MIM
Microbiology and Immunology PhD program

- 180 PhD students
- 79 PIs
- More than 1200 applications in 2014

http://www.lifescience-graduateschool.ch
The Life Science Zurich Graduate School consists of sixteen highly competitive Ph.D. programs, run jointly by the ETH Zurich and the University of Zurich. We aim to attract to Zurich the most promising young scientists from across the world. Our programs offer a comprehensive and challenging Ph.D. education that allows our students to develop into tomorrow's leaders in life science research.
Benefit for the students

- **Recruitment** – being selected
- **Introductory Course** - get familiar with the research of the MIM groups
- **Retreat** – scientific exchange in a collegial atmosphere
- **Transferable skill courses** – having access
- **Mailing** – being informed about courses, talks & other events
- **Travel grants** – getting financial support
- **Student representatives** – representing students’ interest towards the program
- **Mentoring** – fostering the personal development
- **Alumni & students events** – career planning & socializing
- **Facebook & LinkedIn** – networking
- **Coordination office** – contact point for any question
- **Difficult situation** – smoothing down differences of opinion
- **Active participation** – bringing forward own ideas to form the MIM program
MIM Curriculum

MIM PhD students are expected to complete their PhD within a maximum of 4 years and fulfill the following requirements:

• acquisition of 12 credit points
• deposition and defense of a PhD thesis describing an original piece of experimental or theoretical research
• any other requirements imposed by the host institution (UZH or ETH), e.g. teaching obligations of UZH students (min 100 hours)!!!
Thesis Committee

The student is responsible to appoint a thesis committee together with the responsible faculty member/thesis supervisor. The responsible faculty member or the thesis supervisor has to be member of MIM. The composition of the committee has to comply with the respective regulations at UZH or ETHZ.

The thesis committee consists of 3 to 4 persons:

• The responsible faculty member (2 at UZH)
• The thesis supervisor if not identical with the responsible faculty member
• An external advisor from a related research area, who ideally is a member of the MIM PhD program
• An expert not affiliated with the MIM PhD program whose expertise should be outside of the main area of study
Course work and credit points

To complete a PhD the student must acquire **12 credit points in total**. The awarding of credit points complies with UZH/ETHZ regulations. In summary, the 12 requested credit points have to be acquired according to the following scheme:

<table>
<thead>
<tr>
<th>Course type</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introductory block course</td>
<td>compulsory 2 ECTS</td>
</tr>
<tr>
<td>Graduate courses</td>
<td>suggested 7 ECTS</td>
</tr>
<tr>
<td>Other courses</td>
<td>suggested 3 ECTS</td>
</tr>
</tbody>
</table>

Courses can be chosen **after consulting the Thesis Committee**, which is responsible for the supervision and approval of the complementary course work. This is usually done at the thesis committee meetings.
The Program

The MIM PhD Program is a joint program of the ETH Zurich and the University of Zurich, two highly prestigious Swiss Universities with excellent research facilities.

The program offers research and education opportunities in a stimulating international environment for ambitious students who wish to work towards a PhD. Basic, environmental and medical microbiology, molecular microbiology, biochemistry, bacterial and viral pathogenesis, infection biology, experimental and clinical immunology, evolution, parasitology, virology and veterinary bacteriology are covered by the program.
What PIs expect from students
Learning outcomes:

1. Attain a broad knowledge base in the biomedical sciences, coupled with more specific knowledge regarding the biologic mechanisms employed by microbial agents and the immune system. This goal is accomplished by gaining "first hand" knowledge of scientific advances in the particular research front selected for dissertation work.
2. Acquire the ability to formulate a rational hypothesis evolving from critical analysis of existing scientific facts.
3. Learn how to apply the scientific method to test a hypothesis.
4. Learn how to apply existing techniques or develop a new methodology to solve the problem under study.
5. Obtain in-depth training with techniques that are particularly applicable to their chosen research front.
6. Acquire an ability to communicate research findings to the scientific community.
7. Develop and practice an acute appreciation of the professional and scientific ethic.

Creativity  Endurance  Frustration tolerance

Courage  Knowledge  Honesty
The only common denominator I could identify

RESEARCH SHOULD BE THE SOLE FOCUS OF YOUR LIFE.
I EXPECT YOU TO EAT, DRINK AND SLEEP RESEARCH.

I'M ALLOWED TO SLEEP?
ONLY IN A LIE-AWAKE-AT-NIGHT-OBSESSING-OVER-IT KIND OF WAY.

OUTSIDE INTERESTS ONLY TELL ME YOU'RE NOT SERIOUS ABOUT GETTING YOUR PHD.
I MEAN, WHAT COULD BE MORE INTERESTING THAN OUR RESEARCH?

I... I CAN'T ANSWER THAT.
EXACTLY. NOTHING.

http://www.phdcomics.com/comics/archive/phd110306s.gif
Graz, until 1992

Don’t believe in career plans!
Title of thesis: "The par region of broad-host-range plasmid RP4: studies on gene regulation and characterization of the multimer resolution system"

There is no bad project!
It all depends what you can make out of it
Copenhagen, until 1996

Early days in Microbial Ecology at DTU

Starvation

Biofilms – flow chambers

Bacterial physiology

Single cell activity

Quorum sensing
One morning in Lyngby in 1993

Major advances in microbiology are often based on discoveries!

Call it luck or observation skills
Be aware of the literature!

MicroReview

Bees aren't the only ones: swarming in Gram-negative bacteria

Rasika M. Harshey
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Summary

Swarming is a form of active surface motility that is widespread among flagellated, Gram-negative bacteria. In the laboratory, growth of the bacteria on certain agar surfaces leads to induction of the differentiated swarmer-cell state. Swarmer cells are generally long and multinucleate, always hyperflagellated, and and animals profoundly affects our ecology and our health (see Costerton et al., 1987).

A striking example of bacterial surface colonization that can be studied in the laboratory is the swarming response. Swarming is defined as an organized surface translocation that is dependent on extensive flagellation and cell–cell contact (Henrichsen, 1972). Swarmer cells move in a group parallel to their long axis and maintain close contact with other cells. It is clear that a new genetic program must be switched on to produce swarmer cells. Swarming thus offers a unique opportunity not only for studying intercellular interactions, but also for investigating how bacteria
Molecular Biology of Bacterial Bioluminescence

EDWARD A. MEIGHEN

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Although \( \beta \)-hydroxybutyryl homoserine lactone appears to be specific for induction of the \( V. \) harveyi \( lux \) system, evidence exists that cells of other bacterial species, including nonluminescent strains, excrete compounds into the medium that induce the luminescence system of \( V. \) harveyi (56, 58). If so, the autoinducers may be involved in the control of cellular functions other than luminescence. This proposal would be consistent with a role for the autoinducer as a signal of the environmental status because chemical sensors found in other systems appear to affect more than one metabolic pathway.
Early days in quorum sensing research

Show initiative

Back the right horses!
Early days in quorum sensing research

The most important message of this talk:
Don’t aim at a career in microbiology (or whatever) if you don’t consider it great fun
I am a great believer in luck, and I find the harder I work, the more I have of it (Thomas Jefferson)
Dear Leo

Enclosed you find HSL compounds from a red algae called Detosca. It is compound 1, 2, 3 and 9.6. Compound 3, 2 and 5 inhibits swarming of Serralia (we have not tested 4 yet) but not swimming and we have not detected any effect on growth. Further more addition of compound 1 or 2 will inhibit OHTL stimulation of mutant 4. The violacein assay of Chromobacterium cuvee is also inhibited (revived) of these compounds. I order to verify if these compounds actually works as competitive inhibitors of HSL stimulated systems I would like if you would run a growth experiment with the Serralia/pSB403 mutant strain and measure bioluminescence in the absence and presence of each of the algal compounds.

The prediction would be that if they are competitive inhibitors they should, to some extend inhibit the growth phase dependent induction of bioluminescence of Serralia/pSB403 which is thought to be caused by the autoinducer LHR interaction.
Be aware that biology is not entirely predictable, mutations may occur, epigenetic variation is also possible.

Be pragmatic in the interpretation of unusual behaviours of your favorite bet, famous movie quotes may provide sufficient explanation.
- The more measurements you take the better
- Always include a positive and negative control
- If you apply statistics be aware what you are doing and make sure that your data points are good enough for a statistical analysis
Hypothesis-driven research can be highly valuable (sometimes)
We have no equipment here that allows measurements of bioluminescence.

The compounds are dissolved in 100 μl EtOH and they are 100 mg/ml. You should use 100 μg/ml in the assays (~10^5 times dilution).

In addition, I would like if you could test the effect on swarming of Serratia as well.

Add 100 μg/ml to the swarming plates (~20 μl).

Serratia liquefaciens 358403 is no. 3414 in my collection (i.e., box 34).

We have some problems with the wet Serratia. It simply grows too slow, I don't know what is the matter, but it is no man.

Billy, what the hell's the matter with you?

I don't know man, but there is something out there and it is no man. — Ha. Ha.

About the inducer, I am flowing him today saying that since we did not hear anything from their lab about purification or whether they initiated detection of the autoinducer I have started it up here. And in fact this guy does it here
Be careful with collaboration partners, make clear agreements in the very beginning. But don’t get paranoid either, some may be highly fruitful and last your entire career.
München, spring 1996
Zürich, since 2003