

The TopMaster Biomolecular Integration/Systems Biology

CRBCS (Centre for Research on BioComplex Systems), *vrije* Universiteit, Amsterdam

Aims:

- become an **excellent, multidisciplinary, yet profound researcher** in the quantitative life sciences and part of a peer group of such researchers
- **understand** the physical, chemical and organizational **principles** underlying life
- obtain **expertise** with **advanced molecular and cell biological techniques**, such as space- and time-resolved spectroscopy, chemistry of complex molecules, molecular dynamics, confocal microscopy, molecular biology, genetics, integrative genomics and metabolomics
- obtain **expertise** in **advanced conceptual and modeling methodologies** for bioinformation and computing technologies, such as Medical Systems Biology, computational biology, ecological and hierarchical control analysis, networks, Integrative bioinformatics, principles of Systems Biology, self-organization, Silicon Cell, flux analysis, Hierarchical Control Analysis, mathematical/kinetic modeling
- obtain **insight** in the most **important biological and biomedical issues**, and in how they may be addressed scientifically, and **insight** into what systems biology may mean for society
- **unique**, excellent **profile** connecting the physical sciences and the life sciences

Curriculum (2 year, 120 ECTS; 2004-2006)

Portal course	9	ECTS
Central course: molecules integrating into living systems	33	ECTS
Scientific communication techniques	3	ECTS
International research project	65	ECTS
Reflection (ethics, philosophy of systems biology, science sociology)	6	ECTS
Preparation for final comprehensive exam	4	ECTS

Courses

1. **Portal course:** entry course of mathematics and physics for the biologist and medical student, and biology for the physics/chemistry/mathematics bachelor (9 ECTS)
2. **Central course:** from molecules through integration to life
 - a. **Proteins: structures, folding and dynamics** (Van der Vies, Vermeulen 5 ECTS)
 - b. **Molecular Microbiology** (Oudega *et al.* 6 ECTS)
 - c. **Biological Fluorescence-Biomolecule Interactions** (Lill *et al.*; 6 ECTS)
 - d. **Intracellular networks** (Westerhoff *et al.*; 5 ECTS)
 - e. **Sequence Analysis** (Heringa *et al.*; 5 ECTS)
 - f. **Self-organization and emergence of function** (Westerhoff *et al.*; 3 ECTS)
 - g. **Current topics** systems biology (international professors; 3 ECTS)

International research project

One research exchange project in two laboratories (partly in Amsterdam and partly in one of the collaborating International Centers of Excellence), on Systems Biology / Biomolecular Integration:

Orientation on/proposing future research project (including literature thesis)	11	ECTS
Refereeing of similar research proposals	2	ECTS
8 months' actual scientific research	45	ECTS
Scientific article about research project	5	ECTS
Scientific conference (co-organizing, participating, reporting)	2	ECTS

Career opportunities

There is a surge in Systems Biology research, new groups being set up world-wide [*Nature* 427, p. 568 (Feb 2004)]. Young bright people are wanted at the interface between Biology and Physics/Chemistry/Mathematics. The curriculum connects to subsequent Ph D studentships.

Further information: www.systembiology.net/topmaster;

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