

## Brain Health and Disease Across the Lifespan Task Force– 2023 Updates

In 2022, the Brain Health Task Force (BHTF) proposed the pursuit of specific goals that would accelerate the pace of scientific discovery at the UAB Heersink School of Medicine (HSOM) by promoting excellence in fundamental, translational, and clinical neuroscience research. Additionally, these goals were proposed to align the HSOM with the NIH's strategic plan, which included many neuroscience-relevant priorities. The BHTF strategic research proposal outlined the use of task force funds for investment and growth in 1) personnel and training, 2) core facilities, and 3) equipment and infrastructure. In the past year, we have initiated or completed the following investments:

**Personnel, workforce, and training.** Before 2022, the HSOM had already initiated highly successful strategic recruitment efforts for faculty in the neurosciences, and UAB had experienced tremendous growth in funding from neuroscience-relevant NIH institutes. To maximize growth potential, the BHTF participated in, or initiated programs designed to bolster recruitment efforts at the faculty, postdoctoral, and staff scientist levels.

- *Strategic Neurosciences Faculty Recruitment.* BHTF members (including Dr. Erik Roberson) helped to lead the renewed [Strategic Neurosciences](#) recruitment program, which seeks to recruit up to 20 faculty at all ranks as part of a major strategic initiative in the Neurosciences. This effort was launched in June 2023, and as of September 2023, this initiative has received over 120 applications and led to 9 faculty candidate interviews.
- *Brain-PRIME Postdoctoral Program.* In August of 2023, the BHTF launched a new program to enhance the recruitment of postdoctoral scholars to the UAB HSOM. Termed [Brain-PRIME](#) (Postdoctoral Research Initiative for Multidisciplinary Exploration), this program offers increased stipends, career development funds, advanced career mentoring and training, and a cohort-based streamlined application process. The Brain-PRIME program, directed by BHTF lead Dr. Jeremy Day, was designed to create a vital pipeline for diverse junior investigators to drive Neuroscience research at UAB to new heights. This program was created based on similar initiatives currently in place at many peer institutions and will coincide with an overall expansion of Neuroscience faculty at UAB. In less than a month (and without significant external advertising), the program has already received 6 applications.
- *Bioinformatics Recruitment.* To harness recent quantitative advances in sequencing-based readouts from brain tissues, brain machine interfaces, and brain imaging, the BHTF proposed additional recruitment of bioinformatics specialists into existing data science core facilities to prime the pump in this area and promote the implementation of big data and machine learning approaches for brain health. In pursuit of this goal, the BHTF committed \$25,000 (in partnership with additional commitments from D-Tech and I-4ward Themes) towards focused recruitment of a new data scientist into the HSOM bioinformatics community. We envision that this recruitment, in coordination with the [UAB Biological Data Sciences Core](#), will enhance capabilities in spatial and single-cell transcriptomics, which was a shared goal across focus areas.

**Equipment and infrastructure investments.** The UAB Neurosciences community already benefits from prior investments in equipment, including PET and MRI machines for human research, microscopy and imaging facilities, behavioral assessment cores for animal models, small animal imaging facilities, and world-class genomics and bioinformatics facilities. However, to maintain the pace of research growth, the BHTF committed additional investments in the following areas:

- *High resolution spatial transcriptomics.* The BHTF partnered with I-4ward focus area leader Dr. Fran Lund, D-Tech leaders, and other campus leaders in this space to help fund the purchase of a 10X Genomics Xenium instrument. This instrument permits robust error-free and highly multiplexed detection of hundreds to thousands of mRNA transcripts in tissue samples. High-performance *in situ* gene expression mapping will enable breakthrough discoveries using patient biopsies, postmortem human brains, brain organoid systems, and brain samples from animal models. The BHTF committed \$100,000 towards the purchase of this instrument and obtained partner donations from many other campus centers and departments. BHTF and I-4ward task force leaders worked together to submit an HSF-GEF proposal in June of 2023 that would provide the remaining financial commitments for the

purchase of this instrument. Once obtained, the instrument will be located in the [UAB Flow Cytometry and Single Cell Core Facility](#), directed by Dr. Troy Randall.

**2024 Goals.** In addition to these efforts, the BHTF initiated planning and discussions designed to support our long-term goals. In the coming year, we plan to continue working towards the previously established goals, in addition to continuing efforts on the accomplishments and initiatives outlined above.

- *Fostering Graduate Student Recruitment.* The BHTF proposes growth of graduate trainees in neuroscience labs by 10% each year for the next 5 years, supported by investments in existing PhD programs such as GBS Neuroscience and Neuroengineering. The BHTF is currently developing plans for the best approaches to enhance recruitment in this area and will implement these plans in the 2023-2024 application cycle.
- *Creation of a Human Neuroscience Cell Culture Core Facility.* This facility would obtain commercially available patient-derived samples from across the lifespan, generate human neurons and other brain cells to integrate into ongoing research in UAB labs, maintain inventories of human derived cells for rare brain disease states, and provide equipment for high-throughput recording and modulation of patient-derived neurons.
- *Creation of a UAB Brain, Biospecimen, and Data Repository.* Despite UAB's unique patient population, the collection of research quality biosamples (e.g., blood, urine, CSF, postmortem brain tissue, and cell samples) in UAB clinics lag behind peer institutions. As a long-term goal, we propose a strategic investment to grow a facility that would facilitate the collection of biosamples and other relevant clinical/diagnostic data across the UAB Health System and Children's Hospital of Alabama, integrate biosample metadata with existing patient genetic databases, and collect/maintain relevant "neurodata" from ongoing neurosurgery, PET, and MRI activities at UAB. This resource would fill a current gap at UAB, resulting in 1) significant expansion of access to postmortem samples from individuals with neurodegenerative conditions and neurodevelopmental disorders, 2) the ability to perform cutting-edge research to identify blood-based biomarkers for patients vulnerable to addictions, chronic pain, unhealthy aging, and Alzheimer's disease, and 3) integration of biosample information with key brain and peripheral signatures of disease.
- *Create a UAB Brain Supercomputer.* Increasing experimental complexity in the neurosciences will require unique computing power and hardware resources. We propose the establishment of a supercomputer with priority access for neuroscience labs that will permit appropriate storage, management, and analysis of highly dimensional data generated by next-generation neuroscience tools.

**Task force members:**

Jeremy Day, PhD  
Lynn Dobrunz, PhD  
Alayne Markland, DO  
Matt Alexander, PhD  
Donna Murdaugh, PhD

Erik Roberson, MD, PhD  
Karen Cropsey, PsyD  
Brian Samuels, MD, PhD  
Bobby Brunner, MD