



Major Molecular, Cellular and Developmental Biology of Plants (MBP)

Welcome

to the Major Program "Molecular, Cellular and Developmental Biology of Plants" (=MBP), organized by the Heidelberg Institute of Plant Sciences!

Having successfully finished your bachelor degree, you are now showing interest in advanced Molecular Plant Research. With the Major **Molecular, Cellular and Developmental Biology of Plants**, we are offering an attractive teaching program which will introduce you to a wide range of research topics related to molecular plant biology, covering basic and applied aspects. After having studied this information, you are welcome to address the coordinator of this program for individual questions (trausch@hip.uni-hd.de).

Why study Molecular Plant Biology in Heidelberg?

The Ruprecht-Karls-University in Heidelberg is among the top-ranking German universities, offering an extraordinarily stimulating environment for research in the Life Sciences. The novel platform **Molecular Plant Research Heidelberg (MPRH)** has been launched to integrate the multiple plant-related research and teaching activities in the Heidelberg area. It includes research groups from university and several external research centers and is embedded in the **Heidelberg Molecular Life Sciences Network**, reaching out into neighbouring research disciplines.

Plants are a unique class of photoautotrophic organisms with modular design. They represent the major resource for human nutrition and produce a plethora of health-promoting compounds (nutraceuticals and phytotherapeutics). From a biotechnological perspective, plants are solar energy-driven bioreactors. Plants are also an important environmental factor and are increasingly used as a renewable resource. **MPRH** explores fundamental principles of plant function. Included are S-assimilation, sugar metabolism, pectin metabolism, secondary plant metabolism, redox signalling, protein glycosylation, secretory pathway and vacuolar transport, and molecular evolution.

MPRH uses state-of-the-art method platforms of molecular cell biology and functional genomics and is linked with research activities in BIOQUANT and the excellence cluster CellNetworks. Being embedded in an excellent research environment of strong biomedical orientation, **MPRH** has used this position for building alliances with research centers outside the university, including the **DKFZ** (prophylaxis of age-related diseases via phytoprotectants; plant antitumor drugs), **BFEL** (nutritional physiology of plant-based food), **BBA** (plant disease and plant protection), and **EMBL** (structural analysis of protein complexes). **MPRH** also encompasses strong biotechnological activities, investigating cellular processes relevant for total yield and yield stability in crop plants. Productive research collaborations with industrial partners, including BASF Plant Science GmbH, KWS SAAT AG, Südzucker AG, are documented by a series of publications and patents.

MPRH is coordinated by **HIP** scientists. **HIP** has been launched in 2001, and **MPRH** has already developed a unique research profile, exploring fundamental processes in plant function (cellular redox control, metabolic regulation, membrane transport, molecular evolution) but also using this knowledge for translational approaches (plant biotechnology, phytoprotectants, functional food).

As research groups of **MPRH** are solidly funded by DFG, BMBF, Land BW and industrial partners, we offer excellent conditions for your further qualification.

NOTE:

Master students having successfully finished their **MBP Major** may directly enter an ambitious graduate student training program, organized by the **Heidelberg Plant & Fungal Biology (HPFB) Graduate School** (coordinator: Strahl, HIP).

Program outline of MBP Major

Obligatory (minimal) program

Lectures:	- Molecular physiology and biotechnology of plants
(minimum 2)	- Plant developmental biology
	- Plant cell biology
	- Molecular systematics and evolution
Seminars:	Topics related to lecture program
Practicals:	- Research practicals (3 weeks, HP-F)
	- Lab practicals (6 weeks)
Research group seminars:	Weekly
HIP-seminar:	HPFB graduate school; every second week
HIP lecture:	Monthly
Master thesis:	Duration 6 months (capacity up to 10 per semester)

Modul 1*	Frontiers of BioSciences A (with contributions from MBP)	15 CP
Modul 2*	Frontiers of BioSciences B (with contributions from MBP)	15 CP
Modul 3**	Lecture + Tutorial & Seminar + Research practical (3 weeks, HP-F)***	15 CP
Modul 4**	Lecture + Tutorial & Seminar + Research practical (3 weeks, HP-F)***	15 CP
Modul 5	Lab practical (6 weeks) + Research group seminar A	15 CP
Modul 6	Lab practical (6 weeks) + Research group seminar B	15 CP
Modul 7	Master thesis + Research group seminar + HIP lecture	30 CP
		120 CP

* Modules shared with all other Majors of the Master program **Molecular Biosciences**;
see: http://www.uni-heidelberg.de/institute/fak14/MSc/index_e.html#Fach

** General time schedules for modules 3 & 4 are similar with modules 1 & 2: **During a period of 5 weeks Lectures and Tutorials alternate from day to day (8-10 am) and Practicals are scheduled for 10am to 6pm during the first 3 weeks, followed by the Seminars extending over the last two weeks.**

*** 3-weeks Research practicals (HP-F) in modules 3 & 4 may be substituted by 4-6 weeks Lab practicals.

Duration of modules 1-6: 5 weeks + 4 weeks for examination (total 9 weeks)

Duration of module 7: 6 months

Important:

To obtain an MSc degree with major *Molecular, Cellular and Developmental Biology of Plants (MBP)*, the candidate has to pass the modules listed above, but may substitute module 5 or 6 with appropriate module from another *major*.

Study plan for 4 semesters

1. Semester (winter)	Module 1+2
2. Semester (summer)	Module 3+4
3. Semester (winter)	Module 5+6
4. Semester (summer)	Modul 7

How to enter the PhD program?

After successfully finishing the **MBP Major**, you are encouraged to apply for a PhD position within the Heidelberg Plant and Fungal Biology Graduate School. Alternatively, you may apply for any other related PhD program inside or outside of Heidelberg.

Within the **MBP Major**, a **fast track** to directly enter the PhD program will be offered for excellent students having finished the **first year of MBP Major with outstanding results** i.e. if

- all examinations from moduls 1-4 have been passed with excellent results (1.0)
- additional 30 CPs have been obtained via **lab practicals & research seminars** (offered in the time periods *between* modules 2+3 and 4+5)
- a supervisor has agreed to accept the candidate
- a comprehensive examination (written/oral) has been passed with excellent result (1.0)

Who will teach the MBP Major?

The teaching program outlined below is coordinated by the HIP. Experienced research group leaders and teaching staff from university and research centers outside the university offer a rich variety of lectures, seminars and practicals on relevant topics of Molecular Plant Research. This ensures competent training in a wide range of advanced methods in molecular cell biology, extending from *in vivo* imaging techniques with high-end microscopical platforms to functional genomics and the study of structure-function relationships in complex molecular machines.

The following list of teachers (followed by their affiliation and research themes) is not comprehensive but provides a first overview:

Marcus Koch (HIP; molecular evolution); **Christoph Dobeš** (HIP; apomixis research); **David Robinson** (HIP; secretory pathway); **Peter Pimpl** (HIP; protein sorting); **Stefan Hilmer** (HIP; protein localization, kryo-EM); **Giselbert Hinz** (HIP; vacuolar biogenesis); **Thomas Rausch** (HIP; regulation of sugar metabolism, redox control); **Steffen Greiner** (HIP; sugar & pectin metabolism); **Jochen Bogs** (HIP; transcriptional regulation of flavonoid biosynthesis); **Rüdiger Hell** (HIP; S-assimilation, redox control); **Andreas Meyer** (HIP; *in vivo* imaging, redox control); **Ute Krämer** (BIOQUANT; heavy metal homeostasis, phytoremediation); **Sabine Strahl** (HIP; protein glycosylation); **Karin Schumacher** (HIP; vacuolar transport); **Michael Wink** (IPMB; secondary plant metabolism, molecular evolution); **Klaus Scheffzek** (EMBL; structure of protein-protein complexes); **Clarissa Gerhäuser** (DKFZ; functional food, cancer prevention); **Thomas Efferth** (DKFZ; plant anti-tumor drugs);

Wilhelm Jelkmann (BBA; phytopathology, pathogenic bacteria).



For more information on the

Major

Molecular, Cellular and Developmental Biology of Plants (MBP)

and individual research groups contributing to the MBP Major see the following links:

HIP home page:	http://www.hip.uni-heidelberg.de
Heidelberg Plant & Fungal Biology Grad. School:	http://www.hip.uni-heidelberg.de/phd/
IPMB home page:	http://www.uni-heidelberg.de/institute/fak14/ipmb/
Relevant DKFZ home pages	http://www.dkfz.de/en/tox/cancer_chemoprevention.html http://www.dkfz.de/en/tox/agc010-7.html
Home page of Cellular Networks Cluster:	http://www.cellnetworks.uni-hd.de/institutes.html

For individual consultation, you are encouraged to send an e-mail to

Prof. Dr. Thomas Rausch: trausch@hip.uni-hd.de



Important note:

The MBP Major will be launched in the WS 2007/2008.
Information on this Major will be continuously updated and extended.
Please, visit this home page regularly!