Simons Center for the Social Brain

The mission of the Simons Center for the Social Brain (SCSB) is to understand the neural mechanisms underlying social cognition and behavior, and to translate this knowledge into better diagnosis and treatment of autism spectrum disorders. SCSB was founded in January 2012 with support from the Simons Foundation Autism Research Initiative and completed its first five-year phase of funding in December 2016. SCSB funding was renewed for a second phase in January 2017, then for a third phase beginning January 2020.

The Simons Center studies mechanisms of autism spectrum disorders (ASD) in both humans and relevant model organisms and systems, as neural correlates of social cognition and behavior exist in diverse species. Our approaches take advantage of MIT's strengths in genetics and genomics, molecular and cell biology, analyses of neural circuits and systems, cognitive psychology, computation, and engineering.

During academic year 2021, SCSB continued its support for postdoctoral fellows and innovative collaborative targeted projects that involve three to four researchers bridging multiple levels of analysis. SCSB additionally continued to host events that reach a wide audience, including a colloquium series and a lunchtime talks series.

Symposia and Events

To strengthen its community, SCSB runs a colloquium series that brings major autism researchers to MIT. This colloquium has become the preeminent forum in the Boston area for research on autism and neurodevelopmental disorders. In addition, SCSB hosts a lunch talks series featuring postdoctoral fellows and faculty principal investigators who present their latest research.

As in previous years, the colloquium was generally held on alternate Wednesdays during the spring and fall terms. The lunch talks were held about once a month. Although spring 2020 was unusual due to COVID-19, we adjusted our approach and continued to host our colloquium and lunch talks virtually.

From June 2020 through July 2021, SCSB hosted 10 external colloquium speakers as part of its colloquium series, seven internal speakers as part of its lunch series, and one special event. SCSB continues to receive positive feedback and noted a significant rise in attendance due to the ease of attending via Zoom.

In December 2020 and May 2021 SCSB reported on its progress via Zoom during its regular twice-yearly visits from Jim and Marilyn Simons and the Simons Foundation Autism Research Initiative (SFARI) science team.

SCSB hosted a major outreach event—Autism Research at MIT—in December 2020 to showcase the range and depth of the MIT autism research effort to a virtual audience of more than 200 external and internal participants, including major donors.

Research

Postdoctoral Fellowships

SCSB continued its outreach efforts for announcing, receiving, reviewing, and awarding postdoctoral fellowships. Announcements were widely advertised to various departments and centers at MIT as well as institutions throughout the Boston area. Due to Covid-19, SCSB adjusted its postdoctoral application receipt, review, and funding schedule: one round of applications was accepted and reviewed, and a subset was funded. This model of one annual funding round will continue in the future (receipt deadline in May, funding to start in September).

In AY2021, SCSB awarded 10 postdoctoral fellowships (including four renewals for a second year of funding). Applications were reviewed by a review committee with input from Louis Reichardt, director of SFARI, and John Spiro, interim director of SFARI.

Targeted Projects

SCSB supports uniquely collaborative, focused projects undertaken by multiple laboratories to explore specific aspects of autism spectrum disorders in depth. These targeted projects are structured to require collaboration among researchers in order to quickly and flexibly address pressing questions in autism research. They are a vital part of the Simons Center's mission. SCSB supported two targeted projects in AY2020–21: a fourth year of funding for the Circuit Mechanisms of ASD-Relevant Behaviors in Marmosets targeted project, and a third year of funding for the targeted project Predictive Processes in Autistic and Neuro-typical Individuals: A Behavioral, Neural, and Developmental Investigation.

The former project involves four complementary and collaborative teams and aims to dissect brain mechanisms of a range of behaviors in wild-type marmosets. The project has four principal investigators (PIs): Robert Desimone, Ann Graybiel, Mriganka Sur, and Alan Jasanoff.

The latter project involves three complementary teams: Behavioral and electrophysiological investigations of sensorimotor prediction (Pawan Sinha), Investigations of adaptation to social and non-social stimuli (John Gabrieli), and Developmental studies of prediction in autism (Jesse Snedeker).

Each of the project teams made progress despite restrictions. They met regularly during the year to discuss ongoing findings, provide feedback, and share results and ideas between labs.

Major Research Publications

A wide range of publications resulted from SCSB funding. A sample of these is below:

- Amemori S., Graybiel A.M., and Amemori K.-I. (2021) Causal evidence for induction of pessimistic decision-making in primates by the network of frontal cortex and striosomes. *Frontiers in Neuroscience*, 15: 649167. (https://doi.org/10.3389/fnins.2021.649167)

- Gandhi T.K., Tsourides K., Singhal N., Cardinaux A., Jamal W., Pantazis D., Kjelgaard M., Sinha P. (2020) Autonomic and Electrophysiological Evidence for Reduced Auditory Habituation in Autism. *Journal of Autism and Developmental Disorders*, 51: 2218-2228. (https:// doi.org/10.1007/s10803-020-04636-8)
- Segel M., Lash B., Song J., Ladha A., Liu C. C., Jin X., Mekhedov S. L., Macrae R. K., Koonin E. V., Zhang F. (2021) Mammalian retrovirus-like protein PEG10 packages its own mRNA and can be pseudotyped for mRNA delivery. *Science*, 373: 882–889. (https://doi.org/10.1126/science.abg6155)
- Rozenkrantz L., D'Mello A.M., Gabrieli J.D.E. (2021) Enhanced Rationality in Autism Spectrum Disorders. *Trends in Cognitive* Sciences, 25: 685-696. (https://doi.org/10.1016/j.tics.2021.05.004)
- Tang X, Jaenisch R, Sur M. (2021) The role of GABAergic signalling in neurodevelopmental disorders. *Nature Reviews Neuroscience*, 22: 290-307. (https://doi.org/10.1038/s41583-021-00443-x).
- Wehbe L., Blank I., Shain C., Futrell R., Levy R., Malsburg T., Smith N., Gibson E., Fedorenko E. (2021) Incremental language comprehension difficulty predicts activity in the language network but not the multiple demand network. *Cerebral Cortex*, 31: 4006-4023. (https://doi.org/10.1093/cercor/bhab065)

Impact

The impact of SCSB on the community is manifest in many ways. Over 82 investigators across 16 departments, labs, and centers at MIT and 14 Boston-area institutions are engaged as present and former targeted project PIs, former seed grant investigators, or as postdoctoral mentors. SCSB has supported 45 postdoctoral researchers as Simons Fellows, including seven current and 38 previous fellows.

Until now, SCSB researchers have published more than 295 original research papers and obtained over $51 million in external funding from SCSB-supported early-stage research. A significant number of Simons Fellows have obtained faculty or independent research positions.

Administration and Governance

SCSB continues to be run by a small administrative core in which each individual performs a wide range of functions. In AY2021, the team included Mriganka Sur (director), Eleana MacPhail (administrative manager, fiscal officer, and facilities officer), and Alexandra Sokhina (administrative assistant II and events coordinator).

Mriganka Sur
Director
Newton Professor of Neuroscience