

# 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

- 2023 DP2 - NIH Director's New Innovator Award
- 2022 NIH NIBIB Trailblazer
- 2022 DARPA Young Faculty Award (YFA)
- 2021 Packard Fellowship for Science and Engineering
- 2020 Outstanding Undergraduate Research Mentor Award, Rice University
- 2019 Focused Ultrasound foundation, 2<sup>nd</sup> prize poster, FUS Neuromodulation Symposium 2019, University of Oxford
- 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), 3<sup>rd</sup> 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 (selected)

- 01/20-current **Assistant Professor, Rice University, Bioengineering, and Rice Neuroengineering Initiative (RNI)**  
- Laboratory for noninvasive neuroengineering focuses on development of technologies for noninvasive interfacing with the brain to accelerate the development of therapies.
- 06/2015-12/19 **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).  
- Developed and performed surgery protocols for intracranial administration of mechanically labile erasable MRI contrast agents, see *Nature Materials* reference (2018).
- 09/2010-06/15 **Dervan lab (Caltech), Graduate Research Assistant, Bioengineering**  
- Developed a method of impairing hypoxic response in tumors - one of the main culprits in resistance to chemotherapy, radiation, and anti-angiogenic therapies. Selected as a highlight of AACRs *Mol. Cancer Therapeutics*.  
- Established a role of Pyrrole-Imidazole polyamides as potential breast cancer therapeutics in mice. Selected as AACR Hot topics 2013.
- 09/2007-09/09 **Synthetic Neurobiology Group (Pi: Edward Boyden; MIT Media Lab), Undergraduate Res. Assistant**  
Engineered preliminary light-activated dopamine receptors.
- 10/2005-09/07 **Robert Langer and Alan Jasanoff labs (MIT); Frances Arnold lab (Caltech), Undergraduate Res. Assistant**

- Co-developed functional MRI sensors for noninvasive imaging of neurotransmitters and intracellular signaling. See *Nature Biotechnology* and *JACS* references.
- Solved a limitation in the high-throughput screening for improved neurotransmitter binding methods, which lead to 3-fold increased binding over the previous best sensor (see *Nature Biotech (2010) reference*).

## SERVICE

### Rice University

2022-current	Rice Future Leaders in Bioengineering, seminar series aimed at promoting diversity in Bioengineering (co-founder; organizing committee)
2022-current	Rice Neuroengineering Initiative annual meeting, organizing committee
2022-2023	Faculty search committee, Dept. of Bioengineering
2021-current	Professional Masters Affairs Committee, Rice University Dept. of Bioengineering
2021-2022	Industry and Alumni Relations Committee, Rice University Dept. of Bioengineering
2021-current	IACUC, standing member
2021-current	DEI Committee, standing member, Rice University Dept. of Bioengineering
2020	Graduate admissions committee, Rice University Dept. of Bioengineering
2021-current	Graduate admissions committee, Systems, Synthetic, and Physical Biology program
2020	Rice Bioengineering Covid-19 task force (co-founder)

### External Service

Grant reviews: NIH BRAIN and NIH study sections ad-hoc reviewer, John S. Dunn foundation grant reviews, Israel Science Foundation (ISF), Chan-Zucker Berg Initiative (CZI) grant reviewer, Human Frontiers Science Foundation (HFSP), National Science Foundation (NSF) ad hoc reviewer, Children's Cancer and Leukaemia Group ad hoc grant reviewer

Papers reviews: Cancer Research, Theranostics, iScience, Nature Biomedical Engineering, Nature Biotechnology, Nature communications; Molecular Therapy: Nucleic Acids, Transactions in Biomedical Engineering, Abstracts: BMES, WMIC;

2020-2021	11th International Conference for Biomolecular Engineering (organizing committee),
2022-2023	SEED 2023 (Organizing committee).

### Memberships

2018-present	BMES
2016-present	World Molecular Imaging Society
2018, 2020	Society for Neuroscience

## TEACHING EXPERIENCE OUTREACH, AND MENTORING

Trainees: My trainees so far have received NSF GRFP fellowships (x 2), and NSF GRFP Honorable mention, Goldwater scholarships (x2), and NSF NRT Bioelectronics fellowship (2x), BRAIN initiative trainee highlight awards (x2). Out of the undergraduate mentees, 2 have received admissions in top 5 BioE Ph.D. programs (Stanford, UCSD), and 4 have gone to top medical schools (UTSW, Texas A&M, UT McGovern), one for international scholarship and Helmholtz Zentrum.

2020-current	Lecturer, BioE 422 / 522: Gene therapy, Rice University, Houston, TX
2022	Guest Lecturer, ELEC 682 Spotlight on Latest Neurotechnology, Rice University, Houston, TX
2021	Guest Lecturer, BME 6470-001 Studies in Neural Engineering, University of Utah, Salt Lake City, UT
2019	Lecturer, Bi 23: Current Advances in Gene Therapy, Caltech, Pasadena, CA

## PUBLICATIONS (selected)

'#' denotes equal contribution, first author contributions underlined; 5-first author contributions, 17 published; 6 corresponding author submissions and preprints; 3 published/in press; \* **corresponding author**; # co-first author

1. Huang Z., Mitrofan A, Nouraein S, Horak C, Seo JP, Harb M, Jin R, **Szablowski JO\***, Site-specific Brain Therapeutics, *in submission*
2. Seo JP, Trippett JS, Huang Z, Wang R, Lee S, **Szablowski JO\***. Acoustically-Targeted Measurement of Transgene Expression in the Brain. *bioRxiv*. 2023:2023-05.
3. Nouraein S, Lee S, Saenz VA, Del Mundo HC, Yiu J, **Szablowski JO\***, Acoustically Targeted Noninvasive Gene Therapy in Large Brain Regions, *Gene Therapy* (2023). <https://doi.org/10.1038/s41434-023-00421-1>
4. Chen, M., Kim, B., Jarvis, M., Fleury, S., Deng, S., Nouraein, S., Butler, S., Chambers, C., Hodges, H.C., **Szablowski, JO**. Suh, J., and Veiseh O., Targeted immunosuppression enhances repeated gene delivery., *Gene Therapy* (30):429–442 (2023)
5. Lee, S., Nouraein, S., Kwon, J. J., Huang, Z., & **Szablowski, JO\***. (2022). Engineered Serum Markers for Noninvasive Monitoring of Gene Expression in the Brain. *bioRxiv* 2022.07.17.500352; doi: <https://doi.org/10.1101/2022.07.17.500352>, *in revision*
6. Hongyi Li, John E. Heath, James S. Trippett, Mikhail G. Shapiro\*, **Jerzy O. Szablowski\***, Engineering Viral Vectors for Acoustically Targeted Gene Delivery, *bioRxiv* 2021.07.26.453904; doi: <https://doi.org/10.1101/2021.07.26.453904>, *in revision*
7. Xia B, Sebesta C, Lee S, Nair V, Zhao X, Coffler S, Robinson JT\*, **Szablowski JO\***. Biohybrid approaches to interface with the nervous system: the best of both worlds. *Current Opinion in Biotechnology*. 2021 Dec 1;72:86-94.
8. **Szablowski, Jerzy O\***, and Manwal Harb. "Focused ultrasound induced blood-brain barrier opening for targeting brain structures and evaluating chemogenetic neuromodulation." *JoVE (Journal of Visualized Experiments)* 166 (2020): e61352.
9. **Szablowski JO#**, Bar-Zion A#, Shapiro MG, Achieving spatial and molecular specificity with ultrasound-targeted biomolecular therapeutics, *Acc. Chem. Res.* 52, 9, 2427-2434 (2019)
10. **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]
11. 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
12. 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.]
13. 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)
14. 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)
15. **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)
16. 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)



17. 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).
18. 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
19. 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)
20. 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
21. Shapiro MG, **Szablowski JO**, Langer R, Jasanoff AP, "Protein nanoparticles engineered to sense kinase activity in MRI", *JACS*, 131(7):2484-2486, (2009)

## GRANT SUPPORT

### Current Research Support

NIH Director's New Innovator Award, DP2EB035905, Monitoring neuronal activity with a blood test - Released Markers of Activity (RMA), 09/01/2023-08/31/2028, 100% PI, (\$2,347,500 total)

NIH NEI, R21EY032596, *Acoustically targeted, high-resolution, site-specific, transretinal delivery of macromolecules*, 09-30-2022 – 08-31-2024, Co-PI (50%)(\$434,598 total)

NIH NIBIB Trailblazer Award, R21EB033059, *Noninvasive site-specific measurement of gene expression in deep tissues with secreted reporters*, , 09/13/2022-05/31/2025, (100% PI), (\$585,920 total)

Packard Fellow, David and Lucile Packard Foundation (\$875,000 total), 11/01/21-10/31/26

The G. Harold & Leila Y. Mathers Foundation research grant, ID #MF-2012-01228, *Noninvasive neuromodulation as a widely applicable therapy for brain disorders*; (total direct cost: \$385,000; 100% PI), 4/15/2021 - 4/14/2024

MJ Fox Foundation, MJFF-020154, Improved Outcome Measures, *Development of PD biomarkers using focused ultrasound-based noninvasive biopsies*, 08/01/2021-07/31/2023, (2 years; \$447,510, Contact PI; total direct cost: ~\$300,000 to the PI)

DARPA-RA-21-03-01-YFA1-FP-003, *Therapeutics for rapid cold adaptation - beyond the natural human capability*, , 11/1/2022 – 10/31/2025, 70% PI, \$500,000 total, with additional \$500,000 option.

Merkin Institute for Translational Research, "Engineering and Validation of Viral Vectors for Ultrasound-Targeted Gene Delivery to the Brain", Shapiro (PI), Role: Co-I (~\$30,000 to Szablowski), Dates TBD

### Completed Research Support (past three years)

NARSAD Young Investigator grant, *Acoustically Targeted Chemogenetics*, Brain and Behavior Research Foundation, funding: 01/2019-01/2021, (\$35,000/yr, 2 years)

John S. Dunn Foundation Collaborative Research Award, *Region-specific and Brain-wide Gene Therapy for Neurodevelopmental Disorders*, (Total direct: \$100,000, 50% PI), 09/01/2020 – 08/31/2022

DARPA-SN-21-05-KEY-PA-006, DARPA BTO Keystone Study, LOI stage, *High-speed biophysical and biochemical monitoring to discover early markers of unconventional brain injury*, (Co-I with Luan (PI), Villapol, Robinson, Xie, Kemere; ~\$350,000 to the PI)

Welch Foundation Research Grant, Welch Foundation, *Engineering a new class of site-specific therapeutics for brain disorders*, (Total direct cost: \$240,000; 100% PI), 06/01/2020-05/31/2023

## SELECTED PRESENTATIONS

1. Szablowski JO, *Noninvasive Neuroengineering*, Woodward Departmental Colloquium, Dept. of Chemistry and Chemical Biology, Harvard University, Boston, MA, November 2<sup>nd</sup>, 2023, upcoming
2. Szablowski JO, *Molecular Engineering in Gene Delivery with Focused Ultrasound*, Focused Ultrasound Gene Therapy Symposium (November 16-17<sup>th</sup>, 2023, Washington DC, upcoming)
3. Szablowski JO, *Noninvasive Monitoring Brain Physiology*, AAPM (July 23-27, 2023, Houston), invited talk (upcoming)
4. Szablowski JO, *Noninvasive Monitoring of Brain Physiology*, SEED (2023, Los Angeles), June 2<sup>nd</sup>, invited talk
5. Szablowski JO, *Noninvasive Neuroengineering*, NeuroNano, SBMT (Feb 2023), invited talk
6. Szablowski JO, *Noninvasive Neuroengineering*, UT Health Houston, Dept. of Neuroscience, Oct. 5<sup>th</sup>, 2022, invited talk
7. Szablowski JO, *Noninvasive Neuroengineering*, D-CFAR Research Forum, October 10<sup>th</sup>, 2022, invited talk
8. Szablowski JO, *Noninvasive Neuroengineering*, NeuroNano, Columbia University, 07/21/2022, invited talk
9. Szablowski JO, *Noninvasive Neuroengineering*, VIB Neurotechnologies (KU Leuven, Belgium), 28/09/2022, invited talk
10. Szablowski JO, *Neuroengineering*, Brain Bee 2021, educational talk for high school students (03/2021).
11. Szablowski JO, Li R, Heath J, Shapiro M, *P370.05: A viral vector engineered for improved spatially-specific noninvasive gene delivery to the brain.*, SFN Global Connectome (01/11/2021)
12. Szablowski JO, Li R, Heath J, Shapiro M, *A viral vector engineered for improved focused ultrasound BBB opening gene delivery.*, FUS Foundation annual meeting (11/2020)
13. Jerzy Szablowski, Audrey Lee-Gosselin, Brian Lue, Dina Malounda, Mikhail Shapiro, *Acoustically Targeted Chemogenetics for a Noninvasive Spatially, Temporally, and Cell-specific Control of Neural Circuits.*, BMES 2018 Annual Meeting, oral presentation, 10/19/2018
14. Szablowski JO, Lue B, Lee-Gosselin A, Malounda D, Shapiro MG, *Acoustically Targeted Chemogenetics for noninvasive neuromodulation*, WMIC 2018, 09/15/2018
15. 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
16. 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
17. Szablowski JO, *Acoustically Targeted Chemogenetics*, “Neurolunch” Seminar Series, 12/12/2017
18. 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*
19. Szablowski JO, *Bioengineering and Biological Engineering*, 23.09.2010, 14th Science Festival in Warsaw [Educational talk for general audience]
20. 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 AND DISCLOSURES

1. Szablowski JO, Huang Z, *Site Specific Brain Therapeutics*, Rice Tech ID 2023-066-PZ
2. Szablowski JO, Seo JP, *"Noninvasive Site-Specific Measurement of Transgene Expression in the Brain"*, Rice Tech ID: 2023-067
3. Szablowski JO, Lee S, *Noninvasive monitoring of gene expression in the brain using synthetic serum markers*, Rice Tech ID 2022-069, 05/30/2022
4. Szablowski JO, Li H, Heath JE, Shapiro MG, *Viral Vectors Engineered for Enhanced Ultrasound-Mediated Delivery to the Brain*, Serial Number: 63/225,006, Filed: 7/23/2021, CIT File Number: 8680-P
5. Szablowski JO, Shapiro MG, *Methods And Systems For Noninvasive Control Of Brain Cells And Related Vectors And Compositions*, Serial Number: 16/213,991, Filed: 12/7/2018, CIT File Number: 7921
6. 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

7. Szablowski JO, *User-adjustable knee orthosis for patellar instability and related disorders*, CIT File No.: CIT 12-216, Provisional Filed: 8/7/2012