

SCIE5508

Synthetic Biology: Solving Global Challenges



Lecture 1 – Introduction to the unit

Dr. Georg Fritz (Unit coordinator)

Senior Lecturer

School of Molecular Sciences



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AUSTRALIA**

Location: Bayliss Building, room 3.69

Email: georg.fritz@uwa.edu.au

Phone: 6488 3329

Office hours: By appointment



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A bit about myself...



Dr. Georg Fritz
School of Molecular Sciences
georg.fritz@uwa.edu.au

- **2000-2006 Studied Theoretical Physics, Univ. Freiburg, Germany**
- **2006-2012 PhD in Biological Physics, LMU Munich**
- **2012-2014 Postdoc in Synthetic Microbiology, LMU Munich**
- **2014-2019 Group leader, Center of Synthetic Microbiology, Marburg**
- **Since Oct 2019 Senior Lecturer @UWA**



Our mission is to...



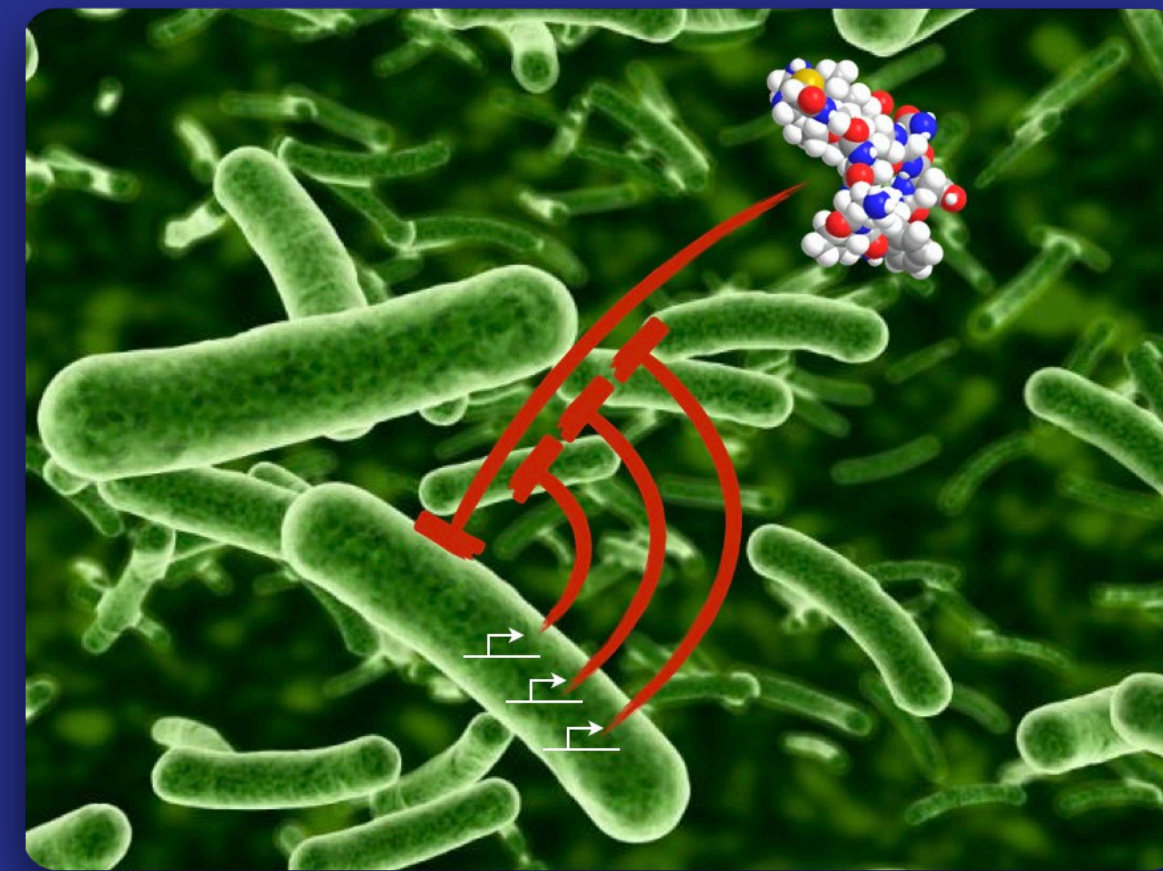
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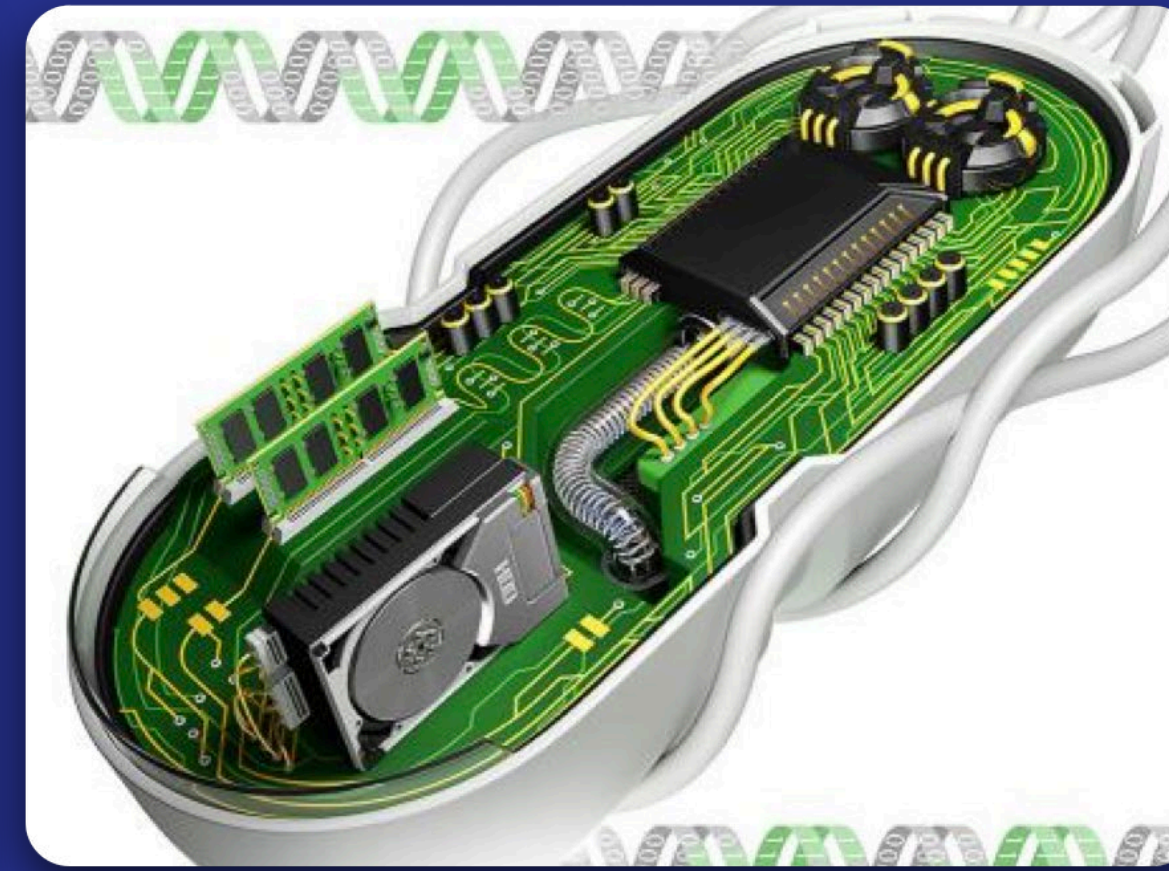
Dr. Georg Fritz
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**Systems and synthetic
biology of microbial
regulatory networks**

**... crack antimicrobial
resistance**



**... build tools for
bioengineering**



**... engineer metabolic
pathways**



Lecturers of SCIE5508



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Dr. Georg Fritz
School of Molecular Sciences
georg.fritz@uwa.edu.au

**Systems and synthetic
biology of microbial
regulatory networks**



A/Prof. Yit-Heng Chooi
School of Molecular Sciences
yitheng.chooi@uwa.edu.au

**Molecular genetics
and biochemistry of
secondary metabolite
biosynthesis**



Dr. Farley Kwok Van Der
Giezen
School of Molecular Sciences
farley.kwokvandergiezen@u
wa.edu.au

**Molecular biology,
systems biology of
plant development**



Prof. Ryan Lister
School of Molecular Sciences
ryan.lister@uwa.edu.au

**Biochemistry and
molecular biology of
epigenetic control in
eukaryotes**

Unit outline



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Semester week number and date	Lecture (pre-recorded) Q&A sessions on demand	Lecturer	Workshop	Seminar / Tutorial	Reading
1	1) Introduction to the unit 2) Foundational concepts of Synthetic Biology	GF		(selection of seminar topics)	See Lecture Notes / LMS Site
2	3) Designing genetic circuits I 4) Designing genetic circuits II	GF	Workshop: <i>In silico</i> cloning of synthetic timer circuits using Golden-Gate assembly (GF)	Tutorial: Developing a SynBio project (GF)	See Lecture Notes / LMS Site
3	5) Rewiring microbial metabolism I 6) Rewiring microbial metabolism II	Y-HC	Workshop: Building and analysing synthetic metabolic pathways (Y-HC)	Seminar: Recent advances in microbial synthetic circuit design (GF)	See Lecture Notes / LMS Site
4	7) Designer plants I 8) Designer plants II Quiz #1 (online, covering lectures 1-6)	IS	Workshop: Designing synthetic PPR proteins (IS)	Seminar: Recent advances in metabolic engineering (Y-HC)	See Lecture Notes / LMS Site
5	9) Engineering of mammalian cells I 10) Engineering of mammalian cells II	RL	Workshop: Epigenome editing with a CRISPR/dCas9 system (RL)	Seminar: Recent advances in plant synthetic biology (IS)	See Lecture Notes / LMS Site
6	Quiz #2 (online, content: lectures 7-10)		Project meeting with lecturers (Design phase: discuss project ideas)	Seminar: Recent advances in mammalian synthetic biology (RL)	See Lecture Notes / LMS Site
TEACHING BREAK					

7			Project meeting with lecturers (Design phase: select project)		See Lecture Notes / LMS Site
8			Project meeting with lecturers (Build phase)		See Lecture Notes / LMS Site
9			Project meeting with lecturers (Test & Learn phase)	Oral project pitch (group presentation)	See Lecture Notes / LMS Site
10			Writing		See Lecture Notes / LMS Site
11			Project meeting with lecturers (Review)		See Lecture Notes / LMS Site
12			Writing	Submission deadline for funding proposal	See Lecture Notes / LMS Site
TEACHING BREAK					



Schedule weeks 1-6

- **Lectures:** Online (pre-recorded, 2 x ~45min)
- **Q & A sessions:** Online (live); 1 session per week, Wednesday 5-6 pm (weeks 1-5)
- **Workshops:** Thursday, 15:00–18:00, RBST: [G16] Robert Street LT, weeks 2 – 5
- **Seminars:** Friday, 15:00–17:00, Simmonds Lecture Theatre G01, weeks 2–6



Schedule weeks 6-12

- **Self-study time:** Read literature & develop project
- **Student group meetings:** Develop project & prepare discussion with supervisor (1-2h/week minimum)
- **Project meetings:** Scheduled by lecturer, 1 hour per week online mentoring on demand (via MS Teams)

Workshops

- **Prepare:** Maximize hands-on training by studying the theoretical concepts **before** the workshop (materials on LMS)
- **Hands-on training:** Learn how to design genetic constructs using DNA management software
- **Examine real-world data**
- **Get to know our experimental setups**

Seminar (journal club)



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- **Choose** a recent Synthetic Biology paper from pre-selected list (see LMS); provide 3 choices by the end of **week 1** via an LMS survey
- **We assign you in teams of 3 students** (random assignment on LMS)
- **Prepare** ~10-12 Powerpoint slides to cover the background, experimental concept, main findings and conclusion of the work1
- **Present** a 10-12 min talk to your peers (**WE EXPECT A FREE SPEECH WITH PPT SLIDES - NO NOTES ON PAPER OR PPT ALLOWED! NO READING OF FULL SENTENCES FROM PPT SLIDES! THE USE OF NOTES / READING OFF THE SCREEN WILL LEAD TO A PENALTY OF 5 MARKS (OUT OF 20 MARKS TOTAL)**)
- **Discuss** the work for 3-5 min in a Q&A session

Project: Develop a Synthetic Biology funding proposal



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- **Challenge:** Propose a Synthetic Biology project using a multi-gene construct (sensory & regulatory circuit, metabolic pathway, etc.) to address a topical problem (environmental, agricultural, biotechnological, medical, etc.)
- **Teams** of 4 students (team-assignment via poll, management on **MS Teams**)
- **3 phases: Design** (weeks 6 & 7), **build** (weeks 8), **test & learn** (week 9)
- **Present an oral pitch** of your proposal (5 min group presentation, week 9)
- **Write** funding proposal describing the 3 phases (Intro + 1 section/student) – more details will be given in a tutorial in week 2

Assessments



- **Quizzes 25%** (In weeks 3 & 5)

- **Oral 35%**

- **Seminar talk (20%)**



- **Active participation in Q&A sessions (5%)**

- **Project pitch (10%)**



- **Written proposal 40%**

- **Late submissions will be penalised with 5% per 24h block**

Attendance



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- **If you have a clash with an element of the unit please let me know ASAP. Attendance in workshops and seminars is compulsory (sessions are not recorded).**
- **If you cannot make the assessment submission deadline please see the Science Student Office (SSO), well in advance of the due date or else you will be penalized for late submission.**

Support & resources



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- If you are struggling with the assessment and require guidance/clarification, please see the lecturer/unit coordinator
- If you have problems with reading/writing/speaking (incl. English language) please take advantage of UWA's STUDY smarter resources

Other information



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- **No recommended textbook for the unit. See individual lecture notes and workshop materials for suggested readings on LMS**
- **Plagiarism: any doubts about what constitutes plagiarism, see**
<http://www.science.uwa.edu.au/students/sing-current-students/assessments/dishonesty>
- **A note about contacting academic and professional staff by email:** Writing a professional email is a generic skill that you should acquire while at UWA. Email messages should be polite, considerate, and contain correct grammar and spelling. All should begin with an appropriate salutation, e.g. “Dear...”, and end with a suitable closing, e.g. “Regards...”
- **Do not expect an answer to an email outside of business hours (Monday – Friday, 9.00 – 17.00).** Please check the “Announcement” section in the unit’s LMS page before sending an email. Your question may have already been addressed.

Learning Management System (LMS)



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- **Unit Outline and detailed schedule of lectures, workshops and seminars**
- **Assignment Coversheet/Plagiarism Declaration Form, Lecture Notes & Recordings**
- **Assessments release and submit**
- **Discussion Board (Forums)**
 - **Each lecture has a Q & A forum (remember: gain 5% of your mark via active participation)**
 - **No guarantee that lecturer will check the discussion board, so contact them directly with any queries or comments**

Questions?

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