

Master Systems Biology

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Maastricht Centre for Systems Biology
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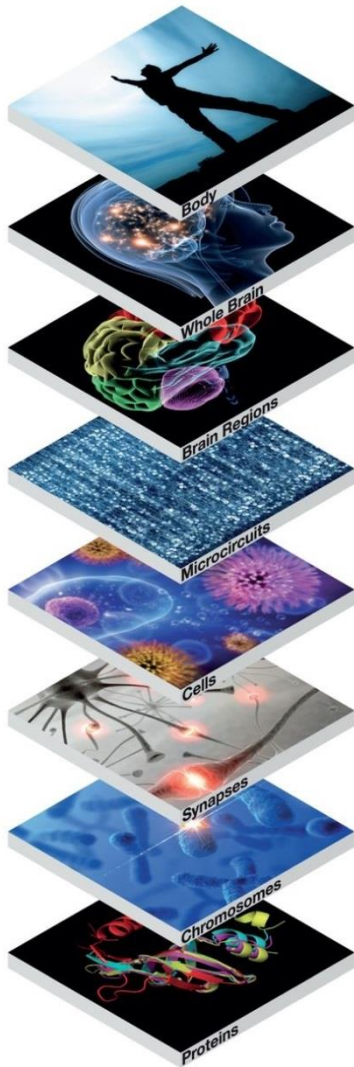
Master Systems Biology

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

B Mathematical formulation

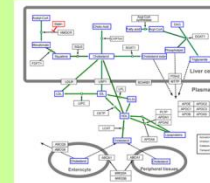
$$S = \begin{pmatrix} f_1 & f_2 & f_3 & \dots & f_n \\ 1 & 2 & 0 & \dots & 0 \\ -1 & 0 & 0 & \dots & 0 \\ 0 & 1 & 0 & \dots & 0 \\ 0 & 0 & 1 & \dots & 0 \end{pmatrix} \begin{pmatrix} m_1 \\ m_2 \\ m_3 \\ \dots \\ m_n \end{pmatrix}$$

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

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

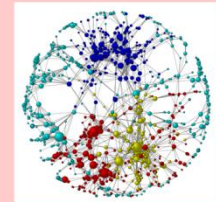
Pathway analysis

- biology based
- easily add regulatory info



Data-driven analysis

- correlations
- detect novel mechanisms



Organs



Cells



Molecules



DNA



Why Systems Biology?

Societal



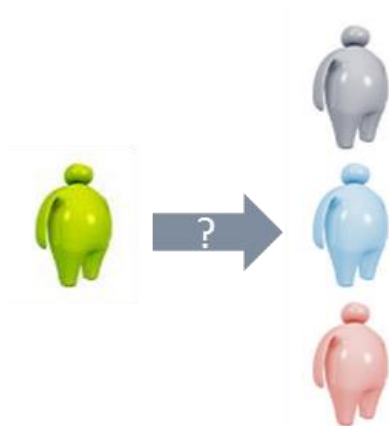
Replace animal testing



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



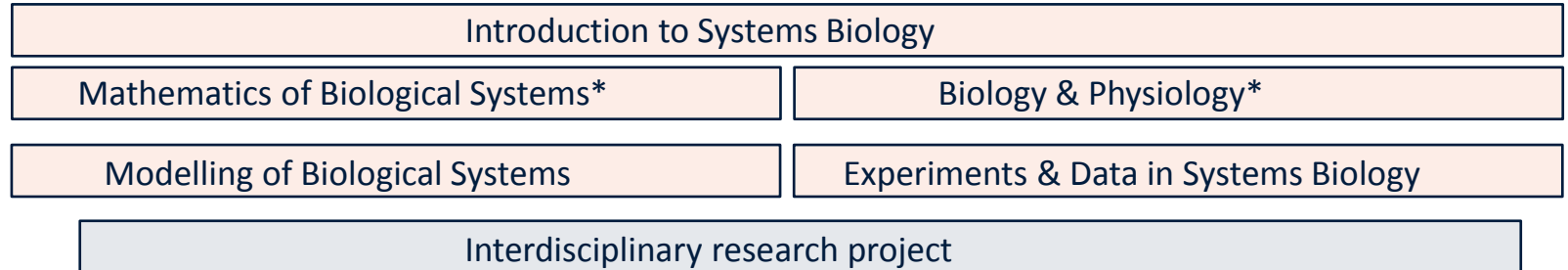
Curriculum set-up:

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

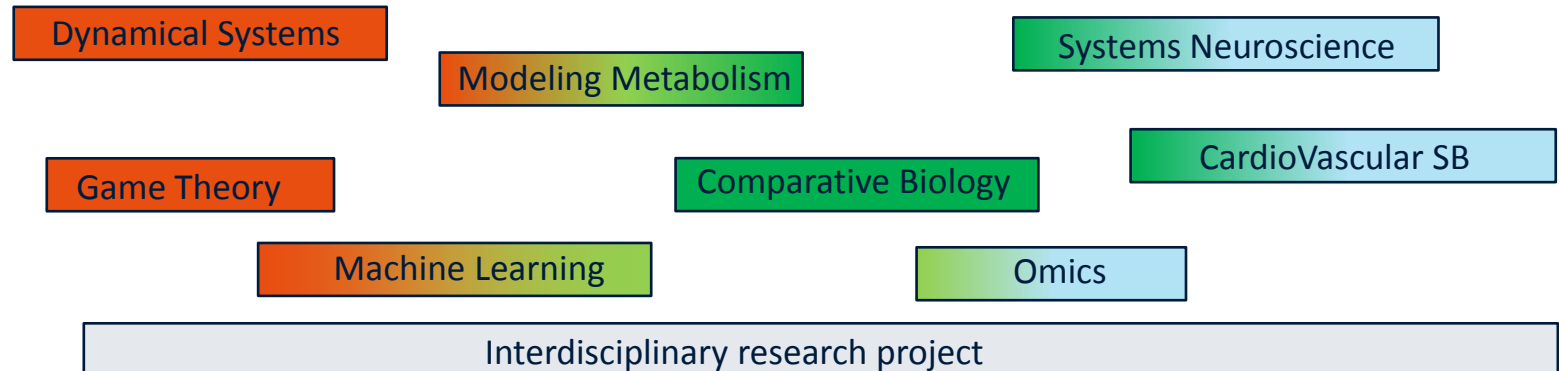




Semester 1



Semester 2



Semester 3/4



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
• <i>Self study</i>	20-24 hr/week	20-24 hr

Academic advisor system



- **Every student** has a Academic advisor throughout the 2 year SB Master
- Academic advisor gives **guidance and advice** regarding your **personal curriculum**
- Academic advisor is an **active researcher** in the field of Systems Biology

Teaching by active researchers



Infrastructure and facilities



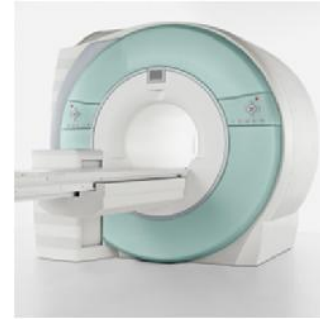
Laboratories



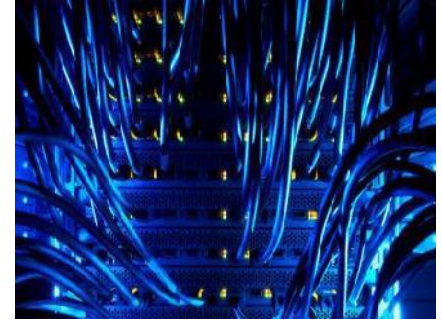
Clean rooms



Large cohorts



MRI scanners



High-performance
computing facilities



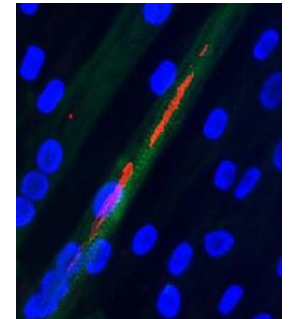
Multi-modal molecular
imaging



Macro/micro/nano-
biofabrication technology

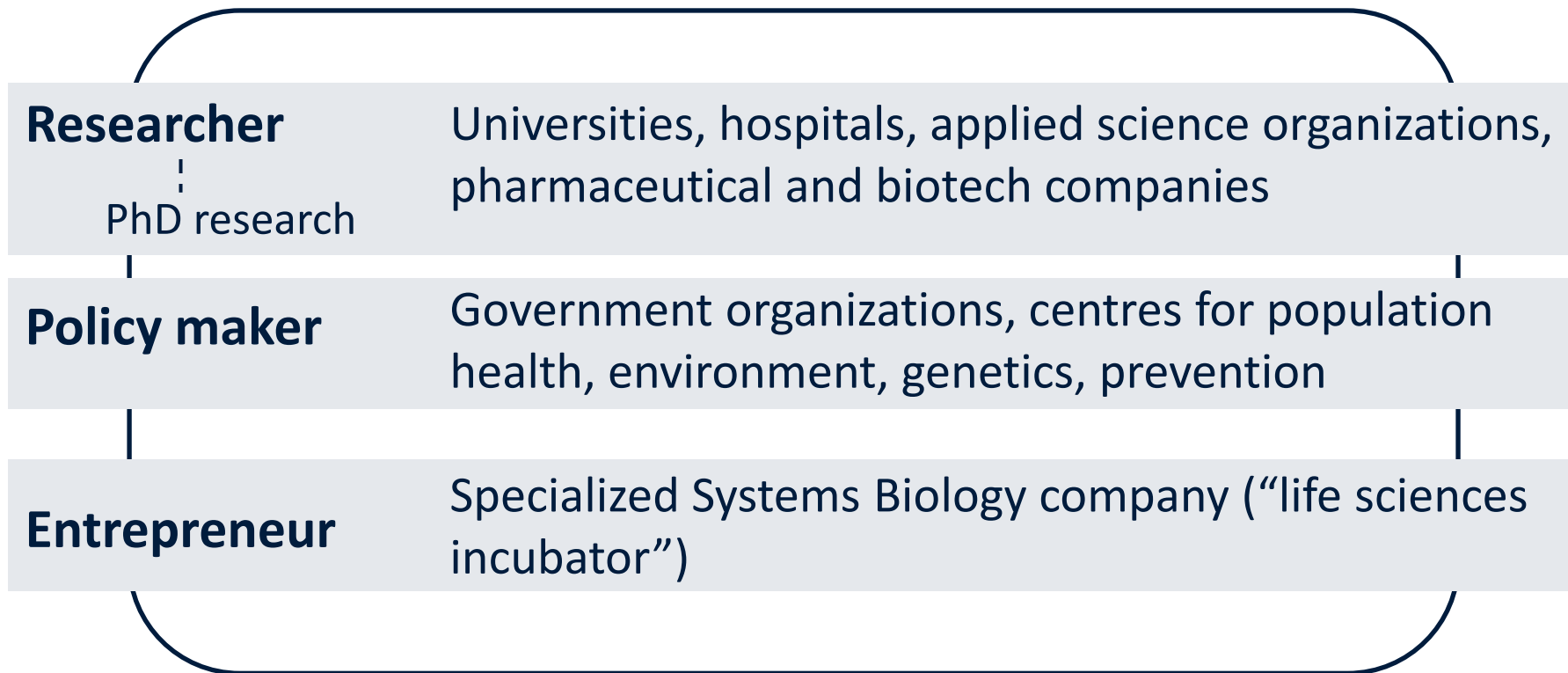


Genomics &
Proteomics



Cell Biology/
iPSC facilities

Career opportunities



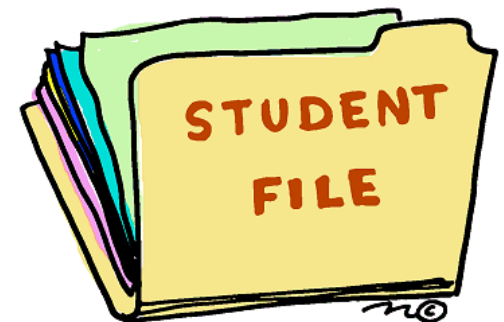
Admission requirements:

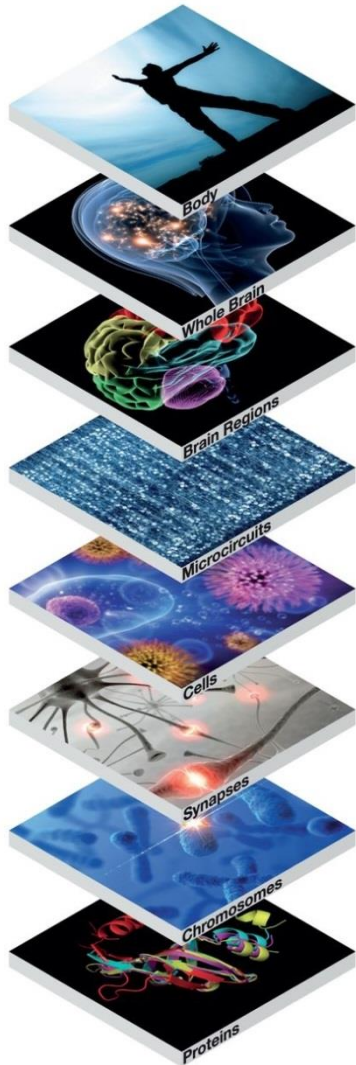
- **Bachelor diploma:** biomedical sciences, sciences (e.g., MSP), university college (e.g., UCM), mathematics, data science, neuroscience, biomedical engineering, (bio)informatics, etc.
- **Motivation** to study across disciplines
- Proficiency in the **English** language
- Required **15 ECTS in mathematics/statistics**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

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