SAS Center Annual Report FY19

Penn's hub for the integrative study of the mind, connecting researchers across our campus and with our community.

May 28, 2019

This is a report on the activities of the Mind Center for Outreach, Research, and Education (MindCORE) for fiscal year 2018-2019. MindCORE was officially created in the fall of 2017 as one of the School's key endeavors under the "Mapping the Mind" initiative identified in the School's strategic plan, *Foundations and Frontiers*.

Sharon Thompson-Schill, Chair of the Psychology Department, agreed to serve a two-year term as the inaugural faculty director for MindCORE beginning in FY18 and was vital to getting the center up and running. Sharon's term ends June 30, 2019 at which time she will be replaced by Joe Kable as Director of MindCORE, for a four-year term beginning July 1, 2019.

MindCORE Directors 2018-2019
Director: Sharon Thompson-Schill, Professor of Psychology
Associate Director of Research: Joseph Kable, Professor of Psychology
Associate Director of Education: Nicole Rust, Associate Professor of Psychology
Associate Director of Outreach: Michael Weisberg, Professor of Philosophy
Executive Director, Heather Calvert

Faculty Advisory Board 2018-2019
Vijay Balasubramanian, Physics (2017-2020)
Danielle Bassett, SEAS (2017-2020)
Nancy Bonini, Biology (2017-2019)
John Detre, PSOM (2017-2020)
Angela Duckworth, Psychology (2017-2019)
Emily Falk, Annenberg (2017-2020)
Martha Farah, Psychology (2017-2020)
Joshua Gold, PSOM (2017-2019)
Konrad Kording, SEAS and PSOM (2017-2019)
Caryn Lerman, PSOM (2017-2019)
Barbara Mellers, Psychology and Wharton (2017-2019)
Michael Platt, Psychology, PSOM and Wharton (2017-2019)
Adrian Raine, Criminology and PSOM (2018-2020)
Marc Schmidt, Biology (2017-2019)
John Trueswell, Psychology (2017-2019)
Lyle Ungar, SEAS (2017-2020)
Charles Yang, Linguistics (2017-2020)

Larry Gladney, SAS Associate Dean for the Natural Sciences (ex-officio) was replaced by MindCORE EC member, David Brainard in spring of 2019 when he assumed the Associate Dean post.

Mission

Penn MindCORE is an interdisciplinary effort to understand human intelligence and behavior. Research programs in MindCORE bring together faculty with diverse approaches to the study of the mind, from disciplines in the Arts & Sciences ranging from Psychology, Biology, Cognitive Science, Neuroscience, and Physics to Economics, Linguistics, Political Science, Sociology, and Philosophy; and they bridge to centers and departments in Medicine, Wharton, Engineering, and Annenberg. MindCORE is the home of several undergraduate and graduate programs that are educating the next generation of students of the mind. MindCORE promotes cutting-edge research, increases the broader societal impact of new knowledge about human behavior and decision making gained from current research, and influences public policy and education through coordinated outreach programs.

Most Significant Accomplishments & Developments

In the second year of center operations, MindCORE continued to build on programs inherited from the old Institute for Research in Cognitive Science (IRCS), grow initiatives launched in FY18, and start new initiatives. Accomplishments include:

Launched Innovative Programs Including some Penn Firsts

- Started an outreach library consisting of exhibits, demonstrations, and educational tools that can be borrowed by anyone in the greater Penn community for use in scientific outreach. The lending kits are all designed, created, or verified by Penn researchers. There are currently 15 kits available in the library and discussions are underway with the Penn Biomedical Library to expand this resource.
  https://mindcore.sas.upenn.edu/outreach/outreach-library/
- Started an Interview with Scientists series whereby weekly seminar speakers were interviewed about their work in plain language to appeal to young scientists and the greater public. There are 22 completed interviews available:
  http://mindcore.sas.upenn.edu/outreach/interviews-with-scientists/
- Planned and launched the MindCORE Writing Room program to support intensive writing and deep-work by students and researchers inspired by the Graduate Student Center's Dissertation Boot Camp but employing behavioral science research from Penn researchers Katie Milkman and Angela Duckworth to apply "situational strategies" for self-control (in which a person changes their environment or circumstances to better focus on their goals) and research-backed commitment devices including pledging to attend specific dates and working in silence and without social media.
  https://mindcore.sas.upenn.edu/outreach/mindcore-writing-room/

- Launched a Growing Up in Science[1] series, for Penn undergraduate and graduate students and the greater Penn community considering a career in science in partnership with the Center for Undergraduate Research & Fellowships (CURF). Growing Up in Science is a conversation series that is not about science, but about becoming and being a scientist. The sessions are filmed. See the talk with Prof Sudeep Bhatia here: https://www.youtube.com/watch?v=GfdtM9vAOac

Organized and Supported 80+ Seminar Series, Professional Development Talks, and Special Events
- Hosted 1 welcome back reception for the MindCORE community in September 2018 with 100+ attendees
- Continued the success of the MindCORE Interdisciplinary Mind and Brain Seminar by hosting 22 speakers at the invitation of the IMB Planning committee (Maria Geffen, Assistant Professor, Department of Otorhinolaryngology, PSOM; Ted Satterthwaite, Assistant Professor, Department of Psychiatry, PSOM; and Anna Jenkins, Assistant Professor of Psychology, SAS). The weekly seminars regularly attracted 75+ attendees for standing-room only crowds. Speakers included names such as Jon Krakauer, Helen Mayberg, and Felipe De Brigard.
- Held talks by four new hires to MindCORE-affiliated departments including assistant professors Ishmail Abdus-Saboor (Biology), Anna Jenkins (Psychology), and Becky Waller (Psychology). Also hosted 45-minute talks by MindCORE Fellows Julia Leonard and Colin Twomey.
- Staffed 24 weekly Computational Neuroscience Initiative talks held Tuesdays at 11:30-1:00 in the Barchi Library.
- Staffed 13 bi-weekly Vision Science Seminar talks held Mondays from 12:15-1:30 in Barchi Library.
- Organized the 21st Annual Pinkel Lecture by Cori Bargmann, Head of Science, Chan Zuckerberg Initiative & Torsten N. Wiesel Professor, the Rockefeller University on "Organizing behavior across timescales," April 19. See video of that lecture here: https://www.youtube.com/watch?v=O3j1bVA7xRc&feature=youtu.be
- Co-sponsored a visit to campus by Michael Gazzaniga to deliver the 2018 Annual Oration Lecture of the Philomathean Society on October 23, 2018.
- Co-sponsored the two Penn Neuroscience Public Lectures, one in Winter 2018 (12/4/18) on "Uncovering the Neuroscience of Mental Illness" and one in Spring 2019 (4/16/19) on "We can, but should we? Ethical considerations in modern neuroscience." Both were full-house events in the Rubenstein Auditorium with ~240 attendees.
- Sponsored 6 MIRA (Mind-like Intelligence, Research, and Analysis) Group open talks with visiting speakers on subjects such as "What does Neuroscience want to know?" and "The Routes of Introspection."
- Hosted 8 professional development talks on the following subjects: How to write a successful research grant; Structuring an effective presentation; Open science workshop;

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[1] http://www.cns.nyu.edu/events/growingupinscience/

Navigating the academic job market: How to give a successful job talk and interview; Negotiating your job offer and starting a lab; and the Living Laboratory Program.

- Partnered with CURF to hold 4 Growing Up in Science Talks for Penn students and trainees about the challenges that faculty faced in their path to a job in academia. The Penn faculty speakers included Michelle Johnson (SEAS & PSOM), Konrad Kording (SEAS & PSOM), Sudeep Bhatia (SAS), and Maria Geffen (PSOM). The 3 latter talks were all filmed.
- Hosted 7 Technical Workshops on the following topics: Best Practices for Online Data Collection with Todd Gureckis, Data Visualization in Practice, PennController (2 times), Version Control in Science, and Visual Communication of Science with Jen Christiansen, Senior Graphics Editor at Scientific American.
- Held 1 Women in MindCORE Social and 1 year-end May Social.
- Hosted 28 weekly free coffee & connection sessions throughout the school year on Wednesdays at 2 PM on the 2nd Floor of Levin.
- Provided staff support to the Penn Symposium on Cultural Evolution and Global Social Dynamics that ran on campus May 15-17, 2019
- Launched a summer yoga series that will offer 10 free 1-hour yoga classes this summer.

Grew MindCORE Community to Unite and Promote Penn's Work in Mind & Brain
- Added 10 new faculty members to the faculty affiliate list for a total of 95 faculty across the University working in areas related to mind and brain.
- Grew social media presence from 303 to 692 Twitter followers and 1400 to 3200+ Tweets (@MindCORE) with a focus on 1) building the community for mind and brain across the University and 2) promoting the work taking place within Penn to the greater academic and scientific community and the public.
- Maintained a Facebook page dedicated to outreach and sharing information on the science of mind and brain to a lay audience with 71 followers.
- Grew the MindCORE campus email distribution list to 306 members.
- Held 9 Executive Committee meetings throughout the academic year, plus 1 Faculty Advisory Board meeting in December 2018 and one faculty Town Hall in January 2019.
- Surveyed MindCORE affiliates about their interest in professional education teaching and learning for FY20.

Supported Interdisciplinary Research
- Reviewed applications for the 3rd round of funding for a new interdisciplinary research initiative in mind and brain within the University and agreed to fund 1 new research proposal for up to a maximum of $200,000 per year for 1-3 years, for the Social and Cultural Evolution Working Group as led by Gareth Roberts and Erol Akcay.
- Continued to provide support to two existing research initiatives. Together these two initiatives hired 2 postdocs each, and SBSI hosted 8 Brown Bag lunches and 1 seminar featuring Joseph Henrich. ILST hosted 23 seminar speakers. Full details of these initiatives' activities are included in the attached separate reports for each:
    - Social and Decision Sciences (Coren Apicella & Geoff Goodwin): An understanding of the human mind, both its intelligent capacities and limitations or biases, is becoming increasingly important to explaining how human social, political and economic

institutions work. Social and decision sciences use contemporary theories of behavioral decision-making, neuroeconomics, networks, and social evolution to understand how individuals and groups make decisions. It considers how to address a real-life problems in an array of fields, such as social and public policy, law, education, business, and medicine.

- o Language Science (John Trueswell & Charles Yang): Human capacity for complex language is unique within the animal kingdom, and psychologists have long appreciated how the languages we learn can shape our patterns of thought in subtle ways. Language science fosters collaboration between researchers in cognitive science, computer linguistics, psycholinguistics, and phonetics to drive research in language acquisition and use. This research aims to develop and improve language and speech technologies (e.g., automatic speech recognition, translation, and transcription). In addition, this research can develop computational tools to learn more about how the human brain works and how sciences understands social groups.

- Supported two inaugural MindCORE Fellows in FY19: Colin Twomey (started 7/1/18) and Julia Leonard (started 9/1/18). Designed for individuals who have recently obtained a PhD degree in psychology, linguistics, neuroscience, philosophy or other cognitive science discipline, the MindCORE Fellowship is intended as a springboard for young researchers to help them build and establish their own research. Fellows pursue collaborative research with faculty working across disciplines at Penn and receive a competitive salary and health insurance plus a modest research budget. Fellows are invited to join regular working group meetings within their field plus career development workshops aimed at young researchers, and are provided with a mentoring committee. Funding is provided in one year terms renewable for up to three years.

- Received 100 applications in 2019 (up from 72 in 2018) for the MindCORE Research Fellowships. These were reviewed by a Postdoc Selection Committee of four faculty: Josh Plotkin, Biology (Chair); Russ Epstein, Psychology; Scott Weinstein (Philosophy), and Coren Apicella, Psychology. Five candidates were invited to interview on February 25, 2019.

- Offered fellowships to two applicants, both of whom accepted.
  - o Andrea Beltrama is a linguist who combines the study of the formal properties of the meaning of words and morphemes with the study of what humans *do* when using these expressions in everyday language (https://andreabeltrama.com/) arriving on campus August 2019.
  - o Rista Plate is a developmental psychologist who studies how children make sense of complex social environments (https://www.ristaplate.com/) who will join MindCORE in January 2020.

<u>Established the Plan and Framework for Living Laboratory Pilot Program</u>
- Began work to pilot a Living Laboratory program to involve scientists recruiting participants and conducting experiments in a public setting in order to collect data for and educate the public about on-going studies or exhibit a research toy. The MindCORE Living Laboratory framework has the following goals:
  - o Participants will engage in conversations with researchers to learn about MindCORE-related scientific research.

- o Participant education will focus on the process of science, increasing interest in and understanding of research questions and research methods, as well as study results.
    - o Participants will contribute to the process of scientific discovery through participation in active studies.
    - o Non-participants (members of the public ineligible for study participation) will engage with researchers and learn about on---going studies in ways similar to study participants.
- Experiences for MindCORE-affiliated researchers and staff who will implement the Living Laboratory pilot program will include:
    - o Researchers and partner institutions will share their respective expertise (current research studies, methods, practices, etc. and accessible communication of science to public audiences, respectively) in order to strengthen cross-disciplinary practice in communicating science with public audiences.
    - o Scientists will work closely with educational partners to communicate the questions and methods of their work to members of the public via informal conversations and hands-on activities that illustrate recent research.
    - o Researchers will expand their available participant recruitment settings.

Most Promising Areas of Research

MindCORE faculty work in a number of promising areas of research including the affiliated groups such as the MindCORE-funded Social and Decision Sciences Initiative (SBSI) and the Integrated Language Science and Technology (ILST) groups, listed above and included in the attached reports for each. Plus MindCORE continued to provide staff support to the Computational Neuroscience Initiative (CNI) in FY19. This year MindCORE also awarded research initiative funding of $200,000 beginning in FY20 to:

- Social and Cultural Evolution Working Group (SCEW) - Since humans are fundamentally a social species, a full understanding of human cognition ultimately has to take into account the interaction of different individuals' minds with each other (Hasson et al., 2012). Cultural evolution is a crucial element in this enterprise of broadening the reach of cognitive science beyond the confines of single minds. The evolutionary feedback between culture and social structure is crucial in determining the social landscape individuals find themselves in. The grand challenge in cultural evolution is to elucidate and integrate cognitive, social, and population-level mechanisms into a coherent evolutionary theory designed for culture from the ground up. SCEW is working on this.

MindCORE-supported postdoctoral fellows—of whom there will be ten in FY20—are also working at the forefront of several areas related to brains and behavior. The FY19 MindCORE Fellows' research included the following:

- Colin Twomey - exploring information theory to understand the social dynamics that cause natural languages to form efficient descriptions of sensory information and;
- Julia Leonard - working to understand the various factors that impact children's decisions to persist in the face of challenges, with applications to real-world learning.

Fundraising

MindCORE, founded in response to the SAS strategic plan, has thus far relied on an agreement for support from the SAS Dean's office and the advancement staff working to raise donor funds to support the center under the University-wide Power of Penn campaign. To date, the following donor commitments have been secured:

Gifts in Hand	FY19	FY20	FY21	FY22	FY23	Total Available over 5 Years
$715,703	$320,000	$320,000	$320,000	$320,000	$120,000	$2,115,702

This represents an $800,000 gain over what was reported in the FY18 Annual Report ($1,315,703). MindCORE staff have begun to look for grant opportunities, particularly for those that provide support for FGLI and URM student programming for the future.

As part of the agreement with new faculty director Joe Kable, the SAS Dean's office committed to continuing the current level of funding of $1.25 million per year, for at least the duration of Joe Kable's four-year term as Director (FY20 – FY23).

Alignment with Strategic Plan

MindCORE was born from the SAS Strategic Plan (http://www.sas.upenn.edu/strategic-plan/emerging-academic-opportunities), in particular the "Advancing Integrated Knowledge: Mapping the Mind" section; and as such, many of the MindCORE initiatives were spelled-out in that plan including:

- *"These contiguous facilities will now be used to promote intellectual synergies and serve as a dedicated home for shared instrumentation and collaborative laboratory facilities."*
  - The MindCORE-funded SBSI and ILST research initiatives both have shared instrumentation and laboratory facilities.
  - Planning is underway for a new Brain Imaging Center administered by MindCORE that includes an MRI scanner to be built in the next 1-2 years to support research in human brain function.
- *"The School will establish a Neuroscience Council composed of faculty across the disciplines to propose additional targeted faculty hiring particularly where it will foster meaningful connections between the humanities, social sciences, cognitive science, and neuroscience. Recruitment strategies will include cluster hiring and the appointment of senior faculty who build bridges across schools, including through the Penn Integrates Knowledge program."*
  - The Faculty Advisory Board serves as this council.
  - MindCORE will develop a new proposal for a cluster hire in FY20.
- *"SAS will also support post-doctoral "junior fellows" who will be recruited for their ability to work across disciples and with multiple faculty mentors."*
  - The MindCORE Fellows were proposed in direct answer to this charge and are specifically designed to work on their own research with multiple faculty across several disciplines. There will be 4 MindCORE Fellows, and 2 postdoctoral scholars in

each of the three MindCORE-funded research initiatives for a total of ten postdocs in FY20.

- *"This initiative will also fund new opportunities for undergraduate research, especially in the summer."*
  - Ten Penn undergraduates will participate in the MindCORE Undergraduate Summer Fellows program in 2019 following the 11 participants from the summer of 2018. A $1M gift was secured in 2018 to endow this program for future years.
- MindCORE is also working to *"strengthen relationships among departments, programs, schools, and disciplines"* and *"have a significant impact on undergraduate and graduate education"* and to that end has begun to partner with other centers and departments on campus to provide collaborative and coordinated programming which thus far includes:
  - Collaborating with CURF to co-present the Growing Up in Science Series.
  - Mentoring a PhD student extern as part of a Career Services program.
  - Helping BBB obtain news coverage for their annual Kids Judge event.
  - Co-sponsoring all NGG (Neuroscience Graduate Group) Outreach events including attendance at the Philadelphia Science Festival and the two public lectures.
  - Coordinating and hosting a convening of the SAS Research centers this summer to compare best practices and look for ways to work together in the future.
  - Partnering with CURF and the LRSM (Laboratory for Research on the Structure of Matter) to provide access this summer to coordinated professional development and other educational events to all 300 of our collected summer research students.
  - Finally, information about MindCORE events is widely distributed and programming is open to all of the Penn community. The professional development events and seminar series are regularly attended by BGS, NGG, and graduate and undergraduate students from other schools and programs across campus. Everyone from Penn is always welcome to participate in MindCORE programming.

Education: Links to Undergraduate Education, Graduate Education & Liberal and Professional Studies

MindCORE is the home of the large Cognitive Sciences Major, and hosts two campus-based undergraduate summer programs, one for Penn students and one targeting underrepresented groups. The Center also supports professional development sessions for graduate students and postdocs and is working to create links to other interdisciplinary programs at Penn (e.g., BBB, PPE, Visual Studies, etc.) The primary undergraduate education programs to date include:

- Provides all staff support to the Cognitive Sciences Program and as such supports 164 students in the major and 28 in the minor with declarations, enrolling students in courses, and providing year-round support for student registration issues, and social events. There has been a five-fold increase in students in the major since 2010.
- Represent the COGS program at all recruitment events.
- Hosts the Undergraduate Summer Workshop (UGSW) on Interdisciplinary Mind and Brain, a two-week residential workshop for 25 undergraduate students enrolled at any university or college with an interest in Interdisciplinary Mind and Brain Studies. In the summer of 2018 the session ran from June 3-16, 2018. Lectures focused on Social and Decision Sciences (Week 1) and Integrated Language Science and Technology (Week 2). For summer 2018

UGSW, 120 applications were received. This number grew to 144 applications for this summer. Workshop participants receive free room and board, plus a travel stipend.

- Offers an Undergraduate Summer Fellowship Program for Penn students working with MindCORE faculty. The program is a full-time, 10-week Fellowship where admitted students are awarded a $4000 stipend for research work with a faculty mentor, whereby the faculty lab is provided a $1000 allowance. The program begins with an optional short training course in MATLAB or R, weekly journal club-style lunches, ethics and communications training, ongoing mentoring and professional development throughout the summer, and a final research presentation.
- The summer 2018 program received 60 applications for the ten 10-week Undergraduate Summer Fellowship spots. The summer 2019 program received 44[2] applications. The 2019 fellowships will begin next month. The 2018 students included the following who gave the following final presentations based on their research:
    - Mariya Bershad (mentor: Dawn Mechanic-Hamilton): *Early detection of AD-related cognitive change with a mobile cognitive app performance program (mCAPP)*
    - Deniz Beser (mentor: Charles Yang): *An Evaluation of Models of Rule Learning in Language*
    - Yiyi Chen (mentor: John Trueswell): *Do Two-Year-Olds Learn Novel Verbs in Negative Sentences?*
    - Miranda Flamholz (mentor: Ramon Diaz-Arrastia): *Exsosomal Biomarkers for Traumatic Brain Injury*
    - Emily Hong (mentor: Barb Mellers): *When Does Group Discussion Make Crowds Wiser?*
    - Justin Morrison (mentor: Ramon Diaz-Arrastia): *Longitudinal Assessment of Cerebral Vascular Dysfunction in Traumatic Brain Injury Using Functional Near Infrared Spectroscopy*
    - Ortal Nakash (mentor: Desmond Oathes): *Brain stimulation and data analysis*
    - Melvin Reyes (mentor: Roy Hamilton): *Examining the effects of cathodal tDCS administration uncommon use generation task*
    - Savannah Simon (mentor: Juhi Pandey): *Auditory Time Processing in Autism*
    - Salamon Villatoro (mentor: John Dani): *Optogenetic Modulation of Dopamine Release and Ethanol Self-Administration*
    - Quentin Wedderburn (mentor: Allyson Mackey)*: Examination of hyper-myelination, internalizing, and externalizing behavior in children from high deprivation backgrounds*

Long-term Leadership & Succession Planning

MindCORE is committed to leadership development at all levels and provides the following:

- Junior faculty are offered positions on low-work, high-visibility committees, such-as the MindCORE seminar committee, that provides a valuable leadership opportunity and contact with visiting speakers but only requires a few hours of work per year.
- Mid-career faculty are invited to join committees to review and recommend MindCORE Fellowship selection. While this committee requires more hours of work, the committee is fully staffed, and the duration of the work is only over a few weeks in the spring semester.
- New executive committee members are invited to join based on their interest in the area of concentration (outreach, research, and education) and MindCORE involvement.

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[2] Other summer campus research programs, such as PURM, increased their stipend amount $1000 over last year's while the MindCORE advertised stipend remained the same so MindCORE was not as competitive in recruiting applicants this year. The stipend has since been increased to remain competitive with other programs.

- Faculty and trainees are invited to participate in professional development talks around negotiation, applying for grants, science communication, and technical training (e.g., open science, version control, science journal graphics and working with an editor), and others.
- Faculty and trainees are eligible to apply for MindCORE Family Care grants that provide funding to support conference travel important to early career progression.
- Secession planning – The faculty director is selected by the Dean's Office.

Outreach: Enhancing Faculty and Student Diversity
- The Undergraduate Summer Workshop (mentioned above) has a particular focus on recruiting first generation and underrepresented minorities to the field. Recruitment and advertising is focused on HBCUs and schools with established Cognitive Science programs. In 2019 144 complete applications were received, 48 (33%) of which were from URMs. Yet of the 19 student enrolling next week, only 3 (16%) are from underrepresented groups. Offers were made that were not accepted, and one URM student cancelled her enrollment three weeks before the program start due to family issues.
- MindCORE faculty and staff met twice with the new Penn First Plus office staff to begin planning for enhanced programming for first-generation, low-income students (FGLI) students in the year ahead. MindCORE is particularly interested in mentor-matching both students and trainees and providing information on mentoring best-practices to affiliated faculty, and teaching student supervisors about some of the unique needs of FGLI Students.
- MindCORE initiated a new Growing Up in Science speaker series in collaboration with CURF that invites Penn faculty to talk about their path to academia, with a particular focus on set-backs and failures to provide students advice and inspiration to successfully navigate their own academic path. Half of the speakers to date have been members of underrepresented groups.

Note that traditional science outreach directed off-campus/to the greater community is discussed above.

MindCORE is well positioned with strong leadership and experienced staff—plus a growing recognition and enthusiasm among the mind and brain community for MindCORE activities—to continue to grow and provide innovative programming and support for Penn's interdisciplinary effort to understand human intelligence and behavior with the Dean's support.

Respectfully submitted by,
Heather Calvert, Executive Director

Attachments:
MindCORE Governance Structure
ILST Report
SBSI Report