

**Master Molecular Life Sciences –
Microbiology, Biotechnology and Biochemistry**



**MSc/PhD Program
Molecular Life Sciences -
Microbiology, Biotechnology and Biochemistry**

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UNIVERSITÄT
GÖTTINGEN

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Master Molecular Life Sciences – Microbiology, Biotechnology and Biochemistry



Key feature:

Research-oriented Studies

Primary Model Organisms:

Microorganisms (single cell, multicellular)



Plant-Microbe Interactions

Plants

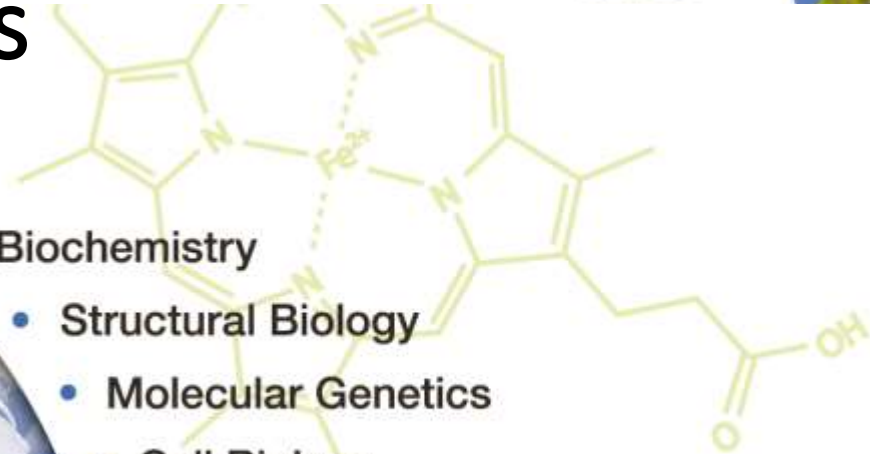
Master Molecular Life Sciences – Microbiology, Biotechnology and Biochemistry



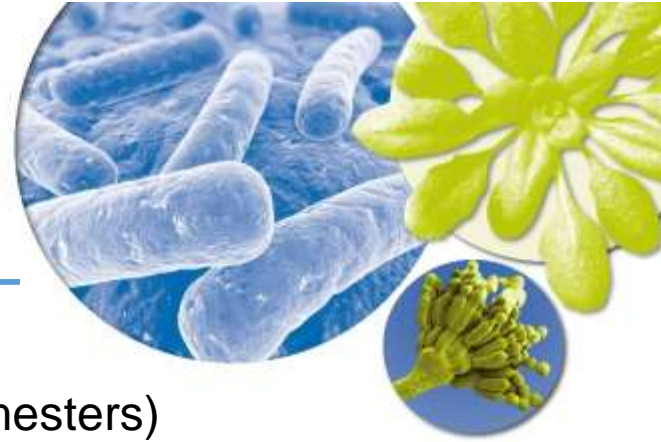
Subjects



- Biochemistry
- Structural Biology
- Molecular Genetics
- Cell Biology
- Microbiology
- Biotechnology
- Plant Molecular Biology
- Plant-Microbe Interactions
- Chemical Biology
- -Omics
- Biophysics
- Bioinformatics



Master Molecular Life Sciences – Microbiology, Biotechnology and Biochemistry



Key features

- from BSc to MSc in 2 years (4 semesters)
 - consistent focused program
- 120 credits according to the European Credit Transfer System (ECTS)
 - program limited to 48 students
 - English as main teaching language
- practical training in small groups with state of the art equipment
 - inspiring international research environment
 - complementary training (“soft skills”)
- direct access to the PhD programs of the faculty for excellent students

Master Molecular Life Sciences – Microbiology, Biotechnology and Biochemistry



Basic structure

module	number	structure and options		C/ module	C total
core module	3	lecture + seminar/tutorial + methods course	choice of 7 different modules	12	36

Seven Core Modules

"General and Applied Microbiology"

"Molecular Genetics & Microbial Cell Biology"

"Cell & Molecular Biology of Plant-Microbe Interactions"

„Applied Bioinformatics in Molecular Bioscience“

“Structural Biochemistry”

“Biochemistry & Biophysics”

"Enzyme Catalysis and Chemical Biology"

„M.Bio.101 General & Applied Microbiology“



Prof. Jörg Stülke

Metabolic and
Regulatory
Patterns in Bacterial
Cells

Regulated protein-RNA
Interaction



PD Dr. Michael Hoppert

Biominerall formation

Terrestrial microalgal
biofilms



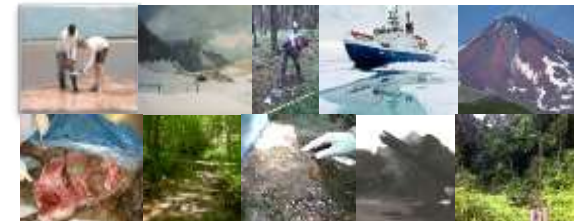
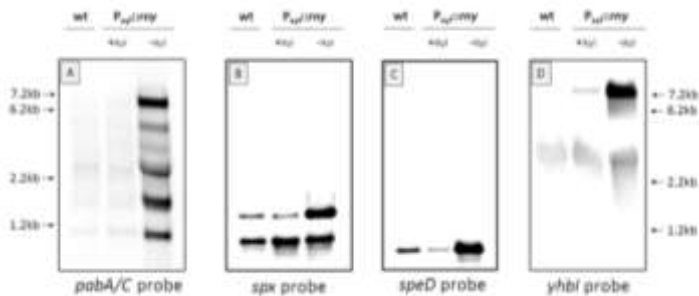
Prof. Rolf Daniel

Dr. Heiko Liesegang

(Meta)genomics

Applied Microbiology
Synthetic Microbiology

Genes and enzymes
for biotechnology



„M.Bio.102 Molecular Genetics & Microbial Cell Biology“



Prof. Stefanie Pöggeler
Dr. Daniela Nordzieke

Fruiting-body development in filamentous ascomycetes



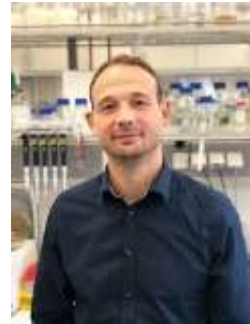
Prof. Gerhard Braus

Fungal Genetics, Development and Cell Biology



Prof. Heike Krebber

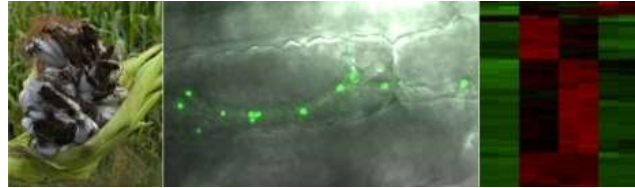
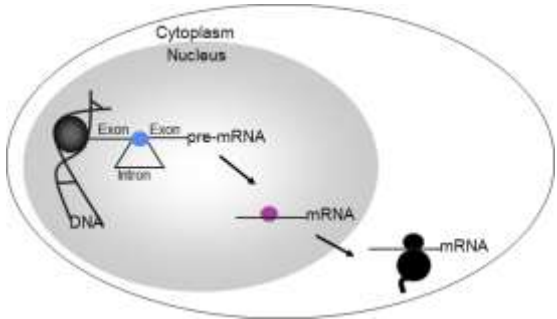
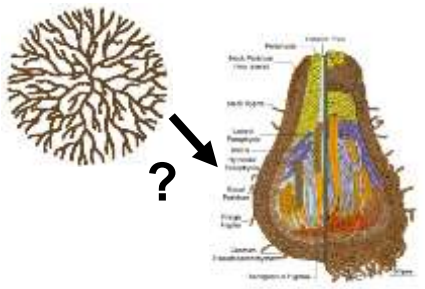
Nucleocytoplasmic Transport



Prof. Kai Heimel

Unfolded Protein Response in filamentous fungi

Pathogenicity of Colletotrichum



„M.Bio 105 Applied Bioinformatics in Molecular Bioscience“

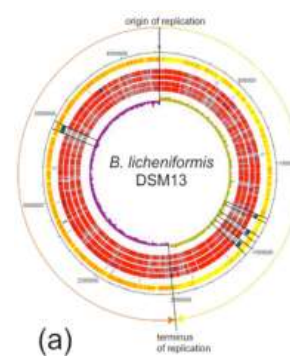


Biology

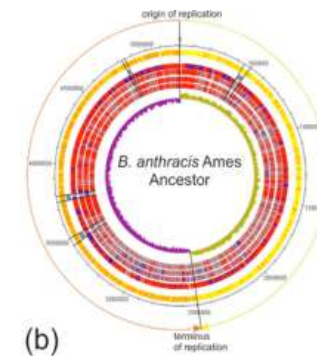
Prof. Rolf Daniel

Dr. Heiko Liesegang

Handling of programs, bioinformatic tools and databases with respect to data-driven Omics-based research, allowing to answer important questions of modern biology.



(a)



(b)

- Application of bioinformatic approaches in molecular phylogeny, evolution, genome dynamics und (meta)Omics
 - Bioinformatic analysis of RNAs and proteins
 - Identification of motifs and genes
- Generation and analysis of metabolic models and networks

„M.Bio 108 Enzyme Catalysis & Chemical Biology“



Prof. Kai Tittmann

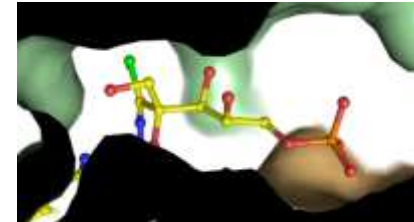
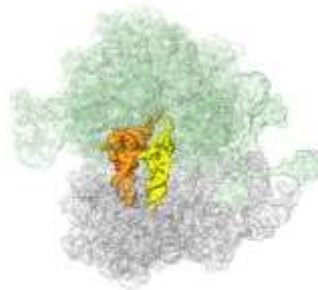
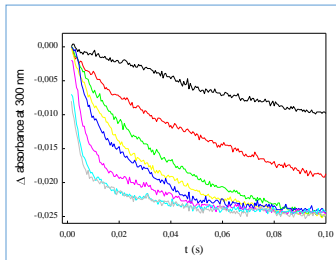
**Reaction mechanisms of
thiamin-dependent enzymes
and flavoenzymes**



MPI for Multidisciplinary Science

Prof. Marina Rodnina

**Kinetics of
Bacterial Translation**



- Reaction mechanisms of enzymes and macromolecular machines
- Kinetics and thermodynamics of biochemical reactions
 - Synthesis of biooligomers and ligands
 - Chemical model systems of enzymes

„M.Bio.104 Cell & Molecular Biology of Plant-Microbe Interactions“



Prof. Volker Lipka

**Signal perception &
dynamic cellular defence
in plant innate immunity**



„M.Bio.107 Biochemistry & Biophysics“



Prof. Ivo Feussner

**Biochemical analysis of
carbohydrates, lipids, proteins and nucleic acids
(HPLC / GC / GCMS / UPLCMS / ESIMS)
Plant biotechnology for production of renewable resources**



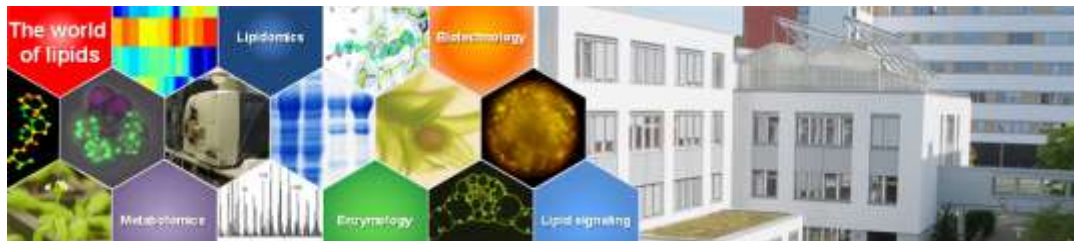
Prof. Claudia Steinem



Prof. Andreas Janshoff

**Spectroscopy of biomolecules
(fluorescence, FT-IR, CD, UV/Vis),
optical microscopy, scanning probe techniques**

- Plant primary and secondary metabolism → Metabolomics
- Lipid metabolism, enzymes of lipid metabolism and lipids as signal molecules
 - Modern biophysical methods for analysis of biomolecules
- Molecular biochemistry and biophysics of different classes of biomolecules
 - Functional analysis of membrane proteins

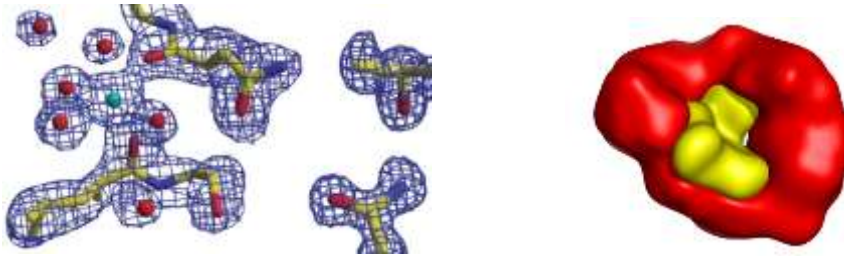


„M.Bio.106 Structural Biochemistry“



Prof. Ralf Ficner

Molecular structural biology
RNA processing & transport



Structure-function relationship
Protein-Protein interaction
Protein-RNA-DNA recognition

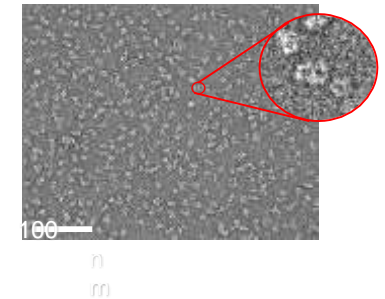
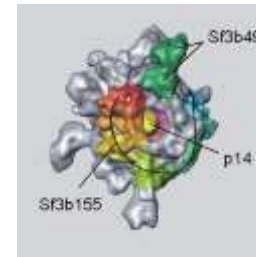
Structure-based drug design



MPI for Multidisciplinary Science

Prof. Holger Stark

3D Electron Cryomicroscopy



Methods in Structural Biology
X-ray crystallography
NMR spectroscopy
Electron Microscopy
Computational Methods

Profile module (12C)



module	number	structure and options		C/ module	C total
core module	3	lecture + seminar/tutorial + methods course	choice of 7 different modules	12	36
profile module	1	additional core module MBB core module DNB, MSc Chemistry interdisciplinary courses*		12	12

(flexibility option)

DNB = Master
"Developmental, Neural,
and Behavioral Biology"

* permission of examination board required

examples for approved external profile modules:

University Uppsala, **Sweden**
 University of Queensland, Brisbane, **Australia**
 Sanford Burnham Medical Research Institute, San Diego, **USA**
 Donnelly Center, Toronto, **Canada**
 Sainsbury Laboratory, Norwich, **United Kingdom**
 University of Exeter, **United Kingdom**
 University of Aberdeen, **United Kingdom**
 Massey University, **New Zealand**

Module M.MM.101 "Biomolecules and Pathogens" of Master program "**Molecular Medicine**" in **Göttingen**

Internships in departments of the **MPI for Multidisciplinary Science, Göttingen**

Internship in pharmaceutical or chemistry industry:

Henkel AG & Co, **Düsseldorf**, Bayer Crop Science, **Monheim**, DSM Nutritional Products, **Basel**, BASF, **Ludwigshafen**

Key Competence Module (2-12C)



module	number	structure and options		C/ module	C total
core module	3	lecture + seminar/tutorial + methods course	choice of 7 different modules	12	36
profile module	1	additional core module MBB core module DNB, MSc Chemistry interdisciplinary courses*		12	12
key competence module		course offer ZESS course offer MBB, Chemistry, DNB, BEE interdisciplinary courses*		2-12	12

e.g.

language courses

obligatory german language courses (6 C) for students with fair language skills (B1)

„Industry excursions“

MBB = Master „Molecular Life Sciences – Microbiology, Biotechnology and Biochemistry“

DNB = Master "Developmental, Neural, and Behavioral Biology

BEE = Master "Biodiversity and Ecology"

ZESS = "Zentrale Einrichtung für Sprach- und Schlüsselkompetenzen,, (e.g. language courses)

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key competence module		course offer ZESS course offer MBB, Chemistry, DNB, BEE interdisciplinary courses*		2-12	12

advanced module	1	7 weeks lab course I	12	30
	1	7 weeks lab course II	12	
	1	scientific project management	6	
Master thesis (26 weeks)				30

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Curriculum

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key competence module		course offer ZESS course offer MBB, Chemistry, DNB, BEE interdisciplinary courses*		2-12	12
advanced module	1	7 weeks lab course I		12	30
	1	7 weeks lab course II		12	
	1	scientific project management		6	
Master thesis (26 weeks)					30

* Permission of examination board required

MBB = Master Molecular Life Sciences: Microbiology, Biotechnology and Biochemistry

DNB = Master Developmental, Neural and Behavioral Biology

BEE = Master Biodiversity, Ecology and Evolution

ZESS = Zentrale Einrichtung für Sprach- und Schlüsselkompetenzen

exemplary study plan	
core I	12
core II	12
key competence	6
profile	12
core III	12
key competence	6
advanced I	12
advanced II	12
scientific project management	6
Master thesis	30

PhD
(GAUSS)