

Jerzy O. Szablowski, Ph.D.

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EDUCATION

- 06/2015- **California Institute of Technology (Caltech)**
Postdoctoral fellowship, Department of Chemical Engineering
Acoustically Targeted Chemogenetics (ATAC) for noninvasive control of brain circuitry
Advisor: Mikhail G. Shapiro
- 2009-2015 **California Institute of Technology (Caltech)**
Ph.D. in Bioengineering, Systems and Synthetic Biology track
Biological Activity of Pyrrole-Imidazole polyamide *in vivo*
Advisor: Peter B. Dervan
- 2005-09 **Massachusetts Institute of Technology (MIT)**
B.Sc. in Biological Engineering, minor in Biology

AWARDS AND HONORS

- 2019 Burroughs Wellcome Fund – Career Award at The Scientific Interface, finalist
- 2018 NARSAD Young Investigator awardee, Brain and Behavior Research Foundation
- 2018 World Molecular Imaging Congress travel award
- 2009-10 Henry and Grazyna Bauer Fellowship for graduate studies
- 2009 International Genetic Engineering Machines competition (iGEM), 3rd place worldwide, (*Synthetic Standard prize*), *Best New Application area* and *Best Experimental Measurement* awards.
- 2008 BE-BMES/Johnson&Johnson Prize for Excellence in Biomedical Research
- 2002 Finalist of Physics Olympiad for Secondary School students (Poland)

RESEARCH EXPERIENCE

Starting 01/20 **Assistant Professor, Rice University, Bioengineering**

- Laboratory for noninvasive neuroengineering focuses on development of technologies for noninvasive interfacing with specific brain cell populations.

2015-current **Shapiro Lab (Caltech), Postdoctoral, Chemical Engineering**

- Developed Acoustically Targeted Chemogenetics (ATAC), a method of fully noninvasive neuromodulation with spatial, temporal, cell-type and molecular pathway specificity for more specific treatment of neuropsychiatric and neurological diseases.
See *Nature Biomedical Engineering* reference (2018).
- Established use of new research techniques in the laboratory: focused ultrasound BBB opening, intracranial EEG recording, 3D printing, next-generation sequencing (NGS)
- Developed and performed surgery protocols for intracranial administration of mechanically labile erasable MRI contrast agents, see *Nature Materials* reference (2018).

2010-15 **Dervan lab (Caltech), Graduate Research Assistant, Bioengineering**

- Developed a method of impairing hypoxic response in tumors *in vivo*. Hypoxic response is one of the main culprits in resistance to chemotherapy, radiation, and anti-angiogenic therapies. Selected as a

- highlight of AACRs *Molecular Cancer Therapeutics*, see reference 7, started a collaboration with a clinical center, see ref. 8.
- Established a role of Pyrrolle-Imidazole polyamides as potential breast cancer therapeutics in mice. Performed next-generation sequencing, evaluated toxicity, pharmacokinetics, and mechanisms *in vivo* and in tissue culture. Selected as American Assoc. of Cancer Research (AACR) Hot topics 2013, see ref. 10.
 - Established methods for histologic evaluation of subcellular biodistribution of Py-Im polyamides in tissues, investigated pharmacology and biodistribution of Py-Im polyamides, see refs 6-10.
- 2009 **International Genetically Encoded Machine competition Universidad Polytechnica Valencia, Valencia, Spain**
- Originated the concept and described the project to a team of UPV students and scientists
 - Developed software and electrical stimulation devices.
 - Advised the student team, the project resulted in a publication, see ref. 10.
- 2007-09 **Synthetic Neurobiology Group (Pi: Edward Boyden; MIT Media Lab)**
Undergraduate Research Assistant
- Engineered preliminary light-activated dopamine receptors for molecular-pathway specific optogenetics using rhodopsin/GPCR chimeras.
- 2005-07 **Robert Langer and Alan Jasanoff labs (MIT); Frances Arnold lab (Caltech)**
Undergraduate Research Assistant
- Took part in development of functional MRI sensors for noninvasive imaging of neurotransmitters and intracellular signaling. See *Nature Biotechnology* and *JACS* references (refs 12 and 13)
 - Solved a limitation in the high-throughput screening for improved neurotransmitter binding through a custom statistical analysis methods, which lead to 3-fold increased binding affinity over the previous best sensor, described in the final publication (ref. 12, *Nature Biotechnology*).
- 2005 **Zylicz Lab (International Institute of Molecular and Cell Biology, Poland)**
High school intern
- Investigated functional and structural differences between Heat Shock Protein 90 (HSP90) variants.

TEACHING EXPERIENCE AND OUTREACH

- 2019 Lecturer, Bi 23: Current Advances in gene therapies; *Designed a new course.*
California Institute of Technology, Pasadena, CA
- 2018 Course Design Intensive Workshop for faculty,
Caltech Center for Teaching Learning and Outreach (CTLO), Pasadena, CA
- 2017-current Guest lecturer, ChE/BE/MedE 188, Molecular Imaging
California Institute of Technology, Pasadena, CA
- 2016-now Undergraduate student mentor, Student Undergraduate Research Fellowships (SURF)
California Institute of Technology, Pasadena, CA
- 2008-09 Undergraduate student mentor, Undergraduate Research Opportunities Program (UROP)
MIT, Cambridge, MA
- 2007-08 Biology Tutor for Biology Undergraduate Education and Office of Minority Education
MIT, Cambridge, MA
- 2007 Introductory Biology facilitator for Office of Minority Education
(Taught a seminar course in introductory biology)
MIT, Cambridge, MA

OTHER EXPERIENCE AND PROFESSIONAL MEMBERSHIPS

Memberships:

World Molecular Imaging Society (2016-2018), Society for Neuroscience (2009, 2018), BMES (2018), AIChE (2018), Society for Biological Engineering (2018), American Heart Association (2015-16), American Epilepsy Society (2016)

Reviewing: *Cancer Research*

PUBLICATIONS

‘#’ denotes equal contribution, first author contributions underlined; 3-first author contributions, 12 total.

1. **Szablowski JO**#, Bar-Zion A#, Shapiro MG, Achieving spatial and molecular specificity with ultrasound-targeted biomolecular therapeutics, *in revision*
2. **Szablowski JO**, Lue B, Lee-Gosselin A, Malounda D, Shapiro MG, Acoustically Targeted Chemogenetics for Noninvasive Control of Neural Circuits, *Nature Biomedical Engineering*, 2 (7), 475, (2018) [Cover article. Highlighted in News and Views, F1000 Prime]
3. Maresca D#, Lakshmanan A#, Abedi M, Bar-Zion A, Farhadi A, Lu GJ, **Szablowski JO**, Wu D, Yoo S, Shapiro MG, Biomolecular Ultrasound and Sonogenetics, *Annu. Rev. Chem. Biomol. Eng.*, 9:229-252 (2018)



#, co-first authors

4. Lu GJ, Farhadi A, **Szablowski JO**, Barnes SR, Lakshmanan A, Bourdeau RW, Shapiro MG, Acoustomagnetic imaging with gas-filled protein nanostructures, *Nature materials* 17 (5), 456 (2018) [Cover article. Highlighted in News and Views.]
5. Piraner DI, Farhadi A, Davis HC, Wu D, Maresca D, **Szablowski JO**, Shapiro MG, Going Deeper: Biomolecular Tools for Acoustic and Magnetic Imaging and Control of Cellular Function, *Biochemistry* 56 (39), 5202-5209 (2018)
6. Mysore VS, **Szablowski JO**, Dervan PB, Frost PJ. A DNA-binding Molecule Targeting the Adaptive Hypoxic Response in Multiple Myeloma has Potent Anti-tumor Activity. *Mol Cancer Res.* 14 (3), 253-266 (2016)
7. **Szablowski JO**, Raskatov JA, Dervan PB. An HRE-binding Py-Im polyamide impairs hypoxic signaling in tumors. *Mol. Cancer Ther.* 15 (4), 608-617 (2016)
8. Raskatov JA, **Szablowski JO**, Dervan PB, “Tumor Xenograft Uptake of a Py Im Polyamide Varies as a Function of Cell Line Grafted”, *J. Med. Chem.*, **57**:8471-8476 (2014)
9. Yang F, Nickols NG, Li BC, **Szablowski JO**, Hamilton SR, Meier JL, Wang C, Dervan PB. "Animal Toxicity of Hairpin Pyrrole-Imidazole Polyamides Varies with the Turn Unit", *J. Med. Chem.*, **56**:7449-7457, (2013).
10. Nickols NG#, **Szablowski JO**#, Hargrove AE, Li BC, Raskatov JA, Dervan PB. "Activity of a Py-Im Polyamide Targeted to the Estrogen response Element," *Mol. Cancer Ther.*, **12**:675-684, (2013). (Article selected as one of the ‘AACR hot topics, 2013’, available without subscription).



#, co-first authors

11. Vilanova C, Hueso A, Palanca C, Marco G, Pitarch M, Otero E, Crespo J, **Szablowski JO**, Rivera S, Domínguez-Escribà L, Navarro E, Montagud A, Fernández de Córdoba P, González A, Ariño J, Moya A, Urchueguía J& Porcar M, "Aequorin-expressing yeast emits light under electric control", *J Biotechnology*, 152(3):93-5, (2011)

12. Shapiro MG#, Westmeyer GG#, Romero P, **Szablowski JO**, Küster B, Shah A, Otey CR, Langer R, Arnold FH, & Jasanoff AP, “Directed evolution of an MRI contrast agent for noninvasive imaging of dopamine”. *Nature Biotechnology*, 28:264–270 (2010)
#, co-first authors
13. Shapiro MG, **Szablowski JO**, Langer R, Jasanoff AP, “Protein nanoparticles engineered to sense kinase activity in MRI”, *JACS*, 131(7):2484-2486, (2009)

SELECTED INVITED TALKS

1. Szablowski JO, *Noninvasive Control of Neural Circuits*, invited talk, *Mount Sinai Neuroscience Seminars*, Icahn School of Medicine at Mount Sinai, 5/3/2019
2. Szablowski JO, *Noninvasive Control of Neural Circuits*, invited session, *Society for Brain Mapping and Therapy*, 03/15-17/2019.
3. Szablowski JO, *Noninvasive Control of Neural Circuits*, invited talk, Purdue University, 11/1/2019.
4. Szablowski JO, *Noninvasive Neuroengineering*, Helmholtz Pioneer Campus Symposium “*Engineering Biomedical Breakthroughs Enabled by Computer Sciences*”, Munich, Germany, 11/15/2018, invited talk
5. Szablowski JO, *Noninvasive gene therapy for brain disorders – Acoustically Targeted Chemogenetics*, 2nd Annual Imaging Elevated, Utah, 09/26/2018, invited talk

SELECTED PRESENTATIONS

6. Szablowski JO, Lue B, Lee-Gosselin A, Malounda D, Shapiro MG, *Acoustically Targeted Chemogenetics for noninvasive neuromodulation*, *WMIC 2018*, 09/15/2018
7. Szablowski JO, Acoustically Targeted Chemogenetics for noninvasive neuromodulation, at “*Methods and applications of ultrasound in molecular imaging and drug delivery*” workshop at *WMIC 2018*, 09/12/2018, educational talk
8. Szablowski JO, Lue B, Lee-Gosselin A, Malounda D, Shapiro MG, Acoustically Targeted Chemogenetics for noninvasive control of neural circuits, *International Society of Therapeutic Ultrasound Annual Meeting*, 05/15/2018
9. Szablowski JO, Translational research strategies panelist at *Field Conference: Development of Radiopharmaceutical Probes for Cancer/Bone Diseases, 2017*; Organized by US Dept. of Veteran Affairs, Office of Research and Development
10. Szablowski JO, An HRE-binding Py-Im Polyamide Impairs Adaptation of Tumors to Hypoxia, 04/02/2015, *Center for the Chemistry of Cellular Signaling Seminar*
11. Szablowski JO, Bioengineering and Biological Engineering, 23.09.2010, 14th Science Festival in Warsaw [Educational talk for general audience]
12. Szablowski JO, Protein Engineering or how to make your own enzymes, 23.09.2010, 14th Science Festival in Warsaw [Educational talk for general audience]

PATENTS

1. Szablowski JO, Shapiro MG, Acoustically Targeted Chemogenetics, CIT File No.: CIT-7921-P, patent application filed on Dec 7th, 2018
2. Lu G, Farhadi A, Szablowski JO, Shapiro MG, Gas Filled Structures and related compositions, methods and systems for magnetic resonance imaging, CIT File No.: CIT-7580-P, Provisional filed: 7/28/2016, Patent application filed: 7/28/2017
3. Szablowski JO, User-adjustable knee orthosis for patellar instability and related disorders, CIT File No.: CIT 12-216, Provisional Filed: 8/7/2012

GRANT SUPPORT

Jerzy Szablowski, Ph.D.

Wrote or co-wrote ~12 grant and fellowship applications including for the NIH, DARPA, BBRF, Jacobs Institute, resulting in several funded grants.

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