

**DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
NATIONAL INSTITUTES OF HEALTH**

**NATIONAL ADVISORY COUNCIL FOR
BIOMEDICAL IMAGING AND BIOENGINEERING**

Summary of Meeting¹

September 14, 2021

The National Advisory Council for Biomedical Imaging and Bioengineering (NACBIB) was convened for its 57th meeting on September 14, 2021, by Zoom for the Open Session and Closed Session. Dr. Bruce Tromberg, Director of the National Institute of Biomedical Imaging and Bioengineering (NIBIB) presided as Council chairperson. In accordance with Public Law 92-463, the meeting was open to the public from 12:00 p.m. to 4:27 p.m. for review and discussion of program development, needs, and policy. The meeting was closed to the public from 4:33 p.m. to 4:49 p.m. for the consideration of grant applications.

Council members present:

Dr. Samuel Achilefu, Washington University School of Medicine, St. Louis, MO
Dr. Gilda Barabino, Olin College, Needham, MA
Dr. Jennifer Barton, University of Arizona, Tucson, AZ
Dr. Simon Cherry, University of California, Davis, Davis, CA
Dr. Maryellen Giger, University of Chicago, Chicago, IL
Dr. Paula Hammond, Massachusetts Institute of Technology, Cambridge, MA
Dr. Amy Herr, University of California, Berkeley, Berkeley, CA
Dr. Ranu Jung, Florida International University, Miami, FL
Dr. Kathryn Nightingale, Duke University, Durham, NC
Dr. Bruce Rosen, Massachusetts General Hospital, Charlestown, MA
Dr. Gordana Vunjak-Novakovic, Columbia University, New York, NY

Ex officio member attending:

Dr. Zane Arp (*on behalf of Dr. Jeffrey Shuren*), U.S. Food and Drug Administration, Silver Spring, MD
Dr. Vincent Ho, Uniformed Services University of the Health Sciences, Bethesda, MD
Dr. Anne Plant, National Institute of Standards and Technology, Gaithersburg, MD
Dr. Sohi Rastegar, National Science Foundation, Arlington, VA

Ex officio members absent:

Mr. Xavier Becerra, Department of Health and Human Services, Washington, DC
Dr. Francis Collins, National Institutes of Health, Bethesda, MD

Ad Hoc Attendees:

Dr. Tejal Desai, University of California, San Francisco, San Francisco, CA
Dr. Manu Platt, Georgia Institute of Technology, Atlanta, GA

Chairperson:

Dr. Bruce Tromberg

Executive Secretary:

Dr. David T. George

¹ For the record, it is noted that members absent themselves from the meeting when the Council is discussing applications (a) from their respective institutions or (b) in which a conflict of interest may occur. This procedure only applies to applications that are discussed individually, not to “en bloc” actions.

Also Present:

Approximately 220 observers attended the open session, including NIBIB staff, and members of the public.

Call to Order: Dr. David T. George

Dr. David T. George called to order the 57th meeting of the National Advisory Council for Biomedical Imaging and Bioengineering. He reminded attendees that the morning session of the meeting was open to the public and welcomed attendees.

I. Director's Remarks: Dr. Bruce Tromberg

A. In Memoriam

Dr. Tromberg announced the passing of [Dr. George H. Patterson](#), who was a senior investigator and chief of the Section on Biophotonics at NIBIB. Dr. Patterson was a ground-breaking and world-renowned researcher, known for his development of photo-activatable probes and contributions to the development of photo-activated localization microscopy, or PALM. Dr. Tromberg noted that there have been discussions on how to commemorate Dr. Patterson in an enduring way within NIBIB and NIH.

B. Welcome New Council Members

Dr. Tromberg welcomed two new soon-to-be-appointed council members: Dr. Manu Platt, professor and Walter H. Coulter Distinguished Faculty Fellow in Biomedical Engineering at the Georgia Institute of Technology; and Dr. Tejal Desai, professor and the Ernest L. Prien Endowed Chair in the Department of Bioengineering and Therapeutic Sciences at the University of California, San Francisco.

C. Staff News

Dr. Tromberg welcomed three new NIBIB staff: Dr. Taylor Gilliland, Senior Advisor for Innovation Programs; Dr. Steven Santos, a member of the HHS Testing Diagnostic Working Group who will also work on projects related to the Rapid Acceleration of Diagnostics (RADx®) initiative; and Dr. Songtao Liu, a Scientific Review Officer.

Dr. Tromberg also announced several upcoming retirements: Lead Grants Management Ms. Specialist Florence Turska; Grants Management Specialist Ms. Angie Eldridge; Scientific Review Officer Dr. John Holden; Chief Grants Management Officer Ms. Holly Taylor; and Supervisory Public Affairs Specialist Ms. Kate Egan.

D. Budget

NIBIB participated in the Senate Appropriations Subcommittee on Labor, Health and Human Services, Education, and Related Agencies hearing on May 26, 2021.² In July, a House minibus bill for FY22 was passed, which included approximately \$49 billion in NIH funding. This is an increase of approximately \$7 billion over FY21, where \$3 billion is dedicated to the creation of Advanced Research Projects Agency for Health (ARPA-H) and the remaining approximately \$3.5 billion is dedicated to other institutes, centers, and offices. Finally, there is a pending infrastructure bill related to vaccines, therapeutics, and diagnostics, which would provide additional multi-year support for pandemic preparedness.

In terms of NIBIB funding, there was a modest increase in the funding base from FY20 to FY21. There was substantial additional funding to legislated programs that address the COVID-19 pandemic. While these additional funds have primarily been devoted to the RADx initiative, NIBIB has also supported activities in

² Correction to the minutes by Dr. George

imaging, artificial intelligence (AI), digital health, and new technologies surrounding COVID-19. Dr. Tromberg projects a continued appropriation of funds in FY22 that would allow the Institute to maintain such activities, resulting in a total anticipated budget of approximately \$1 billion.

E. ARPA-H

Dr. Tromberg referred to a [recent policy forum article](#) in *Science* focused on ARPA-H. The article highlights the success of the RADx initiative and suggests that ARPA-H could function effectively at the NIH. Dr. Tromberg noted that ARPA-H will be centered around urgency, nimbleness, and innovation, which are all attributes of the RADx initiative. Further, ARPA-H would involve a convergence of scientific disciplines, with collaborations across academia, industry, and government, which was also required for the success of RADx.

Dr. Tromberg highlighted the [15 ARPA-H listening sessions](#) held by NIH, which had over 5,000 stakeholders and addressed the value that ARPA-H can bring to the community. Dr. Tromberg noted that the [NIBIB listening session](#) included incoming NIBIB council member Dr. Desai.

F. Program Announcements, Opportunities, and Updates

Dr. Tromberg noted that the NIBIB website has been recently updated and now includes new features that point to [funding opportunities](#). He then described several such funding opportunities, along with other NIBIB opportunities and updates.

Alzheimer's Supplements: Dr. Tromberg highlighted a new [Notice of Special Interest](#) (NOSI) to supplement existing awards that are not currently focused on Alzheimer's disease which would allow the research to develop such a focus. Applications are due October 2, 2021. Dr. Tromberg noted that NIBIB has awarded approximately 15 Alzheimer's supplements, totaling around \$3 million per year for the past several years. Dr. Randy King is leading the NIBIB effort.

Medical Imaging Phantom Library: This NIBIB-NIST (for National Institute of Standards and Technology) [collaboration](#) is focused on developing and sharing imaging phantoms for standardization and validation. Dr. Tromberg noted that the library is currently at an early stage, with only magnetic resonance imaging (MRI) phantoms at present, but will expand to include all forms of imaging. Dr. Guoying Liu is leading the NIBIB effort.

NIH HEAL Initiative®: A new funding opportunity, co-led by NIBIB and NCCIH (National Center for Complementary and Integrative Health), will soon be published as a part of the NIH HEAL (Helping to End Addiction Long-term) Initiative®. Dr. Tromberg highlighted the [Notice of Intent to Publish](#) (NOITP) of this funding opportunity, which focuses on the development of quantitative imaging and other relevant biomarkers of myofascial pain tissues for clinical pain management. The expected earliest application submission date will be December 15, 2021. Dr. Guoying Liu is the NIBIB lead on this effort.

Blueprint MedTech: The [Blueprint MedTech program](#), an NIH incubator that aims to accelerate the development of cutting-edge medical devices to diagnose and treat disorders of the nervous system, has several new funding opportunity announcements (FOAs). Dr. Tromberg noted that this program shares many features with the RADx Initiative, including an accelerated "innovation funnel"-like process. The FOAs include [Blueprint MedTech Incubator Hubs \(U54\)](#) and first-in-human clinical studies [[Blueprint MedTech Translator \(UG3/UH3\)](#) and [Blueprint MedTech Small Business Translator \(U44\)](#)]. Applications are due on October 20, 2021. Dr. Michael Wolfson is leading the NIBIB effort.

NSF-NIH Smart and Connected Health Program: The National Science Foundation (NSF)-NIH Smart and Connected Health initiative has a new program, "Smart Health and Biomedical Research in the Era of Artificial Intelligence and Advanced Data Science," which was recently restructured. Dr. Tromberg

highlighted several program announcements, including an [NSF program solicitation](#) along with an NIH [notice](#) of participation. The next application due date is November 10, 2021. Dr. Qi Duan is the NIBIB on this effort.

Virtual 2021 Synthetic Biology Consortium Meeting: The [second Synthetic Biology Consortium meeting](#) will take place November 4-5, 2021. Dr. Tromberg noted that this meeting will involve engaging with U.S Food and Drug Administration (FDA) stakeholders, showcasing research from the consortium's grantees, and networking with NIH program staff. Dr. David Rampulla is leading the NIBIB effort.

NIH DATA Scholars: The NIH Data and Technology Advancement National (DATA Scholars) Program will have its next round of calls in April 2022. This trans-NIH program is a sabbatical-like experience where scholars work with the extramural program and engage with policy makers. Dr. Tromberg mentioned that the three current NIBIB DATA scholars will be giving presentations later during this council meeting.

DEBUT Challenge: This year, the Design by Biomedical Undergraduate Teams (DEBUT) Challenge had 76 applications from 47 universities and 26 different states, engaging approximately 400 students. Prize money totaled \$115,000. Dr. Tromberg reviewed the [award winners](#). NIBIB-sponsored prizes included the following:

- The Steven H. Krosnick first-place prize (\$20,000): Awarded to a team from the University of South Florida for their invention called the Eucovent, a ventilator add-on that allows multiple patients to be ventilated with a single ventilator.
- The second-place prize (\$15,000): Awarded to a team from Rice University for their invention called Cephalopump, an assistive treatment device for low differential pressure hydrocephalus.
- The third-place prize (\$10,000): Awarded to a team from Columbia University for their invention called Eyephone, which is an at-home glaucoma monitoring device with a low-cost virtual reality application.

NIH-sponsored prizes included the following:

- The Office of Aids Research (OAR) Prize for HIV/AIDS Research (\$15,000): Awarded to a team from Texas A&M University for a device for the early diagnosis of HIV.
- The National Institute on Minority Health and Health Disparities (NIMHD) Prize for Healthcare Technologies for Low-Resource Settings (\$15,000): Awarded to a team from Lehigh University for their sickle cell disease screening device.
- The National Cancer Institute (NCI) Prize for Technologies for Cancer Prevention, Diagnosis and Treatment (\$15,000): Awarded to a team from Duke University for their invention called LowCostomy, an affordable colostomy bag for ostomy patients in low-resource settings.

VentureWell-sponsored prizes included the following:

- The VentureWell prize (\$15,000): Awarded to a team from Georgia Institute of Technology for their invention called AsculBand, an affordable patient-facing electronic stethoscope that can be marketed at a significantly lower cost than the current competition.
- The VentureWell Design Excellence prize (\$5,000): Awarded to a team from Stanford University for their invention called NeedleDelivery, a tool to facilitate transvaginal injection of medicine.

Honorable mentions (\$1,000 each) included the following:

- A team from Johns Hopkins University for their invention called ThermoBeat, a pacemaker battery that uses a temperature gradient to greatly extend battery life.
- A team from the University of Miami for their invention called Iris-Concussion Dx, a concussion diagnostic tool that utilizes eye tracking.
- A team from Harvard College for their invention called RoboSock, a post-stroke ankle rehabilitation device.
- A team from Western New England University for their invention called Coagulation Lab-on-a-Chip, a blood clotting timed test.
- A team from University of Minnesota-Twin Cities for their invention called DuoPouch, a calibrated, two-pouch systems to diagnose postpartum hemorrhaging.

Dr. Tromberg noted that the DEBUT awards ceremony will take place at the Biomedical Engineering Society (BMES) Annual Meeting in October, which will include dedicated parallel sessions featuring the winners. Drs. Zeynep Erim and Joan Greve are the NIBIB program contacts for the DEBUT program.

G. RADx® Updates

RADx Tech Updates: Dr. Tromberg noted that there was a second solicitation for RADx, which opened in June 2021. Combined with the first solicitation, which opened in April 2020 and closed a few months later, there have been a total of 824 applications, resulting in 35 technologies receiving ‘phase 2’ funding (which encompasses funds for the scale-up, manufacturing, and commercialization of the COVID-19 testing technology). Dr. Tromberg expects that several more technologies will be awarded funding following the second solicitation.

RADx Impact: Dr. Tromberg highlighted the various COVID-19 diagnostic testing technologies that have been supported by the RADx initiative, including point-of-care, home, and laboratory tests, along with laboratory products. The cumulative impact of all these testing technologies has culminated in increasing the COVID-19 testing capacity by approximately 815 million new tests. As of August 2021, there have been 28 emergency use authorizations (EUAs), including the first over-the-counter EUA, and approximately 4 million tests and test products are produced each day. Dr. Tromberg anticipates that the initial congressional authorization of approximately \$1 billion will be expended by the end of the calendar year. Further, he noted that there has been an additional \$1.3 billion in private capital raised to this point.

Dr. Tromberg also highlighted the WhenToTest.org [website](#), an online tool that makes COVID-19 testing recommendations for organizations based on risk factors, such as vaccination rates, mask wearing, and unmasked activities. There has been a steady increase in users, with almost 11,000 users in August 2021. Dr. Tromberg noted that the tool can also provide guidance on pooling, and a ‘playbook’ for COVID-19 testing at schools is now being recognized and used by the Centers for Disease Control and Prevention (CDC). He also noted that the website has links to purchase COVID-19 tests, and that a testing calculator for individuals should be released soon.

Dr. Tromberg also spoke of Say Yes! COVID Test, a public health effort in collaboration with the CDC designed to assess the efficacy and effectiveness of serial at-home COVID-19 testing. This effort utilizes the Quidel QuickVue test, a RADx-supported diagnostic technology. Dr. Tromberg noted that there have been approximately 2 million tests that have been purchased and distributed through the Say Yes! COVID Test effort and that additional Say Yes! COVID Test locations are forthcoming. Two of these locations (one in Georgia and one in Hawaii) will have a rollout in collaboration with the White House Pandemic Testing Board involving a partnership with HHS surge teams. This collaboration will distribute another 4 million at-home COVID-19 tests.

Finally, Dr. Tromberg highlighted the digital health platform CareEvolution, which has been supported by NIBIB since the beginning of the pandemic. Together with the Office of the National Coordinator and the American Public Health Labs, this effort takes information from phone applications, standardizes the data elements, and transmits the information to public health authorities and federal databases. Drs. Andrew Weitz and Krishna Juluru are leading the NIBIB effort.

RADx Variant Task Force: In January of 2021, NIBIB established the RADx Variant Task Force, which was initiated for the following reasons: first, to understand the impact of variants on both nucleic acid and antigen COVID-19 tests; and second, to potentially design COVID-19 testing technologies for variant surveillance. At the center of this effort is a sequencing database called ROSALIND, and collaborators in the Task Force include experts from industry and from Emory University and the University of Washington. Dr. Tromberg highlighted a project within the initiative called Project Rosa, a collaborative effort responsible for designing a 48-marker genotyping approach to determine the positivity of COVID-19 samples, the lineage of the variant, and the identification of mutations of biological interest. Compared with next generation sequencing of COVID-19 samples, this approach would be both faster and cheaper. Dr. Tromberg hopes that an EUA for this technology will be submitted to the U.S. FDA as early as mid-November.

Ongoing Challenges: Dr. Tromberg wrapped up the RADx summary by discussing some of the ongoing challenges. The first challenge is the infrastructure for reporting COVID-19 test results. He highlighted a [story](#) by POLITICO which detailed how delays in tracking COVID-19 infections led failures to identify hotspots quickly enough to prevent future outbreaks. The second challenge is insufficient COVID-19 screening and surveillance. Dr. Tromberg highlighted the [study](#) authored by NIBIB researcher Dr. Kaitlyn Sadtler and others which estimates that nearly five out of six COVID-19 cases were undetected in the early months of the pandemic, corresponding to nearly 17 million undiagnosed Americans.

Dr. Tromberg said that, because of these challenges, guidance and policy decisions are made based on lagging and incomplete test data. Solutions to these challenges include real-time COVID-19 data; better, accessible, and fast COVID-19 tests; multiplex tests; and fast, accurate, and cost-effective COVID-19 surveillance. He noted that several of these solutions are in-line with the second RADx solicitation, and that in the future, RADx processes and networks can be leveraged for other pathogens.

Lastly, Dr. Tromberg highlighted the COVID-19 Action Plan from the Biden administration which includes several points about testing. The plan will provide further federal support for over-the-counter and point-of-care COVID-19 tests. Further, the White House and the COVID-19 Pandemic Testing Board are working with retailers to sell over-the-counter tests at cost and coordinating with Medicaid with reimbursement for such tests.

H. Discussion

Dr. Gilda Barabino asked about the recent increase in NIBIB funding due to COVID-19, and what amount would be retained by NIBIB in the future, and how the RADx initiative would shift after the pandemic. Dr. Tromberg anticipates that once this pandemic shifts to an endemic, NIBIB will be investing some of its resources for pandemic preparedness, and he hopes for stable, long-term support for RADx. Drs. Amy Herr and Paula Hammond asked about how RADx processes could be applied to more research questions, including bioengineering and biomaterial advances that are not represented by testing and diagnostics. Dr. Tromberg believes that the RADx concept could be applied to fundamental research questions, as RADx utilizes open science, contributory processes, and broad community engagement—features that are not normally found in traditional research settings. Dr. Sohi Rastegar asked about strategies to increase funding for research to develop accepted, rapid diagnostic tests for the public. Dr. Tromberg mentioned the announcement from the Biden administration focused on delivering more at-home tests and noted that at-home testing networks and digital health infrastructure could be leveraged into other areas, like other respiratory viruses or sexually transmitted diseases.

There was also discussion about the medical imaging phantom libraries collaboration with NIST—how NIBIB is supporting its infrastructure, ways to collaborate on this project, and the potential of using phantoms for virtual clinical trials. There was also a suggestion for adding requirements for imaging phantoms into grants, and potential grant supplements for those investigators who generated such phantoms, facilitating data sharing between researchers.

II. NIBIB Diversity Working Group: Dr. Gilda Barabino and Dr. Roderic Pettigrew

To set the stage for the discussion, Dr. Tromberg reminded the audience of the combined working group meeting that took place on August 30. Several items were discussed during this meeting, including an update on the BETA (Biomedical Engineering & Technology Accelerator) Center, themes from the May council meeting, the landscape of current mechanisms, and new programs to fill gaps. Key areas emerged during this discussion included pipeline issues, new resources and training for students and researchers, grant review and funding considerations, how to improve outreach and engagement, prizes, connecting to industry, and connecting to other agencies.

Dr. Tromberg noted that Dr. Griffin Rodgers is the chair of the search committee for the BETA Center Director. This will be a dual position as the NIBIB Associate Director for Scientific Diversity, Equity, and Inclusion. The search committee has been formed and includes NIBIB council member Dr. Barabino. Dr. Tromberg anticipates that the advertisement for the position will be posted by the end of September.

Dr. Tromberg concluded by highlighting the landscape of current mechanisms, which is quite extensive, and noted that Dr. Joan Greve is the NIBIB program contact for FOAs to address workforce diversity and health disparities.

Diversity, Equity, and Inclusion (DEI) Work Group Report. Dr. Barabino, co-chair of the DEI working group along with Dr. Roderic Pettigrew, led the discussion with the council members. She framed this discussion as an expansion of the discussion that began at the May 2021 Council meeting. Themes from previous discussions included how pressure can be exerted on institutions and new center heads; doing a better job of networking across institutions; taking advantage of existing opportunities like the NIBIB DEBUT program; creating award programs to recognize exemplary programs, and policies that promote diversity at all levels.

An example model award program is the Office for Research on Women's Health prize for enhancing faculty gender diversity in biomedical and behavioral science that recognizes institutions that have demonstrated success in this area. Dr. Pettigrew added that there has been a sustained focus on this topic at the national level, citing discussion being held by the National Academies.

One topic that is being discussed is that race as an identifier is often misused in medicine, as it can be used as a biological surrogate when it is a sociological descriptor. This reinforces myths that there are biological differences that don't exist. An example of this is the use of different rates of kidney function in people of different races, which may not have any physiological basis at all. He suggested that evaluating and exposing such myths may be a worthwhile endeavor. Another example is the use of different bone density charts for Black and white women.

It was suggested that looking at the grant application level for projects that propose research that would counter implicit bias in medicine could help to develop models of disease, treatment, etc. that are more inclusive and specific for various communities and groups. Funds could be included in grant awards that specifically include a broader group of target populations. It was suggested that it would be important to be sure that such conditions of awards were clearly built into study section criteria and understood by study section members.

The Common Fund Bridge to AI program was given as an example of a new program that aims for carefully curating diverse data before it is used to build AI and ML applications. Similarly, the Medical Imaging Data and Resource Center (MIDRC) has taken diversity, especially bias, very seriously in terms of their researchers and the data coming in, to avoid biased algorithms.

Additional suggestions included having, for example, a specific aspect of DEBUT calling for technologies that address health problems of underrepresented communities; assessing how much diversity is incorporated into the development of phantoms and other technologies such as where skin tone comes into play; and systematically integrating opportunities for diversity research in the mentoring process.

III. Concept Clearances

Bioengineering Partnership with Industry: Dr. George Zubal presented a concept clearance on a new funding opportunity to stimulate academic/industry interaction. Current funding opportunities designed for this type of interaction include the Bioengineering Research Partnership (BRP) and the Academic-Industrial Partnership (AIP). NIBIB proposes to issue a new FOA that would combine the best features of the BRP and AIP programs.

The new FOA was described as a hybrid-BRP/AIP, named the Bioengineering Partnership with Industry (BPI). The BPI would emphasize commercialization and clinical applications and use a U01 mechanism that requires deliverables and milestones.

The new funding opportunity announcement will have an emphasis on commercialization targeting projects that include first-in-human testing leading to FDA approvals and investigational device exemptions (IDEs); establishing proof of concept with first-of-its-kind system development; and stimulating pre-commercial prototype production, and release of software packages.

Council members were supportive of this concept and liked the idea of pulling the best parts from the BRP and AIP programs into one new program. There were questions about how much research and how much development was hoped for in this program. Dr. Zubal explained that it was hoped that the program would support newer ideas at early stages of development that would move more toward commercialization in the later years of the project.

Team-Based Design in Biomedical Engineering Education: Dr. Greve presented a concept clearance on the reissuance of Team-based Design in Biomedical Engineering Education, which uses an R25 Research Education Program mechanism. The program began in 2010 and targeted junior and senior undergraduates and first-year graduate students in biomedical engineering departments and programs. Those early programs encouraged innovative courses, multidisciplinary training, and diversity inclusion.

The program has evolved over the last ten years with new emphasis on clinical immersion, training in regulatory pathways for commercialization of medical devices, workforce development in both research and healthcare technologies, and undergraduate team-based activities.

The plan for the reissuance is to encourage integration of health equity into course design from the beginning; expand the clinical immersion perspective with community-based engagement and problem-driven solutions; and encourage multidisciplinary teams that include nursing, computer engineering, data science, and public health.

Council members were supportive of this concept and liked the idea of including more nursing and public health care into the program. Members also stressed that building equity and diversity into the program was of paramount importance and applauded that aspect of the program. Regarding a question about the level of engagement from Historically Black Colleges and Universities (HBCUs) and smaller institutions that may not have medical schools, Dr. Greve noted that the need for virtual contact over the past 18 months had

increased the ability for smaller institutions to engage with medical institutions and set up partnerships.

IV. NIH DATA Scholars

Three NIH DATA scholars presented their work over the past year in collaboration with their NIBIB mentors.

Dr. Mohammad M. Ghassemi: BRAINWORKS: Workspace to Organize Knowledge Space. Dr. Ghassemi was introduced by his NIBIB mentor Dr. Grace Peng. He described his work, developing the “BRAIN initiative Workspace to Organize the Knowledge Space” platform (BRAINWORKS). The workspace is a tool that integrates multi-modal, multi-scale brain data and knowledge with the goal of discovering comprehensive theories of brain function.

A central BRAINWORKS project was the development of a web application that uses AI to organize the neuroscience literature as a knowledge graph, which combines data that unites information on grants, papers, topics, authors, institutions, and patents.

Dr. Ghassemi presented visualized data that displays nodes of research topics, research trends, and how various topics co-occur in papers published by BRAIN awardees. The visualizations tracked how such co-occurrences increase inter-group and intra-group output over five-year periods of BRAIN funding. Other examples of data generated through the visualizations included data on increases in major and minor group collaborations over various periods of BRAIN funding.

Dr. Rui C. Sá: MIDRC COVID-19 and Beyond: Dr. Sá was introduced by his NIBIB mentor Dr. Kris Kandarpa. Dr. Sá worked with Medical Imaging Data and Resource Center (MIDRC), which was created to collect and curate medical images with adjunct clinical data and develop AI/machine learning (ML) methods to aid in the analysis and interpretation of medical images in response to the COVID-19 pandemic.

Dr. Sá outlined the achievements of MIDRC over the past year. Early achievements centered around building infrastructure and the standardization of processes, including de-identification, quality control, and annotation necessary before the data is released publicly. Such data needs to be AI/ML ready, Findable, Accessible, Interoperable, and Reusable (FAIR) and represent the diversity in populations.

A critical mission of MIDRC is to address problems such as siloed datasets that lack diversity and cannot be generalized to other populations, and critical gaps in AI/ML deployment that result from lack of diverse representative data. Several algorithms have been developed to address these issues by enriching the process of extracting clinical entities and relations from radiology reports. The algorithms are being used to construct diverse, accurate datasets that can be used to train and validate real world performance of AI/ML tools developed by MIDRC.

Dr. Judy W. Gichoya: Harnessing Data Science for Health Discovery and Innovation in Africa (DS-I Africa): Dr. Gichoya was introduced by her NIBIB mentor Dr. Tiffani Baily Lash. Dr. Gichoya gave an overview of her background and time in medical school in Kenya where Kenya was struggling with an HIV epidemic and the limited data resources that were available to answer questions, such as, who had died? Who was taking their medications? Who was losing weight? What was their support system?

Her experience made her an excellent fit with the goals of DS-I Africa, which aims to harness data science for health discovery and innovation in Africa. Grants are just being awarded in response to the four FOAs, which generated 110 applications with representation from 28 African countries and collaborators from North America and Europe. She described the concept of the DS-I Africa Hive Learning Ecosystem, which builds on her experience with village mentoring with cross-disciplinary groups and support structures.

The ecosystem features contributions from diverse participants involved in data science and healthcare in the

communities they serve. The ecosystem includes cross-disciplinary expertise from data scientists, clinicians, educational agencies, and teachers, and supports cross-cultural discussions between students and community members. People within the hive create a support network that helps students learn and persevere as they navigate co-evolving fields like AI and data science.

Dr. Tromberg thanked all the data scholars and noted that their work with the tremendous enthusiasm for building diversity into all aspects of biomedical research and development.

V. Adjournment

The open session of the NACBIB meeting was adjourned at 4:27 p.m.

VI. Closed Session

Review of Council Procedures and Regulations: Dr. David T. George

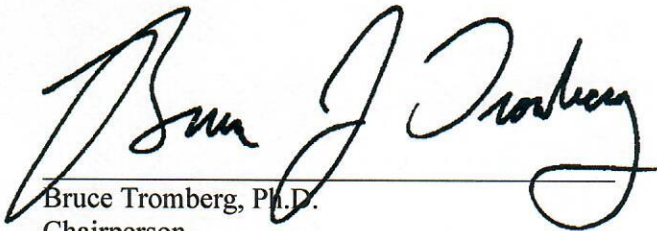
The grant application review portion of the meeting was closed to the public in accordance with provisions set forth in Section 552b(c)(4) and 552b(c)(6), Title 5, U.S. Code, and 10(d) of the Federal Advisory Committee Act, as amended (5 U.S.C. appendix 2). The closed session was adjourned at 4:49 p.m.

Certification:

We certify that, to the best of our knowledge, the foregoing minutes are accurate and complete.³



David T. George, Ph.D.
Executive Secretary
National Advisory Council for Biomedical Imaging and Bioengineering
Associate Director for Research Administration
National Institute of Biomedical Imaging and Bioengineering



Bruce Tromberg, Ph.D.
Chairperson,
National Advisory Council for Biomedical Imaging and Bioengineering
Director,
National Institute of Biomedical Imaging and Bioengineering

³ These minutes will be approved formally by the Council at the next meeting on January 19, 2022, and corrections or notations will be stated in the minutes of that meeting.