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Jernej TURNŠEK

Molecular, cell and synthetic biologist

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Education

University of California, San Diego, CA, USA
Visiting Graduate Student, Scripps Institution of Oceanography | 09/2016–08/2018
Advisor: Prof. Andrew E. Allen, PhD

Harvard University, The Graduate School of Arts and Sciences (GSAS), Cambridge, MA, USA
PhD Candidate in Biological and Biomedical Sciences | 04/2014–present
Advisor: Prof. Pamela Silver, PhD

PhD Thesis
Illuminating Diatom Cell Biology with a Genetically Encodable Tag for Electron Microscopy and Subcellular Proteomics

ETH Zürich, PhD Program in Systems Biology, Zürich, Switzerland (accepted in Sep 2012; declined)

University of Ljubljana, Ljubljana, Slovenia
Diploma in Biotechnology (Summa Cum Laude) | 06/2012

Selected Coursework

Scripps Institution of Oceanography
Seminars in Marine Chemical Biology and Natural Products (SIO 262)

Harvard University
Molecular Biology (BCMP 200) • Principles of Genetics (GENETICS 201) • Programming and Statistical Modelling in R (BIO 503) • Genomic Data Manipulation (BIOSTAT 297) • Quantitative Methods for Biologists (NEURO 306qc) • Biomaterials (ENG-SCI 228) • Chemistry in Materials Science and Engineering (APPHY 235)

University of Ljubljana
Chemistry • Physical Chemistry • Biochemistry • Selected topics in Physics • Mathematics • Statistical Methods • Bioinformatics • Genomics • Microbial Physiology • Microbial Biotechnology • Plant Physiology • Plant Biotechnology • Metabolic and Protein Engineering • Membrane Biology • Molecular Evolution

Selected Honors

Kavčič Award, Ljubljana, Slovenia | 04/11/2013
Proteus, the oldest popular science magazine in Slovenia (est. 1933), awarded me for an article about bionanotechnology and the BIOMOD competition.

University of Ljubljana **Prešeren Award** for Diploma Thesis, Ljubljana, Slovenia | 11/22/2012
This award represents the highest recognition of undergraduate academic work in Slovenia. I was one among 13 recipients and one among 3 in the Life Sciences category.

Krka Prize for Diploma Thesis, Novo mesto, Slovenia | 10/19/2012
Krka is one of the two largest pharmaceutical companies in Slovenia. This prize acknowledges outstanding under- and postgraduate work in pharmacy-related disciplines. I was one among 25 prize winners in a joint category including postgraduate students.

University of Ljubljana Rector's **"Best Innovation Award"**, Ljubljana, Slovenia | 12/07/2011
Presenting a business idea built on the iGEM 2010 project our team was a runner-up among 6 finalists and 40 participating teams in this entrepreneurship competition.

Selected Honors

Gold Medal, BIOMOD 2011, Boston, MA | 11/05/2011
Our project on zinc finger-mediated DNA origami functionalization placed 2nd at this annual Biomolecular Design Competition.

Grand Prize, iGEM 2010, Cambridge, MA | 11/08/2010
iGEM - international Genetically Engineered Machines competition. I co-presented our team's 1st place winning project on DNA-guided assembly of biosynthetic pathways. 130 teams participated.

Zois Stipend | 2002–2011
Stipend given by the Slovenian government to the most gifted students and those whose skills are most likely to complement the economic and cultural needs of society.

Work Experience

Research Fellow, J. Craig Venter Institute (JCVI), Microbial & Environmental Genomics, La Jolla, CA | 09/2016–present
Advisors: Prof. Andrew E. Allen, PhD & Prof. Chris Dupont, PhD

Organism Engineer, Ginkgo Bioworks, Inc., Boston, MA | 10/2012–07/2013
Utilized in-house developed DNA assembly and LC-MS pipelines as well as genome and metabolic engineering tools to build an industrially viable bacterial strain for high-added value fragrance molecule production.

Expert Associate, National Institute of Chemistry, Ljubljana, Slovenia | 06/2010–08/2012
Laboratory of Prof. Roman Jerala, PhD: Co-developed a DNA-based synthetic biology strategy for optimization of biosynthetic pathways. Expressed and characterized zinc finger-containing fusion proteins for DNA origami functionalization.

Undergraduate Research Assistant, Chair of Biotechnology, Microbiology and Food Safety, Biotechnical Faculty, Ljubljana, Slovenia | 10/2009–04/2010
Laboratory of Prof. Hrvoje Petković, PhD: Involved in a project that aimed to establish an industrially important bacterial strain less susceptible to hypoxia by incorporating a bacterial haemoglobin gene into its genome.

Undergraduate Research Assistant, Chair of Food Chemistry and Biochemistry, Biotechnical Faculty, Ljubljana, Slovenia | 10/2008–04/2009
Laboratory of Prof. Nataša Poklar Ulrih, PhD: Performed research on α-synuclein-liposome interactions.

Undergraduate Research Assistant, IMI - Institute of Microbiology and Immunology, Faculty of Medicine, Ljubljana, Slovenia | 07/2007–08/2007
Laboratory of Prof. Miroslav Petrovec, MD: Used qPCR to compare DNA extraction efficiencies of two automatic DNA extraction devices.

Professional Development

Material Research Society (MRS) Science Writing Workshop, Boston, MA | 11/29/2015
Learnt about key elements of storytelling, their translation to scientific writing, and conducting an interview with a scientist.

Discover Management Program (DMP), Bled, Slovenia | 07/2011
International summer school in economics and project management.

"S(t)imulating life!", KTH - Royal Institute of Technology, Stockholm, Sweden | 06/2011
International summer school in systems biology, bioinformatics, protein structure, molecular modelling, transcriptional regulation and quantum chemistry.

Regional BioCamp, LEK - a Sandoz Company, Ljubljana, Slovenia | 05/2011
International meeting of 35 most perspective young life scientists in the Alpe-Adria region including a workshop on Technology Transfer in biotech.

Research Interests

1. **Silicon** and **iron biogeochemistry** and **metabolism**.
2. Molecular mechanisms behind intricate **nanoscale patterning of natural biomaterials**.
3. **Intrinsically disordered proteins** and **phase separation** in biology.
4. **Polyamines** and polyamine metabolism.

Grants and Funding

The Gordon and Betty Moore Foundation Grant GBMF4958 awarded to Prof. Julie Theriot (Stanford University), Prof. Andrew Fire (Stanford University) and Prof. Pamela Silver (Harvard University) (July 2015, $401,010).
I have co-written a 3-year grant with James Russel—a PhD Candidate in Prof. Julie Theriot's laboratory—to develop new molecular tools for diatom research and engineering. In my part, I proposed the use of APEX2 to study subcellular proteomes in diatoms.

Research Skills

<u>Laboratory</u>
Molecular cloning • Recombineering • Bacterial, yeast, diatom culture and genetic engineering • Yeast two-hybrid (Y2H) • SDS-PAGE • Western blot • Protein purification • Electrophoretic Mobility Shift Assay (EMSA) • (Fluorescence) spectroscopy • Luminometry • Laser scanning confocal microscopy (LSCM) • Metabolite extraction (violacein, resveratrol and carotenoids) • Dynamic light scattering (DLS) and circular dichroism (CD) of protein samples • RNA isolation and cDNA library preparation • TEM sample preparation

<u>Some hands-on laboratory experience also with:</u>
DNA microarrays • Plant and mammalian tissue culture • qPCR • Liposome preparation • Microscale thermophoresis (MST) • Total internal reflection fluorescence (TIRF) microscopy • Scanning Electron Microscopy (SEM) • Transmission Electron Microscopy (TEM) • Atomic Force Microscopy (AFM)

<u>Computer</u>
General: Microsoft Office 2010 Word, Excel, PowerPoint, OneNote
Graphics: GIMP, Inkscape
Bioinformatics: Vector NTI, Geneious, Benchling
Molecular visualization tools: Chimera, PyMOL
Programming and statistics: Basic knowledge of UNIX, R, MATLAB and Python

Teaching and Outreach

"Ocean Lights" | 05/09/2018
I helped with this outreach event at the Scripps Institution of Oceanography. Our goal was to teach the public about phytoplankton and the biology behind bioluminescence that hit San Diego beaches.

Mentoring a student | 04/2017–present
Introducing an Environmental Engineering graduate to molecular cloning techniques, genetic engineering of diatoms and fluorescence microscopy.

Science in the News (SITN) Waves Correspondent | 10/2015–04/2016
Writing short articles on trending science after consulting with experts in relevant fields.

Biochemistry Bootcamp Mentor, Wellesley College, Wellesley, MA | 01/2015
Mentor for the inaugural biochemistry bootcamp aimed at promising undergraduates at Wellesley College. Students expressed a protein in bacteria, purified it, assayed its activity, and presented their findings. I directly supervised a pair of undergraduate participants.

Publications

Peer Reviewed Journals

Conrado R.J., Wu G.C., Boock J.T., Xu H., Chen S.Y., Lebar T., **Turnšek J.**, Tomšič N., Avbelj M., Gaber R., Koprivnjak T., Mori J., Glavnik V., Vovk I., Benčina M., Hodnik V., Anderluh G., Dueber J.E., Jerala R., DeLisa M.P. (2012) DNA-guided assembly of biosynthetic pathways promotes improved catalytic efficiency. Nucleic Acids Research. 40, 4: 1879–1889.

Open Source Publications

Turnšek, J. (2018) Revisited *Thalassiosira pseudonana* (*Tp*) conjugation protocol enables fusion protein delivery to *Tp* frustule. DOI: dx.doi.org/10.17504/protocols.io.nbzdap6

Turnšek, J. and Dupont, C. (2017) Pour plating of *Thalassiosira pseudonana* (*Tp*). DOI: dx.doi.org/10.17504/protocols.io.jfncjme

Turnšek, J. and Gholami, P. (2017) Guidelines for highly efficient construction of diatom episomes using Gibson Assembly. DOI: dx.doi.org/10.17504/protocols.io.jy7cpzn

Turnšek, J. (2017) HA tag enables highly efficient detection of heterologous proteins in *Phaeodactylum tricornutum* (*Pt*) exconjugants. DOI: dx.doi.org/10.17504/protocols.io.j7ncrme

Turnšek, J. (2016) Conjugation of *Thalassiosira pseudonana*. DOI: dx.doi.org/10.17504/protocols.io.f55bq86

Other publications

Turnšek, J. (2014) Relativity 2.0. DOI: 10.13140/RG.2.2.20781.59365

Turnšek, J. (2013) On phase separating properties of RNA polymerase II. DOI: 10.13140/RG.2.2.15861.58084

Popular Writing

Turnšek, J. Going with the Flow: New Evidence for Liquid Water on Mars. Science in the News (SITN) Wave | LINK

Turnšek, J. Diatoms: Nature's nanotechnologists. Science in the News (SITN) Art | LINK

Turnšek, J. Slovenski uspeh na tekmovanju iz biomolekularnega dizajna BIOMOD 2011. Proteus, vol. 75, no. 8: pp. 347–352 (in Slovene; **Kavčič Award**)

Jerala R., Gaber R., Mori J., **Turnšek J.** Synthetic Biology: from Nanoscale to the Molecular Assembly Line. Quark - Research and Development in Slovenia, Summer 2012: pp. 20–23

Creative Writing

Turnšek, J. Marine Microbes: Triathlete's Best Friends | LINK

Turnšek, J. Tahonts | LINK

Turnšek, J. DNA Sciku. Science in the News (SITN) Art | LINK

Conferences and Meetings	**ASM Microbe 2018**, Atlanta, GA | 06/07/2018–06/11/2018 Illuminating *Phaeodactylum tricornutum* Cell Biology with a Genetically Encodable Tag for Electron Microscopy and Subcellular Proteomics (Poster)
	A New Age of Discovery for Aquatic Microeukaryotes, Heidelberg, Germany | 01/26/2016–01/29/2016 Spatial Proteomics in Diatoms: Towards a Systems View of Biosilicification and Beyond (Poster)
	The Eleventh Annual Broad Institute Retreat, Boston, MA | 12/14/2015–12/15/2015 Spatial Proteomics in Diatoms: Towards a Systems View of Biosilicification and Beyond (Poster)
	Wyss Institute 7th Annual Retreat, Boston, MA | 11/19/2015 Biomineralization in Diatoms: Using Spatial Proteomics to Reveal Unknown Players (Poster)
	Molecular Life of Diatoms 2015, Seattle, WA | 07/07/2015–07/10/2015 Size- and shape-constrained synthesis of nanomaterials using biofilms and viral capsids (Poster)
	2014 MRS Fall Meeting and Exhibit, Boston, MA | 11/30/2014–12/05/2014
	4th ISS - International Summer School, Piran, Slovenia | 08/27/2011 2010 Slovenian iGEM Project (Invited talk)
	6th CeBiTec Symposium Genome-Based Microbiology: From -omics Research to Systems and Synthetic Biology, Bielefeld, Germany | 07/20/2011 Slovenian iGEM Projects (Invited talk)
	1st Bio:Fiction, Science, Art and Film Festival, Vienna, Austria | 05/13/2011 Participated in "Do it yourself Biology and Biohackers: Facts and Fiction" panel session.
	iGEM 2010 Jamboree, Cambridge, MA | 11/06/2010 & 11/08/2010 DNA coding beyond triplets (Grand Prize winning iGEM project talks)
Community Service	protocols.io Ambassador | 11/2017–present Providing platform feedback and ideas for growth in regular meetings with the employees at this open access repository for science methods.
Professional Memberships	American Society for Cell Biology (ASCB) (2018–) • American Society for Microbiology (ASM) (2018–) • The American Association for the Advancement of Science (AAAS) (2017–2018) • "VTIS" - Association of Slovenes Educated Abroad (2014–) • Material Research Society (MRS) (2014–2015) • Genetic Society of Slovenia (2012–) • Slovenian Biochemical Society (2011–)
Other Memberships	Swami's Cycling Club (2017–2018) • Triathlon Club of San Diego (2017–) • MIT Triathlon Club (2016) • Harvard University Cycling Association (HUCA) (2015–) • Harvard Triathlon Team (2014–) • MIT European Club (2012–)
Languages	Slovenian (Native proficiency) • English (Full professional proficiency) • Bosnian-Croatian-Montenegrin-Serbian (Limited working proficiency) • German (Elementary proficiency) • Spanish (Elementary proficiency)
Interests and Hobbies	Space exploration • Triathlon • Exercise physiology • Sports technology industry • Traveling • Electronic music • Collecting vinyl records