease prevalence and phenotypes. The aims of EUVADIS are to study the variability of European citizens at the genome sequence level, with a special focus on common human disorders and traits, and to integrate epidemiology and preventive measures. To achieve these goals, the human genomes of 1 000 subjects with ten common disorders will be dissected at the sequence level, and the biological data of medical conditions will be integrated for the prevention, diagnosis and treatment of common human diseases.

5. Molecular Biology of Survival
Presented by Professor Miroslav Radman, Inserm 571, Hospital Necker, FR

As life expectancy continues to rise (since 1997 for example, France has seen an increase of life expectancy at birth from 78.38 to 81.9 years), this places increasing strain on the health and social systems. New approaches are needed to understand the processes of aging, robustness and disease, so the goal of health aging can be achieved. As aging is a highly complex process, taking a systemic approach should prove highly beneficial. The proposal aims to systematically unravel the molecular mechanisms underlying the robustness and mechanisms of ageing and death in a diverse range of living organisms.

6. Calibrating Europe's Biodiversity using DNA Barcodes (ECBOL)
Presented by Professor Pedro W. Crous, CBS Fungal Biodiversity Centre, Utrecht, NL

Our ability to assign biological specimens or their derived products to species can be critical for public health, conservation, environmental monitoring and quality, food safety, and basic research. Europe has the world's largest repositories of biological specimens, but it is often impossible to identify specimens using traditional methods. 'DNA barcoding' uses a short, standardised gene sequence for species identification and European researchers are actively involved in building global libraries of referenced sequences. By establishing a European network of high throughput DNA barcoding laboratories, we will be able to accurately identify and monitor biodiversity, and improve quality of life.

Parallel Sessions

10:30-13:00
Session IV
European Profiles of Structural and Sequence Variation of the Human Genome in Disease (EUVADIS)

Session V
Molecular Biology of Survival

Session VI
Calibrating Europe's Biodiversity using DNA Barcodes (ECBOL)

13:15-13:30
Closing Remarks
John Marks, Deputy Chief Executive & Director of Science and Strategy, ESF
Wouter Spek, Director, EuroBioFund

13:30-15:00
Lunch

Appendix III – List of Participants

Professor Stylianos Antonarakis
Department of Genetic Medicine and Development, University Hospital of Geneva & University of Geneva Medical School, Geneva, Switzerland

Dr. Christoph Antz
Department of Life Sciences, EMBL Ventures GmbH, Heidelberg, Germany

Dr. Fabrizio Arigoni
Nestlé Research Center, Lausanne, Switzerland

Dr. Miquel A. Arnedo
Department of Animal Biology, University of Barcelona, Barcelona, Spain

Dr. Freek T. Bakker
Biosystematics Group, Wageningen University/Nationaal Herbarium Nederland, Wageningen, The Netherlands

Dr. Tanja Bauschlicher
Division ERG 3, Project Management Jülich, Jülich, Germany

Dr. Daniela Bertinetti
Faculty of Natural Sciences, University of Kassel, Kassel, Germany

Dr. Véronique Blanc
Genes and Disease Programme, Centre for Genomic Regulation (CRG), Barcelona, Spain

Dr. Helmut Blöcker
Genome Analysis, Helmholtz Centre for Infection Research, Braunschweig, Germany

Dr. Peer Bork
Structural & Computational Biology Unit, European Molecular Biology Laboratory (EMBL), Heidelberg, Germany

Professor Christian Brechot
Cie Merieux-Alliance, Lyon, France

Dr. Veronique Briquet-Laugier
Department of Health and Biology, French National Research Agency (ANR), Paris, France

Professor Han Brunner
Department of Human Genetics, Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands

Dr. Christian Burks
Ontario Genomics Institute, Toronto, Canada

Mr. Vincent Bussmann
Protéus, Nîmes, France

Professor Charles Buys
Netherlands Organisation for Scientific Research (NWO), The Hague, The Netherlands

Dr. Pamela Byrne
Department of Agriculture, Fisheries & Food, Dublin, Ireland

Mr. Nicolas Carboni
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Dr. Filipe Costa
Department of Biology, Minho University, Braga, Portugal

Professor Pedro W. Crous
CBS Fungal Biodiversity Centre, Utrecht, The Netherlands

Mr. Robert Davidson
Invitrogen Corporation, Courtenay, Canada

Dr. Rafael De Andres-Medina
Carlos III Health Institute (ISCIII), Madrid, Spain

Professor H.J.M. de Groot
Leiden Institute of Chemistry, Leiden, The Netherlands

Professor Willem de Vos
WU Agrotechnology and Food Sciences, Wageningen University, Wageningen, The Netherlands (& European Technology Platform "Food for Life" Operational Committee & TI Food & Nutrition)

Dr. Jan Dijkhof
Department of Earth and Life Sciences, The Netherlands Organisation for Scientific Research (NWO), The Hague, The Netherlands

Dr. Anna Maria D'Onghia
CIHEAM/Mediterranean Agronomic Institute of Bari, Valenzano (BA), Italy

Professor Stefan Dübel
Institute of Biochemistry and Biotechnology, Technical University of Braunschweig, Braunschweig, Germany

Professor Zijad Durakovic
Department of Medical Sciences, Croatian Academy of Sciences and Arts, Zagreb, Croatia

Dr. Richard Durbin
Informatics Division, Wellcome Trust Sanger Institute, Cambridge, United Kingdom

Dr. S. Dusko Ehrlich
Department of Microbiology and the Food Chain, French National Institute for Agricultural Research (INRA), Jouy-en-Josas, France

Professor Xavier Estivill
Genes and Disease Programme, Centre for Genomic Regulation (CRG), Barcelona, Spain

Mr. Éric Fourmentin
Fondation Fourmentin Guilbert, Noisy-Le-Grand, France

Dr. Alenka Gagro
The National Foundation for Science, Rijeka, Croatia

Dr. James Goodwin
Help the Aged, London, United Kingdom

Mr. François Guissart
Belgian Coordinated Collections of Microorganisms (BCCM), Belgian Federal Science Policy, Brussels, Belgium

Dr. Ivo Gut
Centre National de Génotypage (CNG), Evry, France

Dr. Hélène Guyot
Biotechinfo (Biotechnology Newsletter), Romainville, France

Dr. Florence Haimet
Department of Microbiology and the Food Chain, French National Institute for Agricultural Research (INRA), Jouy-en-Josas, France

Dr. Bogumil Hausman
Swedish Governmental Agency for Innovation Systems (VINNOVA), Stockholm, Sweden

Ms. Lisa Hearty
School of Biological and Chemical Sciences, Queen Mary University of London, Mile End, United Kingdom

Dr. Paul Hébert
Biodiversity Institute of Ontario, University of Guelph, Guelph, Canada

Professor Klaas Jan Hellingwerf
Department of Microbiology, Swammerdam Institute for Life Sciences, Amsterdam, The Netherlands

Ms. Janna Hensing
Department for Research Science and Technology, Ministry of Education, Culture and Science, The Hague, The Netherlands

Professor Friedrich W. Herberg
Faculty of Natural Sciences, University of Kassel, Kassel, Germany

Mrs. Anne-Juliette Hermant
AXA Research Fund, AXA Group, Paris, France

Professor Jan Hoeijmakers
Department of Genetics, Erasmus MC, Rotterdam, The Netherlands

Professor Hans Hofstraat
Healthcare Strategic Partnerships, Philips Research, Eindhoven, The Netherlands

Dr. Sonja Ihle
Life Sciences Division 2, German Research Foundation (DFG), Bonn, Germany

Mr. Gérard Jacquin
Directorate for Valorisation, French National Institute for Agricultural Research (INRA), Paris, France

Dr. Olivier Jaillon
Genoscope, French Atomic Energy Commission (CEA), Evry, France

Mrs. Patricia J. Jeandel
Department of Biomedicine, Institute Pierre Vernier, Besançon, France

Mrs. Monique Jung
Alsace Regional Councillor, Strasbourg, France

Dr. Nanette Kälin
DLR Project Management Agency, Federal Ministry of Education and Research, Bonn, Germany

Dr. Arja Kallio
Life, Earth and Environmental Sciences (LESC), European Science Foundation, Strasbourg, France

Dr. Oliver Kemper
Thematic Programmes, Austrian Research Promotion Agency (FFG), Vienna, Austria

Dr. Peter Klatt
Secretariat of State for Research, Spanish Ministry of Science and Innovation, Madrid, Spain

Dr. Werner Klotzbücher
Max-Planck Institute for Bioinorganic Chemistry, Mülheim an der Ruhr, Germany

Dr. Janis Klovins
Genome Center, Latvian Biomedical Research and Study Center, Riga, Latvia

Dr. Menno Kok
Department of Research Policy, Erasmus MC, Rotterdam, The Netherlands

Professor Kornel Kovacs
Department of Biotechnology, University of Szeged, Szeged, Hungary

Dr. Leo Marcel
Kriegsman National Museum of Natural History (Naturalis), Leiden, The Netherlands

Dr. Andreas Kruess
Ecology and Conservation of Fauna and Flora, Federal Agency for Nature Conservation, Bonn, Germany

Dr. Hannele Lahtinen
Biosciences and Environment Unit, Academy of Finland, Helsinki, Finland

Professor Richard Lane
Natural History Museum, London, United Kingdom

Dr. Françoise Laurent-Huck
EUROLAURE, Strasbourg, France

Dr. Oliver Lenz
Institute for Biology & Microbiology, Berlin, Germany

Professor Xavier Leverve
Human Nutrition and Food Safety, French National Institute for Agricultural Research (INRA), Paris, France

Dr. Pepa Limeres
Technology Transfer Unit, Fundación Marcelino Botín, Madrid, Spain

Professor Peter Lindblad
Department of Photochemistry and Molecular Science, Uppsala University, Uppsala, Sweden

Mrs. Michèle Longuet
French Ministry of Higher Education and Research, Paris, France

Professor Candida Lucas
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