MSc/PhD Program

Molecular Life Sciences -

Microbiology, Biotechnology and Biochemistry

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UNIVERSITÄT
GÖTTINGEN

30_06_2023

Master Molecular Life Sciences – Microbiology, Biotechnology and Biochemistry

Key feature:

Research-oriented Studies

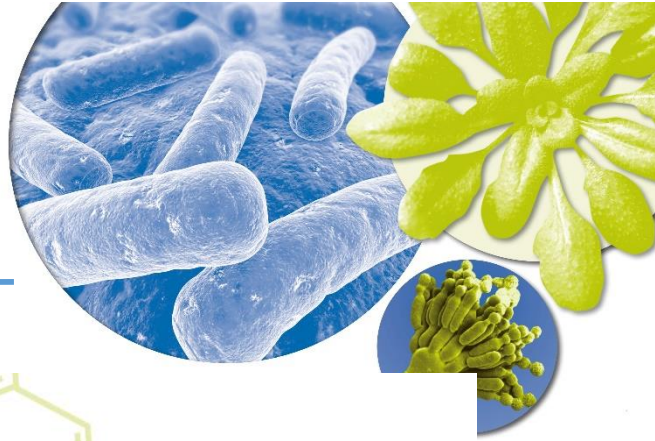
Primary Model Organisms:

Microorganisms (single cell, multicellular)

↕ Plant-Microbe Interactions

Plants

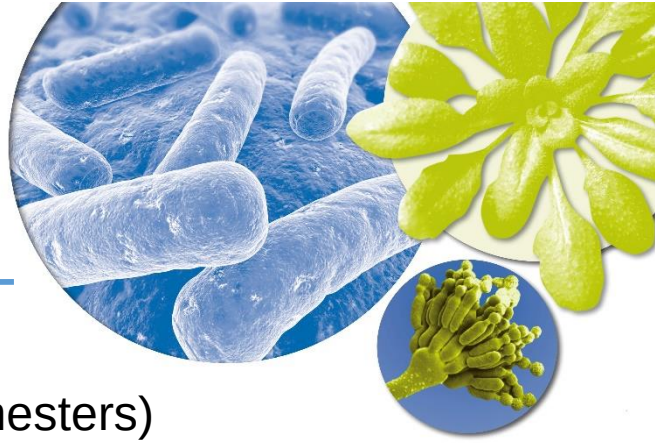
Master Molecular Life Sciences –
Microbiology, Biotechnology and Biochemistry



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

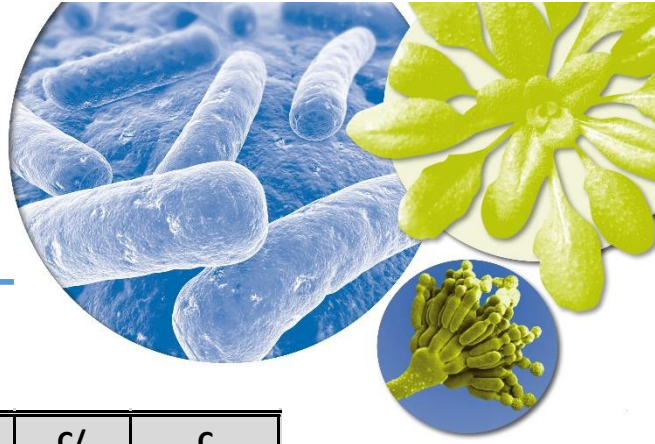
→ practical training in small groups with state of the art equipment

→ 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”

„Applied Bioinformatics in Molecular Bioscience“

"Enzyme Catalysis and Chemical Biology"

"Cell & Molecular Biology of Plant-Microbe Interactions”

“Structural Biochemistry”

“Biochemistry & Biophysics”

„M.Bio.101 General & Applied Microbiology"

Biology

Prof. Jörg Stülke

Metabolic and Regulatory Patterns in Bacterial Cells

Regulated protein-RNA Interaction

PD Dr. Michael Hoppert

Biomineral formation

Terrestrial microalgal biofilms

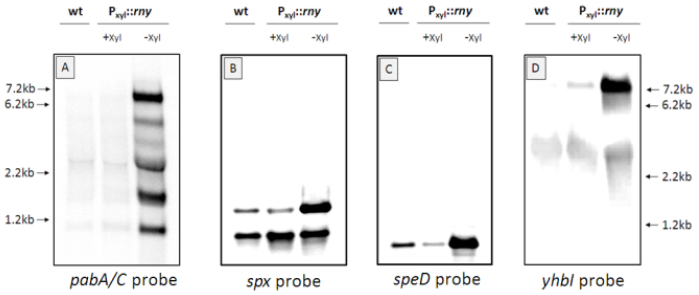
Prof. Rolf Daniel

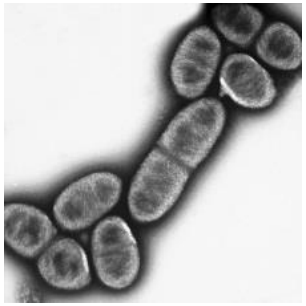
PD Dr. Heiko Liesegang

(Meta)genomics

Applied Microbiology
Synthetic Microbiology

Genes and enzymes for biotechnology





BioMik GenTech Network Centre Göttingen

GenoMik

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

Biology

Prof. Stefanie Pöggeler

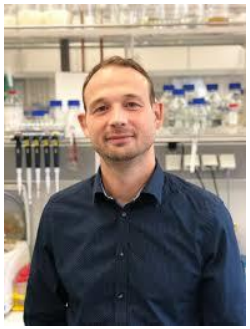
Fruiting-body Development in Filamentous Ascomycetes

Prof. Gerhard Braus

Fungal Genetics, Development and Cell Biology

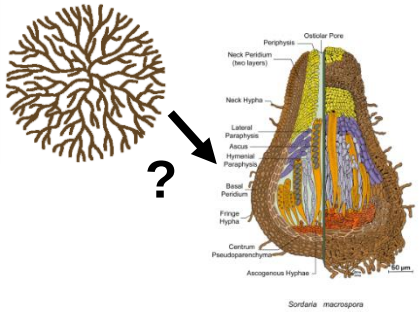
Prof. Heike Krebber

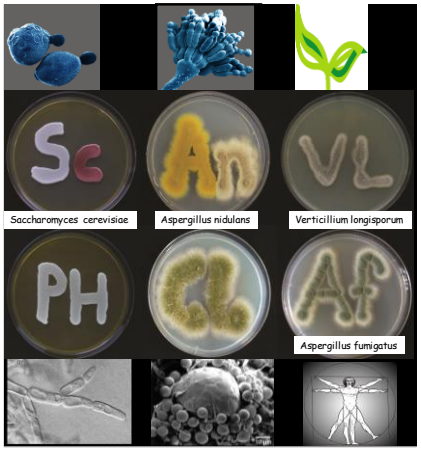
Nucleocytoplasmic Transport

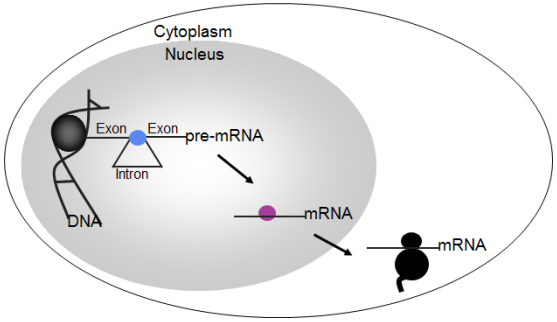


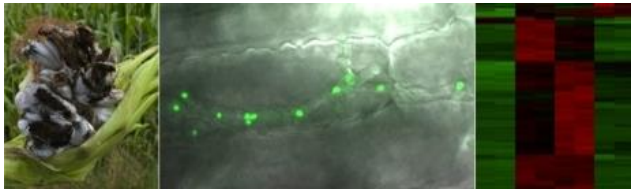
Prof. Kai Heimel

Unfolded Protein Response in Filamentous Fungi









„M.Bio.105 Applied Bioinformatics in Molecular Bioscience"

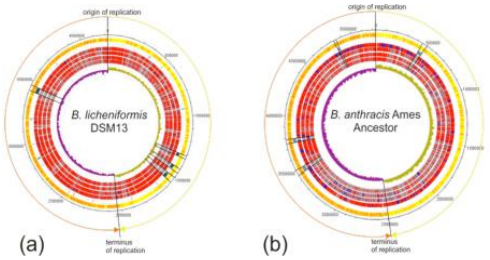
Biology

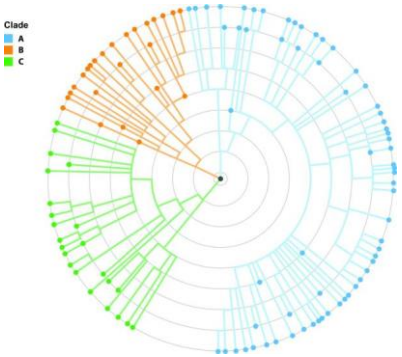
Prof. Rolf Daniel

PD Dr. Heiko Liesegang

Handling of programs, bioinformatic tools and databases with respect to data-driven Omics-based research

- **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"

Biology

Prof. Kai Tittmann

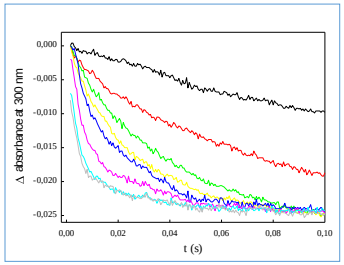
Reaction mechanisms of thiamin-dependent enzymes and flavoenzymes

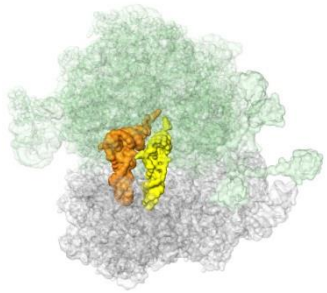
MAX-PLANCK-GESELLSCHAFT

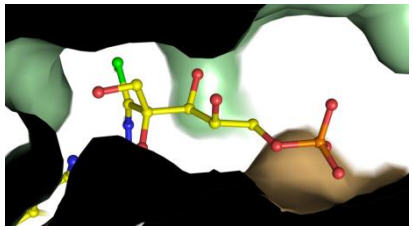
MPI for Multidisciplinary Science

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**

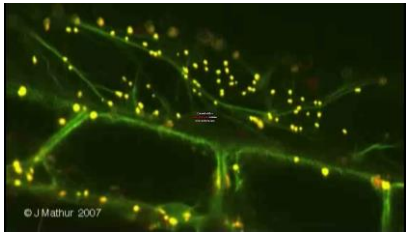
- **Chemical model systems of enzymes**

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

Biology

Prof. Volker Lipka

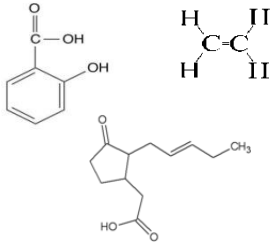
Signal perception & dynamic cellular defence in plant innate immunity

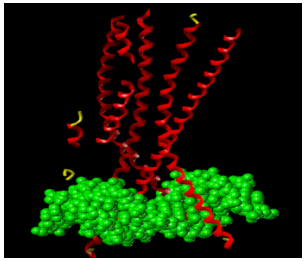


Biology

Prof. Christiane Gatz

Signal transduction by plant defense hormones





„M.Bio.107 Biochemistry & Biophysics"

Biology

Prof. Ivo Feussner

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

Chemistry

Prof. Claudia Steinem

Chemistry

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"

Biology

Prof. Ralf Ficner

Molecular structural biology

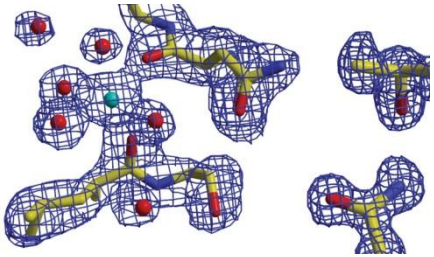
RNA processing & transport

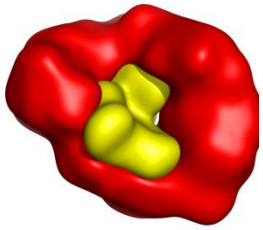
MAX-PLANCK-GESELLSCHAFT

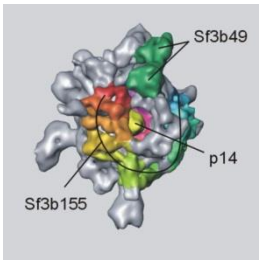
MPI for Multidisciplinary Science

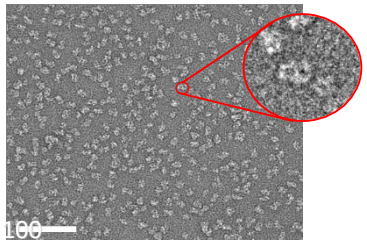
Prof. Holger Stark

3D Electron Cryomicroscopy









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

Structure-based drug design

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 MLS core module DNB, MSc Chemistry interdisciplinary courses*		**12**	**12**

(flexibility option)

*** 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 MLS core module DNB, MSc Chemistry interdisciplinary courses*		**12**	**12**
key competence module		course offer cross faculty, ZESS course offer MLS, 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“

MLS = 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)

Master Programme (M.Bio.150)
Key Competence Module "Industry excursion" (3C)"

- 3 days excursion: WS semester break
- visit of companies which hire molecular biologists/biochemists
- get an insight into the job of molecular biologist/biochemist in the industry

Master Programme (M.Bio.149)
Key Competence Module
"Planing and organization of Industry excursons (3C)"

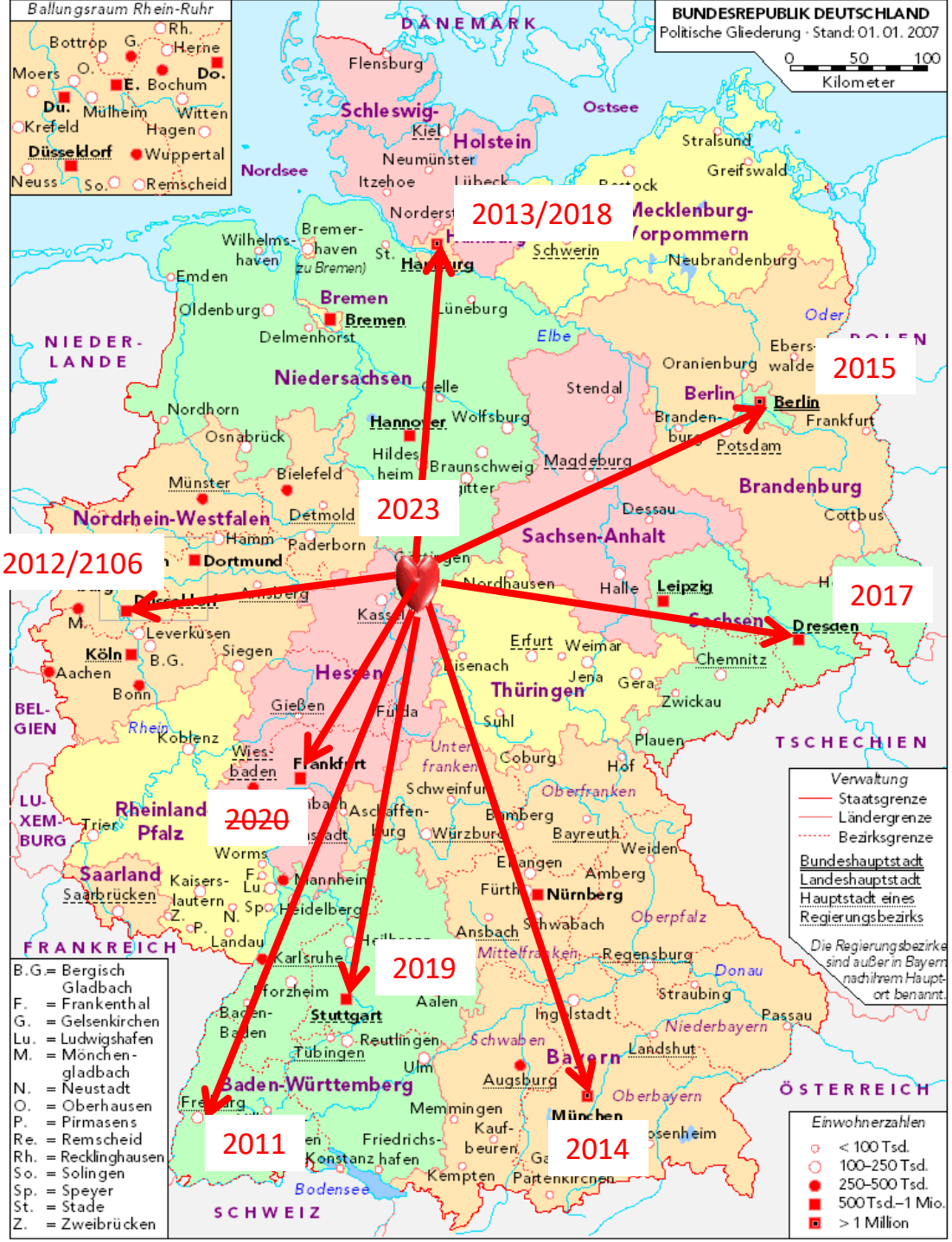
- selection and contact of the companies
- travel organization: bus operators, youth hostal etc.

Admission requirements: participitation in the core module M.Bio.102 "Molecular Genetics and Microbial Cell Biology"

West
North
South
East
South-East

~~2021~~

~~2022~~



Industry excursion 2023 Göttingen

KWS
Zukunft säen
seit 1856

Plant breeding and seed company
KWS Saat AG Einbeck

SARTORIUS

Company for lab equipment, life science, Satorius, Göttingen

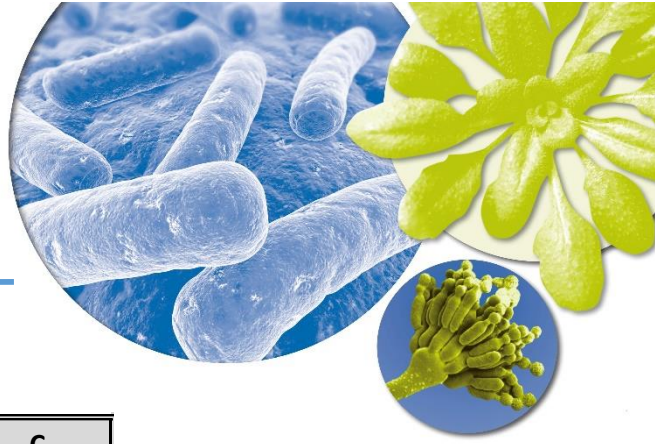
Bioreactors & Fermenters

evotec

Pharmaceutical company
Evotec, Göttingen

Fluid Management

Master Molecular Life Sciences – Microbiology, Biotechnology and Biochemistry



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 MLS core module DNB, MSc Chemistry interdisciplinary courses*		**12**	**12**
key competence module		course offer cross faculty, ZESS course offer MLS, 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**

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
profile module	1	additional core module MLS core module DNB, MSc Chemistry interdisciplinary courses*		12	12
key competence module		course offer cross faculty, ZESS course offer MLS, 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**

MLS = 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

Curriculum

examplary 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)

Timetable winter term

Time/ Weekday	Monday	Tuesday	Wednesday	Thursday	Friday
8 - 9	M.Bio.101/M.Bio.141 Microbiology (lecture/seminar) **	M.Bio.102/M.Bio.142 Genetics and cell biology (lecture/seminar)**	M.Bio.108/158 Enzymes and biolog Chemistry (lecture/tutorial)	M.Bio.102/M.Bio.142 (lecture/seminar)**	M.Bio.101/M.Bio.141 (lecture/seminar)**
9 - 10					
10 - 11	M.Bio.108/M.Bio.158 (lecture/tutorial)				
11 - 12					

block methods courses

October			November			December			January			February		
1 Sa			1 Di		Isolation of biotechn relev MOs or Signaltransduction in bacteria	1 Do		M.Bio.102	1 So		christmas break	1 Mi		M.Bio.108 Enzyme catalysis and biological chemistry
2 So			2 Mi			2 Fr			2 Mo			2 Do		
3 Mo	Tag der Deutschen Einheit		3 Do			3 Sa			3 Di			3 Fr		
4 Di			4 Fr			4 So			4 Mi			4 Sa		
5 Mi			5 Sa			5 Mo		M.Bio.105 Applied bioinformatics in molecular biosciences	5 Do			5 So		
6 Do	introductory meeting		6 So			6 Di			6 Fr			6 Mo		
7 Fr			7 Mo			7 Mi			7 Sa			7 Di		
8 Sa			8 Di			8 Do			8 So			8 Mi		
9 So			9 Mi			9 Fr			9 Mo		M.Bio.105 Applied bioinformatics in molecular biosciences	9 Do		
10 Mo			10 Do			10 Sa			10 Di			10 Fr		
11 Di			11 Fr			11 So			11 Mi			11 Sa		
12 Mi			12 Sa			12 Mo			12 Do			12 So		
13 Do			13 So			13 Di			13 Fr			13 Mo		
14 Fr			14 Mo			14 Mi			14 Sa			14 Di		
15 Sa			15 Di		M.Bio.102 Molecular genetics and microbial cell biology	15 Do			15 So			15 Mi		
16 So			16 Mi			16 Fr			16 Mo			16 Do		
17 Mo			17 Do			17 Sa			17 Di			17 Fr		
18 Di			18 Fr			18 So			18 Mi			18 Sa		
19 Mi			19 Sa			19 Mo			19 Do			19 So		
20 Do			20 So			20 Di			20 Fr			20 Mo		
21 Fr			21 Mo			21 Mi			21 Sa			21 Di		
22 Sa			22 Di			22 Do			22 So			22 Mi		
23 So			23 Mi			23 Fr			23 Mo			23 Do		
24 Mo		M.Bio.101 General and applied microbiology	24 Do			24 Sa		christmas break	24 Di			24 Fr		
25 Di			25 Fr			25 So			25 Mi			25 Sa		
26 Mi			26 Sa			26 Mo			26 Do			26 So		
27 Do			27 So			27 Di			27 Fr			27 Mo		
28 Fr			28 Mo			28 Mi			28 Sa			28 Di		
29 Sa			29 Di			29 Do			29 So					
30 So			30 Mi			30 Fr			30 Mo		M.Bio.108			
31 Mo						31 Sa			31 Di					

Timetable summer term

Time/ Weekday	Monday	Tuesday	Wednesday	Thursday	Friday
8 - 9	M.Bio.107/147 Biochemistry and Biophysics (lecture)	M.Bio.104/144 Plant-microbe-IA (lecture)	Plant-microbe-IA (lecture)	M.Bio.107/147 Biochemistry and Biophysics (lecture/tutorial)	Structural Biochemistry (lecture/seminar)
9 - 10			Plant-microbe-IA (seminar)		
10 - 11			M.Bio.106/156 Structural Biochemistry (lecture)		
11 - 12					

block methods courses

April		May		June		July		August	
1 Sa		1 Mo		1 Do		1 Sa		1 Di	
2 So		2 Di		2 Fr		2 So		2 Mi	
3 Mo		3 Mi		3 Sa		3 Mo		3 Do	
4 Di		4 Do		4 So		4 Di		4 Fr	
5 Mi		5 Fr		5 Mo		5 Mi		5 Sa	
6 Do		6 Sa		6 Di		6 Do		6 So	
7 Fr	easter break	7 So		7 Mi		7 Fr		7 Mo	
8 Sa	easter break	8 Mo	M.Bio.107 Biochemistry or Biophysics	8 Do		8 Sa		8 Di	
9 So	easter break	9 Di	M.Bio.107 Biochemistry or Biophysics	9 Fr		9 So		9 Mi	
10 Mo	easter break	10 Mi	M.Bio.107 Biochemistry or Biophysics	10 Sa		10 Mo		10 Do	
11 Di	M.Bio.104 Cellular and molecular biology of plant-microbe interactions	11 Do	M.Bio.107 Biochemistry or Biophysics	11 So		11 Di		11 Fr	
12 Mi	M.Bio.104 Cellular and molecular biology of plant-microbe interactions	12 Fr	M.Bio.107 Biochemistry or Biophysics	12 Mo	M.Bio.108 Structural Biochemistry	12 Mi		12 Sa	
13 Do	M.Bio.104 Cellular and molecular biology of plant-microbe interactions	13 Sa	M.Bio.107 Biochemistry or Biophysics	13 Di	M.Bio.108 Structural Biochemistry	13 Do		13 So	
14 Fr	M.Bio.104 Cellular and molecular biology of plant-microbe interactions	14 So	M.Bio.107 Biochemistry or Biophysics	14 Mi	M.Bio.108 Structural Biochemistry	14 Fr		14 Mo	
15 Sa	M.Bio.104 Cellular and molecular biology of plant-microbe interactions	15 Mo	M.Bio.107 Biochemistry or Biophysics	15 Do	M.Bio.108 Structural Biochemistry	15 Sa		15 Di	
16 So	M.Bio.104 Cellular and molecular biology of plant-microbe interactions	16 Di	M.Bio.107 Biochemistry or Biophysics	16 Fr	M.Bio.108 Structural Biochemistry	16 So		16 Mi	
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18 Di	M.Bio.104 Cellular and molecular biology of plant-microbe interactions	18 Do	M.Bio.107 Biochemistry or Biophysics	18 So	M.Bio.108 Structural Biochemistry	18 Di		18 Fr	
19 Mi	M.Bio.104 Cellular and molecular biology of plant-microbe interactions	19 Fr	M.Bio.107 Biochemistry or Biophysics	19 Mo	M.Bio.108 Structural Biochemistry	19 Mi		19 Sa	
20 Do	M.Bio.104 Cellular and molecular biology of plant-microbe interactions	20 Sa	M.Bio.107 Biochemistry or Biophysics	20 Di	M.Bio.108 Structural Biochemistry	20 Do		20 So	
21 Fr	M.Bio.104 Cellular and molecular biology of plant-microbe interactions	21 So	M.Bio.107 Biochemistry or Biophysics	21 Mi	M.Bio.108 Structural Biochemistry	21 Fr		21 Mo	
22 Sa	M.Bio.104 Cellular and molecular biology of plant-microbe interactions	22 Mo	M.Bio.107 Biochemistry or Biophysics	22 Do	M.Bio.108 Structural Biochemistry	22 Sa		22 Di	
23 So	M.Bio.104 Cellular and molecular biology of plant-microbe interactions	23 Di	M.Bio.107 Biochemistry or Biophysics	23 Fr	M.Bio.108 Structural Biochemistry	23 So		23 Mi	
24 Mo	M.Bio.104 Cellular and molecular biology of plant-microbe interactions	24 Mi	M.Bio.107 Biochemistry or Biophysics	24 Sa	M.Bio.108 Structural Biochemistry	24 Mo		24 Do	
25 Di	M.Bio.104 Cellular and molecular biology of plant-microbe interactions	25 Do	M.Bio.107 Biochemistry or Biophysics	25 So	M.Bio.108 Structural Biochemistry	25 Di		25 Fr	
26 Mi	M.Bio.104 Cellular and molecular biology of plant-microbe interactions	26 Fr	M.Bio.107 Biochemistry or Biophysics	26 Mo	M.Bio.108 Structural Biochemistry	26 Mi		26 Sa	
27 Do	M.Bio.104 Cellular and molecular biology of plant-microbe interactions	27 Sa		27 Di	M.Bio.108 Structural Biochemistry	27 Do		27 So	
28 Fr	M.Bio.104 Cellular and molecular biology of plant-microbe interactions	28 So		28 Mi	M.Bio.108 Structural Biochemistry	28 Fr		28 Mo	
29 Sa		29 Mo		29 Do	M.Bio.108 Structural Biochemistry	29 Sa		29 Di	
30 So		30 Di		30 Fr	M.Bio.108 Structural Biochemistry	30 So		30 Mi	
		31 Mi				31 Mo		31 Do	

Welcome to Göttingen!