

MIROSLAV GASPAREK

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CURRENT POSITION

DPhil in Engineering Science, St Cross College, University of Oxford 2019 - 2022

- *Thesis title:* A control theory approach to analyse and design synthetic gene circuits.
- Supervisors: Professor Antonis Papachristodoulou, Professor Harrison Steel

EDUCATION

MEng in Biomedical Engineering, Imperial College London 2015-2019

Overall grade: First Class Honours

Private Secondary Grammar School, Zilina, Slovakia 2010-2015

Bilingual education in English language (awarded scholarship covering the tuition fees). Final Exam: 1.0 Overall (the highest possible grade)

St Edmund's College, Ware, United Kingdom 2012-2013

A study visit. AS Levels: Mathematics, Further Mathematics, Physics, Chemistry

RESEARCH EXPERIENCE

Undergraduate Research Student in Tanaka Group, Imperial College London Oct 2018 - Jun 2019

- Advisor: Dr. Reiko Tanaka
- Research project: (MEng Final Year Project) Design of the individualized eczema treatment policies using reinforcement learning.
- Approach: Mathematical and computational applications of reinforcement learning to determine optimal eczema treatment using clinical data-based model.

Visiting Research Intern at Endy Lab, Stanford University Jul 2018 - Sep 2018

- Advisor: Professor Drew Endy
- Research project: Changing compatibility of the plasmid vectors for the realization of protein-protein interaction assay in the minimal genome (JCVI-syn3.0)
- Approach: (Experimental) Primers design, PCR, Gibson assembly, gel electrophoresis, electroporation, Golden Gate cloning, preparation of samples for the sequencing. (Computational) Fundamentals of the supervised machine learning, protein database search using BioPython.

Visiting Research Intern at Murray Lab, California Institute of Technology Jul 2017 - Oct 2017

- Advisor: Professor Richard Murray
- Research project: Development of the computational framework *BioSIMI* for the input/output modeling of interconnected genetic circuits in the context of bottom-up approach to construction of a simple artificial cell
- Approach: (Computational) Modeling of the interconnection of subsystems in MATLAB *SimBiology*, analysis of the nonlinear dynamical systems. (Experimental) Protein expression from the TX-TL cell-free extract, encapsulation of the cell-free extract into the manufactured liposomes.

Undergraduate Research Intern in Tanaka Group, Imperial College London Feb 2016 - Aug 2016

- Advisor: Dr. Reiko Tanaka
- Research Project: Mathematical and computational modeling of the optimal treatment of eczema.
- Approach: The non-linear hybrid model of eczema dynamics was analyzed using the methods of nonlinear dynamical systems analysis in MATLAB under the co-supervision of a doctoral candidate.

RESEARCH INTERESTS

Synthetic Biology: Genetic circuit design, sRNA feedback systems, population-level control, synthetic cells.

Systems Biology: Optimal eczema treatment.

Control Theory: Feedback control, model predictive control, biological systems applications.

Reinforcement Learning: Optimal control & policy planning, applications in biology and health care.

PUBLICATIONS

- “A stochastic, individual-based model for the evaluation of the impact of non-pharmacological interventions on COVID-19 transmission in Slovakia.” Miroslav Gasperek, Michal Racko, and Michal Dubovsky. MedRxiv. 2020. (Preprint)
- “Reducing post-transcriptional disturbances by small RNA-based antithetic integral feedback circuit.” Miroslav Gasperek, Harrison Steel, Antonis Papachristodoulou. In American Control Conference. 2021. (Submitted for Initial Review)

PROFESSIONAL EXPERIENCE

Advisor to the Institute of Health Policies, Slovak Ministry of Health Mar 2020 - May 2020

- Worked on modelling COVID-19 spread for Slovak governmental think-tank. Developed a stochastic, agent-based model of the disease spread, conducted literature research, background analysis, and public communications.

Co-founder at Genbiotics Feb 2020 - present

- Co-founder of start-up that engineers bacteria to treat human diseases. Responsible for the engineering, product and marketing.

Member of Scientific Advisory Board at DNA Era Sep 2019 - present

- Scientific Advisor to the Slovak startup *DNA Era* focused on the genetic testing and analysis of the saliva samples.

Team Member at DNA Era Dec 2018 - Apr 2019

- Assisted with the marketing and promotion of a Slovak genetic testing startup.
- Conducted the literature search and co-authored the health reports related to the particular genetic variants.

Value Delivery Consultant Intern at Exponea Aug 2016 - Oct 2016

- Internship in a Slovak start-up offering e-commerce data analysis and customized marketing solutions.
- Customer analytics consulting, implementation of the automated marketing solutions using HTML and JavaScript.

WORKSHOPS AND CONFERENCES

6th Build-A-Cell Meeting, NASA Ames Research Center, Sunnyvale Jan 2020

- I actively participated in the “*in silico* Cell” working group in the workshop on construction of the artificial cells.
- I was assigned the specific responsibilities with regards to the modelling of cell-free systems and outreach activities.

SynBioControl 2019 Workshop, Worcester College, University of Oxford Sep 2019

- Attended the workshop on the applications of Control Theory in Synthetic Biology to inform the specific selection of my doctoral research topic.

5th Build-A-Cell Meeting, Massachusetts Institute of Technology, Boston Aug 2019

- Participated in the workshop on the construction of the artificial cells, learned about the major challenges associated with building of the functioning cells.

SynBITECH 2019 Conference, Queen Elizabeth II Centre, London Jun 2019

- Participated and networked with the academic and business leaders in the conference on building a multibillion-dollar synthetic biology industry.

4th Build-A-Cell Meeting, University of Minnesota, Minneapolis

Aug 2018

- Participated in the workshop on the construction of the artificial cells, learned about the role of the essential genes in this process.

TEACHING, OUTREACH, PUBLIC SPEAKING AND MENTORING EXPERIENCE

Graduate Teaching Assistant at University of Oxford

Jan 2020 - Mar 2020

- Graduate Teaching Assistant for Control Labs course A2 Helicopters. Mentored students during the computational task assignments and marked their laboratory work.

Podcast Host at *Pravidelna Davka* podcast

Jun 2019 - present

- One of three hosts of Slovak podcast focused on Philosophy, Science & Religion, and Bioengineering.
- Analysis, news, and discussions about current innovations in Bioengineering, Synthetic Biology, and Medicine.
- Podcast is distributed through the communication channels of the major Slovak daily newspaper "Dennik SME".

Mentor at TalentGuide, Slovakia

Feb 2018 - present

- Mentoring of the talented Slovak high school students through the established mentoring scheme.

Public Lecturing about Synthetic Biology and Bioengineering in Slovakia

Sep 2017 - present

- Promotion of Bioengineering and Synthetic Biology through invited lectures at the various Slovak high schools and at the other occasions (approx. 15 lectures).

Team Member at Unimak

Sep 2015 - present

- Member of the non-profit organization helping Slovak & Czech students with admissions to the foreign universities.
- Former Vice President and STEM Team Leader, advised to approx. 30 students.
- Co-founded the lecture tour about studying abroad in the Slovak high schools.

Undergraduate Teaching Assistant at Imperial College London

Jan 2018 - Jun 2019

- Undergraduate Teaching Assistant for the Signals and Control (BE2-HSCL), Wet Labs (BE2-HWLS), and Modelling in Biology (BE3-HMIB). Mentored students during the computational/experimental task assignments, prepared introductory and final remarks, prepared and explained the example solutions.

Invited Speaker at Strategic Conference of Svet Zdravia, Slovakia

Apr 2017

- Lectured about Synthetic Biology and Bioengineering to approx. 250 clinicians and executives at the strategic medical conference of Svet Zdravia, the largest Slovak private network of hospitals.

Invited Speaker at Medical Conference of Svet Zdravia, Slovakia

Nov 2016

- Lectured about the Mathematics and Bioengineering applications in Health Care and Eczema treatment to approx. 200 clinicians at the working medical conference of Svet Zdravia, the largest Slovak private network of hospitals.

Private Tutor of Mathematics and Physics

2013-2014

- Tutored Mathematics (Calculus) and Physics (Mechanics) to the Slovak high school and university students.

AWARDS AND HONORS

St Edmund Hall: Pontigny Scholarship

2020

- Scholarship awarded to a student studying towards a research degree in 2020 who will take a leading role in fostering academic exchange between the graduate students and the faculty at St Edmund Hall.

Build-A-Cell: Travel Award

Aug 2019, Nov 2019

- Awarded travel grants to participate in the 5th and 6th workshop on engineering of the synthetic cells at the MIT and at NASA's Ames Research Centre.

Tatra Banka: Students to the World Scholarship

2018, 2019

- Scholarship helped to partially cover the living expenses associated with research at Stanford University (2018) and the University of Oxford (2019).

- Central European Foundation (CEF): Talents of the New Generation Scholarship** 2018, 2019, 2020
- Tatra Banka and CEF Scholarship covered the expenses associated with research at Stanford University (2018) and the University of Oxford (2019).

- Institution of Engineering & Technology: Undergraduate Award** 2018
- Awarded to 11 final year UK engineering students for the demonstration of engineering leadership & commitment.

- Imperial College Faculty of Engineering Alumni Association: Student Activity Award** 2018

- Royal Academy of Engineering: Engineering Leaders Scholarship** 2017
- Scholarship awarded to 22 potential UK engineering leaders in the second year of their undergraduate studies.

- Penta Foundation Scholarship** 2017
- Scholarship from the Slovak foundation covered the costs of the research at Caltech in the summer of 2017.

- Imperial College London: UROP Award** 2016
- Scholarship covered the costs of the summer research in Tanaka Group in the summer of 2016.

- Diploma of St Gorazd** 2015
- Top prize awarded by Education Secretary of the Slovak Republic for representation in 7 international Olympiads.

- International Olympiad on Astronomy and Astrophysics 2011-2015** 2011-2015
- Participation in 5 International Olympiads: Poland 2011 (Certificate of Participation), Brazil 2012 (Honorable Mention), Greece 2013 (Gold Medal), Romania 2014 (Bronze Medal), Indonesia 2015 (Silver Medal)

- International Physics Olympiad 2015** 2015
- India 2015 (Honorable Mention)

- International Young Physicists Tournament 2015** 2015
- Thailand 2015 (Honorable Mention)

SOCIETIES, COMMITTEES, AND AFFILIATIONS

- Vice President of the Oxford University Czech and Slovak Society** Mar 2020 - present

- President of the Oxford University Synthetic Biology Society** Dec 2019 - present
- Synthetic Biology Society aims to increase the awareness of Synthetic Biology and its benefits in Oxford area through talks, discussions, competitions, and other events.

- Founder of St Cross College Innovation Society at the University of Oxford** Nov 2019 - present
- The Society brings together students from different disciplines and backgrounds to discuss and contribute to the solution of major global challenges, such as UN Sustainable Development Goals and NAE Grand Challenges.

- UG Engineering Representative at Imperial College Union Council** Oct 2018 - Aug 2019
- One of four representatives of undergraduate engineers in the highest body of the Imperial College student union.

- Bioengineering Departmental Representative at Imperial College London** Oct 2017 - Aug 2019
- Representative of all undergraduate and taught postgraduate bioengineering students (approx. 700) on the Departmental level, participated in the curriculum review, managed the Bioengineering student representation team.
- Management of the student representation team, engineering representative to the Imperial College Union Council.

- Bioengineering Year Representative at Imperial College London** Oct 2015 - Aug 2017
- Representative of Class of 2019 undergraduate bioengineering students (approx. 100).

Co-Chair of Imperial College Synthetic Biology Society

Aug 2017 - Aug 2018

Industrial Liaison Officer at Imperial College Bioengineering Society

Aug 2016 - Aug 2018

- Responsible for the corporate relations, sponsorship acquisition, and organization of the entrepreneurial events.
- Co-organized & secured funding for the first two Imperial Hackatons focused on the healthcare applications.

SELECTED PROJECTS

Development of the interactive educational games about eczema

Oct 2017 - Jun 2018

- MEng group project (8 students) developed four educational games explaining the important aspects of eczema mechanisms and treatment to the wide public and showcased in the Imperial Festival 2018.

Synthetic Biology course, mini iGEM project: NOxIOUS

Feb 2018 - Mar 2018

- Group project (6 students) designed a denitrifying genetic circuit in *E. Coli* converting NO_x species into N_2 .
- Designed and modelled the denitrifying pathway, final design also included biological kill switch and biosensor.

Engineering Design Project: ThinkControl Group Universal Controller

Oct 2016 - Jun 2017

- Group (9 students) developed a headset providing users (especially those with cognitive and/or motor impairments) with inputs for the wireless control of the systems such as Scalextric racing car and computer mouse cursor.

Co-Founder & Head of R&D at Wells: Smart Water Intake Management

Oct 2015 - Oct 2016

- Co-founded a start-up project of a smart PET bottle cap (WellsCap) and smartphone app (WellsApp) measuring and tracking user's water intake, developed algorithm for the optimal water intake calculation.
- Project won the UK National round of "CISCO Switch-Up Challenge" focused on IoT applications.
- WellsCap's flow measurement system legally protected as an utility model by Slovak Industrial Property Office.

TECHNICAL SKILLS & OTHER INTERESTS

Technical Skills: MATLAB, Python, Wet Lab Skills, Data Analytics & ML in Python (Keras)

Other Interests: Accordion, Weightlifting, Medicine & Healthcare, Entrepreneurship, Economics, Politics