

Stanford



Sergiu P. Pasca

Assistant Professor of Psychiatry and Behavioral Sciences (Sleep Disorder/Sleep Center)

Psychiatry and Behavioral Sciences - Stanford Center for Sleep Sciences and Medicine

CONTACT INFORMATION

- **Administrative Contact**

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Bio

ACADEMIC APPOINTMENTS

- Assistant Professor, Psychiatry and Behavioral Sciences - Stanford Center for Sleep Sciences and Medicine
- Member, Bio-X
- Member, Maternal & Child Health Research Institute (MCHRI)
- Faculty Fellow, Stanford ChEM-H
- Member, Wu Tsai Neurosciences Institute

ADMINISTRATIVE APPOINTMENTS

- Director, Stanford Neurosciences Institute Stem Cells Core & Human Brain Organogenesis Program, (2015- present)

HONORS AND AWARDS

- Ben Barres Investigator, Chan-Zuckerberg Initiative (CZI) (2019-)
- A.E. Bennett Award, Society of Biological Psychiatry (2018)
- Daniel H. Efron Award, American College of Neuropsychopharmacology (ACNP) (2018)
- Life Sciences Research Award, American Society of Cell Biology (2018)
- Vilcek Award for Creative Biomedical Promise, Vilcek Foundation (2018)
- Visionaries in Science and Medicine, New York Times (2018)
- NYSCF Robertson Stem Cell Investigator, New York Stem Cell Foundation (2017-)
- Jordi Folch-Pi Award for Neurochemistry, American Society for Neurochemistry (2017)
- NARSAD Independent Investigator Award, Brain & Behavior Research Foundation (2017)
- NIMH Director's BRAINS Award, National Institute of Mental Health (2015-2020)
- Baxter Faculty Scholar Award, Baxter Foundation (2015)
- MQ Fellow Award for Transforming Mental Health, MQ Foundation, London (2014-2017)
- Alumni Excellence Research Award, Medicalis (2013)
- Grand Prize Best Romanian Student Abroad, LRSA (2013)

- NARSAD Young Investigator Award, Brain & Behavior Research Foundation (2013)
- Best Postdoctoral Research Award, Stanford University (2012)
- Sammy Kuo Award, Best Postdoctoral publication in Neuroscience at Stanford University (2012)
- Tashia & John Morgridge Endowed Fellow, Child Health Research Institute (CHRI) (2010-2012)
- IBRO Outstanding Research Fellow, International Research Organization (IBRO) (2009-2010)
- Medical Student of the Year, VIP Foundation (2006)

PROFESSIONAL EDUCATION

- Postdoctoral, Stanford University School of Medicine , Neuroscience (2013)
- Medical Doctor, Hatieganu School of Medicine, Romania , Medicine (2007)

COMMUNITY AND INTERNATIONAL WORK

- Co-Organizer of the FENS/SfN Summer School on Neural Stem Cells and Organoids
- Co-Organizer of the Inaugural Cold Spring Harbor Meeting on Human Brain Development and 3D Modeling
- Co-Director of the Cold Spring Harbor Course in Autism Spectrum Disorders
- Working group: Translating Mechanisms to Treatments in Autism Spectrum Disorders

LINKS

- Pasca Lab website: <http://www.pascalab.org/>
- Video presentation: <https://www.youtube.com/watch?v=fbkhvjUKork>

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

A critical challenge in understanding the intricate programs underlying development, assembly and dysfunction of the human brain is the lack of direct access to intact, functioning human brain tissue for detailed investigation by imaging, recording, and stimulation.

Our lab is using pluripotent stem cells derived non-invasively from human individuals to generate in a dish specific regions of the human brain in a functional 3D preparation we have developed. We are using months-to-years long 'brain-a-dish' cultures (also known as brain region-specific organoids or spheroids) to understand how neurons find their final position in the brain and how they mature functionally. To investigate how different brain regions talk to each-other in normal and diseased states, we introduced a new approach for in vitro assembly of neural circuits, also known as assembloids.

We employ state-of-the-art stem cell biology, genome engineering, imaging and neuroscience approaches to identify the dynamical processes that go awry in neural cells derived from patients with neuropsychiatric disorders, such as autism or schizophrenia, and what should be therapeutically targeted in these conditions.

Teaching

COURSES

2019-20

- Neurosciences Development Core: NEPR 202 (Win)

2018-19

- HUMAN BRAIN ORGANOGENESIS: BIOS 275 (Win)
- Neurosciences Development Core: NEPR 202 (Win)

STANFORD ADVISEES

Med Scholar Project Advisor

Avin Veerakumar

Postdoctoral Faculty Sponsor

Jimena Andersen, Fikri Birey, Xiaoyu Chen, Minyin Li, Xiangling Meng, Yuki Miura, Omer Revah

Doctoral Dissertation Advisor (AC)

Themasap Khan

Doctoral Dissertation Co-Advisor (AC)

Tommy Li

Postdoctoral Research Mentor

Fikri Birey

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Bioengineering (Phd Program)
- Biology (School of Humanities and Sciences) (Phd Program)
- Chemical and Systems Biology (Phd Program)
- Developmental Biology (Phd Program)
- Genetics (Phd Program)
- Molecular and Cellular Physiology (Phd Program)
- Neurosciences (Phd Program)
- Stem Cell Biology and Regenerative Medicine (Phd Program)

Publications

PUBLICATIONS

- **Assembling human brain organoids.** *Science (New York, N.Y.)*
Pasca, S. P.
2019; 363 (6423): 126–27
- **Human 3D cellular model of hypoxic brain injury of prematurity.** *Nature medicine*
Pa#ca, A. M., Park, J. Y., Shin, H. W., Qi, Q., Revah, O., Krasnoff, R., O'Hara, R., Willsey, A. J., Palmer, T. D., Pa#ca, S. P.
2019
- **The hidden biology of the human brain.** *Nature medicine*
Pa#ca, S. P.
2019
- **Differentiation and maturation of oligodendrocytes in human three-dimensional neural cultures.** *Nature neuroscience*
Marton, R. M., Miura, Y., Sloan, S. A., Li, Q., Revah, O., Levy, R. J., Huguenard, J. R., Pa#ca, S. P.
2019
- **Reliability of human cortical organoid generation.** *Nature methods*
Yoon, S. J., Elahi, L. S., Pa#ca, A. M., Marton, R. M., Gordon, A., Revah, O., Miura, Y., Walczak, E. M., Holdgate, G. M., Fan, H. C., Huguenard, J. R., Geschwind, D. H., Pa#ca, et al
2019; 16 (1): 75–78
- **Generation and assembly of human brain region-specific three-dimensional cultures.** *Nature protocols*
Sloan, S. A., Andersen, J., Pa#ca, A. M., Birey, F., Pa#ca, S. P.
2018
- **The rise of three-dimensional human brain cultures.** *NATURE*

- Pa#ca, S. P.
2018; 553: 437-445
- **Building Models of Brain Disorders with Three-Dimensional Organoids.** *Neuron*
Amin, N. D., Pa#ca, S. P.
2018; 100 (2): 389-405
 - **Assembly of functionally integrated human forebrain spheroids** *NATURE*
Birey, F., Andersen, J., Makinson, C. D., Islam, S., Wei, W., Huber, N., Fan, H. C., Metzler, K. R., Panagiotakos, G., Thom, N., O'Rourke, N. A., Steinmetz, L. M., Bernstein, et al
2017; 545 (7652): 54-?
 - **Human Astrocyte Maturation Captured in 3D Cerebral Cortical Spheroids Derived from Pluripotent Stem Cells.** *Neuron*
Sloan, S. A., Darmanis, S., Huber, N., Khan, T. A., Birey, F., Caneda, C., Reimer, R., Quake, S. R., Barres, B. A., Pa#ca, S. P.
2017; 95 (4): 779-90.e6
 - **Functional cortical neurons and astrocytes from human pluripotent stem cells in 3D culture.** *Nature methods*
Pasca, A. M., Sloan, S. A., Clarke, L. E., Tian, Y., Makinson, C. D., Huber, N., Kim, C. H., Park, J., O'Rourke, N. A., Nguyen, K. D., Smith, S. J., Huguenard, J. R., Geschwind, et al
2015; 12 (7): 671-678
 - **Engineering a Genetically Encoded Magnetic Protein Crystal.** *Nano letters*
Li, T. L., Wang, Z., You, H., Ong, Q., Varanasi, V. J., Dong, M., Lu, B., Pasca, S. P., Cui, B.
2019
 - **Engineered materials for organoid systems** *NATURE REVIEWS MATERIALS*
Kratochvil, M. J., Seymour, A. J., Li, T. L., Pasca, S. P., Kuo, C. J., Heilshorn, S. C.
2019; 4 (9): 606-22
 - **Cell diversity in the human cerebral cortex: from the embryo to brain organoids** *CURRENT OPINION IN NEUROBIOLOGY*
Arlotta, P., Pasca, S.
2019; 56: 194-98
 - **Cell diversity in the human cerebral cortex: from the embryo to brain organoids.** *Current opinion in neurobiology*
Arlotta, P., Pa#ca, S. P.
2019; 56: 194-98
 - **A framework for the investigation of rare genetic disorders in neuropsychiatry.** *Nature medicine*
Sanders, S. J., Sahin, M., Hostyk, J., Thurm, A., Jacquemont, S., Avillach, P., Douard, E., Martin, C. L., Modi, M. E., Moreno-De-Luca, A., Raznahan, A., Anticevic, A., Dolmetsch, et al
2019
 - **Polarizing brain organoids.** *Nature biotechnology*
Miura, Y., Pa#ca, S. P.
2019
 - **Loss of Adaptive Myelination Contributes to Methotrexate Chemotherapy-Related Cognitive Impairment.** *Neuron*
Geraghty, A. C., Gibson, E. M., Ghanem, R. A., Greene, J. J., Ocampo, A., Goldstein, A. K., Ni, L., Yang, T., Marton, R. M., Pa#ca, S. P., Greenberg, M. E., Longo, F. M., Monje, et al
2019
 - **Inhibitory Interneurons in Hemimegalencephaly: A Survey of 9 Cases**
Lumms, S., Andersen, J., Pasca, S., Kleinschmidt-DeMasters, B., Vogel, H.
OXFORD UNIV PRESS INC.2018: 501
 - **A human cellular model of amyotrophic lateral sclerosis** *NATURE MEDICINE*
Marton, R. M., Pasca, S. P.
2018; 24 (3): 256-57
 - **The ethics of experimenting with human brain tissue.** *Nature*
Farahany, N. A., Greely, H. T., Hyman, S., Koch, C., Grady, C., Pa#ca, S. P., Sestan, N., Arlotta, P., Bernat, J. L., Ting, J., Lunshof, J. E., Iyer, E. P., Hyun, et al

2018; 556 (7702): 429–32

- **Absent forebrain replaced by embryonic stem cells.** *Nature*
Andersen, J., Pasca, S. P.
2018; 563 (7729): 44–45
- **Building three-dimensional human brain organoids.** *Nature neuroscience*
2018
- **Nondestructive nanostraw intracellular sampling for longitudinal cell monitoring.** *Proceedings of the National Academy of Sciences of the United States of America*
Cao, Y., Hjort, M., Chen, H., Birey, F., Leal-Ortiz, S. A., Han, C. M., Santiago, J. G., Pasca, S. P., Wu, J. C., Melosh, N. A.
2017
- **The Zika threat to the periphery.** *Nature neuroscience*
Khan, T. A., Pasca, S. P.
2017; 20 (9): 1191–92
- **MicroRNA-9 Couples Brain Neurogenesis and Angiogenesis.** *Cell reports*
Madelaine, R., Sloan, S. A., Huber, N., Notwell, J. H., Leung, L. C., Skariah, G., Halluin, C., Pasca, S. P., Bejerano, G., Krasnow, M. A., Barres, B. A., Mourrain, P.
2017; 20 (7): 1533–42
- **Neural Differentiation in the Third Dimension: Generating a Human Midbrain.** *Cell stem cell*
Marton, R. M., Pasca, S. P.
2016; 19 (2): 145-146
- **Personalized Human Cortical Spheroids.** *American journal of psychiatry*
Pasca, S. P.
2016; 173 (4): 332-333
- **A deleterious Nav1.1 mutation selectively impairs telencephalic inhibitory neurons derived from Dravet Syndrome patients.** *eLife*
Sun, Y., Pasca, S. P., Portmann, T., Goold, C., Worringer, K. A., Guan, W., Chan, K. C., Gai, H., Vogt, D., Chen, Y. J., Mao, R., Chan, K., Rubenstein, et al
2016; 5
- **Cre-dependent selection yields AAV variants for widespread gene transfer to the adult brain.** *Nature Biotechnology*
Deverman, B. E., Pravdo, P. L., Simpson, B. P., Kumar, S. R., Chan, K. Y., Banerjee, A., Wu, W., Yang, B., Huber, N., Pasca, S., Gradinaru, V.
2016; 34 (2): 204-9
- **Alteration in basal and depolarization induced transcriptional network in iPSC derived neurons from Timothy syndrome** *GENOME MEDICINE*
Tian, Y., Voineagu, I., Pasca, S. P., Won, H., Chandran, V., Horvath, S., Dolmetsch, R. E., Geschwind, D. H.
2014; 6
- **Generating human neurons in vitro and using them to understand neuropsychiatric disease.** *Annual review of neuroscience*
Pasca, S. P., Panagiotakos, G., Dolmetsch, R. E.
2014; 37: 479-501
- **Timothy syndrome is associated with activity-dependent dendritic retraction in rodent and human neurons** *NATURE NEUROSCIENCE*
Krey, J. F., Pasca, S. P., Shcheglovitov, A., Yazawa, M., Schwemberger, R., Rasmusson, R., Dolmetsch, R. E.
2013; 16 (2): 201-209
- **A promoter in the coding region of the calcium channel gene CACNA1C generates the transcription factor CCAT.** *PLoS one*
Gomez-Ospina, N., Panagiotakos, G., Portmann, T., Pasca, S. P., Rabah, D., Budzillo, A., Kinet, J. P., Dolmetsch, R. E.
2013; 8 (4)
- **Motor abnormalities as a putative endophenotype for Autism Spectrum Disorders.** *Frontiers in integrative neuroscience*
Esposito, G., Pasca, S. P.
2013; 7: 43-?
- **Using iPSC-derived neurons to uncover cellular phenotypes associated with Timothy syndrome** *NATURE MEDICINE*

Pasca, S. P., Portmann, T., Voineagu, I., Yazawa, M., Shcheglovitov, A., Pasca, A. M., Cord, B., Palmer, T. D., Chikahisa, S., Nishino, S., Bernstein, J. A., Hallmayer, J., Geschwind, et al
2011; 17 (12): 1657-U176

- **Surround modulation of neuronal responses in V1 is as stable over time as responses to direct stimulation of receptive fields** *CORTEX*
Pasca, S. P., Singer, W., Nikolic, D.
2010; 46 (9): 1199-1203
- **Paraoxonase 1 activities and polymorphisms in autism spectrum disorders** *JOURNAL OF CELLULAR AND MOLECULAR MEDICINE*
Pasca, S. P., Dronca, E., Nemes, B., Kaucsar, T., Endreffy, E., Iftene, F., Benga, I., Cornean, R., Dronca, M.
2010; 14 (3): 600-607
- **One carbon metabolism disturbances and the C677T MTHFR gene polymorphism in children with autism spectrum disorders** *JOURNAL OF CELLULAR AND MOLECULAR MEDICINE*
Pasca, S. P., Dronca, E., Kaucsar, T., Craciun, E. C., Endreffy, E., Ferencz, B. K., Iftene, F., Benga, I., Cornean, R., Banerjee, R., Dronca, M.
2009; 13 (10): 4229-4238
- **Vomiting is not an adaption for glaucoma (and Darwinian medicine is difficult)** *MEDICAL HYPOTHESES*
Pasca, S. P., Nesse, R. M.
2008; 71 (3): 472-473
- **Serum paraoxonase 1 activities and homocysteinemia in hemodialysis patients** *CLINICAL CHEMISTRY AND LABORATORY MEDICINE*
Dronca, M., Pasca, S. P., Nemes, B., Vlase, L., Vladutiu, D.
2008; 46 (6): 880-881
- **Behavioral effects of corpus callosum transection and environmental enrichment in adult rats** *BEHAVIOURAL BRAIN RESEARCH*
Miu, A. C., Heilman, R. M., Pasca, S. P., Stefan, C. A., Spanu, F., Vasii, R., Olteanu, A. I., Miclea, M.
2006; 172 (1): 135-144
- **High levels of homocysteine and low serum paraoxonase 1 arylesterase activity in children with autism** *LIFE SCIENCES*
Pasca, S. P., Nemes, B., Vlase, L., Gagyi, C. E., Dronca, E., Miu, A. C., Dronca, M.
2006; 78 (19): 2244-2248

PRESENTATIONS

- Assembling Three-Dimensional Models of the Human Brain to Study Development and Disease - Child-X
- Vilcek Award Presentation - Vilcek Foundation
- Minds Wide Open (documentary)