ISBE Infrastructure for Systems Biology Europe

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An ISBE report which reviews the current systems biology education in Europe

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Content

Appendices:

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1. Executive Summary

Systems biology is one of the most promising areas in the life sciences. By connecting fields such as molecular and cell biology, medicine, biochemistry, and genetics with mathematics, bioinformatics, physics, engineering, and computation, it facilitates the discovery of yet unknown principles underlying the functioning of living cells. Mathematical models of complex cellular pathways and eventually of whole cells and organs are generated, which are vital for efficient experimental design and bioengineering as well as the network-based design of drugs and therapies.

Due to the rapid growth of this emerging research field during the last years there is a strong demand for interdisciplinary trained scientists in Europe and beyond. Cross-disciplinary training and education at all levels, in all relevant fields of systems biology, is regarded as an essential prerequisite to implement systems biology approaches on a broad scale throughout Europe.

Even if almost all countries within Europe have recognised the importance of systems biology research, the landscape of training activities in systems biology in Europe is rather diverse and not as mature and prevalent as underpinning disciplines e.g. bioinformatics, genomics.

Whereas almost all European countries offer bespoke curricula for bioinformatics, masters programmes with a specific focus on systems biology tend to be clustered in countries where there has been significant strategic investment in systems biology by the national governments in the past e.g. UK, Ireland, Scandinavian countries, The Netherlands, Germany, and Luxembourg (ref. WP11 report “Mapping of current European funding for systems biology of relevance for establishing ISBE”).

Nevertheless many European countries offer some kind of systems biology training via special courses and teaching modules in the context of master’s programmes in biology, bioinformatics, chemistry, physiology, neuroscience and medicine.

Postgraduate training in systems biology is primarily carried out within individual research groups throughout Europe and/or embedded as special topics in general PhD programmes. PhD curricula solely dedicated to systems biology are rather limited. Again, these tend to be implemented in countries where there has been a strategic investment in systems biology through national and international funding.

Conclusion:

In general, systems biology training is less advanced in the eastern European countries compared to other European countries presented in this report. In these countries, systems biology training is mostly integrated into the curricula for bioinformatics and often depends on the efforts of individual scientists working in the field of systems biology.

But even European nations with a much more advanced training portofolio for systems biology have to face several obstacles to the establishment of high quality interdisciplinary training in systems biology in their respective country. These include more general issues such as:

- Issues relating to the fundamental problem of interdisciplinary education within the discipline-focussed structure of Higher Education institutes (e.g. approval process for new degree qualifications and cultural differences between the research disciplines with respect to the backgrounds of teachers as well as students),
- Issues relating to the promotion and development of an emerging research area (e.g. availability of trainers with appropriate expertise, student recruitment, availability of financial support for both students and trainers),

And, also systems biology specific issues such as

- Issues relating to the fact that university education in biology and medicine often do not provides sufficient advanced mathematics that is needed for state-of-the-art systems biology research projects
- The fact that systems biology is a rapidly moving scientific field but with no standard textbooks

There appears to be a demand for a pan-European strategy for education and training in systems biology with recommendations relating to programme planning, development and dissemination of best practice and quality assurance.

ISBE, as a distributed research infrastructure, is in a unique position to set standards and maintain access to sustainable, high quality and state-of-art training in systems biology.

This ISBE report offers a comprehensive review of the important systems biology teaching activities in Europe. It represents the basis for further activities towards a European postgraduate core curriculum for systems biology (Deliverable 10.2) and to the establishment of a curriculum and processes for a multicentre Systems Biology/Medicine training programme (Deliverable 10.3).

2. Introduction to National Reports, including Conclusions

2.1 The role of ISBE in the development of systems biology training

The vision of ISBE is to enable Life Scientists from all sectors across Europe to tackle complex biological problems from a systems perspective. Training of scientists, at all levels, in all relevant fields of systems biology, is regarded as an essential prerequisite to implement systems biology approaches on a broad scale throughout Europe. This will require a major cultural change in training in the Life Sciences in order to develop the integrated approach required to generate the skilled work force necessary to exploit systems biology to its full potential. ISBE will therefore develop a pan-European strategy for education and training in this field with recommendations relating to interdisciplinary programme planning, course development and best practice elements.

The need for trained staff to manage and operate European research infrastructures has also been identified as a key issue for the effective running and use of these infrastructures. A strategy for training in this area is being developed in discussion with other Research Infrastructures in the Biomedical Sciences to facilitate faster adoption of best practice across RIs.

2.2 Review of current status of systems biology education

The aim of this report is to provide a review of existing training programmes and courses in systems biology, from the point of view of applicability to ISBE. This report will feed into the development of core curricula for systems biology education (Deliverable 10.2) and to the establishment of a curriculum and processes for a multicentre Systems Biology/Medicine training programme (Deliverable 10.3).

A mapping exercise was carried out to compile a list of training activities in systems biology across Europe. Initially, this task was distributed across the beneficiaries who were responsible for gathering information for the specific countries, which they were allocated. In October 2013, WP10 held a meeting at which representatives of EMTRAIN and ERASysAPP were invited and it was noted that ISBE had overlapping objectives in regard to collecting information about training in systems biology. It was therefore agreed to share the data that had been collected by the 3 activities in order to reduce duplication of effort. The most comprehensive dataset has been provided by on-course (a web portal which provides access

to biomedical postgraduate courses including short courses (CPD), Masters and PhD programmes in the EU and associated countries www.on-course.eu). On-course is supported by the Innovative Medicines Initiative via EMTRAIN.

This report includes a brief analysis of the reasons behind the different levels of training activity in individual countries (see Section 3, National Reports) and how this relates to the specific country's strategy and funding for research and training in systems biology, as well as other possible factors.

An analysis of postgraduate training in systems biology and underpinning disciplines using the on-course database http://www.on-course.eu/ suggests that, in general, training in systems biology in Europe is not as mature or as prevalent as underpinning disciplines such as bioinformatics and genomics (see Table 1 below).[1] In addition, training in systems biology tends to be focussed in areas and countries where there has been significant strategic investment in the research base in systems biology by the national governments in the past e.g. UK, Ireland, Scandinavian countries, The Netherlands, Germany, and Luxembourg (ref. WP11 report "Mapping of current European funding for systems biology of relevance for establishing ISBE").

Despite this strategic investment, there remain several obstacles to the establishment of training in systems biology across Europe. These include:

- Issues relating to the fundamental problem of interdisciplinary education within a traditional departmental organisational structure in Higher Education institutions.
- Issues relating to the promotion and development of an emerging area (e.g approval process for new degree qualifications, student recruitment, availability of trainers with appropriate expertise, availability of financial support for both students and trainers).
- The lack of a clear career path for those trained in systems biology.

Country	Systems Biology - Masters	Systems Biology PhD	Systems Biology Short Courses	Bioinformatics Masters	Genetics and Genomics- Masters
Austria	2	0	2	9	8
Belgium	23	2	2	44	76

[1] It should be noted that the data from on-course for systems biology education does not correlate absolutely with the data in the appendices which was collected by a variety of methodologies in order to get a comprehensive picture.

Bulgaria	1	0	0	1	4
Croatia	0	0	0	0	0
Czech Republic	0	0	0	1	1
Denmark	0	1	1	10	7
Estonia	0	0	0	1	2
Finland	2	0	0	7	7
France	15	7	1	78	137
Greece	0	0	0	1	1
Germany	10	15	21	29	41
Hungary	1	0	0	4	6
Iceland	0	0	0	4	2
Ireland	4	0	0	9	16
Italy	2	0	0	10	17
Latvia	0	0	0	0	0
Lithuania	1	0	0	3	9
Luxembourg	1		1	1	1
Malta	0	0	0	0	9
Netherlands	12	Via SB@NL	1	18	31
Norway	2	0	0	10	9
Poland	0	0	0	4	6
Portugal	12	0	0	28	52
Romania	0	0	0	0	0
Slovakia	1	0	0	3	4
Slovenia	2	0	0	2	5
Spain	18		1	34	73
Sweden	2	4	0	20	28
Switzerland	10	4	0	16	24
UK	104	18	10	178	428

Table 1: An analysis of post-graduate training in systems biology and the underpinning disciplines of Bioinformatics and Genetics and Genomics using the on-course database http://www.on-course.eu/

3. National Reports

Austria

Training in systems biology is provided by several Austrian Universities mainly through specialized courses and seminars in the context of more general master's programmes.

For instance, the University of Vienna has integrated several systems biology related courses in the master's curricula on Molecular Biology (Zentrum für Molekulare Biologie), Molecular Microbiology and Immunobiology (Zentrum für Molekulare Biologie), Ecology and Ecosystems (Faculty of Life Sciences) and Computational Sciences (Faculty of Physics).
The University Salzburg offers special courses on systems biology in the context of the master's programme Biology (Focus: Molecular Biology & Genetics).
The master's programme Biomedical engineering at the Vienna University of Technology has got a core element on mathematical and computational biology and also offers more specialized courses on mathematical systems biology with an emphasis on brain modelling.
At Graz University of Technology systems biology education is carried out in the context of the master's programme Biotechnology.
For more information on the courses offered at the Medical University Vienna, Danube University in Krems and Johannes Kepler University Linz we refer to the list of graduate programmes in the Appendix.

Postgraduate training

The Max F. Perutz Laboratories, Vienna and the Institute of Science and Technology Austria both offer systems biology as a thematic focus in the context of their respective international PhD programmes.

Belgium

In Belgium training in systems biology is offered by the Université Libre de Bruxelles, the University of Liège, the University of Leuven and Ghent University.
The Université Libre de Bruxelles offers a 2-years master's programme Bioinformatics and Modelling in collaboration with the Université de Pierre et Marie Curie in Paris, France with a strong emphasis on systems biology.
At the University of Liège systems biology is mainly taught in the context of the master's programme Bioinformatics and Modelling offered by the Department of Life Science and the Department of Electrical Engineering and Computer Science. In addition, special courses/seminars on systems biology are integrated in the master's programmes Biochemistry and Molecular & Cell Biology (Faculty of Science).
The University of Leuven offers special courses on systems biology within the master's programmes Biomedical Engineering (Faculty of Engineering Science), Biophysics, Biochemistry and Biotechnology (Faculty of Science and the Faculty of Medicine) and Bio-informatics (Faculty of Bioscience Engineering).
Ghent University offers systems biology education in the master's programme Biochemistry and Biotechnology (Faculty of Sciences) as well as in master's programme Biomedical

Engineering in cooperation with Vrije Universiteit Brussel (Engineering faculties of UGent und VUB)

Postgraduate training

At the Flanders Institute for Biotechnology (VIB) systems biology teaching at the postgraduate level is offered in the context of both the international PhD and the international Postdoc programme.

Bulgaria

Bulgaria does not offer any education or training regarding SB but there are some groups working in the field of SB. Bioinformatics education is established and offers a good perspective for SB education and training development.

At the University of Plovdiv Faculty of Biology bachelor's study programme of Bioinformatics is offered. University of Sofia Faculty of Mathematics and Informatics and Faculty of Biology organize MSc study programmes of Bio- and Medical Informatics and Genetics and Genomics, respectively. Bioinformatics MSc study programme is organized also at South-West University "Neofit Rilski" Faculty of Mathematics and Natural Sciences/Department of Informatics.

Croatia

In Croatia SB training is carried out at University of Rijeka, University of Zagreb and University of Split but not as a full study programme just special subjects/courses.

At the level of MSc the Department of Biotechnology, University of Rijeka offers subject Systems Biomedicine within the study programme of Biotechnology in Medicine.

The Faculty of Sciences/Department of Biology, University of Zagreb offers several SB related subjects in the programme Molecular Biology: Algorithms and Programming in Biology, Bioinformatics, Mathematical basis of Computational Biology, Computational Genomics, Machine Learning and Statistics and Structural Computational Biophysics.

At the PhD level there is a Systems Biomedicine course offered at the Department of Biotechnology at University of Rijeka. At the Faculty of Science, University of Split courses on Bioinformatics, Mathematical Modelling of Biological Systems, and Basics of Systems Biomedicine are offered within the PhD programme Biophysics.

Czech Republic

Faculty of Informatics Masaryk University, Brno, Czech Republic has several SB related subjects in different programmes and courses (e.g. Computational methods in Bioinformatics

and Systems Biology, introduction and laboratory in Systems Biology) but does not offer a bespoken SB curriculum. It is up to students to select the relevant subjects for their career.
For more information on the different courses see the listed in the Appendices.

- Bioinformatics and Systems Biology Project (IV114); Computational methods in Bioinformatics and Systems Biology (PB051)
- Computational methods in Bioinformatics and Systems Biology (PB051); Computer science applications in biology (IV121); Formal Methods in Systems Biology (PA054); Introduction to Systems Biology (PA052); Systems Biology Seminar (PB172); Laboratory of Systems Biology (PV225); Modelling and Prediction in Systems Biology (PB050); Project in Systems Biology (PA183); Systems Biology Seminar (PB172)
- Introduction to Systems Biology (PA052)
- Laboratory of Systems Biology (PV225)
- Computational methods in Bioinformatics and Systems Biology (PB051)

Denmark

The Ministry with the highest share of R&D funding is the Ministry for Science, Innovation and Higher Education (formerly the Ministry of Science, technology and Innovation). The Danish Councils for Independent Research (Det Frie Forskningsråd) is responsible for researcher-driven research. The Council for Strategic Research (Det Strategiske Forskningsråd) administers strategic research programmes in areas of political priority. It funds research projects and gives advice to applicants. The Council also contributes to increased university-industry collaboration. Whilst neither systems biology nor ISBE are specifically listed in the current Infrastructures roadmap, short-term support for national research infrastructures in Mass spectroscopic proteomics has been identified.
In Denmark, the current main research foci are on synthetics biology or biotechnology. The main initiatives in Denmark within systems biology are:

- Danish Technical University Center for Biosustainability: http://www.biosustain.dtu.dk/
- The Synthetics Biology Centre at Copenhagen University: http://synbio.ku.dk/
- DTU Centre for Systems Biology: http://www.bio.dtu.dk/
- The Novo Nordisk Foundation Center for Basic Metabolomics: http://metabol.ku.dk/about/
- The Novo Nordisk Foundation Centre for Protein Research: http://www.cpr.ku.dk/

The University of Copenhagen received about £80M funding for systems biology in 2011.

Postgraduate training

Aarhus University is offering a PhD programme 'Molecular Biology and Genetics' with large number of projects including systems biology.
(http://talent.au.dk/phd/scienceandtechnology/programmes/molecular-biology-and-genetics/).
At other universities (DTU and University of Copenhagen) postgraduate training in systems biology is carried within individual research groups.

MSc training at universities

The Technical University of Denmark (DTU) offers a 2-year master degree program (120 ECTS) in systems biology.
(http://www.dtu.dk/english/Education/msc/Programmes/systems_biology)
Independent courses in systems biology were not identified at other Universities.

Estonia

Training in systems biology on the bachelor's, master's and PhD level is provided by three universities (Tallinn University of Technology, University of Tartu and Tallinn University) in Estonia. All these centres are also involved in diverse research activities related among others to systems biology.
They offer a variety of specialized courses on systems biology in different programmes and courses (for more details see the list of master's and PhD programmes in the Appendices) but do not offer a bespoken SB curriculum yet.
Training performed by universities is part of official curriculum funded by state budget.

Finland

The direct funds for R&D in higher education institutions (HEIs) are mainly distributed by the Ministry of Education and Culture through core funding and by the Academy of Finland through research grants and funding of Centres of Excellence in Research and individual research posts

Postgraduate training

Postgraduate training is organized thorough independent research groups or Centres at the following Universities:

- **Institute for Molecular Medicine Finland** (http://www.fimm.fi) Medical Systems Biology
- **University of Helsinki** (http://research.med.helsinki.fi/sysbio//)

- **Turku Centre for Biotechnology** (http://www.btk.fi/research/affiliated-groups/laehdesmaeki-harri-computational-systems-biology/)

MSc training at universities

Aalto University is offering 2-year master degree program (120 ECTS) in Computational and Systems Biology - euSYSBIO (https://into.aalto.fi/display/enesb/Homepage). This program is organized in cooperation between KTH Royal Institute of Technology in Sweden (KTH) and Instituto Superior Tecnologico in Portugal (IST).

University of Turku is offering 1-year master program in Molecular Systems Biology starting from September 2014.
(http://www.utu.fi/en/units/sci/units/biochem/studying/mdps/msb/Pages/home.aspx)

Helsinki University is offering 2- year master program in Biomathematics. The program has strong theoretical component and is oriented towards students with the background in engineering and mathematics (http://mathstat.helsinki.fi/research/biomath/teaching.html).

Independent courses in systems biology were not identified at other Universities.

France

In France, funding for public research is split across several national research agencies, in particular the National Centre for Scientific Research (CNRS) and, more recently, the National Agency for Research (ANR). France has, traditionally, had very strong research and training activities in the disciplines which underpin systems biology such as bioinformatics, genetics and genomics. France has a number of key research centres in systems biology which are also active in postgraduate training at both the Master and PhD level. Of particular note are:

- The Centre for Research and Interdisciplinarity (CRI) which offers two postgraduate degree programmes: a masters programme (Interdisciplinary Approaches to Life Sciences, AIV Master, Paris-Descartes University, Paris-Diderot University), and a doctoral programme (Frontiers of Life, Ecole doctorale 474 Frontières du Vivant, FdV).
- The interdisciplinary graduate school for life sciences (IVIV) at the University Pierre et Marie-Curie (UPMC)
- The Masters in Genome and Organism Sciences (specialisation Systemic and Synthetic Biology) at University of Evry Val d'Essonne

Overall, there are approximately 15 Masters programmes and 7 doctoral programmes in France which include elements of systems biology training.

Germany

Past developments and current state

Already before the rise of systems biology as a recognized discipline, a number of German universities have designed successful curricula that bring together comprehensive training in biology and the quantitative sciences, especially physics and mathematics (e.g., the biophysics curricula at Humboldt University Berlin and the Technical University of Kaiserslautern, which started as 5-year *Diplom* courses in the late 1970s and early 2000s, respectively, and continue to date, as well as the Molecular Biotechnology degree at the University of Heidelberg). Beginning in the late 1990, nationwide funding initiatives by the DFG and the Federal Ministry for Education and Research (BMBF) established bioinformatics curricula at universities at a large scale. The majority of these degree courses offer interdisciplinary training within uniform Bachelor and MSc curricula, rather than providing add-on specializations for traditional biology, physics or computer science courses. Today, several of these courses have essentially evolved into modern systems biology curricula (e.g., the biophysics MSc course at Humboldt University Berlin) or incorporated substantial systems biology parts. Although nationwide figures are not available, graduates from these interdisciplinary courses appear to be in strong demand both by industry and academia.

In 2006, the BMBF funding initiative FORSYS – Research Units for Systems Biology – catalysed the introduction of dedicated systems biology modules at the four centres that have been selected for funding, Heidelberg, Freiburg, Magdeburg and Potsdam. At around the same time, large-scale funding for systems biology at national research centres through the Helmholtz Alliance of Systems Biology provided a further stimulus. Today nearly 20 major universities offer substantial systems biology courses, primarily at MSc level but also for Bachelor students. However, only about a quarter of these have 'systems biology' in the name of the degree. The systems biology components are primarily integrated in courses in the traditional life sciences, bioengineering as well as in interdisciplinary bioinformatics and biophysics curricula. Physics curricula, where a substantial share of systems biology PhD students are educated, are conspicuously absent from this list. A notable exception is the systems biology PhD program at the Technical University Dresden, which is based in both biology and physics faculties and involves the two local Max Planck Institutes for Cell Biology and Genetics and for Physics of Complex Systems.

In summary, the currently available systems biology courses at Bachelor, MSc and PhD levels in Germany offer ample opportunities for students who want to enter this field (for details see the Tables on BA/MSc and PhD programs in systems biology, respectively). Congruent with the particular strengths of the universities and research centres involved, a broad range of

biological fields is covered, including systems medicine (e.g., Heidelberg, Freiburg, Munich), developmental biology (e.g., Dresden), stem cell biology (e.g., Dresden, Heidelberg), plant biology (e.g., Potsdam), biophysics (e.g., Berlin) and bioengineering (e.g., Magdeburg, Stuttgart and Heidelberg) – to name some prominent examples.

Challenges

Currently, many of the specialized systems biology programs are offered at the MSc level and primarily address biology bachelors. These programs typically do not target physicists, who make up a substantial share of PhD students and researchers in systems biology and still need to get their biology training 'on the job.' This is an unsatisfactory situation that reflects in part the strong positions of the individual science faculties at German universities. As happening in systems biology research, the traditional faculty boundaries might need to become more permeable in training, too, and interfaculty degree courses are an attractive option.

The recruitment for most systems biology MSc courses is international and the language of instruction is English. However, there is no established grant system at this level in Germany that could support gifted applicants from abroad who cannot fully cover living expenses.

Systems biology as a field of research is still moving rapidly and well-developed textbooks that can shape teaching curricula are still rare. Therefore, there is a need to continuously review and develop the curricula.

Greece

There are only lectures about genomics, metabolomics and high throughput genetics and bioinformatics in the context of postgraduate courses at different universities in Greece (University of Athens, Faculty of Biology; University of Patras, Faculty of Biology; University of Crete, Faculty of Biology) entitled Graduate Programme in Biology/ Bioinformatics, Graduate Programme in Biology/ Genes to Genome, Metabolomics, Bioinformatics and Graduate Programme in Biology/ Bioinformatics.

Hungary

Hungary does not offer any education or training regarding SB but there are some groups working in the field of SB. Bioinformatics education is established and offers a good perspective for SB education and training development.

Iceland

In Iceland systems biology is carried by **University of Iceland** and its newly established Center for Systems Biology. The Center focuses on human metabolism and in addition, the Center will

establish an industrial biotechnology focused program (University of Iceland (https://systemsbiology.hi.is/).
Systems biology training is delivered via several independent courses (e.g. Introduction to systems biology, Systems biology II, Convex optimization).
Since 2007 the Center has organized a number of Short summer courses on systems biology (https://systemsbiology.hi.is/Courses).

Ireland

There are a number of government departments and agencies in Ireland that provide funding for research usually on the basis of competitive bidding. The main funding agencies are Science Foundation Ireland (SFI), Health Research Board, Higher Education Authority, Teagasc and Irish Research Council. SFI, established in 2000, is the national foundation for investment in scientific and engineering research and is the largest funder of research in Ireland.
In 2009, SFI funded Systems Biology Ireland under their Centre for Science, Engineering and Technology (CSET) programme. Systems Biology Ireland (SBI) is led by University College Dublin and is supported by researchers in NUI Galway. The centre received €14.8 million from SFI and a further combined contribution of almost €4.7 million by Industry partners. The initial funding period was 5 years; however, further funding leveraged from national and international public sources in addition to private entities has ensured continuation of research, training and education activity beyond this period.

Postgraduate training

Postgraduate training is organised through independent research groups or Centres at the following Universities: National University of Ireland, Galway (NUIG), National University of Ireland, Maynooth (NUIM), Royal College of Surgeons in Ireland (RCSI), Trinity College Dublin (TCD), University College Cork (UCC), University College Dublin (UCD) and University of Limerick (UL).
Training and education at the postgraduate level is organized through structured PhD programmes, topic specific seminar series, workshops, training courses, tutorials, summer schools and symposia.

PhD programmes:

Bioinformatics and Systems Biology (UCD): four year structured programme including core advanced taught module in systems biology (5 ECTS); funding through SFI CSET programme.

Biomedical Engineering and Regenerative Medicine (NUIG, UCC, UL): four year structured programme including core module Introduction to Biomedical Systems: Genomic Technologies (5 ECTS).
Computational and Infection Biology (UCD): Wellcome Trust-funded four year structured programme with advanced taught modules including systems biology option (5 ECTS).

Simulation Science (UCD): Four year structured PhD programme with advanced taught modules including systems biology option (5 ECTS).

MSc training:
Bioinformatics and Computational Biology (UCC): one-year taught masters course with different streams for biology, mathematics, statistics and computer science graduates including specific systems biology modules.

Regenerative Medicine (NUIG Regenerative Medicine Institute (REMEDI)): one-year taught masters course including optional module (5 ECTS) Introduction to Biomedical Systems.

Postgraduate summer schools and symposia:
Network Mathematics (NUIM/TCD): on-going initiative for postgraduate students looking to improve their mathematical fundamentals for work in systems biology, amongst other disciplines, funded under the fifth cycle of the national Programme for Research in Third-Level Institutions (PRTLI5) and consisting of one to two week intensive 5 ECTS modules.

Quantitative immunology and stochastic modelling (NUIG): summer school in 2014 as part of Marie Curie ITN QUANTI.

UCD Computational Biology & Innovation PhD Symposium: annual student-organised symposium now in its fourth year

Further postgraduate training (MSc and PhD) is provided by the RCSI Centre for Systems Medicine.

Italy

In Italy SB training is carried out at the University of Milan (UM), the University of Turin (UT) and the University of Florence as special individual subjects for Master and Bachelor students.

At the level of PhD Systems Medicine study programmes are offered at UM and UT. (see appendix)
At the level of PhD systems biology education there are two study programmes in Italy. One is organized at University of Milan (in collaboration with the University of Naples) entitled PhD School in System Medicine and the other at University of Turin; Doctoral School in Complex Systems in Medicine and Life. The duration of both is 3 years.
University of Milan (UM) and University of Turin (UT) offer also courses at the level of Masters; MSc Systems Biology (6 ECTS) at the Department of Biosciences (UM), MSc Systems Biology (6 ECTS) at the Department of Life Sciences and Systems Biology (UT) and MSc Bioinformatics (6 ECTS; the course program list also "Models for the analysis of metabolic pathways") at department of Informatics (UT).
At the bachelors level University of Florence, Department of Biology, Study Programme Biotechnology, offers a subject B017246 – Biotechnology application of Systems Biology (6 ECTS).

Latvia

Latvia does not offer any education or training regarding SB but there are some groups working in the field of SB. Bioinformatics education is established and offers a good perspective for SB education and training development.

Lithuania

Lithuanian Universities offer a few special courses on systems biology relevant topics in the context of their general master's programmes.
The Vytautas Magnus University offers special courses on systems biology in the context of the master's programme Molecular Biology and Biotechnology.
The Faculty of Fundamental Sciences of Vilnius Gediminas Technical University (VGTU) offers studies in bioengineering and mathematical modelling, although as non-related modules. Special courses on systems biology / functional genomics are offered for master of nanobiotechnology and bioengineering at VGTU and for master in biochemistry and molecular biology at Vilnius University. The University of Vilnius also offers a general master's programme on Computer Modelling.

Luxembourg

Systems Biomedicine is a strategic core focus of the country of Luxembourg and the University of Luxembourg. Major investments were and are further undertaken to develop leading

institutions for performing research and training in this area. We are collaborating with worldwide leading institutions. A strategic alliance with the Institute for Systems Biology (ISB), Seattle, USA, is of special significance. In order to attract the best scientists, our philosophy is one of „curiosity driven research“. The *LUXEMBOURG* CENTRE FOR SYSTEMS BIOMEDICINE (LCSB) is a centre stone in the ‘Luxembourg Health Science Plan', which is providing 140 Mio. Euro to transform the country of Luxembourg into a research and technology hub within Europe and beyond.

At the University of Luxembourg a consecutive education in biology and systems biology is offered. It starts with the 3 year Bachelor programme (180 ECTS) in Life Sciences where already a strong focus is put on Biostatistics and Bioinformatics. In this trilingual Bachelor programme teaching is given in French, German and English. Then a 2 year Master programme (120 ECTS) in Integrated Systems Biology (taught in English) is offered which combines theoretical and practical education in systems biology of at least 1,450 hours of practical work in computer labs and wet labs within the university’s Life Sciences Research Unit (LSRU) and Luxembourg Centre for Systems Biomedicine (LCSB) or in partner institutions. Then students can enter the Doctoral School in Systems and Molecular Biomedicine to complete their systems biology training when performing their PhD research work. This is a 3-year programme comprising additional 20 ECTS of course work (teaching/working language is English). For details see http://basv.uni.lu, http://misb.uni.lu, and http://bio.uni.lu/doctoral_school

The education in biology/ medicine and systems biology and systems biomedicine is organized by the LCSB within the University of Luxembourg. Teaching is mainly offered by staff from the LSRU and the LCSB, plus selected external experts. Combining molecular, cellular and computational approaches, research at the LSRU focuses on the fundamental understanding of biological processes relevant to human diseases to make use of it for biomedical applications, mainly on disease relevant signalling networks in cancer and inflammation. An increase of the offered training possibilities is foreseen within the development of our young university.

The training for Bachelor and Master students is highly subsidized. A bi-annual fee of only 200 Euro applies. All PhD students are employed at the University or other research institutes and receive a competitive full salary. The Doctoral School offers additional funding for covering research stays abroad and for additional training measures.

Malta

Malta does not offer any education or training regarding SB but there are some groups working in the field of SB. Bioinformatics education is established and offers a good perspective for SB education and training development.

The Netherlands

To understand the training and education in systems biology in the Netherlands it is essential to have insight into the SB research landscape. Two major investments in systems biology have been made by the Dutch research council NWO. In addition, several systems biology initiatives have been started.

a) The Netherlands Consortium for Systems Biology (NCSB) National research programme aiming at the implementation of systems biology in the red, green and white life sciences. In total 36 selected research groups at all Dutch universities obtained funding to implement and boost systems biology approaches in ongoing research lines. Investment: 18 M€ (2008 – 2013). See http://www.ncsb.nl/ for detailed information.

b) Three systems biology centres obtained start-up funding. These are housed by the University of Groningen, the Radboud University (Nijmegen) and the Netherlands Cancer Institute (NKI) in Amsterdam. Investment 13 M€ (2010 – 2015).

c) At six other Dutch universities with a (life) sciences faculty systems biology institutes/research groups have been formed based on internal funding mechanisms.

d) The nine systems biology institutes/research groups in the Netherlands join forces in a single national systems biology community named SB@NL. See http://www.ncsb.nl/sbnl and http://www.ncsb.nl/sbnl/partners for detailed information. The SB@NL platform obtained a 90 k€ start-up grant via the medical research council ZonMW.

Postgraduate training

The NCSB programme has developed as a community activity a postgraduate systems biology training programme. Now that the NCSB programme has ended (December 2013), the Netherlands' systems biology platform SB@NL will continue these activities. In the near future training activities may be integrated with bioinformatics training activities in a National Graduate Training/Research School. Key components of the systems biology training are web courses, international workshops and training courses, tutorials on specific systems biology-related topics, and the liaison with the Manchester Doctoral Training Centre on Systems Biology:

MSc training at universities

The University of Amsterdam and the VU University in Amsterdam together offer a two-years master programme 'Bioinformatics and Systems Biology'. Most other universities integrate systems biology courses in their regular life sciences master programmes.

Norway

The Research Council of Norway runs the FRIPRO scheme for responsive funding of researcher-initiated basic research projects. The scheme is funded by appropriations from the Ministry of Research and Education. The main strategic "Large-scale" programmes relate to the government's priorities. The seven areas include BIOTEK2021 - Biotechnology for Innovation. About 80% of public funds for R&D in HEIs are channelled directly from the Ministry of Education and Research to the institutions, almost all of which is institutional funding.

January 1st 2012 RCN started the new BIOTEK programme (BIOTEK2021): This will run for 10 years with an expected annual funding of close to €20M. The BIOTEK2021 programme is still at an early phase, and has not yet a dedicated and committed strategy to support systems biology in Norway and elsewhere. However, the programme already takes part in several ERA-net calls, including ERA-SynBio and ERA-IB, where systems biology is a vital component.

Postgraduate training

Postgraduate training is organized thorough independent research groups or Centres at the following Universities: Norwegian University of Science and Technology and Norwegian University of Life Sciences, The Research School for Systems Biology (RS-SysBio) (http://rs-sysbio.umb.no/).

Training and education at the postgraduate level is organized through topic specific seminar series, workshops, training courses and tutorials.

MSc training at universities

Systems biology training is delivered via several independent courses offered by Norwegian University of Science and Technology (http://www.ntnu.edu/biotechnology/systembio):

List of Independent courses

MTEK3001 Anvendt bioinformatikk og systembiologi (Intro to bioinformatics and systems biology)

KP8130 Systembiologi, modellering og analyse (Systems biology, modeling and analaysis)

TBT4165 Systems biology and biological networks
BI8010 Systems Biology: Examples from Current Literature
BI3019 Systems Biology: Resources, standards and tools
BT8118 Systems biology modelling of cellular metabolism
BT3800 EiT: Skreddersydd biologi - potensial, begrensninger og utfordringer for menneskeheten (Tailored biology - potential, constraints and challenges for humanity)

Poland

SB study programmes are established in Poland at University of Warsaw (UW) and West Pomeranian University of Technology Szczecin. Faculty of Mathematics, Informatics, and Mechanics UW offers bachelor's degree in Inter-faculty Studies of Bioinformatics and Systems Biology and MSc study programme of Bioinformatics and Systems Biology.
Faculty of Biotechnology and Animal Husbandry, Faculty of Computer Science and Information Technology at West Pomeranian University of Technology Szczecin offers a bachelor's engineering degree in the field of bioinformatics with specialisations - Systems Biology and Information methods/Information Systems in Biology.
The case of doctoral studies is more complex. Terms such as systems biology or bioinformatics are not areas that you can get scientific degree in Poland, even though such studies are performed and then you get a degree from Biology/Biotechnology or Informatics.

Portugal

Systems biology education is established at several universities in Portugal.
The University of Lisbon has recently started a Ph.D. program with a focus on systems biology: BioSys-PhD (http://biofig.fc.ul.pt/training-phd-programme). Another teaching program with focus on systems biology is the Erasmus Mundus Master Course "Systems Biology" in which the University of Lisbon participates.
The Portuguese Foundation for Science and Technology (FCT) is currently the sole funding source for systems biology studies. The only funded PhD programme at national level is BioSys (44 PhD fellowships over an 8-yr period).

BioFIG PhD programme - Biological Systems, Functional & Integrative Genomics (BioSys), University of Lisbon

The PhD Programme BioSys – Biological Systems, Functional & Integrative Genomics is hosted by BioFIG - Center for Biodiversity, Functional & Integrative Genomics at the Faculty of Sciences of the University of Lisboa (Portugal). This centre will be integrated in the new BioISI

- Biosystems & Integrative Sciences Institute after Jan 2015. A major theme of BioISI research for 2015-2020 period is systems biology: using approaches to understand the complexity of certain processes of living systems by analysing the components of systems, their structural and functional interactions and the emerging properties thereof.

Erasmus Mundus Master Course - Systems Biology, *euSYSBIO*, University of Lisbon

Instituto Superior Tecnico (IST), Universidade de Lisboa, is one of the 3 European Universities involved in the teaching of the Erasmus Mundus Master's Programme in SYSTEMS BIOLOGY – euSYSBIO (http://www.kth.se/en/studies/master/em/eusysbio). euSYSBIO is delivered by a consortium of three Schools of the CLUSTER, the Royal Institute of Technology in Sweden (KTH), Instituto Superior Técnico in Portugal (IST) and Aalto University in Finland, (more recently also with the collaboration of Tsinghua University in China). It is a two-year Master's programme including compulsory mobility for the students, offering education of high international standard as well as the opportunity to experience a multicultural education by carrying out studies in two different European universities in two different countries. The programme includes an annual Winter School held at IST. The euSYSBIO programme ends with a master thesis, jointly supervised by the universities where the student was affiliated in the first and the second year. At the end of the programme, students will get a euSYSBIO Degree Supplement and a double degree from two Institutions. From IST, students will get a Biotechnology Master´s degree. The coordinator of euSYSBIO at IST is Isabel Sá Correia.

In other programs System Biology curricula are integrated as whole teaching units in Master and PhD programs in the field of Molecular Biosciences, Biotechnology and Bioinformatics. Furthermore, there are teaching programs which cover some systems biology topics. For more detailed information see the list of master's and PhD programmes in the Appendix.

Additional to the research groups at the universities there are non-university research institutes e.g. Gulbenkian Institute of Science in Lisbon, INESC-ID Lisbon (Instituto de Engenharia de Sistemas e computadores), Institute of Mechanical Engineering Lisbon, Center for Biological and Chemical Engineering (Institute of Biotechnology and Bioengineering) Lisbon, Biocant Center, Cantahede, that conduct research in systems biology and offer training positions (PhD and Postdoc) in systems biology.

The advanced training activity in Portugal is increasing as a result of expansion of national and international networking with other research centres and institutions, small boost of national funding for PhD training programmes and raise of international recognition. There are training activities being performed all over the country and interest of the Portuguese scientific community to become involved in the field of systems biology.

Romania

There is only one study programme of SB in Romania, MSc Systems Biology (Biologie sistemica) at University of Bucharest Faculty of Biology and a Doctoral School in Complex Systems in Medicine and Life Sciences.

Slovakia

Slovakia does not offer any education or training regarding SB but there are some groups working in the field of SB. Bioinformatics education is established and offers a good perspective for SB education and training development.

Slovenia

The major research funding body in Slovenia is Slovenian Research Agency (SRA) who funds projects, including project for doctoral students (young researchers). The teaching activities are funded by the Ministry of Education, Science and Sports in Slovenia. SB is not an independent research field in Slovenia and is thus not directly supported by the Slovenian Research Agency (SRA). We have an interdisciplinary research field where systems biology fits in, but competes with other interdisciplinary sciences from a variety of areas, including humanities and arts. Generally speaking, in depth of money and strong lobbies in some traditional basic sciences (i. e. physics, classical protein biochemistry) we struggle for financial support of prospective (and internationally established) interdisciplinary sciences, such as systems biology and systems medicine.

The most comprehensive formal SB education is established at the level of MSc training. Biotechnical faculty, University of Ljubljana offers Biotechnology (Systemic Biotechnology) Masters programme with biology subjects as well as computational and SB subjects.

There are two SB elective subjects at University of Ljubljana. Biotechnical faculty offers systems biology elective subject at the MSc level and a PhD elective subject Feedback Control in Biological Systems which is an interdisciplinary study programme of Biotechnical Faculty, Faculty of Electrical Engineering, Faculty of Mechanical Engineering and Faculty of Computer and Information Science.

Faculty of Medicine, University of Ljubljana, offers subjects relevant for systems biology and systems medicine. This is achieved by introducing subjects of choice in the medical curricula. Students enrolled in masters of Medicine or Dental medicine can since 2013/2014 choose from the subjects (3 ECTS each):

- Mathematical problems and principles in biochemistry (year 1 or 2)
- Modelling in biochemistry (year 2)

- Computational simulations of dynamic processes in biochemistry (year 2 or 3)
- Functional Genomics in Medicine (year 4, 5 or 6) (topics include hands-on transcriptome experimentation, hands-on computation of high-throughput data, databases and data mining; introduction to modelling of metabolic networks).

Research projects, that can include systems biology or systems medicine, are evaluated by 6 ECTS.

Other faculties of University of Ljubljana contain relevant topics. Faculty of Chemistry and Chemical technology at University of Ljubljana offers Functional Genomics that includes hand-on bioinformatics and mathematical modelling. Faculties of Electrical Engineering and Computer and information sciences teach several systems biology relevant topics. Applied mathematics is a subject at faculty of Mathematics and Physics.

The master's curricula at University of Primorska contain bioinformatics, introduction to bioinformatics and bioinformatical practicum.

Research training in systems biology is performed within doctoral studies. However, the students can enrol only in PhD programmes of Biostatistics, Biomedicine or Life Sciences that contain some systems biology relevant topics. They do thus not complete with a PhD in systems biology even if their PhD, research work and publications fall into this category. Slovenia is a small (only 2 Million inhabitants) with not sufficient foreign students included into education programmes. This is one of the reasons for slower protrusion of novel education programmes. In the year 2014/2015 a new module of Systems medicine (10 ECTS) will start at doctoral studies of Biomedicine at University of Ljubljana that will focus on systems biology application in medicine.

Spain

Systems biology courses are taught at several universities in Spain: Pompeu Fabra University (Barcelona), University of Barcelona, Complutense University of Madrid, Autonomous University of Madrid, University of Malaga, University of Murcia, University of Girona, University of Lleida, University of Jaén and University of the Basque Country.

The systems biology courses are integrated as optional or compulsory subjects in Bachelor and Master courses in Biology, Molecular Biology and Biochemistry, Bioinformatics, Biotechnology and Biophysics. Additional there are Bachelor and Master courses that teach systems biology concepts in the course of bioinformatics and genomics subjects. For more detailed information see the list of master's courses in the appendix.

At the doctoral and postdoctoral level several research groups at the University of Málaga, Autonomous University of Madrid, University of Lleida, University of Jaén, University of Vic, Complutense University of Madrid offer research possibilities in systems biology.

In addition to the research groups at the universities there are non-university research institutes, e.g. Spanish National Institute of Bioinformatics, Center for Genomic Regulation, Barcelona, Spanish National Biotechnology Center – CNB-CSIC, Institute for research in biomedicine (IRB) Barcelona, Barcelona Supercomputing Center, that conduct research in systems biology and offer training positions (PhD and Postdoc) in systems biology.

The Spanish National Biotechnology Center (CNB) is launching a new program in systems biology in order to promote this new discipline and its Biotechnological applications. The program is also planned to act as a core unit of a broader systems biology initiative at the Spanish National Research Council (CSIC)-(INB node).

A Spanish systems biology network was launched in 2007 (Red Española de Biología de Sistemas, REBS) coordinated by Manuel Canóvas, University of Murcia. REBS is elaborating a central curriculum for systems biology and has set first plans to implement an interuniversity Master programme for systems biology. During the first National School for Systems Biology in Murcia, 2009, a proposal for the organization of the master programme was elaborated. The proposal includes three study modules: Basics and tools for Systems Biology, Systems Biology in Biomedicine and Systems Biology in Bioprocessing. Due to the lack of a financial plan for the maintenance of REBS the realization of this Master is still unclear. REBS plans to continue its work and to further develop the systems biology infrastructure and education in Spain.

National Research Plan funding is available for present systems biology research and education. The Spanish Ministry supports system biology courses integrated in educational programs listed in the appendix. But no program exists, that specifically supports systems biology research or training.

Sweden

Swedish Research Council (VR) supports basic research in all fields of science. Government support for research and innovation continues to increase and is expected to be SEK 4 billion, by 2016.

Stockholm Science for Life Facility was coordinating Swedish high-throughput data collection in collaboration with four universities, including a bioinformatics node. The budget was expected to eventually grow to €500m, from €200k in the planning phase.

In Gothenburg, University of Gothenburg and Chalmers University of Technology formed a joint platform – Gothenburg Centre for System Biology.

Postgraduate training

Postgraduate training is organized thorough independent research groups or Centres at the following Universities: University of Gothenburg, Chalmers University of Technology, Royal Institute of Technology, Uppsala University, Karolinska Institute.
Training and education at the postgraduate level is organized through topic specific seminar series, workshops, training courses and tutorials.
List of available courses:

- Industrial Perspectives on Systems Biology and Bioinformatics (CTH/GU)
- Future challenges in yeast genetics and systems biology (GU)
- Statistics for genome science (GU)

University of Gothenburg organizes International course on yeast systems biology (24 PhD students, two full weeks of theory and experimental work (http://www.icysb.se/). At Chalmers University International Advanced Course on Metabolic Engineering and Systems Biology has been organized in 2008 and 2013 (http://www.sysbio.se/MEcourse/).

MSc training at universities

University of Gothenburg started in 2012 a 2-year master program (120ECTS) in Genomics and Systems Biology. (http://www.utbildning.gu.se/education/courses-and-programmes/program_detail/?programid=N2GSY)

The Royal Institute of Technology (KTH) together with Instituto Superior Tecnico (IST), Portugal and Aalto University School of Science, Finland offers The Erasmus Mundus master's programme in Systems Biology (euSYSBIO). It is a two-year Master's programme including compulsory mobility for the students. Students enter at KTH or Aalto University and continue in the second year at one of the other two institutions (http://www.kth.se/en/studies/master/em/eusysbio).
Independent courses related to systems biology are organized at Chalmers University of Technology (CTH): KMG060 Systems Biology, MMG510 Mathematical Modeling and KKR063 Metabolic Engineering: design of microbial metabolism and at Umeå University Computational and systems biology, at Uppsala University Computational and systems biology I and II.

Switzerland

Systems biology education and training in Switzerland is decentralized. Universities and Graduate Schools (e.g. Life Science Switzerland) offer SB education on Master- and PhD-Level. The offers vary from specialized SB Programs to education in bioinformatics with a

specialization in systems biology. Furthermore, Master Programs in Interdisciplinary Life Sciences (e.g. http://www.unil.ch/ecoledebiologie/page95512_en.html) intend to train flexible interdisciplinary scientists that understand to integrate bioinformatics with biology. At the undergraduate level Universities increasingly integrate SB (e.g. http://www.biol.ethz.ch/documents/Broschuere_2013.pdf) in the basic curricula as it is recognized that biologists of the future need to have an understanding of biological systems, bioinformatics and modelling.

The SIB - in close collaboration with universities - offers multiple training possibilities with a special focus on bioinformatics: (http://www.isb-sib.ch/)

SystemsX.ch, the Swiss Initiative in Systems Biology, aims to promote the education of the next generation of systems biologists. Curricula education in SB (undergraduate and graduate level) is the responsibility of universities and graduate schools and thus funded by them.

Special courses in SB are supported by SystemsX.ch in different ways:

- Partners can apply for financial support of courses relevant for SB (http://www.systemsx.ch/events-education/events/events-supported-by-systemsxch/) .
- Summer schools on SB topics (e.g. http://www.systemsx.ch/events-education/events/educational-events/summer-school/, www.sysbio2014.org/) are organized/supported by SystemsX.ch
- SystemsX.ch offers communication platform (http://www.systemsx.ch/events-education/events/, http://www.systemsx.ch/news/news/) for course providers
- From case to case travel grants are awarded.
- Furthermore, each year SystemsX.ch organizes and funds a Student Retreat (for students working in SystemsX.ch funded projects) that tackles questions relevant for systems biologists, but not SB training itself (e.g. interdisciplinary cooperation): http://www.systemsx.ch/events-education/events/educational-events/systemsxch-retreat/.
- The All SystemsX.ch Day (http://www.systemsx.ch/events-education/events/all-systemsxch-day/) as well as the 2nd International SystemsX.ch Conference on Systems Biology intend to give not only scientific input, but also to provide a platform for researchers to meet and exchange knowledge.

United Kingdom

In the UK, the BBSRC (Biotechnology and Biological Sciences Research Council) is recognised as one of the funders most advanced in its approach to funding systems biology. Most of the other major funders of research in the life sciences (Research Councils and major charities

such as CRUK and the Wellcome Trust) have not identified systems biology, *per se*, as a strategic priority for funding and their support for this area is provided via "responsive mode" funding.

In 2005/2006 the BBSRC established six centres in integrative and systems biology (at Newcastle, Imperial College London, Manchester, Edinburgh and Nottingham) at a total cost of €58M. This was followed in 2006/7 by six further awards (totalling €31M, joint with EPSRC) under the Systems Approach to Biological Research (SABR) Initiative. The latter awards included funding for a total of 20 PhD studentships. In 2007 BBSRC (joint with EPSRC) established three Doctoral Training Centres in systems biology at Manchester, Oxford and Warwick. In 2010 the BBSRC provided 3-years support for six Masters programmes in systems biology (at Aberdeen, Bristol, Cambridge, Glasgow, Imperial College London and Warwick).

In the BBSRC Strategic Plan for 2010-2015, expanding training provision in mathematical, computational, and systems biology for bioscience researchers was identified as a key priority. In the updated BBSRC Strategic Plan (2014/14), systems approaches to the life sciences have been identified as priority area under the enabling theme of Exploiting New Ways of Working (ENWW). The BBSRC no longer has specific calls for training in its priority areas and in 2012 they implemented a programme of Doctoral Training Partnerships (DTPs) which provided support for 220 studentships, of which 172 (78%) fell under the enabling theme of ENWW.

The review of current training and education in the UK indicates that the majority of training programmes in systems biology established with support, or associated with support, from the BBSRC have continued and a growing number of programmes have also been established elsewhere in the UK.

Bachelor's and Master's Degree Programs Systems Biology

Austria

	Institution	Study Course		Course language	Involved Departments	Thematic Focus	Contact
1	University of Vienna	Molecular Biology	Master	German, English	Zentrum für Molekulare Biologie	General: module group **Bioinformatics** (elective) Specific: **Bioinformatics** **Basic principles in Systems Biology** **Current Topics in Computational and Systems Biology** Modelling Ecological Systems Practical Course in Modelling of Ecological Systems **Colloquium - Center for Organismal Systems Biology**	Program director: Ass.-Prof.Dr. Barbara Hamilton, Department für Biochemie, barbara.hamilton@univie.ac.at Vice Program director: Ao.Univ.-Prof.Dr. Angela Witte, Department für Mikrobiologie und Immunbiologie, angela.witte@univie.ac.at
2	University of Vienna	Molecular Microbiology and Immunobiology	Master	German, English	Zentrum für Molekulare Biologie	General: Elective subjects in Advanced Microbiology/Immunobiology and in Biology or Chemistry in general Specific: **Current Topics in Computational and Systems Biology** **Proteomics** Modelling Ecological Systems Practical Course in Modelling of Ecological Systems	Program director: Ass.-Prof.Dr. Barbara Hamilton, Department für Biochemie, barbara.hamilton@univie.ac.at Vice Program director: Ao.Univ.-Prof.Dr. Angela Witte, Department für Mikrobiologie und Immunbiologie, angela.witte@univie.ac.at
3	University of Vienna	Ecology and Ecosystems	Master	English	Faculty of Life Sciences, Faculty Center of Ecology	General: Module group Techniques in Biogeochemistry and ecosystems research; **individual specialization Systems Biology** Specific: **Techniques in Systems Biology** Modelling Ecological Systems Practical course **Basic principles in Systems Biology** **Colloquium - Center for Organismal Systems Biology**	ao.Univ.-Prof.Dr. Harald Krenn, Department für Integrative Zoologie, harald.krenn@univie.ac.at
4	University of Vienna	Ökologie	Master	German	Faculty of Life Sciences, Faculty Center of Ecology	General: Molecular and chemical methods in ecology Specific: **Current Topics in Computational and Systems Biology** **Techniques in Systems Biology** Modelling Ecological Systems Practical course **Basic principles in Systems Biology** **Colloquium - Center for Organismal Systems Biology**	ao.Univ.-Prof.Dr. Harald Krenn, Department für Integrative Zoologie, harald.krenn@univie.ac.at

5	University of Vienna	Computational Science	Master	German, English	Faculty of Physics	General: Computational concepts in Science, Informatics, Mathematics Specific: Focus Biology: **Computational concepts in Biology**, Theoretical Biology (Functional Genomics, **Biological networks**, Organisms and Ecosystems, **Genetics and Metabolomics**, **Systems Biology of human diseases**, dynamical modelling of organism development, environmental modelling), **Bioinformatics**, **Genomics**	Ao.Univ.-Prof.Dr. Helmut Rumpf, Gravitational Physics group, helmut.rumpf@univie.ac.at
6	Vienna University of Technology	Biomedical Engineering	Master	English	Faculty of Physics	General: Core areas: Biomaterials & Biomechanics, Biomedical Instrumentation & Signals, **Mathematical & Computaional Biology**, Medical Physics & Imaging Specific: **Mathematical Systems Biology**, **Bioinformatics**, computer simulations in Biology, data management, brain modelling, stochastic Mathematics	Prof. Dr. Dieter Pahr, Institute for Lightweight Design and Structural Biomechanics, dieter.pahr@tuwien.ac.at
7	University of Veterinary Medicine Vienna	Biomedicine and Biotechnology	Master	English		General: **Bioinformatics**, Molecular Biology, **Biomathematics**, Biomedicine and **Biotechnology**, Immunobiology Specific: **Proteomics, Metabolomics**, Gene regulation, Molecular Bioanalytics	zulassung@vetmeduni.ac.at
8	Medical University of Vienna	Medical Informatics	Master	German, English	CEMSIIS - Center for Medical Statistics, Informatics, and Intelligent Systems	General: **Bioinformatics**, Neuroinformatics, Clinical Informatics, Public Health Informatics, Interdisciplinary Informatics Specific: Statistics, Systems- and Imageanlysis, Intelligent Dataanalysis (machine learning, neural computation), simulations	ao. Univ.-Prof. Dr. Harald Trost, Medical Statistics and Informatics, harald.trost@meduniwien.ac.at
9	Danube University Krems	Computational Life Sciences	Master	English	Faculty of Health and Medicine	General: Fundamentals of Molecular Biology / Disease Pathophysiology, Computer Science / **Computational Biology** Specific: applied translational clinical research aspects: human disease profiling, human disease data landscapes and statistics, **large data bioinformatics, computational models of human diseases**	Pogram management: Dr. Martin Brandl, Department for Health Sciences and Biomedicine, martin.brandl@donau-uni.ac.at Organizational assistant: Sabine Siebenhandl, sabine.siebenhandl@donau-uni.ac.at
10	Johannes Kepler University Linz	Bioinformatics	Master	English	Institut of Bioinformatics	General: Informatics, Statistics, Mathematics, Biology, Genetics and Biochemistry Specific: Sequence Analysis and Phylogenetics, **Theoretical Bioinformatics** and Machine Learning, **Structural Bioinformatics and Gene Analysis**, Information Systems, Mathematical methods for Bioinformatics	Prof. Dr. Sepp Hochreiter, Institute of Bioinformatics, hochreit@bioinf.jku.at

11	University of Graz Graz University of Technology	Biotechnology	Master	German, English	Institute of Molecular Biotechnology (University of Technology)	General: **Molecular Biotechnology including Bioinformatics** Specific: **Systems and Synthetic Biotechnology**: Molecular Biology & Cell Engineering, Metabolic Engineering, Synthetic Biotechnology, **Computational Biotechnology, Systems Biology, Computational Systems Biotechnology**	Prof.Dr. Helmut Schwab, Institute of Molecular Biotechnology, helmut.schwab@tugraz.at
12	University of Salzburg	Biology with specialization in Molecular Biology & Genetics	Master	German	Faculty of Molecular Biology	General: **Bioinformatics**, Immunology & Allergology, Tumor Biology, Biochemistry Specific (Bioinformatics): Genetics & Epigenetics, **Advanced Bioinformatics, Systems Biology**, Integrative Structural Biology, Bioanalytics & Structural Biology, Protein Crystallography	Teaching in Systems Biology: Prof.Dr. Christian Huber, Christian Doppler Laboratory for Biosimilar Characterization, c.huber@sbg.ac.at
Belgium							
1	Université Libre de Bruxelles (ULB)	Bioinformatics and Modelling	Master	English	collaboration with the Université de Pierre et Marie Curie in Paris, France	General: computational analysis, **modeling and simulation of biological systems** ranging from the molecular and cellular level until the level of organisms and populations Specific: **Genomics, Proteomics** and Evolution, Biophysics and structural Bioinformatics and **modelling of dynamic processes in Biology**	Prof. Marianne Rooman, Genomic and Structural Bioinformatics group, mrooman@ulb.ac.be Didier Ginze, Laboratory for Genome and Network Bioinformatics, dgonze@ulb.ac.be
2	University of Liège	Bioinformatics and Modelling	Master	English	Department of Life Sciences Department of Electrical Engineering and Computer Science	General: **Bioinformatics and modelling of biological systems** Specific: **Proteomics, Genomics**, Programming, Mathematics, Structural Biology, **Systemic Biology, Modelling of Macroscopic Systems**	Prof. Bernard Joris, Center for Protein Engineering, bjoris@ulg.ac.be Prof. Louis Wehenkel, Systems and Modelling Research Unit, l.wehenkel@ulg.ac.be
3	University of Liège	Biochemistry and Molecular & Cell Biology	Master	English, French	Faculty of Science	General: Biochemistry, Genetics, Physiology / Development, Microbiology / Immunology Specific: **Professional focus Bioinformatics and Modelling**	info.etudes@ulg.ac.be
4	University of Leuven	Biomedical Engineering	Master	English	Faculty of Engineering Science	General: Bioinstrumentation, Biomaterials, Medical Imaging, Mathematical modelling, **Bioinformatics** and Biomechanics Specific: **Bioinformatics, Modelling of Biological Systems**	Prof. Renaud Ronsse, Center for Research in Energy and Mechatronics, renaud.ronsse@uclouvain.be Prof. Piotr Sobieski, Institute of Information and Communication Technologies, Electronics and Applied Mathematics, piotr.sobieski@uclouvain.be

5	University of Leuven	Biophysics, Biochemistry and Biotechnology	Master	English	Faculty of Science Faculty of Medicine collaboration with the Departments of Physics and Astronomy, Chemistry, Biology, the Medical Imaging Centre, and the Physiology Research Group	General: Interaction and communication between living cells and their molecular constituents, molecular and cellular biology, biochemistry and physics Specific: **Physical Chemistry of Biological Systems**, **Transport Processes in Biological Systems**, **Biomolecular modelling**, Advanced Fluorescence and Fluorescence Microscopy: From Single Molecules to Biological Systems	Prof. Enrico Carlon, Institute for Theoretical Physics, enrico.carlon@fys.kuleuven.be
6	University of Leuven	Bioinformatics	Master	English	Faculty of Bioscience Engineering	General: **Bioinformatics**, including Statistics, Molecular Biology and Computer Science Specific: **Bioinformatics module**, **Omics Techniques and Data Analysis, Management of Large-Scale Omics Data**, Bayesian Modeling for Biological Data Analysis, Evolutionary and Quantitative Genetics, **Comparative and Regulatory Genomics** **Biology module:** Molecular Interactions: Theories and Methods, Bio-Molecular Model Building, Model Organisms	International.MSc.Programme@biw.kuleuven.be
7	Ghent University	Biochemistry and Biotechnology	Master	English, Dutch	Faculty of Sciences	General: Structure and Function of Biological Macromolecules, **Bioinformatics**, Biostatistics, **Biotechnology, Systems Biology** Specific: Major **Bioinformatics and Systems Biology**: Programming for **Bioinformatics**, **Comparative Genomics**, Structural Bioinformatics, Bioinformatics Algorithms, **Computational Biology and Modelling of Biological Systems**, Data Mining, Databases for Bioinformatics	Contact person Systems Biology: Ass.Prof. Steven Maere, Plant Systems Biology department, steven.maere@psb.vib-ugent.be
8	Ghent University (UGent) Vrije Universiteit Brussel (VUB)	Biomedical Engineering	Master	English	Engineering faculties of Ugent und VUB	General: Biomedical Engineering integrates Mathematics, Physics, Chemistry and health sciences with engineering techniques Specific: **Quantitative Cell Biology, Modelling of Physiological Systems, From Genome to Organism**, Biomechanics, Bioelectronics, **Bioinformatics**	Prof. Patrick Segers, Department of Electronics and Information Systems, patrick.segers@ugent.be
Bulgaria							
Croatia							
1	University of Zagreb	Molecular Biology	Master	Croatian	Faculty of Sciences / Department of Biology	Subjects: **Algorithms and Programming in Biology**, Bioinformatics, **Computational Genomics**, Machine Learning and Statistics, Structural Computational Biophysics	uredbo@biol.pmf.hr

Czech Republic							
1	Masaryk University Brno	Bioinformatics	Master/Bachelor		Faculty of Informatics	Subjects: Bioinformatics and Systems Biology Project, **Computational methods in Bioinformatics and Systems Biology**, Computer science applications in Biology, Formal methods in Systems Biology, **Introduction to Systems Biology**, Systems Biology Seminar, Laboratory of Systems Biology, **Modelling and Prediction in Systems Biology**, Project in Systems Biology	sybila systems biology laboratory, sybila@fi.muni.cz
Denmark							
1	Technical University of Denmark	Bioinformatics and Systems Biology	Master	English	Department of Systems Biology	General: Systems Biology Specific: Computational Biology, Bioinformatics, Molecular / Cell Biology, Genomics	Egon Bech Hansen, info@bio.dtu.dk
	Technical University of Denmark	Biotechnology	Master	English	Department of Systems Biology	Study lines: Biofuels and Biochemicals, Biomedical Microbiology, Microbial Cell Factories Specific: Systems Biology, Systems Mycology, Bioinformatics	
Estonia							
1	Tallinn University of Technology	Systems Biology at the level of Doctoral studies	Master			**Overview of history of Systems Biology.** General methods of **–omics studies, data analysis and modelling**. Best practices in the implementation of System Biology approaches in medical etc. practice.	
2	Tallinn University	Systems Biology II (at the level of Master's studies)	Master		The course is mainly intended for students in Biology and Molecular Biochemistry and Ecology.	**Overview of history of Systems Biology. Trends of modern Systems Biology**. **Methods of Systems Biology**. How integrated data at molecular, cellular, individual and other levels can help the understanding of biological processes. How mapping of interaction between different components can help the understanding of entire network. Introduction to **Genomics, Transcriptomics, Proteomics and Metabolomics.** Overview of main mathematic and statistical approaches used in Systems Biology, introduction to the modelling.	Anu Aaspõllu, Tallinn University, Centre for Biology of Integrated Systems, anu.aaspollu@ttu.ee
3	Tallinn University	Systems Biology (at the level of Bachelor's studies)	Bachelor		The course is mainly intended for students in Biology and Molecular Biochemistry and Ecology.	**Overview of history of Systems Biology. Trends of modern Systems Biology**. **Methods of Systems Biology**. How integrated data at molecular, cellular, individual and other levels can help the understanding of biological processes. How mapping of interaction between different components can help the understanding of entire network. Introduction to **Genomics, Transcriptomics, Proteomics and Metabolomics.** Overview of main mathematic and statistical approaches used in Systems Biology, introduction to the modelling.	Anu Aaspõllu, Tallinn University, Centre for Biology of Integrated Systems, anu.aaspollu@ttu.ee

Finland							
1	Aalto University	euSYSBIO - Computational and Systems Biology	Master	English 2 years	cooperating universities: KTH Royal Institute of Technology Sweden Instituto Superior Tecnologico Portugal	General: **basics on computational Systems Biology and courses in experimental techniques in Systems Biology** Courses at IST Lisbon (2nd year) Artificial Intelligence and Decision Systems, Functional and Comparative Genomics, Entrepreneurship in Bioengineering, Cell and Tissue Engineering, Algorithms for Discrete Structures, Neuroimaging, Medicinal Chemistry, Nanotechnology, Optimization and Algorithms, Machine Learning, Molecular and Cellular Microbiology, Molecular Biotechnology	mundus-eusysbio@kth.se
2	University of Turku	Molecular Systems Biology	Master	English 1 year	Department of Biochemistry at University of Turku Turku Centre for Biotechnology	General: Molecular Biology with specific focus on Systems Biology Specific: current theories and state-of-the-art technologies in Systems Biology, including Transcriptomics, Proteomics and Bioinformatics	Coordinator: Minna Lintala, Molecular Plant Biology , systemsbiology@utu.fi http://www.utu.fi/en/units/sci/units/biochem/studying/mdps/msb/Pages/home.aspx
3	Helsinki University	Biomathematics	Master	English 2 years	Faculty of Science, Department of Mathematics and Statistics	General: The program has strong theoretical component and is oriented towards students with the background in engineering and mathematics Specific: modelling and the analysis of biological processes, with particular emphasis on ecology and evolution	Prof. Mats Gyllenberg, mats.gyllenberg at helsinki.fi http://mathstat.helsinki.fi/research/biomath/teaching.html
France							
1	University of Evry-Val-d'Essonne	Genome and Organisms Sciences	Master, year 1	English 1 year		General: Biology, Analysis tools and Bioinformatics, Biomolecular analysis and specialisation Specific: **Quantitative genetics**, Data mining, Databases, Advanced algorithms, **Computer modelling**	Javier PEREA, Philippe MANIVET, Juan PELTA respmasterbio@univ-evry.fr
2	University of Evry-Val-d'Essonne	Systems and Synthetic Biology	Master, year 2	English 1 year	Institute of Systems and Synthetic Biology	General: experimental Biology, modelling and designing Specific: Integrative Biology, Data integration and Bioengineering, **Mathematics applied to Systems Biology**, Formal language for modeling and simulation in integrative Biology, **Dynamic models of biological regulatory networks, Molecular modeling and design, Synthetic Biology**	Ioana Popescu, associate professor, University of Evry-Val-d'Essonne, ioana.popescu@issb.genopole.fr Dominique Zeliszewski, scientific communication, CNRS, dominique.zeliszewski@issb.genopole.fr Jean-Loup Faulon, professor, University of Evry-Val-d'Essonne, jean-loup.faulon@issb.genopole.fr
3	University Paris Descartes University Paris Diderot	AIV Master Interdisciplinary Approaches to Life Science	Master	English 2 years	Center for Research and Interdisciplinarity	General: **Systems Biology** Specific: **Synthetic Biology**, Dynamic of living systems, **Quantitative Biology, Computational Biology, Systems Biology** Statistics, Science and Medicine	Director of studies: Pascal Hersen, Materials and Complex Systems Laboratory, University Paris VII, phersen@gmail.com

4	Université Pierre & Marie Curie	From Molecular Developmental Biology to Biomedicine, Evolution and Systems Biology	Master	English 2 years	University of Lisbon University of Maastricht University of Pompeu Fabra, Barcelona	General: Developmental Biology, **Systems Biology** and Development Specific: integrated data analysis and modeling to build, validate and elucidate complex biological systems in developmental biology	Claire Fournier-Thibault, Claire.Fournier@snv.jussieu.fr
5	University Paul Sabatier Toulouse III	Bioinformatics and Systems Biology	Master	French 1 year (second)	CNRS-Laboratoire de Microbiologie et Genetique	General: Specialisation in **Systems Biology**	
6	University Paul Sabatier Toulouse III	Microbiology, Agrobiosciences, Systems Biology	Master	French 1 year (second)	Faculty of Science and Engineering	Specialization: Bioinformatics and **Systems Biology**	Brigitte Bechu, brigitte.bechu@univ-tlse3.fr
7	Paris Descartes University	Biomedical Engineering, specialisation Systemic and Synthetic Biology, information and interaction	Master	English 2 years	Paris Institute of Technology	General: Integrative Biology Specific: **Systems Biology, Synthetic Biology**, interface between the web sciences (Information and Communication Technologies, CT) track and medicine, health, and life sciences	A. Lindner, Université Paris Descartes, S2I2@bme-paris.org
8	Denis Diderot University	Biology Informatics	Master	french 2 years		General: Bioinformatics, Molecular Biology, from genome to transcriptome via the proteome, Structural Biology, Genomics Specific: **Integrative Systems Bioinformatics: Systems Biology**, Proteomics, Modeling	Catherine Etchebest: catherine.etchebest@univ-paris-diderot.fr
9	University Pierre et Marie Curie	Molecular and Cellular Biology, specialisation Bioinformatics and Modeling	Master	french, english 2 years	coordinated by Information Technology Department Departments of Mathematics, Life sciences and Medicine	General: integrated training course in Biology, combining combinatorial and statistical algorithms for Bioinformatics and **Mathematical Modeling**, Genomics, **Quantitative Biology**	Alessandra Carbone, master.info.bim@upmc.fr
10	University Pierre et Marie Curie	Bioinformatics, Biomathematics & Computer Modeling	Master	2 years	Université Libre Brussels	General: Mathematics, Informatics, Bioinformatics, Modeling for Life Sciences Specific: **Modeling of complex biological systems**, Genomics and Comparative Genomics, Phylogenetics, Population Genetics, Biological Population Dynamics, Structural Bioinformatics	Alessandra Carbone,alessandra.carbone@upmc.fr
11	University Claude Bernard Lyon École Normale Supérieure de Lyon' (ENS Lyon)	Biosciences	Master	French, English 2 years	Biology Department	General: Biology Optional courses: Bioinformatics, Complex systems and Developmental Biology, Epigenetics, Metabolomics, Functional Lipidomics	master.biosciences@ens-lyon.fr
12	University Nice, Sophia Antipolis	Biology, Informatics and Mathematics	Master	French, English	School of Engineering	General: Bioinformatics, Modeling Specific: **Computational Biology** and Biomedicine, **Complex Biological Systems**	Professeur Francine Diener, francine.diener@unice.fr

Germany

1	Technical University of Munich	Bioinformatics	Bachelor	German, partially English	Technical University of Munich: Informatics, Mathematics, Life Sciences; Ludwig Maximilian University of Munich: Informatics, Mathematics, Biology and Chemistry	General: Informatics, Mathematics, Bioinformatics, Biology and Chemistry	Prof. Dr. Ralf Zimmer, Counseling Bioinformatics, Department of Informatics, +49-89/2180-4052, ralf.zimmer@bio.ifi.lmu.de; Prof. Dr. Volker Heun, Academic Counseling, Departmen of Informatics, +49-89/2180-4341, Volker.Heun@ifi.lmu.de
2	University of Erlangen-Nuremberg	Integrated Life Sciences	Bachelor	German	Faculty of Natural Sciences with the Departments of Biology, Mathematics and Physics	General: Biomathematics, Biophysics, Molecular Biology Specific: Bioinformatics, Systems Biology, Computational Biology	Prof. Dr. Christian Koch, Department of Biochemistry, Faculty of Natural Sciences, +49-9131/8528257, ckoch@biologie.uni-erlangen.de
3	University of Frankfurt (am Main)	Bioinformatics/ Focus Systems Biology	Bachelor	German	Biosciences, Informatics & Mathematics, Medical Science, Chemistry	General: Systems Biology, Sequence Analysis, Structural Analysis and Neurobioinformatics Specific: Network Analysis, Petri Nets und Imaging Analysis	Prof. Dr. Ina Koch, Institute of Informatics, +49-69/798-24652, ina.koch@bioinformatik.uni-frankfurt.de; Dr. Jörg Ackermann, Academic Counseling for Bioinformatics, Institute of Informatics, +49-69/798-28241, J.Ackermann@bioinformatik.uni-frankfurt.de
4	University of Magdeburg	Biosystems Engineering (module Theoretical Systems Biology)	Bachelor	German	Faculty of Process and Systems Engineering, Faculty of Electrical and Information Engineering, Faculty of Natural Sciences, Faculty of Medicine	General: Natural Sciences, Engineering and Systems Science, Biosciences und Systems Biology Specific: Bioprocess Engineering, Medical Science, Theoretical Systems Biology	Prof. Dr.-Ing. Udo Reichl, Academic Counseling, Faculty of Process and Systems Engineering, Institute of Process Engineering, +49-391/67-58401, udo.reichl@ovgu.de; Dr. Dirk Benndorf, Academic Couseling, Department of Bioprocess Engineering, +49-391/67-52160, benndorf@mpi-magdeburg.mpg.de
5	University of Tübingen	Bioinformatics	Bachelor	German	Faculty of Mathematics and Natural Sciences: Informatics, Biology, Chemistry/Biochemistry, Pharmacy	General: Bioinformatics, Genomics, Proteomics, Transcriptomics Specific: Systems Biology	Prof. Dr. Oliver Kohlbacher, Course Director Bioinformatics, Center for Bioinformatics, oliver.kohlbacher@uni-tuebingen.de, Hotline +49-7071/29-78981
6	University of Heidelberg	Molecular Biotechnology	Bachelor	German and English	Institute of Pharmacy and Molecular Biotechnology, Faculty of Chemistry, Faculty for Physics, German Cancer Research Center, Center for Molecular Biology and Center for Biochemistry of University of Heidelberg	General: Biology, Chemistry, Mathematics and Physics, Molecular and Cell Biology, Pharmacology, Biochemistry, Bioinformatics, Process Engineering Specific: Bioinformatics, Biophysical Chemistry, Drug Research, Biomedical Research (including Genomics and Proteomics), Genetic Engineering, Drug Design, Diagnostics, Biomedicine	Dr. Holger Schäfer, Academic Counseling, Institute of Pharmacy and Molecular Biotechnology, Department of Biology, +49-6221/54-4865, o73@ix.urz.uni-heidelberg.de; Dr. Dorothea Kaufmann, Course Coordinator, Institute of Pharmacy and Molecular Biotechnology, +49-6221/54-5670, StudienkoordinationIPMB@uni-heidelberg.de;
7	University of Freiburg	Biology (obligatory modules Bioinformatics and Systems Biology)	Bachelor	German	Faculty of Biology, Faculty of Chemistry, Faculty of Mathematics and Physics	Subject of Study Bioinformatics and Systems Biology is integrated into the Study Course Biology (Bachelor) by obligatory modules in Biology, Informatics, Systems Biology and Mathematical Methods	Prof. Dr. Rolf Backofen, Academic Counseling for Bioinformatics and Systems Biology, Department of Computer Science, +49-761/203-7461, backofen@informatik.uni-freiburg.de; Prof. Dr. Wolfgang R. Hess, Academic Counseling for Bioinformatics, Institute of Biology III, +49-761/203-2796, wolfgang.hess@biologie.uni-freiburg.de
8	University of Stuttgart	Technical Biology (Module Systems Biology)	Bachelor	German	Institutes of Biology, Physics, Chemistry and Biochemistry, Center of Bioprocess Engineering, Center for Systems Biology	General: Biochemistry, Bioinformatics and Biostatistics, Chemistry, Physics Specific: Systems Biology, Molecular Biology, Process Engineering, Biotechnology	Apl. Prof. Dr. Christina Wege, Academic Counseling, Institute of Biology, +49-711/685-655073, christina.wege@bio.uni-stuttgart.de; Dr. Gisela Fritz, Course Manager, Institute of Biology, +49-711/685-65089, gisela.fritz@bio.uni-stuttgart.de
9	Humbold Universität Berlin	Biophysics	Master	German	Faculty of Mathematics and Natural Sciences	General: Experimental Biophysics, Theoretical Biophysics Specific: Molecular Biophysics, Systems Biology, Modelling of biological Systems	Dr. Peter Müller, Academic Counseling for Biophysics, +49-30/2093-8691, peter.mueller.3@rz.hu-berlin.de
10	Technical University of Dortmund	Chemical Biology	Master	German	Faculty of Chemistry and Chemical Biology	General: Chemical Biology, Systems Biology, Chemical Medicine	Dr. Beate Heinz, Academic Counseling for Chemistry and Chemical Biology, +49-231/755-3720, beate.heinz@tu-dortmund.de

11	Dresden University of Technology	Molecular Bioengineering	Master	English	Mathematics and Natural Sciences, Electrical Engineering, Mechanical Engineering, Medicine	General: Biomedicine, Technology Specific: Proteomics, Genomics und Stem Cells, Nanotechnology	Dr. Anne Chesneau, Administrative Coordinator of the master programs at the Biotechnology Center of TU Dresden, +49-351/463-40033, anne.chesneau@biotec.tu-dresden.de
12	University of Rostock	Computational Engineering, Computer Sciences and Medical Biotechnology (Specialization in Systems Biology and Bioinformatics)	Master	English	Department of Systems Biology and Bioinformatics	General: Introduction to Biology, Computer based network simulation, Cellular processes and biochemical reaction networks, Simulation, System-theoretical analyses, Dynamic motives of biological networks, Model-Databases, Markup languages and Standardisation, Spatiotemporal and stochastic Modelling	Prof. Dr. Olaf Wolkenhauer, Department of Systems Biology and Bioinformatics, +49-381/498-7570, olaf.wolkenhauer@uni-rostock.de
13	Hamburg University of Technology	Bioprocess Engineering (Courses in Systems Biology and Synthetic Biology)	Master	German, partially English	Process Engineering	General: Application of Systems Biology and Synthetic Biology in industrial Biotechnology, Biosystems Technology	Prof. Dr. An-Ping Zeng, Head of Institue and Scientific Coordinator of the master program Bioprocess Engineering, Institute of Bioprocess and Biosystems Engineering, +49-40/42878-4183, AZE@tuhh.de
14	Technical University of Munich	Bioinformatics	Master	German, partially English	Technical University of Munich: Informatics, Mathematics, Life Sciences; Ludwig Maximilian University of Munich: Informatics, Mathematics, Biology and Chemistry	General: Bioinformatics, Algorithmic Bioinformatics, Systems Biology Specific: Algorithms in Bioinformatics, Structural Bioinformatics, Genome-based Bioinformatics, Systems Biological Models	Prof. Dr. Volker Heun, Academic Counseling, Departmen of Informatics, +49-89/2180-4341, Volker.Heun@ifi.lmu.de; Prof. Dr. Ralf Zimmer, Counseling Bioinformatics, Department of Informatics, +49-89/2180-4052, ralf.zimmer@bio.ifi.lmu.de
15	Bielefeld University	Genome-based Systems Biology (GBSB)	Master	German	Faculty of Biology, Technical Faculty	General: Genome Research, Omics-Methods and Bioinformatics, Microorganisms, *A. thaliana* and Animal Cell Culture Specific: Informatics in relation to omics-data, Industrial Biotechnology, iGEM-Competition	Prof. Dr. Karsten Niehaus, Scientifc Coordinator of the master program GBSB, Faculty for Biology, +49-521/106-5631, GBSB@CeBiTec.Uni-Bielefeld.DE
16	Saarland University	Biotechnology	Master	German and English	Faculty of Natural Sciences and Technology III und I; Faculty of Medicine	General: Systems Biotechnololgy, Natural Products and Drug Discovery, Molecular Biotechnology Specific: Bioinformatics, Biocatalysis, Metabolic Engineering	Prof. Dr. Elmar Heinzle, Chair of Biochemical Engineering and Course Adviser, Faculty of Natural Sciences and Technology III, Department of Chemistry, +49-681/302-2905, e.heinzle@mx.uni-saarland.de,
17	University of Erlangen-Nuremberg	Integrated Life Sciences	Master	German	Faculty of Natural Sciences with the Departments of Biology, Mathematics and Physics	General: Biomathematics, Biophysics, Molecular Biology Specific: Mathematical Modelling and Systems Biology, Bioimaging and Biophysics, Biological Structures and Processes	Prof. Dr. Christian Koch, Department of Biochemistry, Faculty of Natural Sciences, +49-9131/8528257, ckoch@biologie.uni-erlangen.de
18	University of Frankfurt (am Main)	Bioinformatics/Focus Systems Biology	Master	German, partially English	Biosciences, Informatics & Mathematics, Medical Science, Chemistry	General: Systems Biology, Sequence Analysis, Molecular Modeling, Structural Analysis and Computational Neurobiology Specific: Network Analysis, Petri Nets und Imaging Analysis	Prof. Dr. Ina Koch, Institute of Informatics, +49-69/798-24652, ina.koch@bioinformatik.uni-frankfurt.de; Dr. Jörg Ackermann, Academic Counseling for Bioinformatics, Institute of Informatics, +49-69/798-28241, J.Ackermann@bioinformatik.uni-frankfurt.de
19	University of Freiburg	Bioinformatics and Systems Biology	Master	German and English	Faculty of Biology, Technical Faculty, Faculty of Mathematics and Physics	General: Bioinformatics, Systems Biology Specific: RNA Bioinformatics and Systems Biology, Modelling, Signalling	Prof. Dr. Rolf Backofen, Academic Counseling for Bioinformatics and Systems Biology, Department of Computer Science, +49-761/203-7461, backofen@informatik.uni-freiburg.de; Prof. Dr. Wolfgang R. Hess, Academic Counseling for Bioinformatics, Institute of Biology III, +49-761/203-2796, wolfgang.hess@biologie.uni-freiburg.de

20	University of Giessen	Bioinformatics and Systems Biology	Master	German	University Giessen: Departments 07, 08, 09, 10 and 11; University of Applied Sciences Mittelhessen: Departement 06	General: Development of innovative Algorithms in the Bioinformatics, Genomics, Transcriptomics, Proteomics and Metagenomics, Molecular Systems Biology, Modelling of complex biological processes and systems Specific: Analysis of High-throughput data	Prof. Dr. Thomas Wilke, Department of Animal Ecology and Systematics, +49-641/99-35720, m.wilke@allzool.bio.uni-giessen.de; Dr. Kai Maaß, Coordinator of the Master program, Faculty of Biology and Chemistry, +49-641/99-34170, Kai.Maass@dekanat.fb08.uni-giessen.de
21	University of Heidelberg	Molecular Biotechnology	Master	German and English	Institute of Pharmacy and Molecular Biotechnology, Faculty of Chemistry, Faculty for Physics, German Cancer Research Center, Center for Molecular Biology and Center for Biochemistry of University of Heidelberg	General: Bioinformatics, Biophysical Chemistry, Drug Research Specific: Hands-on training in research labs	Dr. Holger Schäfer, Academic Counseling, Institute of Pharmacy and Molecular Biotechnology, Department of Biology, +49-6221/54-4865, o73@ix.urz.uni-heidelberg.de; Dr. Dorothea Kaufmann, Administrative Course Coordinator, Institute of Pharmacy and Molecular Biotechnology, +49-6221/54-5670, StudienkoordinationIPMB@uni-heidelberg.de;
22	University of Heidelberg	Molecular Biosciences (Major Systems Biology)	Master	English	Faculty of Biosciences, Faculty of Chemistry, Faculty of Mathematics	General: Bioinformatics, Computational Analysis, Network Reconstruction, Dynamic Pathway Analysis Specific: Quantitative Experimentation, Modelling and Simulation, Live-Cell Imaging and Image processing	Prof. Dr. Ursula Kummer, Scientific Course Coordinator, Faculty of Biosciences, +49-6221/54-51278, ursula.kummer@bioquant.uni-heidelberg.de; Prof. Dr. Ursula Klingmüller, German Cancer Research Center, Department Systems Biology of Signal Transduction, +49-6221/424481, u.klingmueller@dkfz.de, Dr. Andrea Wolk, Administrative Coordinator, +49-6221/54-5640, stud-dek-bio@urz.uni-heidelberg.de
23	University of Magdeburg	Biosystems Engineering	Master	German	Faculty of Process and Systems Engineering, Faculty of Electrical and Information Engineering, Faculty of Natural Sciences, Faculty of Medicine	General: Natural Sciences, Engineering and Systems Science, Biosciences und Systems Biology, Specific: Bioprocess Engineering, Medical Science, Theoretical Systems Biology	Prof. Dr.-Ing. Udo Reichl, Academic Counseling, Faculty of Process and Systems Engineering, Institute of Process Engineering, +49-391/67-58401, udo.reichl@ovgu.de
24	University of Tübingen	Bioinformatics	Master	German, partially English	Faculty of Mathematics and Natural Sciences: Informatics, Biology, Chemistry/Biochemistry, Pharmacy	General: Bioinformatics, Genomics, Proteomics, Transcriptomics Specific: Systems Biology	Prof. Dr. Oliver Kohlbacher, Course Director Bioinformatics, Center for Bioinformatics, oliver.kohlbacher@uni-tuebingen.de, Hotline +49-7071/29-78981
25	University of Potsdam	Bioinformatics	Master	German	Faculty of Mathematics and Natural Sciences	Bioinformatics, Theoretical Systems Biology, Bioinformatics in the Nutritional Sciences	Prof. Dr. Joachim Selbig, Course Director, Institute of Biochemistry and Biology, +49-331/977-2433, jselbig@uni-potsdam.de; Dr. Detlef Groth, Academic Counceling for Bioinformatics, +49-331/977-2706, dgroth@uni-potsdam.de
26	University of Stuttgart	Technical Biology (Module Systems Biology)	Master	German	Institutes of Biology, Physics, Chemistry and Biochemistry, Center for Bioprocess Engineering, Center for Systems Biology	General: Bioinformatics, Technical Biology, Quantitative Analysis of biochemical data, Molecular Biology Specific: Biological Systems, Biomaterials and Nanobiotechnology, Pharmaceutical and Industrial Biotechnology	Apl. Prof. Dr. Christina Wege, Academic Counseling, Institute of Biology, +49-711/685-655073, christina.wege@bio.uni-stuttgart.de; Dr. Gisela Fritz, Course Manager, Institute of Biology, +49-711/685-65089, gisela.fritz@bio.uni-stuttgart.de
27	University of Hamburg	Bioinformatics	Master	German, partially English	Faculty of Mathematics, Informatics and Natural Sciences, Faculty of Medicine	General: Informatics, Applied Bioinformatics,Structural Analysis Specific: Genome Informatics, Structural Bioinformatics, Chemical Informatics, Drug Development	Prof. Dr. Stefan Kurtz, Course Director, Center for Bioinformatics, +49-40/42838-7311, kurtz@zbh.uni-hamburg.de; Dagmar Schacht, Course Coordinator and Academic Counseling for Bioinformatics, +49-40/42883-2219, dagmar.schacht@informatik.uni-hamburg.de
27	University of Jena	Bioinformatics	Bachelor/Master	German, English	Faculty of Informatics	General: Informatics, Mathematics, Biology Specific: Systems Biology module	Dr. Habil. Peter Dittrich, Institute of Computer Science, peter.dittrich@uni-jena.de
Greece							

Hungary							
Iceland							
1	University of Iceland	Bioinformatics Bioengineering	Bachelor/Master	English	School of Engineering and Natural Sciences Center for Systems Biology	Introduction to Systems Biology, Systems Biology II, Convex optimization	https://systemsbiology.hi.is/
Ireland							
1	University College Cork	Bioinformatics and Computational Biology	Master	English 1 year	College: Science, Engineering and Food Science	General: different streams for biology, mathematics, statistics and computer science graduates Specific: Systems Biology modules, Mathematical modelling for Biology, databases	Dr. Marcus Claesson, m.claesson@ucc.ie
2	National University of Ireland, Galway	Regenerative Medicine	Master	1 year	Regenerative Medicine Institute	General: scientific principles of stem cells, gene therapy, biomaterials, tissue engineering, immunology, and pharmacology optional module (5 ECTS): **Introduction to Biomedical Systems**	Dr. Linda Howard, graduatehealth@nuigalway.ie www.remedi.ie/training/taught-msc-regenerative-medicine http://ncbes.nuigalway.ie/msc-regenerativemedicine.aspx
Italy							
1	University of Milan	Biological Sciences Biotechnology	Master/Bachelor	Italian	Department of Biosciences	Systems Biology (6 ECTS), Computational Biology, Quantitative Biology	Prof. Marina Lotti, marina.lotti@unimib.it
2	University of Turin		Master		Department of Life Sciences and Systems Biology Department of Informatics	Systems Biology (6 ECTS), Bioinformatics (6 ECTS) Models for the analysis of metabolic pathways	amn.dbios@unito.it
3	University of Florence	Study Programme Biotechnology	Bachelor		Department of Biology	Subject: Biotechnology application of Systems Biology (6 ECTS)	
Lithuania							
1	Vilnius Gediminas Technical University	Nanobiotechnology	Master		Faculty of Fundamental Sciences	Courses of Systems Biology / Functional Genomics	Juozas Kulys, Juozas.Kulys@vgtu.lt
2	Vilnius University	Biochemistry and Molecular Biology	Master		Department of Biochemistry and Molecular Biology	Courses of Systems Biology / Functional Genomics	bmbk@gf.vu.lt
Luxembourg							
1	University of Luxembourg	Integrated Systems Biology	Master	English 2 years	Life Sciences Research Unit (LSRU) Luxembourg Centre for Systems Biomedicine (LCSB)	The programme combines theoretical and practical education in Systems Biology of at least 1,450 hours of practical work in computer labs and wet labs within the university's Life Sciences Research Unit (LSRU) and Luxembourg Centre for Systems Biomedicine (LCSB) or in partner institutions.	http://misb.uni.lu

2	University of Luxembourg	Life Sciences	Bachelor	French, German, English 3 years		strong focus on Biostatistics and Bioinformatics, Systems Biology training	http://basv.uni.lu
Malta							
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Netherlands							
1	University of Amsterdam / VU University Amsterdam	Bioinformatics and Systems Biology	Master	English 2 years	VU University Amsterdam: Faculty of Sciences	General: basic introduction to Biomathematics, Biostatistics and Programming Specific: Bioinformatics or **Systems Biology (Modeling techniques, Experimental verification of models, Relevance of Systems Biology to cancer research, Synthetic biology)**	Prof. Jaap Heringa , J.Heringa@few.vu.nl
Norway							
1	Norwegian University of Science and Technology	independent courses	Master/Bachelor			Intro to Bioinformatics and Systems Biology, Systems Biology and biological networks, Systems Biology: Examples from current literature, Systems Biology: Resources, standards and tools, Systems Biology modelling of cellular metabolism, Tailored biology - potential, constraints and challenges for humanity	Lisbeth Aune, lisbeth.aune@ntnu.no
Poland							
1	University of Warsaw	Bioinformatics and Systems Biology	Master	Polish 2 years	Faculty of Mathematics, Informatics, and Mechanics	Knowledge Systems, Comparative Genomics, Genome-scale technologies, Modelling of complex biological systems, Statistical data analysis	Marcin Engel, M.Engel@mimuw.edu.pl
2	University of Warsaw	Bioinformatics and Systems Biology	Bachelor	Polish 3 years	Faculty of Mathematics, Informatics, and Mechanics	Bioinformatics, Databases and Net Services, Biological coordinate systems, **Molecular modelling and Computational Biology, Systems Biology**	Marcin Engel, M.Engel@mimuw.edu.pl
3	West Pomeranian University of Technology	Bioinformatics	Bachelor engineering degree	Polish	Faculty of Biotechnology and Animal Husbandry, Faculty of Computer Science and Information Technology	Specializations Systems Biology and Information methods/Information Systems in Biology	dziekanat.biot@zut.edu.pl
Portugal							
1	University of Lisbon	Erasmus Mundus Masters Course on Systems Biology	Master	English	Instituto Superior Técnico (IST) Partner Universities: KTH Royal Institute of Technology, Sweden Aalto University, Finland	General: **basics on Computational Systems Biology and courses in experimental techniques in Systems Biology** Courses at IST Lisbon (2nd year) Artificial Intelligence and Decision Systems, Functional and Comparative Genomics, Entrepreneurship in Bioengineering, Cell and Tissue Engineering, Algorithms for Discrete Structures, Neuroimaging, Medicinal Chemistry, Nanotechnology, Optimization and Algorithms, Machine Learning, Molecular and Cellular Microbiology, Molecular Biotechnology	mundus-eusysbio@kth.se

2	MIT Portugal	Bioengineering Systems	Master	English	University of Coimbra: Faculty of Science and Technology Centre for Neuroscience and Cell Biology Technical University of Lisbon: Instituto Superior Técnico New University of Lisbon: Faculty of Science and Technology Institute of Chemical and Biological Technology University of Minho: School of Engineering	Mandatory: Introduction to Technological Innovation; Bioprocess Engineering; Cell & Tissue Engineering; **Computational Biosystems Science & Engineering** Elective: Biomedical Devices and Technologies; Nanobiotechnology and Biomaterials; **Neuroscience: Molecular to Systems Neurobiology and Brain Diseases**; Principles and Practice of Drug Development	Dr. José Silva Lopes, New University of Lisbon, Department of Chemistry, jasl@fct.unl.pt Dr. Isabel Rocha, University of Minho, Center of Biological Engineering, Biosystems group, irocha@deb.uminho.pt
3	University of Lisbon	Integrated Master Degree in Biological Engineering	Master	Portuguese, English	Instituto Superior Técnico (IST)	General: cross-disciplinary and updated academic training in Biology, Mathematics, Physics, Chemistry and Engineering Sciences Specific: multi- and cross-disciplinary training in diverse fields inlcuding Environment and Energy, **Medical Bioengineering**, Food Engineering, Industrial Management, Nanobiotechnology, **Bioinformatics, Systems Biology** and Tissue and Cell Culture Engineering	Ârsenio Fialho, Department of Bioengineering: Biological Sciences; afialho@ist.utl.pt
4	University of Lisbon	Integrated Master Degree in Biomedical Engineering	Master	Portuguese, English	Instituto Superior Técnico (IST)	General: Biology and Medicine; Engineering; Physics and Chemistry; Mathematics and Computation Specific: **Integrative Systems and Metabolic Regulation; Systems Physiology; Computational Biology;** Signals and Systems in Bioengineering; Medical Imaging; **Functional and Comparative Genomics; Mathematical Models in Biomedicine**; Health Informatics; Information Systems and Databases; Signal Processing in Bioengineering	Joao Pedro Estrela Conde, Department of Bioengineering: Biomaterials, Nanotechnology and Regenerative Medicine; joao.conde@tecnico.ulisboa.pt Patrícia Figueiredo, Department of Bioengineering: Biomedical Systems and Biosignals, patricia.figueiredo@tecnico.ulisboa.pt
5	University of Lisbon	Biotechnology	Master	Portuguese, English	Instituto Superior Técnico (IST)	General: **Functional Genomics and Bioinformatics**; Molecular and Cellular Microbiology; Cell and Tissue Engineering; Separation and Purification of Biological Products; Environmental Technology Specific: **Computational Biology**; Structural Biology; Chemometrics; Therapeutical Chemistry; Biofuels; Biological Reactors; Entrepreneurship	Isabel Sá-Correia, Department of Bioengineering, isacorreia@ist.utl.pt
6	University of Aveiro	Molecular and Cell Biology	Master	Portuguese, English	Department of Biology	First semester: Development Biology; Neurobiology; RNA Biology; Biological and Molecular evolution; options: **Systems Biology; Functional Genomics** Second semester: Genomics; Molecular and Cellular Biology; Bioentrepreneurship	Maria de Lourdes Gomes Pereira, Biomedical Materials and Biomimetics Group, mlourdespereira@ua.pt

7	University of Minho	Bioinformatics	Master	Portuguese	School of Engineering	**Advanced Bioinformatics and Systems Biology;** Algorithms for Biological Sequence Analysis; Cellular and Molecular Biology; Biochemical Engineering; Statistical Methods and Advanced Algorithms in Bioinformatics; **Biological Databases; Modelling of Biological Processes, Bioinformatics and Systems Biology Projects**	Rui Manuel Ribeiro Castro Mendes, Informatics Department, azuki@di.uminho.pt Bioinformatics and Systems Biology coordinator: Isabel Cristina Almeida Pereira Rocha, irocha@deb.uminho.pt
8	University of Algarve	Biological Engineering	Master	Portuguese	Faculty of Sciences and Technology	General: The course combines basic training in Mathematics, Physics, Chemistry and a strong component of environmental sciences, biological and biomedical technologies, including Molecular and Cellular Biology, Genomics, Proteomics and Microbiology Specific: Mass Transport in Biologic Systems; **Bioinformatics**; Process Dynamics and Control; **Biomolecular Structure Function and Modelling**; Integrated Biological Engineering; **Proteomics**	Guilherme Ferreira, Center of Molecular and Structural Biomedicine, gferrei@ualg.pt
9	University of Minho	Applied Biochemistry	Master	Portuguese	School of Sciences	General: core areas of Biochemistry, such as the structure and function of biomolecules and the methods used in their production, characterization and analysis; recent advances in the areas of molecular cell biology, genetic manipulation, **computational modelling and bioinformatics** Specific: **Biomolecular Modelling**; Cellular Biology and Regulation; **Molecular Biotechnology**; Methods for Cellular and Biomolecular Analysis	João Carlos Ramos Nunes Marcos, Chemistry department, jcmarcos@quimica.uminho.pt
10	University of Lisbon	Integrated Master Degree in Biological Engineering	Bachelor	see above, Master programmes			
11	University of Lisbon	Integrated Master Degree in Biomedical Engineering	Bachelor	see above, Master programmes			
12	University of Minho	Applied Biology	Bachelor	Portuguese	School of Sciences	General: knowledge ranging from the molecular and cell biology to organisms, populations and communities Specific: Molecular Genetics and **Bioinformatics;** Biophysics; **Cell signalling in Health and Disease**	Cristina Alexandra Almeida Aguiar, Biology department, cristina.aguiar@bio.uminho.pt

13	University of Minho	Biochemistry	Bachelor	Portuguese		General: fundamental areas of Biochemistry; structure and function of biomolecules, cell and organism Physiology and Molecular Biology and Genetics Specific: Mathematics; Physics; Molecular Genetics and **Bioinformatics**; **Metabolism and Regulation**; Biophysics; **Cell signalling in Health and Disease**	
Romania							
1	University of Bucharest	Systems Biology	Master	Romanian	Faculty of Biology		mailing@bio.unibuc.ro
Slovakia							
	———————————						
Slovenia							
1	University of Ljubljana	Biotechnology / Systemic Biotechnology	Master		Biotechnical Faculty	Biology subjects as well as Computational and Systems Biology subjects	
2	University of Ljubljana	Medicine / Dental Medicine	Master		Faculty of Medicine	Elective Subjects: Mathematical problems and principles in Biochemistry, Modelling in Biochemistry, Computational simulations of dynamic processes in Biochemistry, Functional Genomics in Medicine (topics include hands-on transcriptome experimentation, hands-on computation of high-throughput data, databases and data mining; introduction to modelling of metabolic networks) Research projects, that can include Systems Biology or Systems Medicine, are evaluated by 6 ECTS.	
Spain							

1	Pompeu Fabra University Barcelona (PFU) / University of Barcelona (UB)	Bioinformatics for Health Sciences	Master	English	UPF: Research program on Biomedical Informatics, Institute of Evolutionary Biology, Developmental Biology Research Group UB: Molecular Modeling and Bioinformatics group, Integrative Biochemistry and Cancer Therapy group, Developmental Genetics and Biology group Barcelona Biomedical Research Park Center for Genomic Regulation Barcelona	**Systems Biology:** description of biological networks and gene, protein and metabolic network modelling. Emphasis on both topological aspects of networks and on their dynamic behaviour **Genome Bioinformatics:** analysis, alignment, comparison and automatic annotation of biological sequences; analysis of genome evolution and variation; molecular biology databases **Structural Bioinformatics:** introduction to experimental methods used in the structural determination of biomolecules, protein structure prediction, and simulation of biomolecular systems **Pharmacoinformatics:** managing molecular libraries and the virtual screening thereof, computer-aided drug design, quantitative modelling of structure-activity relationships (QSAR and 3D-QSAR) **Biomedical Computing:** clinical-health information systems, biomedical image analysis, study of genotype-phenotype relationships, and IT support systems for healthcare decision-making	Scientific coordinators: **Ferran Sanz**, Director of the Research Programme on Biomedical Informatics GRIB (IMIM-UPF), fsanz@imim.es **Roderic Guigó**, Coordinator of Bioinformatics and Genomics at CRG and Head of the Computational Biology of RNA Processing Group (CRG), roderic.guigo@crg.cat Master academic coordinator: **Nuria Centeno**, Associate Professor of the UPF and PI of the PharmacoInformatics group of GRIB (IMIM-UPF), nuria.centeno@upf.edu
2	University of Barcelona (UB) (Partner University)	Biohealth Computing	Master	English	**Coordinating Universities:** University of Grenoble and Joseph Fourier University Grenoble **European partner universities:** University of Barcelona University of Turin Maastricht University, Netherlands University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Romanian University of Geneve **Asian partner universities:** Middle East Technical University Ankara Istanbul University Dongguk University Seoul Tongji University Shanghai	General: Biology from molecules to cells, to organs, to organisms and to populations; **Analysis of multiscale dynamics**; **Integrated system-wide approaches, systemic modeling and simulation tools** including data from bedside, environment, omics and high-throughput techniques, for accelerating health innovation laboratory discoveries into treatments for patients Specific: Clinical Research; **Molecular Biotechnology**, Environmental and Animal Health; **Computational Mathematics**	Consortium coordinator: Prof. Philippe Sabatier, Faculty of Medicine, Joseph Fourier University, philippe.sabatier@biohealth-computing.eu
3	Complutense University of Madrid	Biochemistry, Molecular Biology and Biomedicine	Master	Spanish and English (Master thesis)	Faculties of Chemistry, Biology, Pharmacy, Medicine and Veterinary	General: Biomolecular Methodologies; **Molecular, Structural and Systems Biology**; Biomedical investigation Specific: **Computational Biology and Systems Biology, Proteomics, Genomics, Lipidomics**	Scientific coordinator: Cristina Casals Carro, faculty of chemistry, masterbiomed@quim.ucm.es Professor for Systems Biology: Federico Morán, Faculty of Chemistry: Biocemistry and Molecular Biology I, fmoran@bio.ucm.es
4	University of the basque country	Biomedical Engineering	Master	Spanish	University Nacional de Asunción, Paraguay Polytechnic University of Valencia	General: Application of **Systems Biology and Synthetic Biology** in industrial Biotechnology, **Biosystems Technology**	Prof. Dr. An-Ping Zeng, Head of Institue and Scientific Coordinator of the master program Bioprocess Engineering, Institute of Bioprocess and Biosystems Engineering, +49-40/42878-4183, AZE@tuhh.de
5	University of Malaga	Cellular and Molecular Biology	Master	Spanish	Faculty of Science	General: Functional and structural Genomics; **Bioinformatics**; **Analysis and modeling of complex biological systems** Specific: **Systems Biology**	Program Coordinator: Francisco Cánovas Ramos, Department of Molecular Biology and Biochemistry, canovas@uma.es Professor for Systems Biology: Miguel Ángel Medina Torres, Department of Molecular Biology and Biochemistry, Department of Molecular Biology and Biochemistry

6	Autonomous University of Madrid (UAM)	Molecular Biomedicine	Master	English	Faculties of Science and Medicine	Specific: **Advanced Bioinformatics and Systems Biology**; Proteomics, Genomics and Genetic Modification	Directors: Dr. Cristina Murga Montesinos, Departamento of Molecular Biology, cristina.murga@uam.es Dr. Amparo Cano García, Department of Biochemistry, coordinador.master.biomedicina@uam.es Coordinator Systems Biology: Ramón Díaz-Uriarte, Faculty of Medicine, r.diaz@uam.es
7	Autonomous University of Madrid (UAM)	Molecular and Cellular Biology	Master	English	Faculties of Science and Medicine	Specific: **Advanced Bioinformatics and Systems Biology**; Proteomics, Genomics and Genetic Modification	Directors: Dr. F. Javier Díez Guerra, Department of Molecular Biology, fjdiez@cbm.uam.es Dr. Miguel Ángel Fernández Moreno, Department of Biochemistry, miguelfm@iib.uam.es Coordinator Systems Biology: Ramón Díaz-Uriarte, Faculty of Medicine, r.diaz@uam.es
8	Autonomous University of Madrid (UAM)	Biophysics	Master	Spanish, English	Faculty of Science Institute of Catalysis and Petrochemistry Madrid Severo Ochoa center for Molecular Biology, Madrid	Specific: Physical methods and Mathematics for Biophysics; **Bioinformatics; Systems Biology**; Image Analysis in Biology	Raúl Guantes, Department of Physics of Condensed Matter, raul.guantes@uam.es
9	Universidad de Murcia	Bioinformatics	Master	Spanish, English	Faculties of Biology, Chemistry, Computer Science, Economy, Maths and Medicine Center for Genomics Regulation National Center for Genomic Analysis Príncipe Felipe Research Center National Center for Plant Biotechnology and Genomics	General (Itinerary of Life Sciences): Fundamentals of Biology for Bioinformatics, Fundamentals of Molecular Genetics and Genomics Specific: Biostatistics, **Systems Biology**, **Analysis of Biological Networks**, **Simulation of Biomolecules**, Biomedical Semantic Web, Intelligent Data Analysis, High-performance Computing	Director: Jesualdo Tomás Fernández Breis, Faculty of Informatics, jfernand@um.es Coordinator: Horacio Emilio Pérez Sánchez, Faculty of Informatics, horacio@um.es
10	Universidad de Girona	Molecular Biology and Biomedicine	Master	Catalan, Spanish, English	Faculty of Science	General: Techniques for Genomics, Transcriptomics and Proteomics analysis of organisms with a specific emphasis on humans Specific: **Systems Biology; Structure and Function of Systems**; Biological bases of diseases; **Bioinformatics;** Genomics	Antoni Benito Mundet, Department of Biology, antoni.benito@udg.edu
11	University of Lleida	Biomedical Research	Master	Catalan, Spanish, English	School of Medicine	General: Basics of Biomedical Research; Animal Models of Human Diseases; **Advanced Methods in Biomedicine** Specific: **Methods in Systems Biology:** Genomics, Proteomics, Metabolomics, **Systems Biology:** Network representations, Mathematical models of biological systems, Analyzing mathematical models of biological systems	Coordinator: Marta Llovera, Department for Basic Medical Sciences, marta.llovera@cmb.udl.cat Professor for Systems Biology: Rui Alves, Department for Basic Medical Sciences, ralves@cmb.udl.cat
12	University of Lleida	Biomedical Research	Master	Catalan, Spanish, English	School of Medicine	General: Basics of Biomedical Research; Animal Models of Human Diseases; **Advanced Methods in Biomedicine** Specific: **Methods in Systems Biology:** Genomics, Proteomics, Metabolomics, **Systems Biology:** Network representations, Mathematical models of biological systems, Analyzing mathematical models of biological systems	Coordinator: Marta Llovera, Department for Basic Medical Sciences, marta.llovera@cmb.udl.cat Professor for Systems Biology: Rui Alves, Department for Basic Medical Sciences, ralves@cmb.udl.cat

13	University of Jaén	Biotechnology and Biomedicine	Master	Spanish, English	University of Jaén, Faculty of Experimental Sciences University of Granada University of Seville University of Cordoba, University Miguel Hernández (Elche) Hospitalary Complex of Jaén Zaidín Experimental Station, CSIC, Hospital de Madrid Norte Sanchinarro Institut Biomedical Research August Pi Sunyer. Hospital Clinic. Barcelona	General: Techniques for Molecular, Cellular and Genetic Biology; Biomedicine and Biotechnology Specific: **Genomics, Bioinformatics and Systems Biology**; **Proteomics and dynamic of proteins**; Advanced Microscopy and Image Analysis; Advanced Genetic Engineering; Diagnostic Biotechnology; Molecular Biology of infectious diseases	Coordinator: Juan Peragón, Biochemistry and Molecular Biology Section, Department of Experimental Biology, jperagon@ujaen.es Coordinator Systems Biology: Antonio Arcos Caruz, Genetics section, Department of Experimental Biology, caruz@ujaen.es
14	University of Vic	Omics Data Analysis	Master	English	Polytechnic School	General: Omics and Applications Specific: Genomics, Epigenomics, Transcriptomics, Proteomics, Interactomics, **Bioinformatics**	M. Luz Calle Rosingana, Systems Biology Department, malu.calle@uvic.cat
15	University of Barcelona (UB)	Genetics and Genomics	Master	English	Faculty of Biology	General: Genetics and Genomics; Forward genetic analysis and functional Genomics; Epigenetics and cellular memory; Human Genome Specific: **Advanced Bioinformatics**; **Data analysis throughput high genomic**; Evolution of genetic regulation and regulator nets	Coordinator: Francesc Cebrià Sánchez, fcebrias@ub.edu Department of Genetics, Faculty of Biology, University of Barcelona
16	University of Sevilla	Medical Physics	Master	Spanish	Faculty of Physics	General: multidisciplinary training in areas implicated in application of physics in health sciences Specific: **Biological Networks** and Biomedical Tools, **Bioinformatics**, Imaging, Datamanagement	Prof. Jose Manuel Espino Navas, Faculty of Physics. espino@us.es
17	University of Sevilla	Molecular Genetics and Biotechnology	Master	Spanish	Departments of Medicine; Vegetal Biochemistry and Molecular Biology; Genetics, Microbiology and Parasitology; Pharmacology, Pediatrics and Radiology; Medical Physiology and Biophysics	General: Molecular Biology and Vegetal Biotechnology, Microbial Biotechnology, Molecular Genetics Specific: **Bioinformatics**, Medical Genetics and Genomics, Animal Models	Prof. Manuel Megías Guijo, megiasg@us.es
18	University of Sevilla	Logics, Computation and Artificial Intelligence	Master	Spanish	Department of Computer Science and Artificial Intelligence	Bioinspired Computation, **Computational Analysis and Simulation in Biological Systems**, Intelligent Techniques in Bioinformatics	Prof. Joaquin Borrego Díaz, Department of Computer Science and Artificial Intelligence, jborrego@us.es
19	University of Sevilla	Physiology and Neural Sciences	Master	Spanish	Departments of Medicine; Surgery, Physiology; Medical Physiology and Biophysics; Genetics; Biochemistry and Molecular Biology; Pharmacology, Pediatrics and Radiology; Experimental Psychology	General: training spanning knowlegde from molecular biology of membranes to specific aspects of Physiopathology, especially concerning nervous structures, and from molecular and cellular aspects to behavioural Neuroscience	Prof. Dr. Pedro Antonio Núñez Abades, Department of Physiology, pnunez@us.es
20	University of Valencia	Integrative Evolutionary Biology	Master	Spanish, English	Faculty of Biological Sciences	Evolution, complexity and ecology; Evolution of complex organic systems; Developmental genetics; **Quantitative methods in evolution; Methods of molecular analysis in evolution**	María Antonia Rodrigo Alacreu, Department of Microbiology and Ecology, Maria.A.Rodrigo@uv.es

21	University of Valencia	Bioinformatics	Master	Spanish, English	Departments of Informatics, Statistics, Genetics, Biochemistry and Molecular Biology, Medicine	**General:** Statistical, structural and evolutionary Bioinformatics; algorithms in Bioinformatics, Genomics; **Techniques for "omics" and high-throughput-data; Computational Systems Biology** Electives: Biochemistry and Molecular biology; Databases; Operative systems; Programming; Genetics; Evolution; Medicine and clinical experiments	Vicente Arnau Llombart, Institute of Computational Genomics, Vicente.Arnau@uv.es
22	University of Granada	Biotechnology	Master	Spanish	Institute of Biotechnology Faculty of Science with Departments of physical chemistry, parasitology, microbiology, organical chemistry, genetics, vegetal physiology, chemical engineering, organic chemistry Faculty of Pharmacy with Department of Pharmaceutical and Organic Chemistry	Curriculum contains Bioinformatics and Genomics	Manuel Martinez Bueno, Faculty of Sience, Department of Microbiology, mmartine@ugr.es
23	University of Granada	Genetics and Evolution	Master	Spanish	Departments of Genetics, Animal Biology, Ecology, Paleontology, Vegetal Physiology, Radiology, Medicine, Physical Anthropology, Applied Biology Research Center Estación Experimental del Zaidín Institute of Parasitology and Biomedicine López-Neyra Genyo Center for Genomics and oncological research, Granada	General: Genetic Analysis; Sequence analysis; Cytogenetics; Quantitative Genetics; Evolutionary and developmental Genetics Specific: Functional Genomics, Medical Genomics	Miguel Burgos Poyatos, Faculty of Science, Department of Genetics, mburgos@ugr.es
24	University of Santiago de Compostela	Biotechnology	Master	Spanish, Galician, English	Faculty of Pharmacy	Bioinformatics, Proteomics, Cellular Biotechnology, Genetic Engineering	Tomás González Villa, Department of Microbiology, mpvilla@usc.es
25	University of Malaga (UMA)	Advanced Biotechnology	Master	Spanish	Faculty of Science (UMA) International University of Andalucia Andalusian Institute for Biotechnology	General: **Bioinformatics** and Data Management, Genetical Engineering Specific: Tissue engineering; Structural Biology, Environmental Biotechnology; Cell cultures and manipulation of animal cells, Gene Therapy; **Genomics, Proteomics and Metabolomics**	Javier Ruiz Albert, Faculty of Scienc:, Biochemistry, javieruizal@uma.es José Becerra Ratia, Faculty of Science: Cellular Biology, genetics and Physiology, becerra@uma.es
26	Universidad de Córdoba	Molecular, Cellular and Genetic Biotechnology	Master	Spanish	Faculty of Science	General: **Bioinformatics**, Proteomics Specific: **Biotechnology for Health**: Metabolomics, Advanced techniques for cellular imaging, Advanced techniques for functional genomics	Maria Nieves Abril Díaz, Department of Biochemistry and Molecular Biology, bb1abdim@uco.es
27	University of Vigo	Advanced Biotechnology	Master	Spanish, Galician, English	Faculty of Biology, UVigo Faculty of Sciences, University of Coruña	General: Health Biotechnology Specific: **Bioinformatics**, Genetic Engineering, Cellular and tissular Engineering, **Genomics and Proteomics**	Ángeles Sanromán Braga, Faculty of Biology, sanroman@uvigo.es
28	University of Jaén	Biology	Bachelor	Spanish	Faculty of Experimental Sciences	**Bioinformatics** with **concepts of Systems Biology**	Fermín Aranda Haro, faranda@ujaen.es

29	University of Lleida	Biomedical Sciences	Bachelor	Catalan, Spanish, English	Faculty of Medicine	Bioinformatics (first half Bioinformatics, second half Computational Systems Biology), **Systems Biology**	Professor for Systems Biology: Rui Alves, Department for Basic Medical Sciences, ralves@cmb.udl.cat
30	University of Lleida	Biotechnology	Bachelor	Catalan, Spanish, English	School of Agricultural Engineering	**Bioinformatics** (first half Bioinformatics, second half **Computational Systems Biology**), Proteomics	Professor for Systems Biology: Rui Alves, Department for Basic Medical Sciences, ralves@cmb.udl.cat
31	Autonomous University of Madrid	Biochemistry	Bachelor	Spanish	Faculty of Science and Faculty of Medicine	**Bioinformatics and Molecular Systems Biology**	Professor for Systems Biology: Ramon Diaz-Uriarte, r.diaz@uam.es
Sweden							
1	University of Gothenburg	Genomics and Systems Biology	Master	English 2 years	Department of Biological and Environmental Sciences	Advanced Functional Genomics, Advanced Bioinformatics, Experimental Systems Biology and Evolutionary Genomics	education@biology.gu.se http://www.utbildning.gu.se/education/courses-and-programmes/program_detail/?programid=N2GSY
2	Royal Institute of Technology	Erasmus Mundus master's programme in Systems Biology (euSYSBIO)	Master	English 2 years	Instituto Superior Tecnico Portugal Aalto University School of Science	General: **basics on Computational Systems Biology and courses in experimental techniques in Systems Biology** Courses at IST Lisbon (2nd year) Artificial Intelligence and Decision Systems, Functional and Comparative Genomics, Entrepreneurship in Bioengineering, Cell and Tissue Engineering, Algorithms for Discrete Structures, Neuroimaging, Medicinal Chemistry, Nanotechnology, Optimization and Algorithms, Machine Learning, Molecular and Cellular Microbiology, Molecular Biotechnology	mundus-eusysbio@kth.se
Switzerland							
1	ETH Zuerich/ University of Zurich	Master in Computational Biology & Bioinformatics	Master			The Master's programme in Computational Biology & Bioinformatics is a multi-university partnership and a truly interdisciplinary programme. The programme is a collaboration between the Institutes of Mathematics, Computer Science, Biochemistry and Molecular Biology at the University of Zurich and the Departments of Computer Science, Biology, Information Technology and Electrical Engineering, and Mathematics at the Swiss Federal Institute of Technology Zurich (ETH).	Denise Spicher, denise.spicher@inf.ethz http://www.cbb.ethz.ch/
2	ETH Zuerich	Master of Science ETH in Biology - Major in Systems Biology	Master		Department of Biology	This interdisciplinary major is designed for biologists, bioinformaticians and computer scientists and promotes interdisciplinary communication skills. Depending on interest and capabilities, a focus on theoretical or experimental aspects will be encouraged.	Prof. Uwe Sauer, sauer@imsb.biol.ethz.ch http://www.biol.ethz.ch/education/mscbiology/index_EN
3	ETH Basel	Master in Biotechnology - Major in Systems Biology	Master		Department of Biosystems Science and Engineering	There are three majors offered at D-BSSE: Biotechnology, Systems Biology and Synthetic Biology. For each major there are mandatory core subjects with the same name	Prof. Sven Panke, sven.panke@bsse.ethz.ch http://www.bsse.ethz.ch/education/master

4	EPFL	Master in Life Science and Technology	Master		School of Life Sciences	In neurosciences or in molecular medicine courses deepen the knowledge acquired during the bachelor such as the understanding of brain function, biological systems, the fundamental mechanisms at the origin of cancer and infectious diseases. Biocomputing: modeling of biological systems, and training for understanding the various modern computational approaches necessary for the operation of large databases such as those of the human genome.	Dr. Romain Zufferey, romain.zufferey@epfl.ch http://ssv.epfl.ch/page-25109-en.html
5	University of Basel	Master of Science in Molecular Biology - Specialization Computational Biology	Master		Biozentrum	The specialist subjects studied at the Biozentrum include Biochemistry, Biophysics, Computational Biology, Developmental Biology, Genetics, Immunology, Infection Biology, Microbiology, Neurobiology, Pharmacology, Structural Biology and Cell Biology.	Susan Kaderli, susan.kaderli-at-unibas.ch http://www.biozentrum.unibas.ch/education/master/overview/
6	University of Lausanne	Master of Life Sciences - Specialisation in Bioinformatics	Master		School of Biology	The emphasis is on integrating solid Bioinformatics with Biology. The students are encouraged to pursue master projects either in Bioinformatics, developing new tools and methods, or in experimental biology groups, where Bioinformatics is key to making sense of high throughput data (genomes, transcriptomes, etc.).	Prof.Christian Fankhauser, christian.fankhauser-at-unil.ch http://www.unil.ch/ecoledebiologie/page95512_en.html
7	University of Zurich	Master of Science in Biology - Specialization in Quantitative Biology and Systems Biology	Master		Faculty of Sciences	Here the focus will be on quantitative Proteomics, Genomics, but also strongly on Imaging (microscopy and MRI). In addition Biomechanics, Crystallography as well as tracking methods will be treated.	Dr. Christof Aegerter, aegerter@physik.uzh.ch http://www.degrees.uzh.ch/studiengang.php?CG_SAP_id=50465349&SC_SAP_id=50544113&org_SAP_id=50000008&lang=en
8	University of Geneva	Master in Biology - Orientation Bioinformatics and Data Analysis in Biology	Master		Sciences Faculty	Learn to master (or develop) bioinformatic and biostatistic tools to analyse data from various biological fields of investigation (Population Genetics, Genomics, Proteomics, Evolution, etc.). As well as learning how to use these tools in a specific research theme of one of these fields.	Prof. Alicia Sanchez Mazas, alicia.sanchez-mazas@unige.ch http://biadb.unige.ch/en/objectifs/
9	University of Bern/ University of Fribourg	MSc in Bioinformatics and Computational Biology	Master		Bioinformatics	Specifically designed courses bring you up to speed in Bioinformatics and Computational Biology. You will acquire the tools of the trade focusing on solving current biological problems.	Dr. Rémy Bruggmann, remy.bruggmann@biology.unibe.ch http://www.biology.unibe.ch/unibe/philnat/biology/content/e8103/e196509/e257529/MScBioComp_eng.pdf
United Kingdom							
1	University College London	Synthetic Biology	Master by Research	1 year english	Department of Biochemical Engineering	General: **Synthetic Biology** Specific: Engineering principles, M**athematical Modelling**, Molecular Biology, Biochemical Engineering and Chemistry	Mrs Jana Small, biochemeng@ucl.ac.uk

2	University College London	Computational and Genomic Medicine	Master of Science	1 year english	Division of Biosciences	General: Bioinformatics Specific: **Biocomputing**, Bioinformatic Analysis of Transcription and Protein Data, Bioinformatics of DNA Sequence Data for Translational Medicine, **Computational and Systems Biology**, Genetics of Cardiovascular Genetics, Genetics of Neurological Disease	
3	University of Warwick	Systems Biology	Master of Science	1 year english	Systems Biology Doctoral Training Centre	General: Biology, Computing and mathematical knowledge Specific: **complex biological systems, Quantitative Biology**, application of mathematical modelling and computational approaches	
4	Newcastle University	Computational Systems Biology	Master of Science	1 year english	School of Computing Science Schools of Mathematics and Statistics and Biology Institutes of Cell and Molecular Biosciences and Ageing and Health Centre for Integrated Systems Biology of Ageing and Nutrition (CISBAN)	General: **Systems Biology** Specific: **Modeling Cellular Systems**, Programming, Stochastic Systems Biology, Bioinformatics, **Computational Systems Biology**, Numeric Skills	School of Computing Science, cs.admissions@ncl.ac.uk
5	Newcastle University	Systems Biology	Master by Research	1 year english	Medical Sciences Graduate School	General: **Systems Biology**, Biology, Physics Specific: Systems Biology approaches that enable to understand and manipulate complex biological systems, particularly the vulnerability of such systems to stress	Medical Sciences Graduate School, medpg-enquiries@ncl.ac.uk
6	Newcastle University	Mitochondrial Biology and Medicine	Master by Research	1 year english	Medical Sciences Graduate School	General: medical and molecular biosciences, modules in, or related to, ageing and health Elective subject: **Systems Biology**	medpg-enquiries@ncl.ac.uk
7	Newcastle University	Ageing and Health	Master by Research	1 year english	Medical Sciences Graduate School	General: medical and molecular biosciences, modules in or related to ageing and health Elective subject: **Systems Biology**	
8	University of Glasgow	Biomedical Sciences (Integrative Mammalian Biology/Systems Biology)	Master by Research	1 year english	College of Medical, Veterinary and Life Sciences College of Science and Engineering	General: Specialisation in Integrative Mammalian Biology and **Systems Biology** Specific: Systems Biology approaches integrated with whole animal Physiology, Pharmacology or veterinary science research projects: **Mathematical Modelling, Computing**, 'Omics', Bio-engineering	Dr Christopher McInerny, Chris.McInerny@glasgow.ac.uk Dr Joanna Wilson, Joanna.Wilson@glasgow.ac.uk
9	University of Glasgow	Bioinformatics, Polyomics and Systems Biology	Master of Science	1 year english		General: computing and biological research practices relating to Bioinformatics and Functional Genomics Specific: Programming, Information Systems and Databases, Foundations of Bioinformatics, **Omics and Systems Approaches in Biology**	Dr Mark E S Bailey: mark.bailey@glasgow.ac.uk

10	University of Ulster	Systems Biology	Master of Science	2 years	School of Biomedical Sciences	General: **Systems Biology** Specific: Concepts of Systems Biology, Data Analysis, **Modeling and Simulation, Network Analysis**	Prof. Werner Dubitzky, Biomedical Sciences Research Institute, w.dubitzky@ulster.ac.uk
11	Birkbeck University of London	Bioinformatics with Systems Biology	Master	1 year fulltime 2 years parttime	Institute of Structural and Molecular Biology joint initiative with University College London	General: computational and scientific developments in Bioinformatics, and the application of this knowledge to the fields of molecular and biological science Specific: **BioComputing**, Data Management, Molecular Structure, Sequence Analysis and Genomics, Statistics, Structural Bioinformatics, **Systems Biology**	
12	Imperial College London	Systems Biology and Synthetic Biology	Master by Research	English 1 year	Institute of Systems and Sythetic Biology	General: **Experimental Systems Biology, Theoretical Systems Biology, Synthetic Biology,** Advanced Technology Specific: signalling and gene regulatory pathways and programmes in bacteria, mammalian cells and plants, Structural and Functional Genomics, Molecular Medicine and genetic aspects of health and disease, Modeling, biological building blocks and their characterization, Genetic Engineering, imaging and high-throughput technologies	Prof. Richard Ian Kitney, Faculty of Engineering, Department of Bioengineering, r.kitney@imperial.ac.uk Prof. Paul Freemont, Faculty of Medicine, Department of Medicine, p.freemont@imperial.ac.uk Dr. James Murray, Faculty of Natural Sciences, Department of Life Sciences, j.w.murray@imperial.ac.uk
13	Imperial College London	Bioinformatics and Theoretical Systems Biology	Master of Science	English 1 year	Department of Life Sciences	General: Bioinformatics and **Systems Biology**, Statistical learning, Computing, Mathematics and Statistical Inference Specific: advanced tools for the analysis of biological data; and approaches for **modelling biological systems**, Java, Python and perl; an introduction to program design and command line computing in a Unix shell,high level algorithms and the analysis of large datasets	Prof. Michael Stumpf, Faculty of Natural Sciences, Department of Life Sciences, m.stumpf@imperial.ac.uk
14	Imperial College London	Applied Biosciences and Biotechnology	Master of Science	English 1 year	Department of Life Sciences	General: Biochemistry, Molecular Cell Biology, **Systems and Synthetic Biology**, Bioinformatics, and Entrepreneurship Specific: Genomics, Proteomics, **Integrative Systems Biology and Synthetic Biology**	Miss Lucy York, Department of Life Sciences, l.york@imperial.ac.uk
15	Imperial College London	Chemical Biology: Multidisciplinary physical scientists for next generation biological, biomedical and pharmaceutical R&D	Master by Research	English 1 year	Institute of Chemical Biology	General: Chemical Biology of Health & Disease Specific: Bioanalytical Techniques, Biophysics and **Systems Biology**, Introduction to Cell Biology, Medical Oncology, Physical Techniques in Chemical Biology X-ray Diffraction Studies of Biological Systems, Probe Design of Imaging, Protein Purification Technology, Single Molecule Biology	Dr. Laura Barter, Course Director, Institute of Chemical Biology, l.barter@imperial.ac.uk

16	University of Manchester	Bioinformatics and Systems Biology	Master of Science	English 1 year	Faculty of Life Sciences	General: Bioinformatics, Genomics and **Systems Biology** Specific: Genomics, Proteomics and Metabolomics, **Computational Systems Biology**, Processing Biological data, Programming, Experimental Design and Statistics	pgtaught.lifesciences@manchester.ac.uk
17	University of Manchester	Systems Biology	MPhil	English 1 year	School of Chemical Engineering and Analytical Science	General: **Systems Biology** Specific: Molecular Biology and Functional Genomics, Physical Chemistry and **Mathematical Modelling**, analytical and computational approaches and quantitative experimentation	Mrs Alison Cheslett, pg-ceas@manchester.ac.uk
18	University of Manchester	Systems Neuroscience	Mphil	English 1 year	Faculty of Life Sciences	General: **neural networks, mathematical and computer models**	Faculty of Life Sciences, Postgraduate Research Office, pgresearch.lifesciences@manchester.ac.uk
19	University of Manchester	Translational Medicine: Interdisciplinary Molecular Medicine	Master by Research	English 1 year	School of Medicine	General: intense training in 'omics' skills and techniques such as Genetics, Genomics, Proteomics and Metabolomics. Specific: **Systems Biology/Medicine**	Dr. Janine Lamb, Course Director, Janine.lamb@manchester.ac.uk
20	University of Manchester	Digital Biology	Master of Science	English 1 year	School of Computer Science	General: Biohealth Informatics Specific: **Bioinformatics for Systems Biology, Bioinformatics to Transcriptomics, Computational Systems Biology,** Databases & Data Modelling, **Mathematics for Metabolic Modelling**	School of Computer Science, pg.compsci@manchester.ac.uk
21	University of Manchester	Modelling and Simulation in Pharmacokinetics and Pharmacodynamics	Master of Science	English 2 years	School of Pharmacy and Pharmaceutical Sciences	General: mechanistic approaches to assessing and predicting Pharmacokinetics and Pharmacodynamics, **Systems Biology** Specific: quantitative assessment of drug absorption, distribution and elimination (ADME) in the human body, mathematical physiologically-based pharmacokinetics, data analysis	School of Pharmacy and Pharmaceutical Sciences, admin-pkpd@manchester.ac.uk
22	University of Nottingham	Biological Systems	Master by Research	English 1 year	School of Life Sciences	General: **Systems Biology** approach to studies of development Specific: studies that investigate gene regulatory networks and their relevance to developmental processes in a variety of model systems	life-sciences-pgr-MRes@nottingham.ac.uk
23	University of Nottingham	Applied Bioinformatics	Master by Research	English 1 year	School of Biosciences	Compulsory modules: Computer programming, **Biomolecular Data and networks, Bioinformatics**, Statistics and Experimental Design for Bioscientists	Dr. Dov Stekel, dov.stekel@nottingham.ac.uk

24	University of Edinburgh	Systems & Synthetic Biology	Master of Science, 1 year / Diploma, 9 months	English 1 year / 9 months	School of Biological Sciences	General: **Systems Biology** Specific: systematic and rational application of engineering principles to the understanding and design of biological networks, unicellular models such as baker's yeast and bacteria, all the way through to multi-cellular systems including mammals, primary design principles and biotechnology tools: genome-wide, high-throughput genetic or cell-based screens, DNA synthesis, the use of "Bio-Bricks" to create novel biological outputs	Jennie Morris, School of Biological Sciences, Biology Teaching Organisation, MScSSB@ed.ac.uk
25	University of Edinburgh	Genomics and Pathway Biology	Master of Science	English 1 year	Division of Pathway Medicine	General: in depth training in the tools and technologies of post-genomic biomedical science Specific: This course centers around a particular focus on using the outputs from functional genomic technologies for the **analysis and modelling of biological pathways, networks and systems**	Dr. Douglas Roy, Curriculum Coordinator, douglas.roy@ed.ac.uk
26	University of Edinburgh	Synthetic Biology and Biotechnology	Master of Science	English 1 year	School of Biological Sciences	General: focuses on research and development using biological and chemical principles and systems to create new products, services and industries Specific: **Synthetic Biology, Systems Biology**, Bioinformatics, Enzymology and Biological Production, Gene Expression and Microbial Regulation, Information Processing in Biological Cells, Intelligent Agriculture, **Molecular Modelling** and Database Mining, Vaccine Development and Clinical Testing	Programme Secretary, mscsyntheticbiotech@ed.ac.uk
27	University of Edinburgh	Bioinformatics	Master of Science	English 1 year	School of Biological Sciences	General: Bioinformatics for high-throughput technologies Specific: Bioinformatics, **Computational Systems Biology**, Data Mining and Exploration, Functional Genomic Technologies, Information Processing in Biological Cells, **Molecular Modelling** and Database Mining, Next Generation Genomics	Dr. Simon Tomlinson, Programme Director, bioinfmsc@ed.ac.uk
28	University of Nottingham	Advanced Genomic and Proteomic Sciences	Master by Research	English 1 year	School of Biosciences	General: comprehensive training package in **theoretical biological modelling** and its practical applications to state-of-the-art technologies Specific: Statistics and Experimental Design for Bioscientists, Post-Genomic Data and Integrative Biology, Omics Technologies, Transferable Skills	Dr Chungui Lu, School of Biosciences, chungui.lu@nottingham.ac.uk

29	University of Nottingham	Mathematical Medicine and Biology	Master of Science	English 1 year	Centre for Mathematical Medicine and Biology	General: Biology and the application of Mathematics to Medicine and Biology Specific: Biomolecular Data and Networks, Cell structure and Function for Engineers, Practical Biomedical Modelling, **Mathematical Medicine and Biology, Theoretical Neurosciences, Topics in Biomedical Mathematics**	Dr. Markus Owen, School of Mathematical Sciences, markus.owen@nottingham.ac.uk
30	University College London	Modelling Biological Complexity	Master by Research	English 1 year	CoMPLEX: Centre for Mathematics, Physics and Engineering in the Life Sciences and Experimental Biology	General: B**iological complexity, mathematical modelling of biological systems**, and advanced experimental techniques Specific: Lectures on dynamical systems, reaction diffusion equations, cellular automata, stochastic modelling, curve fitting, Markov chains and coalescent theory as applied to biological systems, physical techniques in the Life Sciences, modern complex systems theory	complex.admin@ucl.ac.uk
31	University of York	Computational Biology and Bioinformatics	Master of Science		Department of Biology Department of Chemistry	General: Computational analysis of biological systems Specific: Data analysis, Programming, Informatics, Modelling and Simulation, Sequence and Structure, Introduction to Programming (Python), Statistical Modelling, Introduction to pattern Recognition and Machine Learning and **Computational Systems Biology**	Biology Admissions Office, Department of Biology, biol-pg-admissions@york.ac.uk
32	University of Cambridge	Computational Biology	Mphil	English 11 months	Cambridge Computational Biology Institute Department of Applied Mathematics and Theoretical Physics	General: Bioinformatics and other quantitative aspects of modern biology and medicine Specific: Scientific Programming, Genome Informatics, Structural Biology, Functional Genomics, Genome Sequence Analysis, Population Genetics, Analysis and Modeling Comorbities, **Systems Biology, Network Biology**	Prof. Simon Tavare, DAMTP, ccbi-mphil-directors@damtp.cam.ac.uk
33	University of Aberdeen	Cell and Molecular Systems Biology (Systems and Synthetic Biology)	Master of Science	English 1 year	College of Life Sciences & Medicine	General: Cell and Molecular Biology, predictive computer models of living systems Specific: **Biological modelling**, Genomes and functional Genomics, **Introduction to Mathematics and Modelling of biological systems or Bio-computing** or Non-linear dynamics, Modelling Theory, Regulation and control in cellular metabolism	College of Life Sciences & Medicine, graduateschool-clsm@abdn.ac.uk

34	University of Warwick	Complex Systems Science (Erasmus Mundus)	Master	English 2 years	Ecole Polytechnique, Chalmers University (Gothenburg) University of Gothenburg	General: Complexity Science Specific: Advanced Dynamical Systems, Artificial Intelligence, Artificial Neural Networks, **Computational Biology**, Dynamical Systems, Introduction to Theoretical Neuroscience, **Modelling and Statistics in Systems Biology, Modelling Biological Systems and Structures, Quantitative Biology**	Prof. Robert Mackay, Centre for Complexity Science DTC, R.S.Mackay@warwick.ac.uk
35	University of Warwick	Mathematical Biology and Biophysical Chemistry	Master of Science	English 1 year	Molecular Organisation and Assembly in Cells (MOAC) DTC	General: Multidisciplinary Science at the interface between Mathematics, Chemistry, Biology, Physics and Computing Specific: **Biological Systems, Cellular Systems and Biomolecules, Mathematical Modeling, Molecular Modeling, Quantitative Biology**	Sarah Grilli-Shute, MSc Programme Coordinator, Systems Biology DTC, moac@warwick.ac.uk
36	University of Sheffield	Mechanistic Biology	Master	English 1 year		General: Mathematical, physical, and computational tools for mechanistic modelling and advanced physical methods for observing, analysing, understanding and predicting biology Specific: Biological Nanotechnology, Biophysical Chemistry, Computing for Mechanistic Biology, **Mathematics for Mechanistic Biology, Modelling and Simulation of Natural Systems**, Physical Biology	Dr. Jeremy Craven, Department of Molecular Biology and Biotechnology, c.j.craven@sheffield.ac.uk
37	University of Sheffield	Cognitive and Computational Neuroscience	Master of Science	English 1 year	Department of Psychology, Faculty of Science	Brain Imaging, Computational Neuroscience: Neurons and Neuronal Codes, **Neuronal Networks and Brain Systems, Cognitive and Systems Neuroscience, Mathematical Modelling**	Josie Cassidy, j.cassidy@sheffield.ac.uk
38	Bangor University	Molecular Biology with Biotechnology	Master of Science	English 1 year	School of Biological Sciences	General: Strong practical emphasis, advanced theoretical and practical background necessary for employment in the Biotechnology industry Specific: Techniques of Molecular Biology and Biotechnology, **Molecular Systems Biology**, Plant Biotechnology, Environmental and Industrial Biotechnology, Medical Biotechnology and Genomes and Molecular Genetics, Bioinformatical Analysis Tools	Dr. A.H. Shirsat, School of Biological Sciences, a.h.shirsat@bangor.ac.uk
39	Durham University	Biophysical Sciences	Master of Science	English 1 year	Biophysical Sciences Institute	Core modules: Molecular Cell Biology, Making Organic Molecules, Experimental Design and Analysis, Mathematical Tools, Practical Course in basic Biological Techniques Optional modules: **Systems Biology** and Bayesian Inference, Macrobiomolecule Dynamics, Soft Matter and Biological Physics, Medicinal Chemistry, Molecular Probes and their Use, Techniques in Cognitive Neuroscience, Protein Crystallography	Biophysical Sciences Institute, chemistry.postgrad-admissions@durham.ac.uk

40	Cardiff University	Chemical Biology	Master of Science	English 1 year	School of Chemistry	General: Chemical background of biological problems and processes at the interface between Chemistry and Biology Specific: Mathematics, Organic and Biological Chemistry, Biocatalysis, Bioinorganic Chemistry, Medicinal Chemistry, **Modelling of Biological Macromolecules, Molecular Modelling**	Dr. Thomas Tatchell, tatchellt@cardiff.ac.uk
41	University of Oxford	Biochemistry	Master of Science by Research	English 2 years	Department of Biochemistry	Training in cutting-edge laboratory research applying techniques in Bionanotechnology, Biophysics, **Computational Biology**, Microscopy, Molecular Biology, Structural Biology and **Systems Biology** to a broad range of fields including Cell Biology, Chromosome Biology, Drug discovery, Epigenetics, host-pathogen interactions, membrane proteins, ion channels and transporters, and RNA biology.	Director of Graduate Studies, dgs@bioch.ox.ac.uk
42	Nottingham Trent University	Bioinformatics	Master by Research	English 1 year	School of Science and Technology	General: Bioinformatics Specific: Statistics for Bioinformatics, Bioinformatics and Molecular Genetics, Medical Informatics, Advanced Genome analysis, **Systems Biology**	
43	University of Liverpool	Post-Genomic Science	Master of Science	English 1 year	School of Life Sciences	General: Genomics, Proteomics and Bioinformatics Specific: **Systems Biology**, Biotechnology, Host-pathogen Population Dynamics, Gene Structure and Function, Cell Signalling, Molecular Medicine, Ageing, Cancer	Dr. Andy Jones, jonesar@liv.ac.uk
44	University of Birmingham	Biomedical Technologies	Master of Science	English 1 year	Biosciences Graduate Research School	General: introduction to the technologies required to develop drugs and genomic, proteomic and metabolomics for use in the context of stratified or personalised medicine. Specific: Genomics, Proteomics, Metabolomics, **Systems Biology**	Prof. Ulrich Guenther, u.l.gunther@bham.ac.uk
45	University of Dundee	Mathematical Biology	Master of Science	English 1 year	Department of Mathematics	General: **Mathematical Biology** Specific: **Computational Modelling**, Programming, Mathematical Ecology & Epidemiology, Mathematical Methods, Mathematical Oncology, Mathematical Physiology	Prof. Mark Chaplain, chaplain@maths.dundee.ac.uk
46	University of Bedfordshire	Biotechnology	Master of Science	English 1 year	Division of Science	General: Biotechnology: through an advanced understanding of Molecular and Computational Biology to applied Microbiology Specific: Analytical methods, Applied Microbiology, **Computational Biology**, Molecular Biology	Doctor Tiantian Zhang, tiantian.zhang@beds.ac.uk

47	King's College London	Bioinformatics	Master of Science	English 1 year	Department of Informatics	General: Bioinformatics, computational tools for storing, organising and analysing the large amounts of biomolecular data now available Specific: algorithm design and analysis in **Computational Molecular Biology**; protein structure analysis and prediction; statistics for bioinformaticians; microarray data analysis; protein/gene interaction networks; S**ystems Biology methods**	Department of Informatics, nms-pgadmissions@kcl.ac.uk
48	Queen's University Belfast	Computational Biology	Master of Science	English 1 year	Centre for Cancer Research and Cell Biology	General: **Computational Biology** Specific: Algorithmic Biology, Analysis of Gene Expression, Bioimaging Informatics, Cell Biology, Genomics and Genetics, Scientific Programming and Statistical Computing, Statistical Biology	Prof. Peter Hamilton, p.hamilton@qub.ac.uk
49	University of East Anglia	Computational Biology	Master of Science	English 1 year	School of Computing Sciences School of Biological Sciences John Innes Centre Institute of Food Research Sainsbury Laboratory Genome Analysis Centre	General: **Computational Biology**, Bioinformatics Specific: Fundamentals of Computational and Structural Genomics, Genome Informatics, Techniques for Biological Database Exploitation, Applications Programming, Data Mining, Database Manipulation, Genetics, Genomics and Bioinformatics, Mathematics and Algorithms for Computational Biology	Faculty of Science, cmp.msc.admiss@uea.ac.uk
50	University of Leeds	Bioinformatics and Genomics	Master of Science	English 1 year	Faculty of Biological Sciences	General: Molecular Biosciences, Bioinformatics, Statistics and Computational Biology Specific: **Computational Biology of Genes and Proteins, Computational Biology of Genomic Systems**	Mrs. Pat Thompson, Graduate School, fbsgrad@leeds.ac.uk
51	Cranfield University	Applied Bioinformatics	Master of Science	English 1 year		General: Bioinformatics Specific: Data integration and Interaction Networks, Exploratory Data Analysis and Essential Statistics using R, Genomics and Gene Expression, Informatics for Metabolomics, Introduction to Bioinformatics using Perl, Programming with Java, Proteome Informatics, **Simulating Biological Systems**	shortcourse@cranfield.ac.uk
52	Plymouth University	Theoretical and Computational Neuroscience	Mphil	English 1 year	Theoretical and Computational Neuroscience Group	Research areas: **Mathematical Neuroscience**, Neural Computation, Models of cognitive functions, Structure and function of neural circuits, Networks of spiking neurons, Biophysical Modelling and Neurophysiology	Prof. Roman Borisyuk, roman.borisyuk@plymouth.ac.uk

53	London Metropolitan University	Bioinformatics	Master of Science	English 1 year	Faculty of Life Sciences and Computing	General: Bioinformatics, Genomic sciences applied to health Specific: **Bioinformatics and Molecular Modelling**, Biomedical Informatics, **Computational Methods in Bioinformatics**, Biomedical Diagnostics, Applied Statistical Modelling and Stochastic Processes, Data Mining for Business Applications, Medical Genetics, Epidemiology of Emerging Infectious Diseases	admissions@londonmet.ac.uk

PhD and Exchange Programs Systems Biology

	Institution	Program	Degree	Involved Departments	Thematic Focus	Contact
Austria						
1	Max F. Perutz Laboratories (MFPL)	MFPL International PhD Program	PhD	Laboratories of MFPL University of Vienna Medical University of Vienna	Molecular Mechanisms of Cell Signalling Chromosome Dynamics **RNA Biology: RNA Structure and Folding, RNA Translation, Transcriptomics & Bioinformatics, Regulators RNAs, RNA Processing & Transport,Epigenetics & Gene Expression**	Scientific coordinator: Prof.Dr. Andrea Barta, MFPL group Post-transcriptional regulation of gene expression in plants, andrea.barta@meduniwien.ac.at Program coordinator: Nicola Wiskocil, Medical University Vienna, nicola.wiskocil@univie.ac.at
2	Institute of Science and Technology Austria (IST)	IST PhD Program	PhD	Research groups: Biophysics and Systems Biology Systems Neuroscience Systems and Synthetic Biology	For students entering the program, their research will focus on biology, neuroscience, computer science, and interdisciplinary areas.	Group leaders: Tobias Bollenbach, tobias.bollenbach@ist.ac.at Jozsef Csicsvari, jozsef.csicsvari@ist.ac.at Călin Guet, calin.guet@ist.ac.at
Belgium						
1	Flanders Institute for Biotechnology (VIB)	VIB International PhD program	PhD	Systems Biology research: VIB Department of Plant Systems Biology Ugent: Ive de Smet, Dirk Inzé, Steven Maere, Yves Van de Peer VIB Vesalius Research Center: Sarah-Maria Fendt, Diether Lambrechts VIB Center for the Biology of Desease: Matthew Holt, Pierre Vanderhaeghen VIB Department of Medical Protein Research: Mohamed Lamkanfi, Lennart Martens VIB Department of Molecular Genetics: Stuart Maudsley VIB Switch Laboratory: Frederic Rosseau, Joost Dchymkowitz VIB Laboratory of Systems Biology: Kevin Verstrepen	Systems Biology projects	InternationalPhD@vib.de
2	Flanders Institute for Biotechnology (VIB)	omics@vib - VIB International Postdoc Program	Postdoc	see above	VIB offers international fellowships to integrative biology postdocs who have advanced skills in omics technologies	omics@vib.de
Bulgaria						
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Croatia						
1	University of Rijeka	Medical Chemistry	PhD	Department of Biotechnology	Subject: Systems Biomedicine	
2	University of Split	Biophysics	PhD	Faculty of Science	Subjects: Bioinformatics, Mathematical Modelling of Biological Systems, Basics of Systems Biomedicine	Prof. Davor Juretić (PMFST) juretic@pmfst.hr
Czech Republic						

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Denmark						
1	Aarhus University	Molecular Biology and Genetics	PhD	Department of Molecular Biology and Genetics	Systems Biology projects with the focus on: Animal and plant genome sequencing, Genome annotation, non-coding RNA Biology, MicroRNA Biology, Genetic mapping of complex traits, Identification of disease genes, Disease models, Functional genomics, Molecular genetics, Epigenetics, Expression quantitative trait loci, Transcriptomics, Genetic and structural variation, Metagenomics, Bioinformatics	Prof. Ernst-Martin Füchtbauer, emf@mb.au.dk http://talent.au.dk/phd/scienceandtechnology/programmes/molecular-biology-and-genetics/
Estonia						
1	Tallinn University of Technology	Systems Biology at the level of Doctoral studies.	PhD	The course is mainly intended for students in applied chemistry and biotechnology.	**Overview of molecular and cellular systems biology.** Methods and conceptions of **Genomics and Bioinformatics**. Integrated and coordinated genetic processes: reparation, transcription, RNA processing. Systematic approach to genetic systems, self-organization and evolution. **Proteomics: Bioinformatics' and experimental approaches**. Protein-protein interactions, complexes and networks. Integrated cellular processes via protein-protein interactions. **Metabolomics: conceptual and experimental approach**. Integration of metabolism into cellular processes. Structural component of cells, membranes and cytoskeleton. Analysis of structural components of cells. Integration of different cellular subsystems for specific functional purposes: cellular mobility, growth, cell division, morphogenesis. Integration of cells in the development of the organism. Evolution of cells.	Anu Aaspõllu, Tallinn University, Centre for Biology of Integrated Systems, anu.aaspollu@ttu.ee
2	University of Tartu	Molecular Interactions in Biological Systems at the level of Doctoral studies	PhD	The course is mainly intended for students in chemistry and gene technology	**Role of biomolecular interactions.** Basic principles: the role of energy and structure in biomolecular interactions. Application of **physical and chemical principles for biomacromolecules and bioactive compounds**. Practical knowledge of **biomolecular modelling**, i.e. visualization, structural modification, comparison and calculation of biopolymers and drug-protein complexes. The aim of the course is to give a basic knowledge for students for planning of their daily research work or intend to improve the quality of their scientific communications with up-to-date explanation at the atomic/molecular level. The course is recommended to students in chemistry and physics who are interested in biological applications and computational methods of determination of macromolecular structure and complexes, and to biologist, pharmacists and pharmacologists who work e.g. in the fields of protein engineering or drug development.	
Finland						
1	**Postgraduate training is organized thorough independent research groups or Centres at the following Universities:**					
2	Institute for Molecular Medicine Finland				Medical Systems Biology	Reetta Niemelä, Administrative Manager, reetta.niemela@fimm.fi http://www.fimm.fi
3	University of Helsinki					bch-sysbio@helsinki.fi http://research.med.helsinki.fi/sysbio//

4	Turku Centre for Biotechnology					Prof. Harri Lähdesmäki, harri.lahdesmaki@hut.fi http://www.btk.fi/research/affiliated-groups/laehdesmaeki-harri-computational-systems-biology/
France						
1	PRES Sorbonne Paris Cité	Frontiers of Life	PhD	Center for Research and Interdisciplinarity	**Systems Biology projects** at the Institute of Systems and Synthetic Biology	François Taddei, francois.taddei@inserm.fr
2	University Montpellier 2	Integrated Systems in Biology, Agronomy, Geosciences, Hydrosciences, Environment	PhD	AgroParisTech Institut des sciences et industries du vivant et de l'environnement Montpellier SupAgro Université dÂvignon et des Pays du Vaucluse Université Montpellier 1	Biology, Medicine, Health Agronomic and Ecologic Sciences Science of the Earth and the Universe, Space	
3	University of Strasbourg	IGBMC International PhD Programme	PhD	Institute of Genetics and Molecular and Cellular Biology, Illkirch	Functional Genomics and cancer Translational Medicine and Neurogenetics, **modeling of human disease** Development and stem cells Integrated structural biology **Bioinformatics and Biocomputing** Cellular signalling and nuclear dynamics Mouse models of human diseases	Institut de génétique et de biologie moléculaire et cellulaire (IGBMC), phdprogramme@igbmc.fr
4	University of Montpellier 1	International EpiGenMed PhD program	PhD	Labex (Laboratory of Excellence) EpiGenMed	Genomics and Epigenetics Cell cycle and Development Molecular Basis of Infectious Diseases Neuroscience and Cell Signalling **Biophysics and Systems Biology**	Stéphanie Martinetti, stephanie.martinetti@epigenmed.fr
5	University Paris-Sud	Genes, Genomes, Cells	PhD	Doctoral School Genes, Genomes, Cells	Molecular Genetics, Quantitative Genetics, Genomics, Microbiology, Cell Biology, Developmental Biology, Molecular Evolution, **Systems Biology**	Secretary Office, ed426.ggc@u-psud.fr
Germany						
1	Berlin Institute for Medical Systems Biology (BIMSB) at the Max-Delbrück-Center for Molecular Medicine, Berlin-Buch	Joint PhD Exchange Program in Medical Systems Biology with Center for Genomics and Systems Biology, Department of Biology, New York University	Dr. rer. nat	Berlin Institute for Medical Systems Biology, MDC and Center for Genomics and Systems Biology, Department of Biology, New York University	Systems Biology & Molecular Networks; Gene Regulation: microRNAs, Epigenetics, Transcription, RNA Biology; Bioinformatics, Computational Biology & Mathematical Modeling; Genomics, Proteomics, Metabolomics, Single Cell Analysis & Imaging; Cell Fate Conversion, Neuronal Differentiation, Reprogramming & Signaling	Jennifer Stewart, Program Administrator, Berlin Institute for Medical Systems Biology (BIMSB), jennifer.stewart@mdc-berlin.de, +49-30/9406-3035
2	Ludwig Maximilian University of Munich	Graduate School of Quantitative Biosciences Munich (QBM)	Dr. rer. nat	Gene Center and Department of Biochemistry (Ludwig Maximilian University of Munich), Max Planck Institute of Biochemistry, Helmholtz Center Munich – National Research Center for Environmental Health	Biochemistry, Bioinformatics, Structural Biology, Medicine, Molecular Genetics, Physics, Applied Mathematics, Theoretical Modeling, Experimental Biophysics; Control of Gene Expression, Interplay between diverse control mechanisms with complex regulatory networks	Prof. Dr. Ulrike Gaul, Scientific Coordinator, Gene Center and Department of Biochemistry, +49-89/2180-76878, gaul@genzentrum.lmu.de; Dr. Michael Mende, Administrative Coordinator, +49-89/2180-7684, mende-qbm@genzentrum.lmu.de
3	Dresden University of Technology	Dresden International Graduate School for Biomedicine and Bioengineering (DIGS-BB) / Program for Cell, Developmental and Systems Biology (CellDevoSys program) in joint association with the International Max Planck Research School for Cell, Developmental and Systems Biology (IMPRS-CellDevoSys)	Dr. rer. nat	Center for Regenerative Therapies Dresden (CRTD), Faculty of Science, Department of Biology, Medical Theoretical Center (MTZ), Max Planck Institute of Molecular Cell Biology and Genetics (MPI-CBG), Center for Information Services and High Performance Computing (ZIH), Biotechnological Center (Biotec), Max Planck Institute for the Physics of Complex Systems (MPI-PKS)	Molecular Cell Biology, Developmental Biology, Neurobiology, Genetics, Computational Biology, Computer Science Systems Biology, Systematic Genome-wide Approaches, High-resolution Imaging, Bioimage Informatics	Dr. Birgit Knepper-Nicolai, PhD Program Manager, +49-351/210-2772, knepper@mpi-cbg.de; Dr. Arantxa Sanchez Fernandez, PhD Program Coordinator, +49-351/458- 82153, Aranzazu.Sanchez@tu-dresden.de

4	University of Göttingen	Göttingen Graduate School for Neurosciences, Biophysics, and Molecular Biosciences (GGNB) / Molecular Biology of Cells	Dr. rer. nat	Faculty of Biology - Göttingen Centre for Molecular Biosciences (GZMB) in cooperation with Max Planck Institute for Biophysical Chemistry (MPI-bpc), Max Planck Institute for Experimental Medicine (MPI-em), German Primate Center (DPZ)	Light microscopy and imaging techniques, Large scale analysis, Quantitative Modelling, Analysis of genomes, transcription signatures, large scale protein identification, Metabolomics	Prof. Dr. Matthias Dobbelstein, Speaker of the Program , Institute of Molecular Oncology, +49-551/39-13840, mdobbel@uni-goettingen.de; Dr. Steffen Burkhardt, Coordinator Molecular Biology, GGNB Office, +49-551/39-12110, gpmolbio@gwdg.de
Greece						
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Hungary						
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Iceland						
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Ireland						
1	University College Dublin	Bioinformatics and Systems Biology			Four year structured programme including core advanced taught module in Systems Biology (5 ECTS).	Steering Committee member Systems Biology: Boris Kholodenko, boris.kholodenko@ucd.ie Scientific Advisory Board Member Systems Biology: Michael Stumpf, m.stumpf@imperial.ac.uk
2	University College Dublin	Computational and Infection Biology			Wellcome Trust-funded four year structured programme with advanced taught modules including Systems Biology option (5 ECTS).	Dr. Anthony Chubb, anthony.chubb@tucd.ie Program Director: Prof. Geraldine Butler, gbutler@ucd.ie
3	University College Dublin	Simulation Science			Four year structured PhD programme with advanced taught modules including Systems Biology option (5 ECTS).	sim.sci@ucd.ie
4	National University of Ireland, Galway	Biomedical Engineering and Regenerative Medicine			Four year structured programme including core module Introduction to Biomedical Systems: Genomic Technolo gies (5 ECTS).	Prof. Peter McHugh, peter.mchughnuigalway.ie
Italy						
1	University of Milan	Doctoral School in Computational Biology	PhD	European Institute of Oncology (IEO) Milan FIRC Institute of Molecular Oncology (IFOM) Milan Center for Genomic Sciences of IIT Milan	Systems Biology, Analysis of Next-Gen Sequencing Data, Network Biology, Evolutionary Genomics, Bioinformatics, Cancer Genomics 4 years program	Pier Paolo Di Fiore, pierpaolo.difiore@ieo.eu
2	University of Turin	Doctoral School in Complex Systems in Medicine and Life	PhD		**Post-genomic biology** by using combined **computational, engineering and experimental approaches with theoretical modelling**, rooted in theoretical physics and mathematics. The biological interests include cell differentiation and development, cell signalling, cell growth and motility, cancer progression, cancer cell genetics, protein folding, gene-expression. 3 years program	Prof. Giovanni Camussi, giovanni.camussi@unito.it
Malta						
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Lithuania						
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Luxembourg						
1	University of Luxembourg	Doctoral School in Systems and Molecular Biomedicine	PhD		**Molecular Biomedicine** offering doctoral education in modern biosciences with relevance to human health and disease, **Systems Biomedicine** offering doctoral education in experimental, high throughput technologies and computational approaches to biological systems and disease processes 3 year programme comprising additional 20 ECTS of course work	Prof. Serge Haan, serge.haan@uni.lu http://bio.uni.lu/doctoral_school Magali Guillaume, Secretary Doctoral School in Systems and Molecular Biomedicine, magali.guillaume@uni.lu
Netherlands						
1	SB@NL / Netherlands Consortium for Systems Biology (NCSB)	Systems Biology Training Programme	PhD	liaison with the Manchester Doctoral Training Centre on Systems Biology	•three basic web-based courses: basic cell biology for non-biologists, basic modelling for biologists, basic calculus • tutorials on specific Systems Biology-related topics, combining lectures and hands-on activities; typically one-day or two-days • international workshops • international training courses	Prof. Dr Jaap Molenaar, Director Biometris, Mathematics and Statistical Methods, Department of Plant Sciences, jaap.molenaar@wur.nl
Norway						
1	Norwegian University of Life Sciences	Research School for Systems Biology	PhD, Postdoc		The primary goal of the research school is to establish a fruitful scientific environment for the PhD-students working in Systems Biology on campus. Further, the research school wants to be a meeting place for researchers, PhD-students and MSc-students interested in Systems Biology at UMB and the surrounding research institutions at Campus Ås. Training and education at the postgraduate level is organized through topic specific seminar series, workshops, training courses and tutorials.	Prof. Gaute T. Einevoll, Gaute.Einevoll@umb.no
Poland						
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Portugal						
1	Gulbenkian Institute of Science (IGC), Lisbon	IGC PhD Programme - Integrative Biology and Biomedicine	PhD	New University of Lisbon	General: basic concepts and cutting edge research in modern biology. Module topics range from structural and molecular biology to evolution and ecology and are taught by IGC faculty and invited lecturers from top universities and research institutes all over the world Specific: **Systems Biology, From cells to organisms, Biophysics, Advanced training in Statistics and Bioinformatics**	Élio Sucena, Evolution and Development group, esucena@igc.gulbenkian.pt
2	MIT Portugal	Bioengineering Systems	PhD	University of Coimbra: Faculty of Science and Technology Centre for Neuroscience and Cell Biology Technical University of Lisbon: Instituto Superior Técnico New University of Lisbon: Faculty of Science and Technology Institute of Chemical and Biologic Technology University of Minho: School of Engineering	Mandatory: Introduction to Technological Innovation; Bioprocess Engineering; Cell & Tissue Engineering; **Computational Biosystems Science & Engineering** Elective: Biomedical Devices and Technologies; Nanobiotechnology and Biomaterials; **Neuroscience: Molecular to Systems Neurobiology and Brain Diseases**; Principles and Practice of Drug Development	Dr. José Silva Lopes, New University of Lisbon, Department of Chemistry, jasl@fct.unl.pt Dr. Isabel Rocha, University of Minho, Center of Biological Engineering, Biosystems group, irocha@deb.uminho.pt

3	University of Lisbon	Biological Systems, Functional & Integrative Genomics (BioSys)	PhD	Center for Biodiversity, Functional & Integrative Genomics (BioFIG)	General: **Systems Biology and Functional Genomics** Specific: one semester intensive training course organized in five modules (each with 3-week duration): Basics & Gene Expression; Cell Signalling, Differentiation & Physiology; Functional Genomics & Advanced Light Microscopy; Biological Systems & Genomics; Bioinformatics & Computational Modelling	Professor Margarida Amaral, BioFIG, mdamaral@fc.ul.pt
4	University of Lisbon	Biotechnology	PhD	Instituto Superior Técnico	Compulsary courses: **Advanced Experimantal Techniques and Methodologies in Biotechnology**, Bioentrepreneurship, Basic Doctoral Formation Optional courses: **Genomics, Proteomics and Bioinformatics; Functional and Comparative Genomics; Molecular Biotechnology;** Systems and Control in Bioengineering; Advanced Topics in Bioengineering and Biological Sciences; **Transport Phenomena in Biological Systems; Sensors, Instrumentation and Measurement in Biological Systems**	Isabel Sá-Correia, Department of Bioengineering, isacorreia@ist.utl.pt
5	University of Coimbra	Doctoral Programme in Experimental Biology and Biomedicine	PhD	Center for Neuroscience and Cell Biology	General: advanced, research-oriented training in emerging areas of contemporary Biology and Biomedicine: Molecular Cell Biology, **Neuroscience and Disease**, **Molecular Biotechnology**, Medical and Environmental Toxicology, **Biophysics** and NMR, Microbiology, Development and Human Fertility, Visual Sciences Specific (Advanced Courses): **Molecular Systems Biology, System Neurosciences, Integrating Biology - The "Omics" World**	Armindo Salvador, University of Coimbra, Molecular Systems Biology group, salvador@cnc.uc.pt
6	University of Minho	Chemical and Biological Engineering	PhD	School of Engineering	General: Biological and Chemical Engineering topics, with special emphasis on its theoretical fundamentals, comprising the specification, the project, the modulation, the representation and exploitation of **biological and chemical systems**, as well as the integration of the associated technologies Specific: **Molecular Biotechnology, Functional Genomics, Systems Biology** and Nanotechnology	Lucília Maria Alves Ribeiro Domingues, Centre of Biological Engineering, luciliad@deb.uminho.pt
7	University of Minho	Bioengineering	PhD	School of Engineering	General: fundamental concepts of physical, chemical and biological engineering, computational systems, and medical technologies Specific: **Computational Biosystems Science and Engineering**	Eugénio Manuel Faria Campos Ferreira, Department of Biological Engineering, ecferreira@deb.uminho.pt
8	NOVA (New University of Lisbon)	Molecular Biosciences	PhD	Instituto de Tecnologia Química e Biológica (ITQB)	General: Biopharmaceutical Technology, Molecular Mechanisms of Biological Processes, Molecular Microbiology and Infection Biology, Plants for Life Specific: **One week unit of Systems Biology**	Claudine Chaouiya, Gulbenkian Institute of Science: Network Modelling group, chaouiya@igc.gulbenkian.pt Ana Teixeira, ITQB: Synthetic Biology Laboratory, anat@itqb.unl.pt
Romania						
1	University of Bucharest	Doctoral School in Complex Systems in Medicine and Life Sciences	PhD			

Slovakia						
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Slovenia						
1	University of Ljubljana	Interdisciplinary study programme	PhD	Biotechnical Faculty, Faculty of Electrical Engineering, Faculty of Mechanical Engineering and Faculty of Computer and Information Science	Elective subject Feedback Control in Biological Systems	
2	University of Ljubljana	Biomedicine	PhD		In the year 2014/2015 a new module of **Systems Medicine (10 ECTS)** will start at doctoral studies of Biomedicine at University of Ljubljana that will focus on **Systems Biology application in Medicine**.	Prof. dr. Ana Plemenitaš, ana.plemenitas@mf.uni-lj.si
Spain						
1	Centre for Genomic Regulation (CRG) Barcelona	CRG International PhD Programme	PhD	CRG and University Pompeu Fabra (Barcelona)	research programmes: **Bioinformatics and Genomics** (Computational Biology of RNA Processing; Genomics and Disease; Comparative Bioinformatics; Comparative Genomics; Evolutionary Genomics; Gene function and Evolution; Genomic and Epigenomic Variation in Disease; Genome Architecture); **Cell and Developmental Biology; Gene Regulation, Stem Cells and Cancer; Systems Biology** (Multicellular Systems Biology, Design of Biological Systems, Genetic Systems, Sensory Systems and Behaviour, Comparative Analysis of Developmental Systems, Cellular & Systems Neurobiology, Biomechanics of Morphogenesis)	CRG International PhD Programme Imma Falero Academic Officer Centre de Regulació Genòmica Dr. Aiguader, 88 PRBB Building 08003 Barcelona Spain phdprogram@crg.es
2	Centre for Genomic Regulation (CRG) Barcelona	CRG Postdoctoral Programme	postgraduate		research programmes: **Bioinformatics and Genomics**; Cell and Developmental Biology; Gene Regulation, Stem Cells and Cancer; **Systems Biology** (see above)	group leaders at CRG
3	Centre for Genomic Regulation (CRG) Barcelona	Joint Post-doctoral Fellowship Programme NCBS-InStem-CRG	postgraduate	National Centre for Biological Sciences (NCBS); Institute for Stem Cell Biology and Regenerative Medicine (inStem) Bangalore, India; CRG Barcelona	research programmes: **Bioinformatics and Genomics**; Cell and Developmental Biology; Gene Regulation, Stem Cells and Cancer; **Systems Biology (see above)**	Kripa V. Jalapathy Research and Academic Coordinator National Centre for Biological Sciences Bellary Road Bangalore 560065, Karnataka, India Email: crgncbsinstem@ncbs.res.in
4	University of Vic	Systems Biology	PhD	Research group Medical Statistics and Bioinformatics	General: **Systems Biology** Specific: Statistical and Computational Modeling of complex diseases; Molecular Evolution in H. sapiens	Dr. Joan Bertran Comulada, joan.bertran@uvic.cat
5	University of Barcelona	Biomedicine	PhD	Institute for Research in Biomedicine (IRB) Barcelona Barcelona Supercomputing Center	research lines offering knowledge and methods of Systems Biology: **Structural Bioinformatics and Systems Biology, Computational Genomics**; in the area of biomedical engineering: **Systems Design** to manipulation and processing of cells and molecules, processing of biomedical images	Albert Tauler Girona, Faculty of Pharmacy, Department of Biochemistry and Molecular Biology, tauler@ub.edu
6	Complutense University of Madrid	Biochemistry, Molecular Biology and Biomedicine	PhD	Faculties of Biology, Pharmacy, Medicine and Veterinary	research lines offering knowledge and methods of Systems Biology: **Computational Biology, Biology of neural and metabolic networks**, Proteomics, Metabolic Engineering	Prof. Maria Antonia Lizarbe, Faculty of Chemistry, lizarbe@bbm1.ucm.es
7	University of Granada	Biochemistry and Molecular Biology		Departments of Biochemistry and Molecular Biology; Immunology	Research lines: **Dynamics of Biological systems**	Esperanza Ortega Sánchez, Faculty of Medicine, esortega@ugr.es

8	University of Malaga	Cellular and Molecular Biology	PhD	Faculty of Science	Research line: **Systems Biology**	Francisco Cánovas Ramos, Department of Molecular Biology and Biochemistry, canovas@uma.es
9	Autonomous University of Madrid	Molecular Biosciences	PhD	Faculty of Science	Research lines: **Bioinformatics and Molecular Systems Biology**, Biotechnology	Miguel Ángel Iñiguez Peña, Department of Molecular Biology, mainiguezarrobacbm.uam.es Margarita Fernández Martín, Department of Metabolism and Cellular Signalling, mfernandez
10	Autonomous University of Madrid	Biophysics	PhD	Faculty of Science	Research lines: **Computational Biology and Systems Biology; Theoretical and Computational Neurosciences; Bioinformatics**; Statistical Physics of Biological Processes; Systems Neurosciences, Biological Imaging; Quantitative Studies of Developmental, Differentiation and Cellular Signaling Processes	Raúl Guantes, Department of Physics of Condensed Matter, raul.guantes@uam.es
11	University of Lleida	Molecular Sytems Biology Group	PhD (3-4) and Postdoc (1-2)	Department of Basic Medical Sciences	**Computational Systems Biology and Biological Design Principles:** development of computational and mathematical method and tools for Systems Biology and Bioinformatics; application of those methods/tools	Rui Carlos Vaqueiro de Castro Alves, ralves@cmb.udl.es
12	University of Vigo	Advanced Biotechnology	PhD	Faculty of Biology, UVigo Faculty of Sciences, University of Coruña	Research lines: Health Biotechnology, **Systems Biology**	Carmen Sieiro Vázquez, Department of Functional Biology and Health Science, mcsieiro@uvigo.es
13	University of Vigo	Methodologies and Applications for Life Sciences	PhD	Faculty of Biology	Research lines: **Bioinformatics**, Modelling of immunitary processes	Armando Caballero Rúa, Department of Biochemistry, Genetics and Immunology, armando@uvigo.es
14	University of Barcelona	Biotechnology	PhD	Faculties of Biology and Pharmacy	research lines offering knowledge and methods of Systems Biology: Genomics, Proteomics and **Bioinformatics**; Biotechnology: models, methodologies and applications; Biomedical Biotechnology	Josefa Badia Palacín Department of Biochemistry and Molecular Biology, Faculty of Pharmacy Tel.: 0034 934034496; josefabadia@ub.edu
15	University of Valencia	Biomedicine and Biotechnology	PhD	Departments of Biochemistry and Molcular Biology, Genetics, Microbiology and Ecology, Vegetal Biology Institute for Biomedicine Valencia Institute for Molecular Biology of plants Príncipe Felipe Research Center Valencia Research Center for agricultural chemistry and food technology Valencia institute of Infertility Valencia	Research lines: Biotechnology, Biomedicine, Genomics, Proteomics and **Bioinformatics**, Molecular Biology and Genetics	Francisco Estruch Ros, Department of Biochemistry and Molcular biology, Francisco.Estruch@uv.es
Sweden						
1	Chalmers University of Technology	Postgraduate courses	PhD / Postdoc		Postgraduate training is organized thorough independent research groups or Centres. Training and education at the postgraduate level is organized through topic specific seminar series, workshops, training courses and tutorials. Available courses: **Industrial Perspectives on Systems Biology**	
2	University of Gothenburg	Postgraduate courses	PhD / Postdoc		Postgraduate training is organized thorough independent research groups or Centres. Training and education at the postgraduate level is organized through topic specific seminar series, workshops, training courses and tutorials. Available courses: **Industrial Perspectives on Systems Biology** **Future challenges in yeast genetics and Systems Biology** Statistics for genome science	
Switzerland						

1	University of Basel	International PhD Program in Molecular Life Sciences	PhD	Biozentrum	including Graduate Teaching Program on topics, like **Computational and Systems Biology**	Angie Klarer (Coordination), angie.klarer@unibas.ch http://www.biozentrum.unibas.ch/education/phd/overview/, http://www.biozentrum.unibas.ch/education/phd/graduate-program/cycle-e/
2	Conférence universitaire de Suisse occidentale (Universities of Bern, Fribourg, Geneva, Lausanne and Neuchâtel)	Doctoral Program Staromics	PhD		Students are offered instruction in **genome-wide and proteome-wide data analysis, biological modelling, quantitative image analysis, programming and statistics**, in addition to a thorough education in experimental biology, through a didactic program that complements both their individual research topic and background. Thus, PhD students become conversant in both experimental and computational approaches and acquire the ability to integrate quantitative and experimental methods in their own research. Graduates from this program will have unprecedented scientific competence to permit them to become future leaders in biological research and beyond.	Corinne Dentan, corinne.dentan(at)unil.ch http://biologie.cuso.ch/staromics/welcome/
3	University of Lausanne	Doctoral Program in Integrative Experimental and Computational Biology	PhD	Doctoral School of the Faculty of Biology and Medicine	Students are offered instruction in **genome-wide and proteome-wide data analysis, biological modelling, quantitative image analysis, programming and statistics**, in addition to a thorough education in experimental biology, through a didactic program that complements both their individual research topic and background. Thus, PhD students become conversant in both experimental and computational approaches and acquire the ability to integrate quantitative and experimental methods in their own research. Graduates from this program will have unprecedented scientific competence to permit them to become future leaders in biological research and beyond. The IECB program, working in close association with the **Swiss Institute of Bioinformatics-SIB**, provides training and experience in the reasoning, logic and abilities inherent to both experimental and computational approaches and educates students in quantitative analysis of biological questions.	Dr Keith Harshman, Keith.Harshman (at) unil.ch http://www.unil.ch/iecb/page78534.html
4	Swiss Institute of Bioinformatics SIB	SIB PhD Training Network	PhD		The Swiss Institute of Bioinformatics maintains a PhD Training Network in bioinformatics open to graduate students at Swiss universities that are supervised or co-supervised by an SIB group leader. It offers graduate students in **bioinformatics cutting-edge courses**, summer schools and workshops to update their knowledge and to promote the exchange of ideas.	Patricia Palagi, Patricia.Palagi@isb-sib.ch http://www.isb-sib.ch/education/sib-phd-training-network/benefits.html
United Kingdom						
1	University of Oxford	Systems Biology	PhD	Centre for Doctoral Training Departments: Biochemistry, Chemistry, the Computing Laboratory and Mathematics	**Detailed pathway modeling, Larger scale network modeling, Cellular modeling, Physiome modelling**	Centre for Doctoral Training, cdt-enquiries@eng.ox.ac.uk
2	University of Oxford	Systems Approaches in Biomedical Sciences	PhD	Centre for Doctoral Training Departments in the Mathematics, Physical and Life Sciences Division and the Medical Sciences Division of Oxford University (including Biochemistry, Chemistry, Computing Laboratory, Mathematics, Pharmacology and Engineering) wide range of Industrial Partners	Training modules in the first year cover life science background and training in mathematical, computational and physical skills required for **advanced quantitative systems research in Biomedicine.**	Centre for Doctoral Training, cdt-enquiries@eng.ox.ac.uk

3	University of Oxford	Life Sciences Interface	PhD	Doctoral Training Centre	Biological Physics, Medical Imaging and Signals, Bioinformatics, Evolution and Genetics, **Computational Biology**	Doctoral Training Centre, dtcenquiries@dtc.ox.ac.uk
4	University of Manchester	Systems Biology	PhD	School of Chemical Engineering and Analytical Science Manchester Interdisciplinary Biocentre Morton Laboratory	Biological Mechanism and Catalysis, Molecular Bioengineering and **Systems Biology**	pgr-ceas@manchester.ac.uk
5	University of Manchester	Systems Neuroscience	PhD	Faculty of Life Sciences	**Neuronal networks, Mathematical and Computer Modeling**	pgresearch.lifesciences@manchester.ac.uk
6	University of Edinburgh	Informatics: ANC: Machine Learning, Computational Neuroscience, Computational Biology	PhD	Institute for Adaptive and Neural Computation (IANC) Neuroinformatics and Computational Neuroscience Doctoral Training Centre	**Computational Neuroscience and Neuroinformatics:** study of how the brain processes information, and analysis and interpretation of data from neuroscientific experiments **Computational Biology:** computational strategies to store, analyse and model a variety of biological data (from protein measurements to insect behavioural data)	School of Informatics Graduate School, phd-admissions@inf.ed.ac.uk
7	University of Edinburgh	Cognitive and Neural Systems	PhD	Centre of Cognitive and Neural Systems (CCNS)	information processing by the central and peripheral nervous systems, at several different levels of analysis, from cognitive psychology through cognitive neuroscience and brain imaging, behavioural neuroscience and neuropharmacology, and extending to **theoretical models of neuronal networks**	Postgraduate Secretary, School of Biomedical Sciences, sbms-postgraduate@ed.ac.uk
8	University of Edinburgh	Cell Biology	PhD	Graduate School of Biological Sciences	Biotechnology, **Synthetic Biology, Systems Biology**	Toni Jenkins, Postgraduate Programme Administrator, toni.jenkins@ed.ac.uk
9	University of Edinburgh	Genetics and Genomics	PhD	Division of Genetics and Genomics	Genetics (molecular, quantitative), Physiology (Neuroendocrinology, Immunology), 'Omics (Genomics, functional Genomics) with particular strengths in **Mathematical Biology** (**Quantitative Genetics**, Epidemiology, **Bioinformatics, Modelling**)	Postgraduate Secretary, Royal (Dick) School of Veterinary Studies, vetpgresearch@ed.ac.uk
10	University of Edinburgh	Pathway Medicine	PhD	Division of Pathway Medicine	**Pathway biology of infection and immunity.** This involves the study of host-pathogen interaction in immune cells and the **modelling of molecular pathways** that control immune cell function in health and disease.	Dr. Douglas Roy, Curriculum Coordinator, Division of Pathway Medicine
11	Imperial Colege London	Cell & Molecular biology	PhD	Division of Cell and Molecular Biology	Immunology and Infection Development of the immune system; intercellular communication and immune surveillance by NK and T cells, and mechanisms of innate immunity complex host-pathogen interactions, integrative Cell Biology and Biophysics, **Systems Neuroscience**	Manami Kanazawa, m.kanazawa@imperial.ac.uk
12	University College London	Biosciences - BBSRC London Interdisciplinary Biosciences PhD Consortium	PhD	Division of Biosciences	This BBSRC programme delivers research training that supports the new cross-disciplinary landscape; providing **mathematical and computational skills to understand and model biological processes and function**	Miss Sahar Freemantle, Division of Biosciences, s.freemantle@ucl.ac.uk
13	University College London	CoMPLEX	MPhil / PhD	UCL departments within the Faculties of Brain Sciences, Engineering Sciences, Life Sciences, Mathematical and Physical Sciences, Medical Sciences, Population Health Sciences and Social and Historical Sciences	**Systems Biology, Synthetic Biology,** Physiological and neural systems , Integration of cellular function, Biomolecular mechanisms, Cancer biology, Immunology and Infectious disease, Evolution and dynamics of populations, Interdisciplinary cardiovascular research	Centre Administrator, complex@ucl.ac.uk
14	University College London	Cancer Institute	PhD	Cancer Institute	Medical Genomics, **Cancer Systems science** and Biomedical Informatics, Epigenetics and signalling networks	Dr. Julie Olszewski, j.olszewski@ucl.ac.uk

15	University College London	Structural, Computational and Chemical Biology - Wellcome Trust PhD	PhD	Department of Structural and Molecular Biology	Structural, Molecular and Cellular Biology, Chemical Biology and the **computational tools necessary to address important problems in biomedicine**	Ms. Manu Davies, manu.davies@ucl.ac.uk
16	University College London	Genetics, Evolution and Environment	MPhil/PhD	Department of Genetics, Evolution and Environment	Biodiversity and Environmental Biology, Biology of Ageing, Computational Biology, Evolutionary Genetics, Evolution and Development, Human Genetics and Human Evolution, **Systems Biology**	Ms Manu Davies, manu.davies@ucl.ac.uk
17	University of Glasgow	BHF PhD programme	PhD	Institute of Cardiovascular and Medical Sciences Institute of Molecular, Cell and Systems Biology	Genetics, Genomics and **Systems Medicine**	Prof. Godfrey Smith, Institute of Cardiovascular and Medical Sciences, Godfrey.Smith@glasgow.ac.uk
18	University of Bristol	Complexity Sciences	PhD	Bristol Centre for Complexity Sciences (BCCS) Complexity Doctoral Training Centre	Modelling and Statistics in **Systems Biology**, **Dynamics on Networks**, Scientific Programming, **Mathematical Modelling**, Nonlinear Dynamics and Nonlinear Control Theory, Probability, Information Theory and Statistical Mechanics, Biology and Complexity, **Biological and Computational Neuroscience**	Complexity Doctoral Training Centre, bccs-enquiries@bristol.ac.uk
19	University of Warwick	Multidisciplinary Science	PhD	Molecular Organisation and Assembly in Cells (MOAC) Doctoral Training Centre	Mathematical Biology projects	moac2@warwick.ac.uk
20	University of Warwick	Mathematics for Real-World Systems	PhD	Systems Biology Doctoral Training Centre Centre for Complexity Science Warwick Systems Biology Centre Warwick Infectious Disease Epidemiology Research	Model Construction and analysis, **Dynamics of systems**, Extracting structure from data, **Networks,** Optimisation, control & robustness	complexity@warwick.ac.uk
21	University of Warwick		PhD	Systems Biology Doctoral Training Centre	Systems Biology projects	Prof. Vicky Buchanan-Wollaston, SBDTC Director, Vicky.B-Wollaston@warwick.ac.uk
22	University of Warwick University of Birmingham University of Leicester	Midlands Integrative Biosciences Training Partnership		University of Warwick, School of Life Sciences	Molecular Systems Biology	Kerry Davies, MIBTP@warwick.ac.uk
23	University of Leeds	Applied Computing in Biology, Medicine and Health	PhD	Institute for Artificial Intelligence and Biological Systems	Systems Biology and Bioinformatics projects	School of Computing, University of Leeds, office@comp.leeds.ac.uk