3rd Meeting of European Systems Biology Centres

23rd October 2009
Radisson Edwardian Heathrow Airport
London, UK

CONTENTS

INSTRUCTIONS TO DELEGATES

The meeting will take place on 23rd October 2009 at the Radisson Edwardian Hotel Heathrow Airport, London UK. The meeting will be held in the Edwardian Suite and lunch and coffee will be served in the Edwardian Foyer.

Meeting venue
Radisson Edwardian Heathrow Hotel
140 Bath Road, Hayes,
Middlesex UB3 5AW
Telephone: +44 (0)20 8759 6311
Facsimile: +44 (0)20 8759 4559
Email: resreh@radisson.com
http://www.radissonedwardian.com/londonuk_Heathrow.

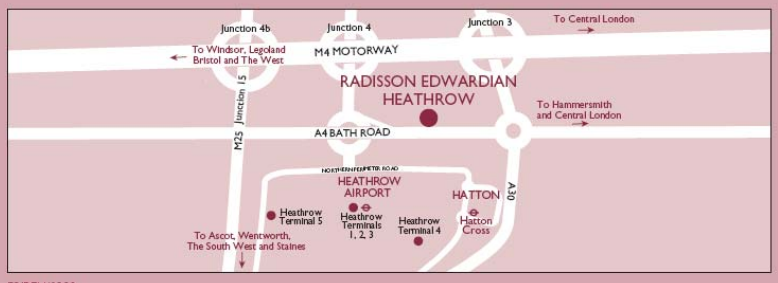
Radisson Edwardian Heathrow Hotel ★★★★

140 Bath Road, Hayes, Middlesex UB3 5AW Telephone: +44 (0)20 8759 6311 Facsimile: +44 (0)20 8759 4559 Email: resreh@radisson.com www.radissonedwardian.com/heathrow	Minutes from Heathrow airport, this award-winning hotel is lavish, stylish and richly equipped for meetings and entertaining on a grand scale. Dramatic spaces, distinctive design and dedicated service come together in a location that's perfect for local, national and international events.

Travel				
Car Park	🅿 Hotel car park available - charges apply (£12 for 24 hours)			
Underground	Heathrow Airport: Piccadilly line			
Hotel to Heathrow Airport				
Terminals	1, 2 & 3	4	5	Hotel Hoppa transfer service operates between hotel and all terminals
Distance	5 minutes	8 minutes	15 minutes	

Facilities and services	Number of bedrooms	Air conditioning – bedrooms	Air conditioning – conference rooms	Mobile phone hire	Modem/ broadband access	ISDN in conference rooms on request	Personal phone number with voicemail	Satellite and pay movies	In room safe	In room bar	In room trouser press	In room iron/ ironing board	Complimentary wireless	Business centre services	Spa and Gym	Car valet service
	459	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Capacity	
Bedrooms	Suites 17; Deluxe 101; Standard 294; Single 47
Events	42 conference and meeting rooms. Capacity of up to 700 people



Radisson EDWARDIAN HEATHROW

FS/REH/0208

Getting to/from the Radisson Edwardian Heathrow

Heathrow Hoppa Bus
The price of a single trip is £4 per adult. Please buy your ticket before travelling. Tickets are available from reception, concierge or self service machine at the front of your hotel. Please retain your ticket for inspection.

Radisson Edwardian to the Terminals:

- For Heathrow Terminals 1, 2 & 3 (transfer time 14-24 minutes). Departure times:
  -04.20am,04.50am,05.20am,05.40am,
  -then every 20 minutes until 1520pm, then 15.35pm, 15.56pm until 16.26 pm
  -then every 30 minutes until the last buses at 22.56pm, 23.08pm
- For Heathrow Terminal 4 take a taxi (approximately 8 minutes), or take the Hoppa bus service to Terminal 3 and transfer to the free Heathrow express train service (please add adequate time for this transfer).
- For Terminal 5 (transfer time 22 minutes) Departure times:
  -04.10am,04.30am,04.50am
  -then every 20 minutes until 15.50pm
  -then 16.18pm,16.30pm,17.03pm until 17.33pm
  -then every 30 minutes until the last buses at 22.33pm,23.04pm,23.36pm

London Underground (The Tube)
Nearest underground station is Heathrow Terminal 1,2,3 on the Piccadilly Line. Plan your journey with London Underground's tube planner.

Train
Heathrow Express is a fast-track train from Paddington to Terminal 1, 2, 3 & 4 and only takes approximately 15 minutes to get to/from central London.
(every 15 minutes, 05.02-23.47 daily)

Car parking
550 spaces available at the hotel.

By road
From junction 4 off the M4 follow signs to Terminal 1, 2 & 3.
At the roundabout take A4 exit on Bath Road.

Plan your route:

Route Planner to Radisson Heathrow

SUMMARY

On 11th-12th September 2008, the ERA-NET for Systems Biology, ERASysBio, organised a meeting which brought together representatives of the majority of the established Centres for Systems Biology in Europe and representatives from funding agencies. In addition to preparing proposals for networks, participants were given an overview of ESFRI – European Strategy Forum of Research Infrastructures - and its mission, the ESFRI Roadmap and its associated Working Groups, the range of projects selected as mature and the process leading up to their launch, and the European Infrastructure for Systems Biology (ISBE) as an emerging infrastructure which required urgently the input and support from its scientific community. The leaders of Systems Biology Centres were urged to get together and come up with a proposal for a systems biology infrastructure, in a way similar to the physical sciences communities.

One of the outcomes of the meeting was that, by initiative of Jaroslav Stark at Imperial College, it was agreed that a working party was set up to develop a proposal. A meeting was then held at Imperial College on 30th April 2009. The objectives of the meeting were: to seek consensus on the concept of a systems biology infrastructure, its structure and content; and to set up a small working group to draft a proposal to be presented to ESFRI.

A working group was then established with the task to develop an outline for ISBE, in consultation with the scientific community of European Systems Biology Centres and other relevant stakeholders. The ISBE outline was circulated to the community on 4th September. The outline provides the basis of the ISBE application, to be submitted to ESFRI by 5th November 2009.

ERASysBio believes that ISBE should be developed by the European Systems Biology Centres, as its primary users, and operate as an integrated multidisciplinary infrastructure for the European scientific community. The ERASysBio 3rd Meeting of the Systems Biology Centres offers the Centres the chance to get together once more to discuss and agree on the infrastructure proposal. Your participation is therefore essential to ensure the effective progress of ISBE and the delivery of an infrastructure that benefits all.

OBJECTIVES

- to seek consensus on the concept of a systems biology infrastructure, its structure and content;
- to consider how centres can work together in developing a European Infrastructure for Systems Biology that stimulates the integration of the systems biology community in the areas of training, data management and data sharing, tools and technology development and academic-industrial links.

PROGRAMME

11.00 Arrival – Morning coffee

11.30 Welcome and introduction by ERASysBio
Gabriela Pastori, Biotechnology & Biological Sciences Research Council (BBSRC) UK

11.45 Tour de table
Representatives from Systems Biology Centres to describe, in 2 min, the research and technological areas being hosted in their centres and their expectations for the meeting, e.g. getting information, participating in developing a research infrastructure, offering a specific component to the infrastructure, etc.

12.30 Session 1: Infrastructure for Systems Biology Europe (ISBE) outline
Chair: Richard Kitney, Institute of Systems and Synthetic Biology, Imperial College London, UK

Introduction to the ISBE
Dimitris Thanos, Biomedical Research Foundation of the Academy of Athens, Greece, ESFRI-BMS member

13.00 Lunch

13:50 The interface ELIXIR-ISBE
Nicolas Le Novère, European Bioinformatics Institute, UK

14:00 Session 2: Developing ISBE
Chair: François Képès, Genopole CNRS, University of Evry, France

Breakout Session
Four groups to discuss and agree on the following topics:

1. How ISBE fits in the existing and future landscape of research and other infrastructures in Europe and worldwide?

2. Technical specification and e-infrastructure. Is it required and how it integrates into existing infrastructures? New technologies and methodologies

3. Training, industry and local/regional impact

14.45 Afternoon Tea & Coffee

15.15 Presentation from breakout groups (10 min each) and discussion

16.00 Summary of conclusions

16.25 Closing remarks
Veronika Simons, Project Management Juelich, Germany

16.30 End

BACKGROUND

'Appropriate structures, both physical and virtual, can facilitate interdisciplinary training and mobility, deliver structured technological innovation, and provide a platform for the generation of high quality data to be made available to the entire scientific community.' Outcomes of the 1st ERASysBio Meeting of the European Systems Biology Centres, London, March 2007, and the ERASysBio Strategy Conference, Oxford, March 2007.

ERASysBio has gathered the community of European Systems Biology Centres at its strategic meetings since March 2007 with the aim to discuss and agree how Centres can work together in areas of common interest.

ERASysBio considers Systems Biology Centres established, publicly-funded research institutions, which possess:

- a concentration of research facilities within a single, appropriate and dedicated physical space run under one national programme;
- a long term commitment of space, research facilities and staff within a philosophy of interdisciplinary working;
- a reservoir of skilled technical staff capable of supporting the necessary range of HTP and other advanced technologies to be deployed, and a commitment to their retention, training and development;
- a matured effective policy and provision for data capture, management and storage;
- a vision and strategy for developing at the cutting edge of integrative systems biology;
- a commitment to outreach, engage and train, and to attract and engage other top-class scientists and engineers from within and outside the institution.

The 1st Meeting of European Systems Biology Centres was held in March 2007 with the aim of identifying areas of common interest where links between institutions could be maximised. At this meeting, the Centres identified the following relevant topics:

1. Training and career structure
    - Moving towards standardisation of graduate, MSc and PhD training
    - Exchange of students and young researchers between Systems Biology Centres
    - PhD and Postdoctoral programmes, such as specialised summer schools
    - Reconsideration of career merit measures and rewards

2. Themes
    - Biomedicine: health nutrition and insulin metabolism
    - Bioenergy and biosustainability

3. Communication, exchange and dissemination
    - model integration
    - development of generic tools
    - communicating systems biology science to the wider community

4. Data management / knowledge management
    - standardization
    - storage
    - management
    - sharing, accessibility, open exchange

The Centres concluded that the added value of working together would be demonstrated by the emerging knowledge, the common understanding, the synergies and the critical mass generated by collaborations. The impact of working together should crystallise in the creation of jobs and qualified workforce, in the mobility of researchers, in a better communication between all concerned, and in the provision of tools in Systems Biology.

The 2nd Meeting of European Systems Biology Centres, held in September 2008, focused mainly on considering how, specifically, centres can work together in developing these European activities. Ideas for network proposals were developed at this meeting in preparation for the ERASysBio+ Call, launched in autumn 2008. The objectives of this meeting were:

- to provide an update on European systems biology activities;
- to seek consensus on the concept of a systems biology network under ERASysBio;
- to identify specific systems biology networks and their area coordinators.

Participants discussed the concept of a network, its purpose, components, governance, the specific areas that should constitute the basis of a European network, and ideas for network proposals. Proposals were made in the following areas:

- Knowledge Transfer – Systems Biology Europe
- Quantitative image analysis
- Cancer - kinome
- An inventory of systems biology – the basis for SysBio Centres in Europe – including training
- Modelling frameworks
- Virus-cell interactions
- Ageing
- Synthetic Biology

In addition to generating ideas for networks, participants were encouraged to develop a proposal for a systems biology infrastructure, to be submitted to the European Strategic Forum for Research Infrastructures (ESFRI). By initiative of Jaroslav Stark, Imperial College, it was agreed that a working party was set up to develop a proposal. As a result, a meeting was then held at Imperial College on 30th April 2009. The objectives of the meeting were: to seek consensus on the concept of a systems biology infrastructure, its structure and content; and to set up a small working group to draft a proposal to be presented to ESFRI.

Participants were heads of established European Systems Biology Centres or their deputies, representatives from other ESFRI projects and from the ESFRI Biological and Medical Sciences-Roadmap Working Group (BMS-RWG), and a funding organisation:

- Prof Ruedi Aebersold, ETH Zurich, Switzerland
- Dr Miguel Botella, University of Malaga, Spain
- Dr Jan Eufinger, DKFZ, Heidelberg, Germany
- Prof Tom Kirkwood, Institute for Ageing and Health, Newcastle University, UK
- Prof Richard Kitney, Institute of Systems and Synthetic Biology, Imperial College London, UK
- Prof Michal Marek, Institute of Systems Biology and Ecology, Ceske Budejovice, Czech Republic

- Dr Ivan Mura, The Microsoft Research - University of Trento Centre for Computational and Systems Biology (CoSBi), Trento, Italy
- Prof Klaus Palme, Institute of Biology II, University of Freiburg, Germany
- Dr Gabriela Pastori, BBSRC, UK
- Dr Barbara Skene, Institute of Systems and Synthetic Biology, Imperial College London, UK
- Prof Jaroslav Stark, Centre for Integrative Systems Biology at Imperial College London, UK
- Dr Dimitris Thanos, Biomedical Research Foundation of the Academy of Athens, Greece
- Prof Roel van Driel, Netherlands Institute for Systems Biology, Amsterdam, The Netherlands
- Prof Hans Westerhoff, Manchester Centre for Integrative Systems Biology, University of Manchester, UK & Vrije Universiteit, The Netherlands
- Prof Kurt Zatloukal, Institute of Pathology, Medical University of Graz, Austria

The working group was then established with the task to develop an outline for ISBE, in consultation with the scientific community of European Systems Biology Centres and other relevant stakeholders. The ISBE outline was circulated to the community on 4th September. The outline provides the basis of the ISBE application, to be submitted to ESFRI by 5th November 2009.

The 3rd Meeting of the European Systems Biology Centres, in October 2009, offers a great opportunity to generate input from the Centres and achieve consensus on the shape and content on the infrastructure proposal. The programme was therefore designed to encourage participation and drive consensus from the Centres, as the infrastructure's primary users. The outcomes of the 1st and 2nd Meetings of the Centres should provide the basis of fruitful discussions and agreements.

PARTICIPANTS

Ruedi Aebersold	Institute of Molecular Systems Biology ETH, CH
Lilia Alberghina	University of Milano-Bicocca, IT
Rudi Balling	Luxembourg Centre for Biomedicine, LU
Nigel Burroughs	Warwick Systems Biology Centres, UK
Kevin Burrage	Oxford Centre for Integrative Systems Biology, UK
Sarah Butcher	Centre for Integrative Systems Biology at Imperial College London, UK
Rudi Ettrich	Institute of System Biology and Ecology, Ceske Budejovice, CZ
Peter Ghazal	Centre for Systems Biology at Edinburgh, UK
Sampsa Hautaniemi	Inst. of Biomedicine and Genome-Scale Biology Research Univ. Helsinki, FI

Thomas Hoefer	German Cancer Research Centre, Heidelberg, DE
Susanne Hollmann	Institute for Biochemistry and Biology, University of Potsdam , DE
François Képès	Institute of Systems and Synthetic Biology (ISSB) at Genopole, FR
Richard Kitney	Institute of Systems and Synthetic Biology, Imperial College London, UK
Walter Kolch	Systems Biology Ireland, University College Dublin, IE
Nicolas Le Novère	European Bioinformatics Institute, Cambridge, UK
Pedro Mendes	The Manchester Centre for Integrative Systems Biology, UK
Richard Middleton	Hamilton Institute, IE
Ivan Mura	Microsoft Research - University of Trento, IT
Angela Oberthuer	Bioquant - University of Heidelberg, DE
Klaus Palme	Freiburg Initiative for Systems Biology, DE
Gabriela Pastori	Biotechnology and Biological Sciences Research Council, UK
Matthias Reuss	Institute of Biochemical Engineering, Stuttgart, DE
Damjana Rozman	University of Ljubljana and National Institute of Biology, SI
Luis Serrano	EMBL/CRG Systems Biology Research Unit, Barcelona, ES
Daryl Shanley	Institute for Ageing and Health, Newcastle University, UK
Barbara Skene	Institute of Systems and Synthetic Biology, Imperial College London, UK
Peter Swain	Centre for Systems Biology at Edinburgh, UK
Dimitris Thanos	Biomedical Research Foundation Academy of Athens, GR
Veronika Simons	Project Management Juelich, DE
Mike Stout	Multidisciplinary Centre Integrative Biology at Nottingham, UK
Roel Van Driel	Netherlands Institute for Systems Biology, Amsterdam, NL
Jacob Edward Wang	The Research Council of Norway (RCN), NO

BREAKOUT GROUPS

GROUP 1	GROUP 2	GROUP 3	GROUP 4
Ruedi Aebersold	Lilia Alberghina	Nigel Burroughs	Kevin Burrage
Sarah Butcher	Rudi Ettrich	Peter Ghazal	Sampsa Hautaniemi
Thomas Hoefer	Susanne Hollmann	François Képès	Richard Kitney
Walter Kolch	Nicolas Le Novère	Pedro Mendes	Richard Middleton
Ivan Mura	Angela Oberthuer	Klaus Palme	Peter Swain
Matthias Reuss	Damjana Rozman	Mike Stout	Jacob Edward Wang
Roel Van Driel	Luis Serrano	Daryl Shanley	Rudi Balling
Dimitris Thanos	Barbara Skene	Veronika Simons	Gabriela Pastori

The European Research Area Network in Systems Biology- ERASysBio

ERASysBio is a transnational funding initiative to support the convergence of life sciences with information technology and systems science. ERASysBio brings together 16 ministries and funding agencies[1] from 13 countries to coordinate their national research programmes in systems biology and agree on a common European research agenda. As an ERA-NET, ERASysBio is committed to supporting the establishment of the European Research Area (ERA) in the field of systems biology by stimulating and facilitating programme coordination and joint activities in the field. The European Commission finances collaboration between funding organisations and policy makers. However, any resulting joint activity or transnational funding programme is funded by the national/organisational budgets.

[1] The ERASysBio partners are: Austria - Federal Ministry for Education, Science and Culture (BMWF); Belgium - National Fund for Scientific Research (FNRS); Finland - Academy of Finland (AKA); France - French National Centre for Scientific Research (CNRS) and Agence Nationale de la Recherche (ANR); Germany - Forschungszentrum Juelich GmbH (FZJ) and Federal Ministry of Education and Research (BMBF); Israel - Israeli Science Foundation (ISF); The Netherlands - Netherlands Organisation for Scientific Research (NWO); Norway - The Research Council of Norway (RCN); Russia - Russian Foundation for Basic Research (RFBR); Slovenia - Ministry of Higher Education, Science and Technology (MHEST); Spain - Ministry of Education and Science (MEC); Trento, Italy - Autonomous Province of Trento (PAT); United Kingdom - Biotechnology and Biological Sciences Research Council (BBSRC); Luxembourg and Switzerland are affiliated partners.

In consultation with the scientific community, ERASysBio set the European Agenda for Systems Biology in its strategy paper 'Systems Biology in the European Research Area'. The paper, published on the ERASysBio website (www.erasysbio.net) in November 2007, describes the actions to be undertaken to improve the position of Europe in this field. Some of the recommendations are being pursued by the ERASysBio partners. For other recommendations the consortium will encourage others to get involved and work together. The recommendations of this paper are listed below:

- Establish a number of trans-national systems biology networks in the ERA
- Encourage the adoption of data management and sharing best practices in the ERA
- Encourage the adoption of data standards in the ERA
- Optimise the education and training in systems biology in the ERA
- Stimulate the establishment of systems biology research structures across the ERA
- Explore mechanisms to strengthen the academic-industrial links in systems biology in the ERA

Network of Systems Biology Centres

ERASysBio proposes to establish Networks of Systems Biology Centres (NSBCs) as the best vehicle to implement systems biology most urgent actions on training, data standards, data management, and academic-industrial links in this area. ERASysBio partners recognise their unique position as funding organisations to achieve this important goal and will strive to create a system that involves all participating countries and benefits all. NSBCs are expected to act as a nucleus to attract and disseminate information, data, ideas, knowledge and expertise, and to facilitate training and mobility of scientists in the ERA.

The 1st Meeting of the European Systems Biology Centres on 7th-8th March 2007 at Imperial College London, UK, and the ERASysBio Strategy Conference in St. Anne's College, Oxford, on the 27th-28th March 2007 provided the basis of ERASysBio strategy paper 'Systems Biology in the European Research Area'. The Note of the 1st Meeting of the European Systems Biology Centres is at Annex 1.

The 2nd Meeting of European Systems Biology Centres, held in Düsseldorf on 11th-12th September 2008, focused mainly on considering how, specifically, centres can work together in developing European activities. Ideas for network proposals were developed at this meeting in preparation for the ERASysBio Plus call, which incorporated a sub-call for network proposals, supported by the German (BMBF) and British (BBSRC) partners.

At this meeting, Heads of European Systems Biology Centres and equivalent institutions were introduced to the ESFRI Roadmap and discussed how Centres could work together in developing a European Infrastructure for Systems Biology. The note of 2nd Meeting of European Systems Biology Centres is at Annex 2.

European Strategy Forum on Research Infrastructures - ESFRI

The European Strategy Forum on Research Infrastructures - ESFRI - brings together representatives of EU Member States and Associated States, appointed by Ministers in charge of Research, and one representative of the European Commission. Its main scope is to support a coherent and strategy-led approach to policy-making on research infrastructures in Europe; to facilitate multilateral initiatives leading to the better use and development of research infrastructures.

In 2006, ESFRI published the European Roadmap for Research Infrastructures, which identified new research infrastructures of pan-European interest corresponding to the long term needs of the European research communities, covering all scientific areas regardless of possible location. The ESFRI Roadmap is the result of an intensive two-year consultation and peer review process involving over 1000 high level European and international experts. The Roadmap is to be updated every two years with input from ESFRI's four Roadmap Working Groups (RWGs).

The Roadmap identified 35 large scale infrastructure projects, at various stages of development, in seven key research areas. Within life sciences six projects were identified by three independent Expert Groups established by the RWG Biological and Medical Sciences (RWG-BMS): 1) Genomics, Bio-Informatics and related fields; 2) Clinical and Translational Research; 3) Biodiversity and the Environment.

The following six projects were evaluated as "mature" and published in the first version of the Roadmap:

- BBMRI - Biobanking and Biomolecular Resources Research Infrastructure
- EATRIS - European Advanced Translational Research Infrastructure for Medicine
- ECRIN - European Clinical Research Infrastructures Network
- ELIXIR - European Life Science Infrastructure for Biological Information
- Infrafrontier: The European infrastructure for phenotyping and archiving of model mammalian genomes
- INSTRUCT - European Integrated Structural Biology Infrastructure

The update process for the ESFRI roadmap has resulted in a revised version, which was approved by ESFRI-BMS on 26th September 2008. This includes four further projects in the Biomedical and Life Sciences area:

- European Marine Biology
- Chemical Libraries
- Category 4 Containment Facilities for Emerging Diseases
- Euro-Bioimaging Facilities.

The RWG-BMS also identified emerging proposals. These projects have not been considered as "mature" enough but could be adopted into the Roadmap in the future. One of these is the European Infrastructure for Systems Biology.

Definition of infrastructure

"Infrastructures play an increasing role in the advancement of knowledge and technology and their exploitation. For example, radiation sources, data banks in genomics and data banks in social science, observatories for environmental sciences, systems of imaging or clean rooms for the study and development of new materials or nano-electronics, are at the core of research and innovation processes. By offering unique research services to users from different countries, including from the peripheral and outermost regions, by attracting young people to science and through networking of facilities, research infrastructures help structuring the scientific community and play therefore a key role in the construction of an efficient research and innovation environment. Because of their ability to assemble a 'critical mass' of people and investment, they contribute to national, regional and European economic development. They are therefore at the core of the knowledge triangle of research, education and innovation." FP7 Capacities Work Programme: Infrastructures. Please visit the FP7 website for more information:http://cordis.europa.eu/fp7/dc/index.cfm?fuseaction=UserSite.FP7ActivityCallsPage&id_activity=13

The term "research infrastructures" refers to facilities, resources and related services that are used by the scientific community to conduct top-level research in their respective fields. This definition covers: major scientific equipment or set of instruments; knowledge based-resources such as collections, archives or structured scientific information; enabling ICT-based infrastructures such as Grid, computing, software and communications; any other entity of a unique nature essential to achieve excellence in research. Such research infrastructures may be "single-sited" or "distributed" (a network of resources). FP7 Capacities Work Programme: Infrastructures.

European Infrastructure for Systems Biology

An outline proposal for a virtual European Systems Biology Centre networking the existing and developing national Centres into an integrated structure had been drawn up by the ESFRI German delegation and submitted to ESFRI by the Irish delegation, with support from the UK. Following recommendations by the ESFRI Board, the BMS-RWG, chaired by Eckhart Curtius, set up a strategy group headed by their scientific advisor Fotis Kafatos. The strategy group wrote a new version of the proposal. A summary of the proposal and an extract from the ESFRI RWG-BMS Report are presented at Annex 3. The new version of the proposal, European Infrastructure for Systems Biology, is described as an emerging area in the ESFRI-BMS Report 2008. Eckhart Curtius was invited to the ERASysBio 2nd Meeting of the European Systems Biology Centres to present the infrastructure for systems biology in Europe (ISBE) as an emerging infrastructure which required urgently the input and support from its scientific community. Eckhart expressed clearly that projects of this magnitude must originate in the scientific community who should unite, organise itself and think 'large scale' for the benefit of all. The Centres are in an excellent position to propose an infrastructure that makes the most of the resources already available and fulfils the requirements that will consolidate systems biology in Europe. As a result, a meeting of a small group of Heads of European Systems Biology Centres and equivalent institutions took place on 30th April 2009, at Imperial College London. The meeting was co-organised by the Systems Biology Centre at Imperial, and by BBSRC, and aimed at discussing and agreeing the structure and content of ISBE. As a result, a small working group was assembled with the task of drafting the new version of this proposal. The note of this meeting is at Annex 4.

ERASysBio
October 2009

ANNEX 1

Note of the 1st Meeting of the European Systems Biology Centres

7-8 March 2007, Imperial College, London

Participants

- Judith Armitage – The Oxford Centre for Integrative Systems Biology, UK
- Roel van Driel – Netherlands Institute for Systems Biology
- Roland Eils – German Cancer Research Centre, Heidelberg, Germany
- Wolfgang Hess – Freiburg Initiative for Systems Biology, Freiburg, Germany
- Charlie Hodgman – Multidisciplinary Centre Integrative Biology at Nottingham, UK (day 1 only)
- Douglas Kell- The Manchester Centre for Integrative Systems Biology, UK
- Thomas Kirkwood – Centre for Integrative Systems Biology of Ageing and Nutrition, Newcastle, UK
- Martin Kuiper – Department of Plant Systems Biology, University of Gent, Belgium
- Tamarah Lah-Turnšek – National Institute of Biology, Ljubljana, Slovenia
- Nicolas Le Novère – European Bioinformatics Institute, Cambridge, UK
- Wolfgang Marwan – Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg, Germany
- Igor Goryanin – Centre for Systems Biology at Edinburgh, UK
- Stig Omholt – Centre for Integrative Genetics, Ås, Norway
- Corrado Priami – Microsoft Research- University of Trento, Italy
- David Rand – Warwick Systems Biology Centre, UK
- Matthias Reuss – Institute of Biochemical Engineering, Stuttgart, Germany
- Joachim Selbig- Max Planck Institute of Molecular Plant Physiology, Golm, Germany
- Jaroslav Stark – Centre for Integrative Systems Biology at Imperial College London, UK
- Bas Teusink – Kluyver Centre, The Netherlands
- Janet Thornton – European Bioinformatics Institute, Cambridge, UK (day 2 only)
- GertJan van Ommen – Center for Human and Clinical Genetics, The Netherlands
- Nikolaus Zacherl – Institute for Medical Genomics Research and Systems Biology (IMGuS), Austria

Funding organisations

- Alf Game – Biotechnology and Biological Sciences Research Council (BBSRC), UK
- Steinar Bergseth – The Research Council of Norway (RCN)
- Thomas Bruhn – European Science Foundation, France
- Nicole Firnberg – Federal Ministry for Education, Science and Culture, Austria
- Maike Heidelberger – Federal Ministry of Education and Research (BMBF)
- Mary Kelly – Science Foundation Ireland
- Oliver Kemper – Federal Ministry for Education, Science and Culture, Austria
- Stefan Lampel – Project Management Juelich (PTJ)

- Frank Laplace – Federal Ministry of Education and Research (BMBF)
- Gabriela Pastori – Biotechnology and Biological Sciences Research Council (BBSRC), UK
- Luc Rietveld – Netherlands Organisation for Scientific Research (NWO)
- Marta Sabec – Ministry of Higher Education, Science and Technology (MHEST)
- Veronika Simons – Project Management Juelich (PTJ)
- Thomas Slagsvold – The Research Council of Norway (RCN)

Background

ERASysBio is an EU funded initiative under the ERA-NET scheme which aims at coordination and cooperation between national programmes for the funding of Systems Biology. ERASysBio is based upon the joint initiative of 12 European member states in order to support transnational R&D co-operations in the field of Systems Biology through coordinating national and regional public funding programmes and horizontal activities. The twelve ERASysBio partners Austria, Flanders (Belgium), Finland, France, Israel, The Netherlands, Norway, Russia, Slovenia, Trento (Italy), United Kingdom and Germany.

The German and British partners of ERASysBio jointly organised this meeting, which primary aims were:

- to identify areas for the development of joint strategies in the context of current and future experimental, computational, technological and socio-cultural challenges;
- to identify areas where collaborations between centres can be established;
- to identify areas where interventions can be applied, indicating the vehicles/mechanisms to implement them.

Purpose of the meeting

The purpose of this meeting was to identify areas of common interest where links between institutions could be maximised and to consider any specific challenges faced by such cooperation. As a general outcome, the organisers expected to identify relevant topics to be considered in the upcoming strategic discussions.

The meeting was targeted exclusively to the heads of established Systems Biology Centers, which possess:

- a concentration of research facilities within a single, appropriate and dedicated physical space run under one national programme;
- a long term commitment of space, research facilities and staff within a philosophy of interdisciplinary working;
- a reservoir of skilled technical staff capable of supporting the necessary range of HTP and other advanced technologies to be deployed, and a commitment to their retention, training and development;
- a matured effective policy and provision for data capture, management and storage;
- a vision and strategy for developing at the cutting edge of integrative systems biology;
- a commitment to outreach, engage and train, and to attract and engage other top-class scientists and engineers from within and outside the institution.

Day 1

Alf Game initiated the meeting with a welcome to all participants. This was followed by a brief introduction to ERASysBio and the purpose of the meeting by Stefan Lampel.

Session 1 – Presentation of European Systems Biology Centres

This session was chaired by Veronika Simons and consisted of a brief roundtable introduction of participants and representatives from funding organizations. This was then followed by a second roundtable, where participants had the chance to introduce their Centres briefly, highlighting major achievements and future goals.

A networking exercise, led by Gabriela Pastori, allowed delegates to introduce themselves and exchange information of relevant research interests in a one-to-one conversation. This exercise was followed by a brief discussion and preparation for day 2.

Day 2

Presentation – From infancy to maturity: key steps for the consolidation of Systems Biology in Europe – by Douglas Kell at The Manchester Centre for Integrative Systems Biology, UK

Douglas gave an overview of the origins and philosophy of the systems approach to research and described the data management structure being developed at Manchester. The requirements for data capture, data storage and data integration were discussed and Taverna, incorporating myGrid, was presented as an ingenious way to integrate disparate data from different sources. The system is being tested as a pilot joined-up infrastructure using a systems biology study of growth control in yeast. Douglas concluded that only a distributed workflow architecture can deliver modern systems biology and contribute strongly to the consolidation of this area in Europe.

Session 2 – Scientific vision

This session, chaired by Alf Game, had the aim to identify areas for the development of joint strategies in the context of current and future experimental, computational, technological and socio-cultural challenges. The main points of discussion are summarized below.

Communication

Communication barriers between wet-dry scientists seemed to be a common problem to the majority of participants. In addition to incorporating this aspect in training, some emphasised the usefulness of using webcams to facilitate communication between groups on a daily basis.

Training

The shortage of trained dry scientists was considered a major bottleneck in the consolidation of systems biology. Participants were informed that the EBI had been developing new teaching tools in the last two years that were proving to work well. The idea was welcomed by participants who thought this could be developed at the under-graduate level.

Tools

Participants discussed the challenges in developing dry tools, in generating mechanisms to deliver them and in getting the necessary funds to do it. The BBSRC's Tools and Resources Development Fund and Bioinformatics and Biological Resources Fund initiatives were highlighted as examples of funding mechanisms available to the systems biology community.

Themes

A number of important areas that should constitute the focus in the next few years were discussed. Some examples are listed below.

- Metabolism, ageing and obesity.
- Multiscale modelling, from molecules to organs and model integration: the dynamics of networks are unknown; it is critical how to compare data but also how to compare models.
- Yeast: proposed as the model to work on by a few; this was generally supported but it was thought that the benefits of using this model would take too long to be applied to solving some biomedical challenges.

Presentation – ELIXIR, European Life Sciences Infrastructure for Biological Information, by Janet Thornton, European Bioinformatics Institute, Cambridge, UK

Janet presented the mission of this project, which is to construct and operate a sustainable infrastructure for biological information in Europe to support life science research and its translation to medicine and the environment, the bio-industries and society. The project is on the current European Strategic Forum for Research Infrastructures (ESFRI) Roadmap. As part of this project an upgrade to the EBI is foreseen. ELIXIR has a preparatory phase funding award from EU Framework 7, which includes a technical feasibility project to assess European data support needs in systems biology and address the potential role of the EBI.

Following the presentation, Janet suggested that a member of the systems biology community becomes part of ELIXIR.

Session 3 – Building on: what can European Systems Biology Centres do together?

This session, chaired by Steinar Bergseth, had the aim to identify three areas where collaborations between centres can be established, indicating the added value of such collaborations and expected, measurable outcomes. The main topics of discussion are summarised below and listed in priority order.

What can Systems Biology Centres do together?

1. Training and career structure
   - Moving towards a common curriculum at graduate and MSc level
   - Exchange of students and young researchers between Systems Biology Centres
   - PhD and Postdoctoral programmes, such as specialised summer schools

- Reconsideration of career merit measures and rewards

2. Themes
- Biomedicine: health nutrition and insulin metabolism
- Bioenergy and biosustainability

3. Communication, exchange and dissemination
- model integration
- development of generic tools
- communicating systems biology science to the wider community

4. Data management / knowledge management
- standardization
- storage
- management
- sharing, accessibility, open exchange

What is the added value to working together?

- Emerging knowledge
- Common understanding
- Synergies
- Critical mass
- Stronger Europe

What are the expected measurable outcomes?

- Creation of jobs and qualified workforce
- Mobility of researchers
- Better communication between all concerned
- E-learning tools in Systems Biology

Session 4 – Realising the vision: what can ERASysBio do to make it happen?

The aim of this session was to identify areas where interventions can be applied, indicating the vehicles/mechanisms to implement them.

The discussions were integrated into the previous session.

END

BBSRC, March 2007

ANNEX 2

Note of the 2nd Meeting of European Systems Biology Centres
11-12 September 2008, Düsseldorf, Germany

SUMMARY

The ERA-NET in Systems Biology ERASysBio proposes to establish Networks of Systems Biology Centres (NSBCs) as the best vehicle to implement the most urgent actions on training, data standards, data management, and academic-industrial links in systems biology.

The 2nd Meeting of European Systems Biology focused mainly on considering how, specifically, centres can work together in developing these European activities. Ideas for network proposals were developed at this meeting in preparation for the ERASysBio+ Call, to be launched in autumn 2008.

OBJECTIVES

- to provide an update on European systems biology activities;
- to seek consensus on the concept of a systems biology network under ERASysBio;
- to identify specific systems biology networks and their area coordinators.

PARTICIPANTS

Heads of established European Systems Biology Centres or their deputies were invited to attend, to discuss and agree on common interests and actions. ERASysBio partners consider that such Centres will possess:

- a concentration of research facilities within a single, appropriate and dedicated physical space run under one national programme;
- a long term commitment of space, research facilities and staff within a philosophy of interdisciplinary working;
- a reservoir of skilled technical staff capable of supporting the necessary range of HTP and other advanced technologies to be deployed, and a commitment to their retention, training and development;
- a matured effective policy and provision for data capture, management and storage;
- a vision and strategy for developing at the cutting edge of integrative systems biology;
- a commitment to outreach, engage and train, and to attract and engage other top-class scientists and engineers from within and outside the institution.

Representatives from other European projects, which current activities and plans are relevant to Systems Biology Centres, were also invited to the meeting.
The purpose of this was:

- to provide European Systems Biology Centres with an update on current activities and the progress of these projects;
- to provide European Systems Biology Centres with a wider context in which the NSBCs could be created;
- to seek input from European Systems Biology Centres on their participation and their role in developing these European projects.

Systems Biology Centres		Representative
Norwegian University of Science and Technology	NO	Martin Kuiper
Systems Biology of Virus-Cell Interactions	DE	Angela Oberthuer
Freiburg Initiative for Systems Biology	DE	Ralf Baumeister
Freiburg Initiative for Systems Biology	DE	Klaus Palme
Max Planck Institute for Dynamics of Complex Technical Systems	DE	Susanne Hollmann
Center Systems Biology Stuttgart	DE	Klaus Pfizenmaier
Max Planck Institute of Molecular Plant Physiology	DE	Lothar Willmitzer
EMBL/CRG Systems Biology Research Unit	ES	Luis Serrano
Conway Institute	IR	Janet Allen
Microsoft Research - University of Trento	IT	Corrado Priami
Centre for Integrative Biology	IT	Alessandro Quattrone
VU Amsterdam / Kluyver Centre Consortium	NL	Bas Teusink
Netherlands Institute for Systems Biology	NL	Roel van Driel
Centre for Integrative Genetics	NO	Stig Omholt
Centre for Functional Genomics and Bio-Chips, University of Ljubljana	SI	Damjana Rozman
CSIC Systems Biology Unit	ES	Santiago Elena
The Oxford Centre for Integrative Systems Biology	UK	Bela Novak
Multidisciplinary Centre Integrative Biology at Nottingham	UK	Tony Pridmore
The Manchester Centre for Integrative Systems Biology	UK	Pedro Mendes
Centre for Integrative Systems Biology of Ageing and Nutrition	UK	Darren Wilkinson
Centre for Systems Biology at Edinburgh	UK	Elizabeth Elliot
Warwick Systems Biology Centre	UK	Nigel Burroughs
Centre for Integrative Systems Biology at Imperial College London	UK	Jaroslav Stark
Institute of Systems and Synthetic Biology (ISSB) at Genopole	FR	François Kepes
Guests		
Max Planck Institute for Molecular Genetics, Berlin	DE	Hans Lehrach
Chair of the ESFRI Biological & Medical Sciences Roadmap Working Group	DE	Eckhart Curtius
European Bioinformatics Institute - ELIXIR	UK	Andrew Lyall
Funding organisations		
Project Management Jülich, PtJ	DE	Veronika Simons
Federal Ministry for Science and Research, BMWF	AT	Nicole Firnberg
Netherlands Organisation for Scientific Research, NOW and Netherlands Organisation for Health Research and Development, ZonMw	NL	Luc Rietveld
Research Council of Norway, RCN	NO	Steinar Bergseth
Biotechnology and Biological Sciences Research Council, BBSRC	UK	Gabriela Pastori
Ministry of Science and Innovation, MICINN	ES	José Salas
Science Foundation Ireland, SFI	IR	Declan Healy
Project Management Jülich, PtJ	DE	Gisela Miczka
ERASysBio Network Steering Committee Chair	UK	Colin Miles
Project Management Jülich, PtJ	DE	Maike Heidelberger

PROGRAMME

The programme was designed to allow participants to focus on relevant aspects where centres can network, integrate and develop common activities. These discussions were held in breakout groups and their outcomes presented at the final session. The programme included short presentations from European projects that are highly relevant to the Centres.

The meeting started with the welcoming remarks from Veronika Simons, ERASysBio Coordinator, and an introduction to the aims of meeting and expected outcomes by Colin Miles, representing Alf Game, Chair of the ERASysBio Network Steering Committee.

Session 1, The European Context, was chaired by Gabriela Pastori and included presentations by Roel van Driel on Systems Biology of Metabolic Syndrome (SBMS); Eckhart Curtius on European Infrastructure for Systems Biology (EISB); and Andrew Lyall on European Life Science Infrastructure for Biological Information (ELIXIR).

Roel van Driel presented SBMS, a project with the ambition to initiate a large-scale, highly coordinated and focused European effort in the field of Metabolic Syndrome, in which the systems biology approach is the integrator of different data sets and the driver of research. Roel gave an overview of the aims and aspirations of the SBMS initiative, described the main objectives of the SBMS Roadmap and the actions taking place in the coming months, e.g. SBMS workshop in Berlin.

Eckhart Curtius gave an overview of ESFRI and its mission, the Roadmap and its associated Working Groups, the range of projects selected as mature and the process leading up to their launch, and the European Infrastructure for Systems Biology (EISB) as an emerging infrastructure which required urgently the input and support from its scientific community.

Eckhart expressed clearly that projects of this magnitude must originate in the scientific communities involved through a new philosophy of collaborative working. It's the community who should unite, organise itself and think 'large scale' for the benefit of all. Eckhart urged the leaders of Systems Biology Centres to get together and come up with a proposal for a EISB, in a way similar to the physical sciences communities. The Centres are in an excellent position to propose an infrastructure that makes the most of the resources already available and fulfils the requirements that will consolidate Systems Biology in Europe.

As a result, Jaroslav Stark expressed his full support to this proposal and his will to take the initiative forward. A working group of no more than six members should now be constituted. BBSRC has offered support to the setting up and running of this working group.

Andrew Lyall gave overview of ELIXIR, one of the six ESFRI projects selected as mature and having been awarded a 3-year preparatory phase grant from the EC. The preparatory phase should allow ELIXIR to develop proposals to construct and operate a sustainable infrastructure for biological information in Europe that supports life science research and its translation to medicine and the environment, the bio-industries and society. The programme includes a feasibility assessment relating to the provision of support for archiving and distribution of models for systems biology, led by Nicholas Le Novère at EBI-Hinxton.

Session 2, Updates from Systems Biology Centres, was chaired by Gisela Miczka and consisted of a Tour de Table where representatives from the European Systems Biology Centres gave, in 4 min, an update on relevant activities and progress of the centres and their expectations for this meeting.

Day one finished with Session 3, What is a network, chaired by Luc Rietveld and presented by Tony Pridmore, Domain Director – Data, at MyCIB, Nottingham, UK. Tony presented an overview of Networks @ Nottingham, as examples of the variety of approaches and aims that networks can take to address issues specific to the communities they serve. These could be focused on: 1) a biological theme or problem; 2) a research methodology; 3) tools and resources; 4) community building.

Session 4, Towards establishing Networks of Systems Biology Centres (NSBCs), was chaired by Steinar Bergseth and Gabriela Pastori. This session consisted of participants discussing in break-out groups:

1) The concept of a network, its purpose, components, governance
Participants were asked discuss and reach consensus on the following questions:
- What is a network?
- What does a network do?
- What are the essential components of a network?
- What structure does a network have?
- What makes a network different to a project consortium?

2) Specific areas that should constitute the basis of a European network
Participants were asked to identify specific areas within each of the following bullet points:
- Training and career structure
- Thematic areas
- Technology development
- Data/models management
- Industry/Knowledge Transfer

3) Proposals for networks. Participants were asked to: a) describe the subject of the network(s), its/their aim, content, structure and governance; b) identify an area coordinator for each network.

At the Final Session, Network Proposals chaired Colin Miles; the following ideas for network proposals were presented:

1) Knowledge Transfer – Systems Biology Europe

Area coordinators: Jaroslav Stark (Imperial) and Elizabeth Elliot (Edinburgh)

Aim: to provide a unified public image, a face outwards to public, politicians, non-systems biology communities.

Activities:
- Website-portal-multilayer: technologies, expertise, public face
- Case studies: no hype, good examples

- Advocacy/ Engagement / Active PR: sharing expertise, editorial, lobbying funding and politicians
- Non-sys bio portal: workflow, contact points by geography and by research theme, good practice
- Industry: contact point for PhD and PDRA opportunities
- Sys Bio expert: community, contact point
- Funding: current projects, working relationships, future opportunities
- Mentoring / networking

Resources:
- 1 x figure head: Steering Group + 1 voice to promote the organization
- Coordinator with relevant experience
- Webmaster
- Meetings: steering group, institute coordinators (1 per year), with journalists
- Travel: 3-4 conferences per year

2) Quantitative image analysis

Area Coordinator: Tony Pridmore (Nottingham)

Aim and description: to be developed by Tony and circulated to all.

3) Cancer - kinome

Area coordinator: to be agreed.

Aim and description: to be developed.

Groups: Berlin, Freiburg, Stuttgart, Trento, Oxford, (Heidelberg)
Samples: Mouse genetics, C. Elegans, Yeast analysis, Kinome cell cycle

4) An inventory of systems biology – the basis for SysBio Centres in Europe

Area coordinator: Bas Teusink (Amsterdam)

Aims (in steps):

- Step 1: Set up a knowledge base - create a database with real content and useful portal for instant info on:
  - research topics
  - people
  - courses, teaching materials
  - techniques and specialist equipment
  - protocols, standards, tools, databases, strains and constructs

- Step 2: Exchange people and knowledge

- exchange students & researchers for direct collaboration
- meeting on specific issues, e.g. teaching, specific calls, topics, identified through the SysBio inventory
- summer schools or courses

o Step 3: Basis for identifying needs and new directions
- lobbying with one voice
- travelling

Resources:
o 2x FTEs (PDRAs) travelling around and getting info, plus 1xFTE to develop database and maintain it.
o Video-conferencing
o Steering committee (10 people)
o Travel
o 20 centres, 25 people @1k€ = 500k€/year
o 3x FTEs at 250k€/year = 5 years at 3750k€

5) Modelling frameworks

Area coordinator: Pedro Mendes (Manchester)

Deliverable: What experiments you need to do to make it model-data driven and viceversa.

Content:
o Provide a resource, kind of information for e.g. metabolic networks, a list of what is available and also what the community needs.
o Provide a website-wiki, and a coordinator/editor visiting regularly the Centres collating information on types of modeling, experiments, etc. The website-wiki should include a list of standards and protocols.
o Members: to include clinicians and industry

Aim: to produce a paper, to outreach through e.g. summer schools, experiments for modelers, modelling for experimentalists.

6) Virus-cell interactions

Area coordinator: Santiago Elena (Madrid)

Aim and description: to be developed.

7) Aging

Area coordinator: Darren Wilkinson (Newcastle)

Aim and description: to be developed.

8) Synthetic Biology

Area coordinator: Francois Kepes (Evry - Paris)

Aim and description: to be developed.

Follow-up and closing remarks

Colin Miles thanked all participants for their contribution to the meeting and encouraged them to further develop the network proposals generated at the meeting, which alongside other ideas could constitute the basis for network applications to the ERASysBio+ transnational call.

BBSRC, October 2008

ANNEX 3

EUROPEAN INTEGRATED SYSTEMS BIOLOGY INFRASTRUCTURE

SUMMARY

Goal: Systems Biology is the emerging major scientific concept that will greatly facilitate the exploration of life's organized complexity. It is primarily based on the integration of large data sets from genomics, proteomics, metabolomics and other –omic fields with the goal to model life processes. The aim of the EISBI is to develop the appropriate Institutional infrastructure and scientific mentality to support multidisciplinary research in the biomedical and biotechnology fields. EISBI Institutes will provide training and education in current and future scientists in cross-disciplinary approaches. EISBI will provide to the European Research Area new tools to understand dynamic biological processes and networks and state-of-the-art core facilities to carry out experiments at the systems level.

Description of the Infrastructure: EISBI Institutes will be part of a distributed arrangement of Infrastructures focusing on different biological problems by carrying out discovery and hypothesis driven research. We envision Institutes each one focusing on distinct aspects of biology such as model organisms, model cell populations, diseases, biotechnology, ecology etc. In addition, the development and application of new technologies will be the main task of a number of the EISBI Institutes. The acquired and implemented complementary expertise at EISBI Institutes will serve the European Research Area by functioning as a host for addressing important scientific problems, by disseminating technologies and by providing open access to data and software. Although, EISBI Institutes will have complementary activities each facility will support the following:

1. Data generation and model verification
2. Data management and curation
3. Data analysis, visualization and modeling.
4. Personnel training and education

1. Major experimental infrastructure for data generation and model verification

- High throughput genomics and transcriptomics (DNA array systems, highly parallel DNA sequenators and advanced multiplexing technologies)
- Equipment relevant to Advanced Mass Spectroscopy and multiplex systems (array based) for analytical and quantitative proteomics and the identification of protein networks and assemblages.
- Gas Chromatography (GC), Liquid Chromatography (LG), Capillary electrophoresis (CE) as well as NMR and Fourier-transform ion cyclotron resonance mass spectrometry (FT-ICR-MS) for metabolomics.
- Advanced high throughput imaging systems including microscopy, flow cytometry and automated cell analysis.

2. Data management and curation

High capacity computing infrastructure for open access storage and curation of large data sets and databases (terabyte level) as well as for the maintenance and distribution of software (tools).

3. Data analysis and management

Mainstream and specialized computers to allow high performance computing in order to analyze and visualize biological data, to model protein and multi- protein assemblies (nano-machines)

and to simulate pathways, networks, cells , tissues and organs. Furthermore, EISBI Institutes will develop and implement GRID computing systems for executing the required massive parallel processing.

4. Personnel Training and Education

EISBI Institutes will house under one-roof scientists with diverse expertise ranging from mathematicians, physicists, engineers and computer scientists to biologists and medical doctors. Each Institute will be involved in training and educating young and current scientists in Systems Biology approaches by providing both the necessary scientific personnel and infrastructures.

Perspectives

Since the field is rapidly developing it is anticipated that within a five year period new technologies will emerge (some from this European Network) mainly in the area of single molecule/single cell analysis. As the relevant nanotechnologies will become available these will enrich the capacities of this pan-European Network. In addition, the Network should be prepared for the acquisition of the next generation of high throughput –omics related infrastructure.

Dimitris Thanos

ESFRI BMS Roadmap Working Group

EXTRACT FROM DRAFT ESFRI-BMS REPORT 2008

RU02 European Research Infrastructure for Systems Biology

Submitted by the ESFRI delegations of UK and Ireland

Short description

This distributed infrastructure will consist of Institutes established by national initiatives but committed to operate as an integrated multidisciplinary infrastructure for the European scientific community. The EISBI will consist of distributed Institutes, newly established or expanding at the national level, which are selected for participation in EISBI after evaluation by a high-level committee of experts. Each Institute will bring together a multidisciplinary group of excellent internationally recognized researchers ranging from biologists, medical doctors, mathematicians and engineers, to computer scientists and physicists, in an interactive, collaborative and welcoming environment, with a philosophy of interdisciplinary working. Each Institute selects its own research projects and focus; it will bring together significant experimental and mathematical analysis capabilities and relevant infrastructures, to work together with its own staff and with visiting researchers and students and thus provide a niche for scientists with diverse backgrounds and expertise under one roof. Each Institute will be focusing on a comprehensive and quantitative analysis of how all the components of its chosen biological system interact functionally over time. Model organisms (uni- or multi-cellular), and model cell populations (e.g. immune cells, skin cells, liver etc) are currently providing the best examples for Systems Biology research, using both discovery-based and hypothesis-based approaches. New directions in SB research are opening up opportunities to study interactions of organ systems and even populations in plants and animals, thus promising new advances in medicine, ecological management, the food industry and animal husbandry.

ANNEX 4

Note of the European Infrastructure for Systems Biology Meeting
Imperial College London, United Kingdom
30th April 2009

Summary

1. On 11th-12th September 2008, the ERA-NET for Systems Biology, ERASysBio[2], organised a meeting which brought together representatives from the established Centres for Systems Biology in Europe and from a number of funding agencies. In addition to preparing proposals for networks, representatives were given a comprehensive overview of ESFRI and its mission, the ESFRI Roadmap and its associated Working Groups, the range of projects selected as mature and the process leading up to their launch, and the European Infrastructure for Systems Biology (EISB) as an emerging infrastructure which required urgently the input and support from its scientific community. The leaders of Systems Biology Centres were urged to get together and come up with a proposal for an EISB, in a way similar to the physical sciences communities. The outcome of the meeting was that, by initiative of Jaroslav Stark at Imperial College, it was agreed that a working party is set up to develop a proposal. BBSRC and Imperial College are providing administrative help to assist with the process.

2. This meeting, held on 30th April 2009, represented a significant progress towards developing an EISB as it is the first time that the Centres got together to agree on the infrastructure proposal. The EISB developed by the Centres is expected to operate as an integrated multidisciplinary infrastructure for the European scientific community.

3. The objectives of the meeting were:

- to seek consensus on the concept of a systems biology infrastructure, its structure and content;
- to set up a small working group to draft a proposal to be presented to ESFRI.

Participants

4. Heads of established European Systems Biology Centres or their deputies were invited to attend, to discuss and agree on common interests and actions. ERASysBio partners consider that such Centres possess:

[2] The ERASysBio partners are: Austria - Federal Ministry for Education, Science and Culture (BMWF); Belgium - National Fund for Scientific Research (FNRS); Finland - Academy of Finland (AKA); France - French National Centre for Scientific Research (CNRS) and Agence Nationale de la Recherche (ANR); Germany - Forschungszentrum Juelich GmbH (FZJ) and Federal Ministry of Education and Research (BMBF); Israel - Israeli Science Foundation (ISF); The Netherlands - Netherlands Organisation for Scientific Research (NWO); Norway - The Research Council of Norway (RCN); Russia - Russian Foundation for Basic Research (RFBR); Slovenia - Ministry of Higher Education, Science and Technology (MHEST); Spain - Ministry of Education and Science (MEC); Trento, Italy - Autonomous Province of Trento (PAT); United Kingdom - Biotechnology and Biological Sciences Research Council (BBSRC); Luxembourg and Switzerland are affiliated partners.

- a concentration of research facilities within a single, appropriate and dedicated physical space run under one national programme;
- a long term commitment of space, research facilities and staff within a philosophy of interdisciplinary working;
- a reservoir of skilled technical staff capable of supporting the necessary range of HTP and other advanced technologies to be deployed, and a commitment to their retention, training and development;
- a matured effective policy and provision for data capture, management and storage;
- a vision and strategy for developing at the cutting edge of integrative systems biology;
- a commitment to outreach, engage and train, and to attract and engage other top-class scientists and engineers from within and outside the institution.

5. Representatives from other ESFRI projects and from the ESFRI BMS-Roadmap Working Group were also invited to the meeting. The purpose of this was to provide European Systems Biology Centres with an update on current activities and the progress of these projects and with a wider context in which the EISB could be created.
Participants to the meeting are listed below:

- Prof Ruedi Aebersold, ETH Zurich, Switzerland
- Dr Miguel Botella, University of Malaga, Spain
- Dr Jan Eufinger, DKFZ, Heidelberg, Germany
- Prof Tom Kirkwood, Institute for Ageing and Health, Newcastle University, UK
- Prof Richard Kitney, Institute of Systems and Synthetic Biology, Imperial College London, UK
- Prof Michal Marek, Institute of Systems Biology and Ecology, Ceske Budejovice, Czech Republic
- Dr Ivan Mura, The Microsoft Research - University of Trento Centre for Computational and Systems Biology (CoSBi), Trento, Italy
- Prof Klaus Palme, Institute of Biology II, University of Freiburg, Germany
- Dr Gabriela Pastori, BBSRC, UK
- Dr Barbara Skene Institute of Systems and Synthetic Biology, Imperial College London, UK
- Prof Jaroslav Stark Centre for Integrative Systems Biology at Imperial College London, UK
- Dr Dimitris Thanos, Biomedical Research Foundation of the Academy of Athens, Greece
- Prof Roel van Driel, Netherlands Institute for Systems Biology, Amsterdam, The Netherlands
- Prof Hans Westerhoff, Manchester Centre for Integrative Systems Biology, University of Manchester, UK & Vrije Universiteit, The Netherlands
- Prof Kurt Zatloukal, Institute of Pathology, Medical University of Graz, Austria

Apologies

6. Apologies were received from Dr. Alf Game, BBSRC, UK; Dr. Emmanuelle Caron, Centre for Integrative Systems Biology at Imperial College London, UK; and from Dr. Nicolas Le Novère, EMBL-EBI, Hinxton, UK, who gave a presentation via Skype.

Programme

7. The meeting started with welcoming remarks from Richard Kitney, and an introduction to the aims of meeting and expected outcomes by Gabriela Pastori. This was followed by a round table of introductions by participants.

BBMRI – Biobanking and Biomolecular Resources Research Infrastructure

8. Kurt Zatloukal, coordinator of the ESFRI project BBMRI, introduced this facility and the key elements leading up to an ESFRI proposal. BBMRI's vision is to sustainably secure access to biological resources required for health-related research and development intended to improve the prevention, diagnosis and treatment of disease and to promote the health of the citizens of Europe.

9. Kurt emphasised the key elements of a successful infrastructure proposal:

- gather official documents and reports as well as numbers that make the case for an infrastructure;
- propose a distributed infrastructure, which includes resources, technologies services, addressing the needs of EU for this specific area;
- identify the best solution and make it accessible;
- emphasise collaboration, integration, and harmonisation as the drivers;
- demonstrate how it would operate (legal & funding structure) e.g. BBMRI is planning to use ERIC (currently being developed) as the legal framework around a distributed hub and spoke structure. ERIC would give BBMRI a legal entity, avoiding parliamentary decision, and giving it more flexibility.

10. The challenges facing BBMRI are common to other European infrastructures:

- harmonized processes (evidence-based standards);
- harmonized ontologies and compatible data formats;
- incentives for contributors;
- access rules;
- heterogenous European ethical and legal landscape;
- data protection in biobanking;
- sustainable funding.

11. The process leading up to an infrastructure proposal includes:

- assessment of existing resources and technologies;
- concept for integration;
- prototype, open and flexible to respond to emerging demands, to get practical experience and to avoid the gap between the preparatory phase and the implementation of the infrastructure;
- data standards, and when not possible, variables analysis to assess how much impact this will have on the final result;
- infrastructure, including what can be integrated and the tools to do it.

12. The proposal requires a great degree of preparation before its launch. BBMRI organised their Stakeholder meeting in Brussels on 20th March 2009, with great participation from a very diverse and large community. Those involved in developing the proposal must ensure that they:

- prepare and engage the diverse community, and gather their support;
- organise workshops, which respond to different communities/topics/issues;
- organise a stakeholders meeting;
- make a presentation at the EU parliament;

- organise a joint workshop with DG Research.

13. The proposal must emphasise the expected impact of the facility:
- scientific excellence;
- rapid progress and cost-effectiveness;
- access to high quality resources and technologies;
- education and training;
- public-private partnerships;
- incubator for regional development.

14. To secure long term funding commitment, Ministries need to see the potential economic impact of the facility, explained in simple documents that help them assess and decide. These documents must include monitoring parameters to assess success of the infrastructure. Public perception and acceptance is critical and calls for a coordinated communication strategy between all ESFRI projects.

15. There are some common elements to BBMRI, ELIXIR and EISB:
- biological samples as primary data source;
- standardised analysis platforms;
- quality control for data generated;
- ontologies;
- data protection;
- data analysis, modelling;
- data interpretation.

16. More details of Kurt's presentation can be found at Annex 1. Comments by participants:

- Careful planning on how to address standardisation is needed. This cannot be done too early for areas where instruments and technologies allowing accurate measurements are still not available. It was suggested that standards should be applied where there is the right type of measurement. The development of new technologies was also discussed.

- Sustainability was also discussed. Google, e-bay and similar services with minimal cost and huge transnational traffic were suggested as a way to secure the life of the facility at relatively low cost.

ELIXIR – European Life Science Infrastructure for Biological Information

17. Nicolas Le Novère introduced this facility via Skype. The preparatory phase should allow ELIXIR to develop proposals to construct and operate a sustainable infrastructure for biological information in Europe that supports life science research and its translation to medicine and the environment, the bio-industries and society. The programme includes a feasibility assessment relating to the provision of support for archiving and distribution of models for systems biology. More details can be found in Nicolas' presentation at Annex 2.

EISB PROPOSAL

Comments are summarised below:

Mission

18. In defining the mission, the Centres should contrast the differences between existing projects and EISB, particularly with regards to resources. For EISB, this is much more diffused than in other facilities. Systems biology is an approach and life sciences will be applying the approach as they develop. EISB's mission can be diminished by limitations in resources, computational issues, storage, single-cell systems. The mission could be to set up an infrastructure that links all these resources.

19. Embedding the systems approach – biologists moving into adopting this new culture of working. EISB could facilitate this through training.

20. Systems biology has the capacity to generate knowledge of value to society. The project needs to demonstrate that systems biology is capable of doing it as the centre of a new way of understanding biological systems.

21. The added value of EISB has to be demonstrated at a pan-EU scale through integrating Systems Biology Centres. Integrating Centres is still a challenge; the UK Centres and Helmholtz encounter similar problems and continue to work on achieving real integration.

22. The idea of launching a prototype was discussed. A prototype can help show the potential benefits of doing it at a large scale, in an infrastructure.

23. Previous EISB proposals were critisised for not being clear. It is expected that the infrastructure is defined right from the beginning. Part of the EISB would overlap with other ESFRI projects so there is a need to emphasise EISB's unique strengths.

24. It was recognised that supporting the whole of biology is an impossible task so there is a need to identify the specific areas and the generic areas where Centres could work together: platforms, tools, data capturing and metadata, computational resource, know-how, training - summer schools do not provide continuity.

25. The emphasis of the infrastructure must be in replacing competition with collaboration.

26. The issue one-roof vs. distributed was discussed. There are advantages to both but perhaps the uniqueness of systems biology is in that expert groups do not need to work in the same place to collaborate as they can run experiments and models simultaneously in distant locations.

27. The major investments already made in the EU should provide the basis for building the case and demonstrating the benefits to the scientific community and society. EISB should consider this as its mission.

28. Systems biology covers a great diversity of aspects/fields – the challenge of EISB is to include them all. Some areas could sit within EISB as subunits with e.g. people working on prokaryotes, metabolic diseases, etc.

29. What is lacking? It was proposed that other groups are approached and asked what they need to work on systems biology.

30. The idea of EISB providing a network of 'railways/roads' to help the community work together and have access to top facilities was discussed.

Aims and Objectives / co-operation with other international activities

31. EISB should integrate existing projects as much as possible, e.g. Network of Excellence funded by EC and other similar projects, ERASysBio.

32. Incentives that encourage people to work together are needed. EISB could provide not just knowing who to contact but also information and access to subsets of the infrastructure owning expertise and giving access to further facilities. EISB proposal needs to build a mechanism that encourages people working together because by working together they benefit.

33. EISB should seek to collaborate with other ESFRI projects, specially on areas that are under development.

34. Technology and methodology development was highlighted as a generic area that could be developed in the EISB proposal. As the systems approach involves a building a quantitative model, measuring parameters accurately is critical.

35. The size and scope of the infrastructure were discussed as they are an important part of its initial development. ESFRI BMS-RWG members advised participants to avoid focusing on specific projects.

36. The EC could be consulted on funding opportunities, e.g. timetable for future opportunities and whether EISB would fit.

37. Jaroslav presented his network model Systems Biology Europe. This is a network proposal developed at the 2nd Meeting of the European Systems Biology Centres on 11th-12th September 2008. The model provides a resource for finding out who is doing what, where and how can this be communicated. It was proposed that Systems Biology Europe is turned into an infrastructure incorporating computing storage, technology, resources, nodes for proteomics, metabolomics, etc.

Agreements and next steps

38. At the end of the meeting there was general agreement in that EISB could focus on 'the living cell' or 'the living organism' and show how this would benefit society.

39. There was a high degree of consensus in that systems biology is a new way of doing science and this is what makes EISB unique and different from other ESFRI projects. It was therefore proposed to exploit the unique way of working together/collaborate, simultaneously, in distant locations, and show where the added value is.

40. As the next steps, a number of activities were proposed: identify organisations, reports, get a comment in Nature to prepare the community, identify constituents, have a meeting with the users' community.

41. Participants proposed that the entire group (not a sub-group) is involved in writing the proposal. There is a need to include contributions from others e.g biologist, a user, industry. It was also proposed to seek input from other Heads of Centres present at the Dusseldorf meeting, and that the approved note of the meeting is circulated to them as well.

42. As a first step, the group decided to start writing a one page technical description of EISB with its motivation. The one page document should include what EISB means as an infrastructure, its aims and objectives. A one page version written for a wider audience, i.e. the public, Governments, will accompany the technical summary.

43. Hans and Dimitris volunteered to write the technical page with Jaroslav. The approved summary will then be circulated to all in the community.

Election of the chair

44. Richard was elected chair until the final version of the summaries have been generated. The issue of who is going to spend real time on the project and take the lead was raised.

Timetable

- Gabriela to circulate note of meeting by 15th May
- Expense claims to be sent to Barbara by 11th May
- Hans Westerhoff / Dimitris Thanos to produce one-pager (technical) outlining consensus of group by 18th May and circulate to group.
- Group to send comments to Barbara and Gabriela by 1st June for collating.
- Participants to suggest any additional members that should be invited to join working party.
- Barbara to canvass members re: possible dates.
- Meeting of working party members to be convened end June in Amsterdam; Roel van Driel to arrange venue.
- Document to be revised and sent to attendees to the Dusseldorf meeting and "stakeholders" for consultation to respond by end July.
- Stakeholders to be discussed and agreed at June meeting.

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