# KMG042-2022 Information Pack

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# 1 Course Description Aims and Content

Examinator
Julie Grantham

Förkunskaper
Basic courses in biochemistry, cell and molecular biology and applied microbiology

Grundläggande kurser i biokemi, cell-och molekylärbiologi och tillämpad mikrobiologi

Syfte
The aim of this course is to provide advanced knowledge in a range of molecular biology techniques with an emphasis on the functional analysis of genes and gene products.

Syftet med kursen är att ge fördjupade kunskaper i en rad molekylärbiologiska tekniker med fokus på funktionell analys av gener och genprodukter.

Lärandemål:

After completion of this course students should be able to:
Describe how different model organisms can be used to address a particular question
Understand the applications and limitations of different model organisms
Be able to plan experiments include appropriate controls
Search scientific literature

Efter fullgjord kurs ska studenten kunna:
Beskriv hur olika modellorganismer kan användas för att behandla en viss fråga
Förstå tillämpningar och begränsningar för olika modellorganismer
Kunna planera experiment och inkluderar lämpliga kontroller
Söka vetenskaplig litteratur

Innehåll

This course will focus on several model organisms: mouse, fruit flies, yeast, worms, zebrafish and cultured mammalian cells.
Lectures will be based mainly on modern genetics and molecular biology methods using these model organisms.
Laboratory classes will include the insertion of genes into cultured mammalian cells, immunofluorescence, analysis of worms.
A literature study will introduce students to searching for scientific papers and students will present their finding regarding a particular molecular biology technique to the rest of the group.
Group work to discuss the use of model organisms

Kursen kommer att fokusera på flera modellorganismer: mus, flugger, jäst, maskar zerbrafish och odlade däggdjursceller.

Föreläsningarna kommer att baseras i huvudsak på moderna genetiska och molekylärbiologiska metoder som använder dessa modellorganismer.

Laborationer under kursen kommer att omfatta införandet av gener i odlade däggdjursceller, immunofluorescence, samt analysis av maskar.

En litteraturstudie introducerar studenterna att söka efter vetenskapliga artiklar och studenter kommer att presentera sin slutsats om en viss molekylärbiologisk teknik för att resten av gruppen.
Grupparbete där man diskutera användningen av olika modellorganismer

Organisation
Lectures /laboratory classes/groupwork/presentations

Föreläsningar / laborationer/ grupparbeten / presentationer

Litteratur
There is no set book but Lodish et al Molecular Cell Biology or Alberts et al Molecular Biology of the Cell would be useful. Recommended reading lists and handouts will be provided.

Det finns ingen bestämd bok men Lodish et al Molecular Cell Biology utgåvan eller Alberts et al Molecular Biology of the Cell upplagan är vara bra. Rekommenderad läsningslister och handouts kommer att tillhandahållas.

Examination
Students must pass the written examination, attend all laboratory classes/ groupwork sessions and produce laboratory reports of the appropriate standard.
Students must participate to an appropriate standard in presentations and group work sessions.

Studenter måste vara godkänd på den skriftliga tentamen samt deltagit och vara godkänd på laborationerna, grupparbetet och presentationer.

# 3 Format of course

The 7.5 points for this course are allocated as follows

- Exam 5.5 points
- Lab Classes 2 points
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There are 3 labs: Worms and two mammalian cell labs

You need to attend and pass all 3 labs to get the 2 points. Only when all 3 labs are complete will the points be entered in LADOK ie you will NOT get 1 point registered if you have only completed 2 labs.

You can have two attempts to correct a failed lab report, before needing to take that lab class again next year.

The following are also compulsory:

- Group work discussion and student presentation

**Grading**

- 5 80%
- 4 65%
- 3 50%
- Below 50% Fail

**Reading material**

There is no set book but Lodish et al Molecular Cell Biology or Alberts et al Molecular Biology of the Cell edition would be useful. Recommended reading lists and handouts will be provided.

# 4 Exams

**Old exam papers**

There is an example of a previous exam on the course home page.
You can request copies of other old exam papers at the Student Office by email:

studieadmmolbio@cmb.gu.se

Please note that the course content has changed since 2012 and the Zebrafish lectures are new in 2021.

**Your own exam**

If you have any questions about how a question was graded you can contact the lecturer that set the question (this will be indicated by their initials on the exam paper).

**Language**

You can answer exam questions in English or Swedish.

# 5 Lab classes-general information

The lab classes are compulsory. If you are unwell and therefore cannot attend, contact Julie Grantham via email.

Lab classes are at the Lundberg building, Medicinaregatan 9C. Upon entering the building, turn left and this is the course lab corridor and also where student office is.

The lab manuals will be available on the homepage in advance of the class and it is expected that you read through then in advance.

Please hand in your lab reports one week after the lab has finished. You will be given instructions (homepage) on what to include in your report. You can expect to hear from the lab assistant two weeks later to say if you have passed or not. If there are corrections to be made, you have two opportunities to resubmit the report. If it is still not ok then you need to do the lab class again next year.

For each lab, students submit an individual lab report. The report must be written in your own words, not using text cut and paste from other sources. Send in your lab report via the assignments section in CANVAS which has a scanning service to ensure no lab reports are copied. Cases of suspected plagerism will be reported.

## 6 Groupwork

Discussion points- think about these points ready to discuss this in the group meeting

**"We can easily do temporal and/or spatial gain of function studies in fly. Discuss how research studies can get benefit from this possibility and explain how other model systems are standing in comparison."**

**"The nematode C. elegans was chosen by Sydney Brenner as a model organism to study questions related to development and nervous systems. Do you think that C. elegans can be used to study phenomena such as metabolic disorders (e.g. obesity), behavior (e.g. addiction), neurological disorders (e.g. Alzheimer), psychology (e.g. depression) or cancer?"**

**How does *Saccharomyces cerevisiae* and *Schizosaccharomyces pombe* compare to mammalian systems with respect to a) the ease of making targeted mutagenesis in the genome b) how RNAi works c) the mitotic cell cycle ?**

**In what ways are cultured cell lines and cells in tissues different?**

**Mice are the workhorses of modern genetic, pharmaceutical and molecular biology research. Tens of thousands of genetically modified mice strains are available, including disease models that spontaneously develop the equivalent of most major human diseases: atherosclerosis, diabetes, obesity, Alzheimer's disease, and virtually any type of cancer. Within a few years knockout mutants for every known mouse gene will be available, in addition to an overwhelming number of gain-of-function transgenic strains and conditional alleles. For humanity, is this a great asset, or a moral burden?**

# 7 Student presentations

**Aim :**
To cover a range of techniques in cell biology and combine theory with examples. Gain experience in searching the scientific literature.

You will be in a small group and the aim is to give a presentation to the class where you describe a technique and then give an example of an original research article that has used the technique to make a discovery.

**Learning Objectives :**
Students will be able to:
Present the chosen technique, describing the theory behind the technique
Provide an example of how the technique has been used to make a discovery. Here you will need to find an original research article (see below).
Answer questions on the chosen topic

**Instructions and time line:**

1) You will be assigned a group and technique. This will be done during Week 3

Initially it is recommended that you search for information about your technique to orientate to yourselves with the theory of how the technique works.

2) You now need to choose an original research article where your technique has been used to make a discovery.

The article must be an original research article NOT a review article. An original article is where experiments are first described and data figures are presented. There is an example of an original research article available on the course home page in the General Information file

A suggested place to start your search is http://www.ncbi.nlm.nih.gov/sites/entrez

Use key words for your search that include the technique and any areas of science that interest you. For example: techniqueX, cancer, cytoskeleton.

Avoid articles in 'Methods' and 'Protocols' type of journals as they tend to just describe the technique.

3) To check that you are on the right track email Julie your chosen original research article (pdf format) by **28th Jan**

Only send ONE article and only an article that you have already read

4) Prepare a short talk briefly explaining the theory of the technique (ie how does it work?). Then use the example of how this was used in the original article of your choice (ie what was found out?). The talk can be a maximum of 15 minutes followed by 5 minutes of questions.

All students in the group should be involved in the talk.

Presentations are on **28th Feb**

**Techniques:**

| | |
|---|---|
| Group 1 | Live cell imaging |
| Group 2 | FACS (Fluorescence activated cell sorting) |
| Group 3 | Proximity Ligation Assay |
| Group 4 | Structured Illumination Microscopy |
| Group 5 | Cell cycle synchronisation |
| Group 6 | Photo Activated Localization Microscopy |
| Group 7 | Cell migration/ Invasion assays |
| Group 8 | Stimulation of cells with growth factors/hormones |
| Group 9 | Subcellular Fraction |
| Group 10 | Chemotaxis assays |
| Group 11 | Neuronal differentiation |
| Group 12 | Cryo-electron microscopy |

# 8 Contact information

**Course organiser :** Julie Grantham julie.grantham@cmb.gu.se

During the course Julie Grantham will be able to answer questions by email and also during a weekly drop-in 'open office hour' Mondays 12-13 via zoom

https://gu-se.zoom.us/j/65227367124 waiting room format

**Question Time (see schedule)**

This is an opportunity to ask questions about the material covered to the lecturers. Julie will also talk about the exam. This will be done via zoom:

https://gu-se.zoom.us/j/2205119897?pwd=NnR5bllXQnlEUVdoL3Z3d3dXUGZFZz09

**Lecturers:**

| | | |
|---|---|---|
| Julie Grantham | julie.grantham@cmb.gu.se | (Cultured mammalian cells) |
| Marc Pilon | marc.pilon@cmb.gu.se | (Worms and Flies) |
| Peter Carlsson | peter.carlsson@cmb.gu.se | (Mouse) |
| Hiroki Shibuya | hiroki.shibuya@gu.se | (Zebrafish) |
| Per Sunnerhagen | per.sunnerhagen@cmb.gu.se | (Yeast) |

**Lab assistants:**

Worm Lab:

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|---|---|
| Dimitra Panagaki | dimitra.panagaki@gu.se |
| Delaney Kaper | delaney.kaper@gu.se |

Mammalian Cell Lab

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|---|---|
| Carmen Cordoba | carmen.maria.cordoba.beldad@gu.se |
| Mara Caputo | mara.caputo@gu.se |

Transfection Lab:

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|---|---|
| Mara Caputo | mara.caputo@gu.se |
| Carmen Cordoba | carmen.maria.cordoba.beldad@gu.se |