

Master Systems Biology

Michiel Adriaens / Mike Gerards
Maastricht Centre for Systems Biology
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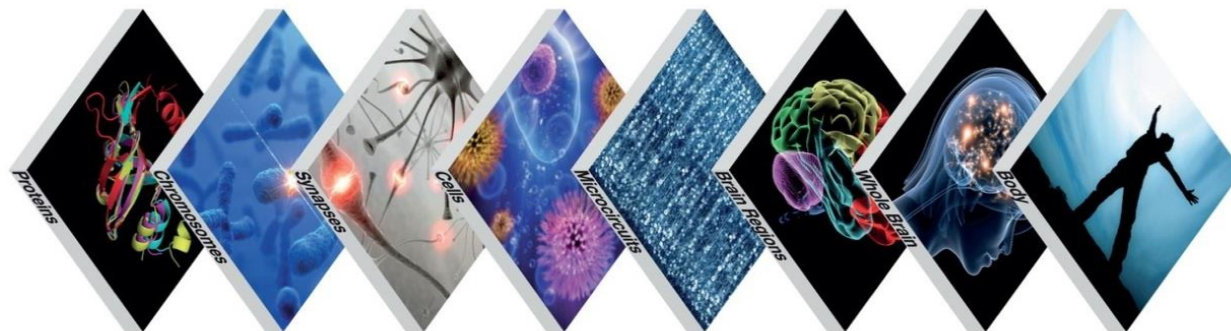
Started 31 august 2015

- 2 year, full-time master
- 120 ECTS
- At the Health Campus (Randwyck, UM)
- Fully English programme



Systems Biology:

- Is a rapidly evolving multidisciplinary field of science
- Combines biology, computational models, and mathematics
- Aims to understand the behavior of biological systems ...
- ... and predict new behaviors



Towards the virtual physiological human



Mathematical modelling

- biology based
- prediction
- metabolism

Mathematical formulation

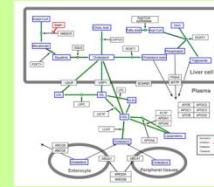
$$S = \begin{pmatrix} m_1 & m_2 & m_3 \\ -1 & 2 & 0 \\ 0 & 0 & -1 \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} v_1 \\ v_2 \\ v_3 \end{pmatrix} = \begin{pmatrix} c_1 \\ c_2 \\ c_3 \\ c_4 \end{pmatrix}$$

Steady-state assumption
 $S \cdot v = 0$

Constraints and objective function
 $0 \leq v_i \leq ub_i$
 Minimize $v \cdot e$

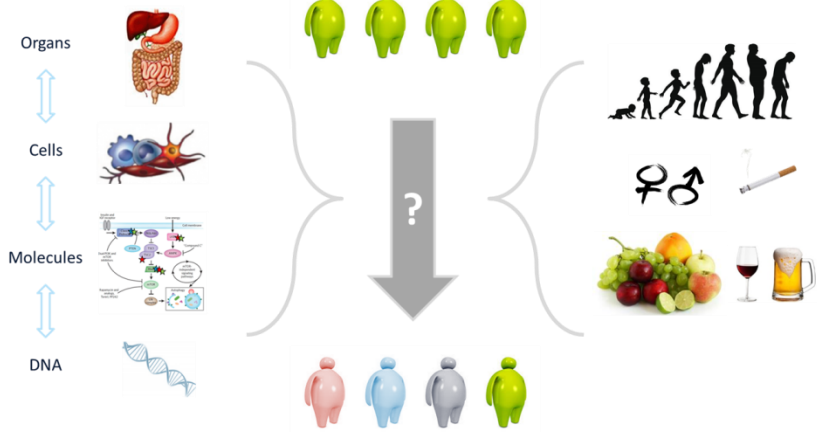
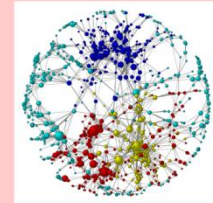
Pathway analysis

- biology based
- easily add regulatory info



Data-driven analysis

- correlations
- detect novel mechanisms



Why Systems Biology?

Societal



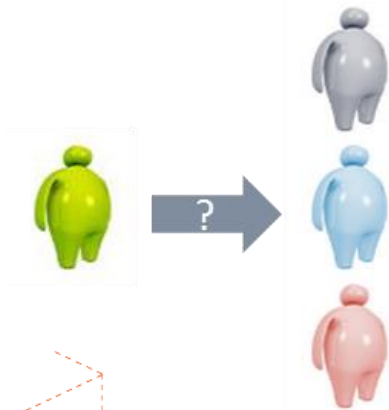
Replace animal testing



Basic research



Diagnostics



Personalized medicine



Scientific challenges for the future:

- are multidisciplinary and international
- need teams spanning scientific disciplines to develop solutions
- require a new generation of scientists
→ new teaching programmes



Need for students:

- who have a broad interest in combining biology, computer science, and mathematics
- who do not want to be limited to a fixed, highly specialized programme
- who want to learn how to think, work and communicate across disciplines



Programme Master SB

1st year MSc Systems Biology (total 60 EC)

8 weeks	8 weeks	4 weeks	8 weeks	8 weeks	4 weeks
Compulsory courses	Compulsory courses	Project	Electives	Electives	Project
		student research (group)	Choose 2	Choose 2	student research (group)
2 x 6 EC	2 x 6 EC	6 EC	2 x 6 EC	2 x 6 EC	6 EC

2nd year MSc Systems Biology (total 60 EC)

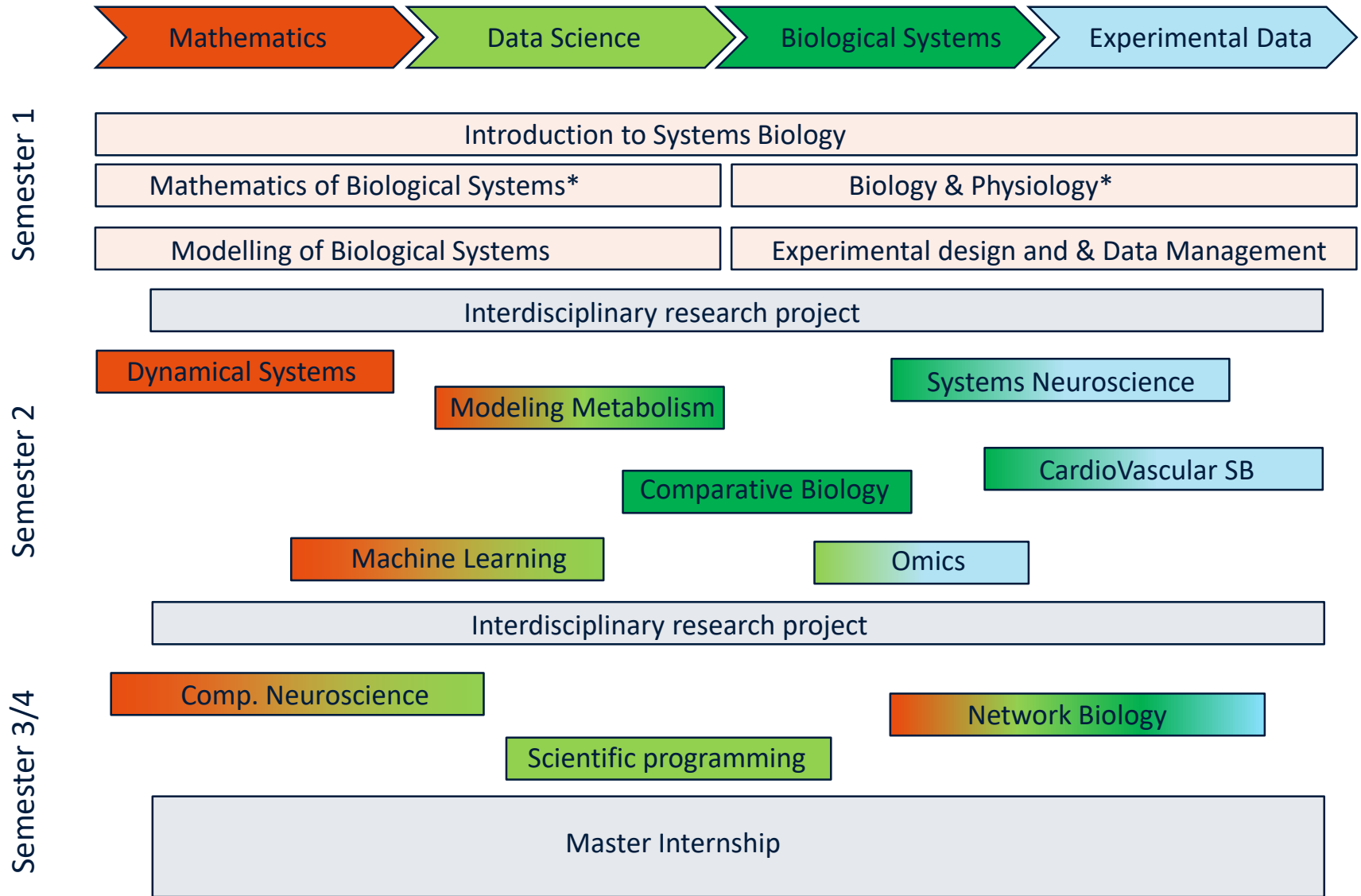
8 weeks	32 weeks
Electives	Master Thesis Research Project
Choose 2	Individual student research project
2 x 6 EC	48 EC

Curriculum set-up:

- Multidisciplinary programme: broad spectrum of topics spanning from mathematics to biology



Please note that all information in this document is tentative and subject to change, since we are still in the process of optimizing the master programme.



**Followed course depends on previous education*

Study load: What does a week of study look like?

Two courses each week (up to 20 hr contact time)

<u>module</u>	<u>hr/module</u>	<u>total/week</u>
• 2 x 1 lecture per week	1.5-2 hr/lecture	3-4 hr
• 2 x 2 tutorials per week	1.5-2 hr/tutorial	6-8 hr
• Skills training: computing, practical, or academic skills		8 hr
• Self study	20-24 hr/week	20-24 hr

Teaching by active researchers



 /macsbio

 @MaCSBio

<https://www.maastrichtuniversity.nl/macsbio>

Infrastructure and facilities



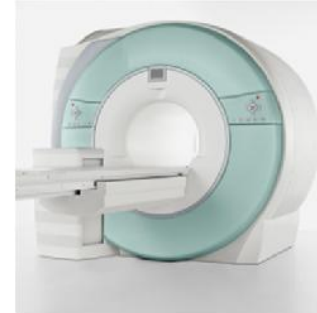
Laboratories



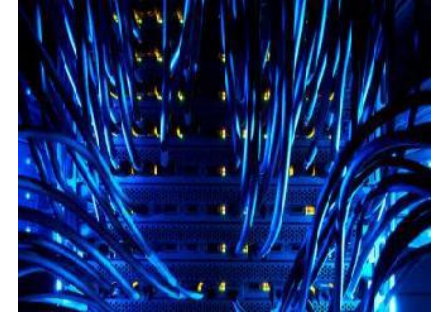
Clean rooms



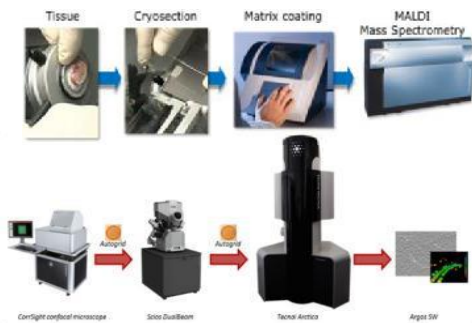
Large cohorts



MRI scanners



High-performance computing facilities



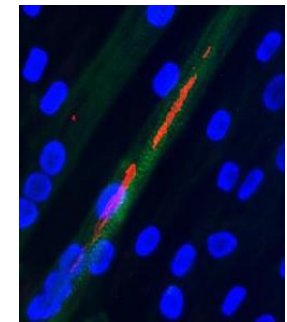
Multi-modal molecular imaging



Macro/micro/nano-biofabrication technology



Genomics & Proteomics



Cell Biology/ iPSC facilities

Career opportunities

Researcher

!
PhD research

Universities, hospitals, applied science organizations, pharmaceutical and biotech companies

Policy maker

Government organizations, centres for population health, environment, genetics, prevention

Entrepreneur

Specialized Systems Biology company (“life sciences incubator”)

Admission requirements:

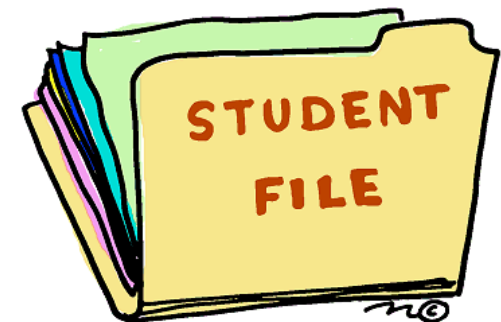
- Bachelor diploma: biomedical sciences, sciences (e.g., MSP), university college (e.g., UCM), mathematics, data science, neuroscience, biomedical engineering, (bio)informatics, etc.
- Motivation to study across disciplines
- Proficiency in the English language
- Required 15 ECTS in mathematics/statistics at bachelor level

→ Can be waived based on individual background: contact us!





Admission procedure:

- Send in all documents: bachelor diploma; transcripts or grade list; motivation letter; 2 reference letters; copy passport; english proficiency (IELTS, TOEFL, etc.)
- Interview: approx. 30 minutes to determine if there is a match between student and master programme
- Board of admissions makes a decision on admission



Contact/Information:

- E-mail: Sb-info@maastrichtuniversity.nl
- Website: www.maastrichtuniversity.nl/systemsbiology
-  [/MScSystemsBiology](https://www.facebook.com/MScSystemsBiology)
-  [Science and Engineering Maastricht University](https://www.youtube.com/ScienceandEngineeringMaastrichtUniversity)
- Student for a day
It is possible to be a student for a day. [Just ask us about the possibilities](#) and we'll make an appointment for you with one of our teachers to get more information about the programme and to see our facilities.
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