VISION

Ohio State will be a global leader in the prevention, characterization, detection, and treatment of brain injuries and neurodegenerative disease.

MISSION

The Chronic Brain Injury Program (CBI) will:

• Drive interdisciplinary and translational research in neurotrauma and neurodegenerative disease

• Facilitate collaboration and engagement across complementary research teams and external partners

• Invest in talent, innovation, shared resources, and training
### CHALLENGES

Brain injury is an invisible and costly epidemic that affects the health, education, careers, relationships, and social participation of individuals, families, and communities. Existing CDC and 2021 Ohio Brain Injury Program data show alarming prevalence and impact of brain injury here and across the nation. To respond to this societal challenge, CBI enables researchers and clinicians to address the full scope and complexity of brain injury through a broad scope and an ambitious set of goals.

- **25%**
  - 1 in 4 Ohio adults will be a brain injury survivor.

- **15**
  - TBIs occur every 15 seconds, more frequently than breast cancer and heart attacks.

- **$77B**
  - Each year, Ohioans incur $6B in direct costs and lost wages; nationally, TBIs cost $77B.

- **70%**
  - Up to 70% of brain injury survivors may face long-term consequences.

- **50%**
  - Up to 50% of concussions may go unreported.

- **?**
  - Limited awareness and training is commonly reported among health professionals.
ABOUT US

CBI creates research and clinical teams across Ohio State and partner organizations who are necessary to solve the health, care, and life challenges of neurotraumas.

Our faculty study a variety of conditions including traumatic brain injury, concussion, stroke, spinal cord injury, mental health, vision, speech, aging, and dementia.

We are developing and improving our understanding and capabilities in translational neuroscience, diagnostic tools, and treatment in clinic and at home.

By leveraging this broad and diverse scope, we can create meaningful change for children, older adults, veterans, athletes, victims of violence, and others affected by chronic brain injury.

SCOPE & SCALE

Chronic Brain Injury

the persistent and progressive life-long effects of brain injury that affect health, independent function and participation in society

110
Faculty Affiliates

11
Colleges

37
Departments
To create change across a broad scope and complex challenges, CBI has set five critical goals shown below that reflect our mission, challenges, and areas of strength and capability. Our program activities are designed against these goals to engage and support faculty, staff, and students to develop impactful projects, improve our research and training environment, and transfer our knowledge to clinicians and community members. In FY21, we launched new funding programs and initiatives to capture larger grants and connect deeper with the clinical community.
As CBI has grown, our faculty affiliates have developed or joined several inter-disciplinary and cross-college research clusters. Each of these areas is developing collaborative projects and publications in order to compete for extramural center and program grants. In FY2021, the Big Data & Population Research and Neuro-Immune Mechanisms clusters launched proposals for multi-million dollar team science grants, while the Trauma & Mental Health group began planning ahead of training and center grants.
OUTCOMES

FY2021 and lifetime metrics are shown for our Core Faculty, including specifically CBI's Program Faculty. In addition, CBI has contributed to a dramatic rise in annual NIH funding for brain injury research, with Ohio State now ranking among the top ten institutions for active NIH projects in both traumatic brain injury and concussion.

*Data for the period July 1, 2020 to June 30, 2021
Financials obtained from e-Activity & Workday | Publications obtained from Scopus
CBI's signature Pilot Award Program invests in teams of scientists that bridge colleges and institutions. Each team is granted $25,000 to realize ambitious ideas and to advance projects to the next level. Since 2016, CBI has funded 47 team projects. Over 40% of our completed projects have already found success, capturing $15.1 million in resulting extramural awards from federal, industry, and foundation funders. In FY2021, CBI funded five new projects featuring newly-eligible translational and transdisciplinary partnerships with nationally-renowned hospitals and local schools.

**A bedside multimodal imaging approach for detection and evaluation of ischemic and hemorrhagic stroke**
Yousef Hannawi, MD | Emre Ertin, PhD
Engineering, Medicine

**A multi-functional electronic tattoo for spasticity tracking and management in severe TBI patients**
Jinghua Li, PhD | William Rymer, MD, PhD | Kiryung Lee, PhD
Engineering, Shirley Ryan AbilityLab

**Does Urinary Tract Infection (UTI) Worsen Outcome Following Central Nervous System (CNS) Trauma?**
Olga Kokiko-Cochran, PhD | Dana McTigue, PhD | Irene Crescenze, MD
Medicine

**Understanding the neurodevelopmental effects of football-related neurotrauma across first year of tackle football participation**
Jaclyn Caccese, PhD | Ginger Yang, PhD | Daniel Cohen, MD
Medicine, Public Health, Nationwide Children’s Hospital

**FORM: Flexion sensors for monitoring on-field activities following return to play from mTBI**
Jaclyn Caccese, PhD | Asimina Klouri, PhD
Engineering, Medicine
**RESEARCH**

Starting in FY2021, CBI began to build beyond fostering individual success and new collaborations to sustaining successful collaborations through larger initiatives featuring multiple projects or integrated activities. CBI awarded its inaugural Action Potential Grant (APG), a planning grant intended to develop multi-college teams that together can address a complex issue in brain injury.

Formation of OSU’s Transformative, Transdisciplinary Research Program in Brain Trauma from Interpersonal Violence (BT-IPV)
Juliana Nemeth, PhD (lead) | Public Health
Jasmeet Hayes, PhD | Arts & Sciences
Cole Vonder Haar, PhD | Medicine
Cecilia Mengo, PhD | Social Work
Rachel Ramirez, LISW-S | Ohio Domestic Violence Network

**TEAM SCIENCE**

CBI faculty affiliates found success in new campus funding programs, with six affiliates receiving the President’s Research Excellence (PRE) Accelerator Grants, including projects led by three CBI Core Faculty. Additionally, CBI Core Faculty members received a Seed Funding for Racial Justice award.

Examining the Role of Physical Fitness in Cognitive and Brain Health of Ohio Senior Olympians
Scott Hayes, PhD | Arts & Sciences

In-Situ 3D Printing of Wireless Medical Implants
Asimina Kiourti, PhD | Engineering

Kathy Wright, PhD | Nursing

**PAPER OF THE YEAR**

Since 2018, CBI has held an annual competition to select our most impactful publication from the past calendar year. In 2020, our Paper of the Year was *A new neutrophil subset promotes CNS neuron survival and axon regeneration*, by Andrew Sas et al, published in Nature Immunology.

Chronic Brain Injury Program | Annual Report | FY 2021
RESEARCH

HIGHLIGHTS

Jennifer Lundine, PhD was awarded a two-year R03 grant from the Eunice Kennedy Shriver National Institute of Child Health & Human Development to better understand how young concussion survivors can safely return to driving. One of the projects, ‘Longitudinal Assessment of Driving After Mild TBI in Teens’, was developed from a CBI Pilot Award project. The other project ‘Adoption and Implementation of an Evidence-based Safe Driving Program for High-Risk Teen Drivers’, focuses on testing the effectiveness, implementation, and cost-effectiveness of an evidence-based safe driving intervention tailored to the needs of rural and urban teen drivers with a traffic violation.

Ginger Yang, PhD was awarded two NIH R01 grants in September 2020 from the Eunice Kennedy Shriver National Institute of Child Health & Human Development to better understand how young concussion survivors can safely return to driving. One of the projects, ‘Longitudinal Assessment of Driving After Mild TBI in Teens’, was developed from a CBI Pilot Award project. The other project ‘Adoption and Implementation of an Evidence-based Safe Driving Program for High-Risk Teen Drivers’, focuses on testing the effectiveness, implementation, and cost-effectiveness of an evidence-based safe driving intervention tailored to the needs of rural and urban teen drivers with a traffic violation.

Shahid Nimjee, MD, PhD was awarded an NIH R01 from the National Institute of Neurological Disorders and Stroke (NINDS) to continue his discovery in reversible stroke therapeutics. Dr. Nimjee is a neurosurgeon and clinical researcher, and his project, “A novel thrombolytic targeting Von Willebrand Factor (VWF) to treat ischemic stroke”, will be awarded $3 million.

Kathryn Lenz, PhD won seed funding from the Brain Injury Association of America to study sex-differences and developmental effects of pediatric TBI, and how the immune system may influence brain myelination and behavior.

Jan Schwab, MD, PhD received the 2020 Apple Award from the American Spinal Injury Association (ASIA) for his work on “Outcome heterogeneity and bias in acute experimental spinal cord injury”, a meta-analysis of several decades of preclinical research showing systemic bias for positive findings that undermine successful translation of findings into therapies. The Apple Award recognizes the best published paper on spinal cord injury rehabilitation in the preceding year.
**RESEARCH**

**HIGHLIGHTS**

**John Corrigan, PhD** directs the Ohio Brain Injury Program, which was awarded a two-year Traumatic Brain Injury (TBI) State Partnership Program from the Administration on Community Living in the U.S. Department of Health and Human Services. The grant will allow the program to continue to focus on workforce training and policy change to assure that Ohio’s Home and Community Based Services waivers are optimized for serving persons living with disability who have experienced brain injury. More than 100,000 non-institutionalized adults in Ohio report that they have a disability and that they have had at least one moderate or severe TBI in their lifetime. Ohio is one of 27 states receiving TBI State Partnership Program grants.

Additionally, the Ohio Brain Injury Program received an increased appropriation as part of the latest state budget. Signed by Governor DeWine, the budget includes $550,000 annually for the Ohio Brain Injury Program. This is an increase of approximately $425,000 from the current, annual state funding. These funds will be used to develop services and infrastructure to better identify needs and deliver education and support to the estimated 1 in 4 Ohio adults who will experience brain injury in their lifetime.

**Andrea Tedeschi, PhD** earned a spot in the top 20 in the 2021 Nikon Small World Competition. Dr. Tedeschi, an Assistant Professor of Neuroscience, earned sixth place by capturing a hyper-close image that shows the complex vasculature of an adult mouse brain. This phenomenal image is featured on our cover page. The annual competition receives thousands of entries and recognizes the world’s most outstanding microphotography across scientific disciplines.

**Catherine Quatman-Yates, PhD** was selected by the National Council on Aging and U.S. Administration for Community Living as one of four EMS-Academic partnerships to showcase as a model of excellence in fall prevention efforts. Falls are the leading cause of traumatic brain injury. The “Community-FIT – CARES” partnership with the Upper Arlington Fire Department was featured in a national webinar by the U.S. Administration for Community Living.

**Andrea Tedeschi, PhD** was elected as Secretary for the National Neurotrauma Society (NNS). The organization serves as an advocate and supporter of basic neurotrauma research.

**Olga Kokiko-Cochran, PhD** was selected as Secretary for the National Neurotrauma Society (NNS). The organization serves as an advocate and supporter of basic neurotrauma research.
**EDUCATION**

**Buckeye Neurotrauma Lectures**
As a complement to successful internal seminar series and events, CBI launched the Buckeye Neurotrauma Lecture series in January 2021 with partners in the College of Medicine’s Center for Brain & Spinal Cord Repair. These talks feature prominent Ohio State faculty studying brain and spinal cord injuries speaking to a national audience.

**Open Access Neuroscience**
Liz Kirby, PhD, Assistant Professor of Psychology, was awarded an Early Concept Grant for Exploratory Research (EAGER) from the National Science Foundation to create an open access, online resource intended to provide free access to foundational neuroscience information for undergraduates world-wide. The two-year award will bring together the expertise of 19 authors who collectively represent broad institutional, ethnic, racial and gender diversity.

**TBI Course Series**
Kris Martens, PhD, Assistant Professor of Neuroscience, is leading development of a three-course graduate-level series covering traumatic brain and spinal cord injury topics. The course series is planned for Spring 2022, and will be open to undergraduates.

**Summer Undergraduate Research Fellowships (SURF)**
CBI offers fellowships to support young researchers completing summer projects with our affiliates. These fellowships create an additional training component to funded research projects.

- **Modeling Metabolic Syndrome following Spinal Cord Injury in Rodent Models of SCI**
  Fellow: Askhaykumar Ganesh | Neuroscience
  Mentor: Jan Schwab, MD, PhD | Neurology

- **The Experience of Caregiving for Family Members Experiencing Cognitive Dysfunction and Recovery after an ICU Stay**
  Fellow: Maria Weibel | Nursing
  Mentor: Judith Tate, PhD | Nursing

- **The Role of Mast Cells in the Cognitive and Inflammatory Consequences Following Juvenile Traumatic Brain Injury**
  Fellow: Brooke Schatz | Neuroscience
  Mentor: Kathryn Lenz, PhD | Psychology

- **Ischemic Stroke: The Role of Aging in Neuromuscular Pathophysiology and Motor Recovery**
  Fellow: Gregory Owendoff | Biomedical Sciences
  Mentor: W. Dave Arnold, MD | Neurology

- **De-noising E-Textile Sensors for Real-World Kinematics Monitoring after mTBI**
  Fellow: Tony Han | Electrical & Computer Engineering
  Mentor: Asimina Kiourti, PhD | Electrical & Computer Engineering
CBI is fortunate to work with several campus and external groups as part of its team-building and outreach missions. Notable new partnerships in FY2021 include:

- Working with memBRAIN to develop recyclable paper-based bicycle helmets through testing at Ohio State’s SIM Center.
- Coordinating with the Defense Health Agency’s TBI Center of Excellence to expand training and resources for Ohio veterans living the effects of brain injury.
- Connecting faculty in Health & Rehabilitation Sciences to Spirit Club, an disability-inclusive online fitness provider to develop post-therapy activities for survivors and their family members.
As part of our initial mission within Discovery Themes, CBI partnered with 5 colleges and 12 departments to recruit 20 new faculty to the university, including Giles Plant and Hiroki Taniguchi in FY21. These interdisciplinary faculty are successful in both research impact, creating new collaborations across research groups, and supporting CBI’s activities. Additionally, our Program Faculty represent a total of 84 undergraduate students, 49 graduate students, and 11 postdoctoral researchers.
CORE FACULTY

In addition to Program Faculty hired via Discovery Themes, our Core Faculty members are highly engaged contributors to the CBI mission and program activities. Core Faculty attend events, serve on advisory boards and as reviewers, poster judges, mentors, and gateways to new and exciting collaborative research.

Michele Basso, EdD, PT
Professor
Health & Rehabilitation Sciences
Medicine

Sheital Bavishi, DO
Assistant Professor
Physical Medicine & Rehab
Medicine

Cynthia Beaulieu, PhD
Associate Professor
Physical Medicine & Rehab
Medicine

Marcia Bockbrader, MD, PhD
Assistant Professor
Physical Medicine & Rehab
Medicine

Jennifer Bogner, PhD
Professor
Physical Medicine & Rehab
Medicine

John Corrigan, PhD
Professor Emeritus
Physical Medicine & Rehab
Medicine

Daniel Efferman, MD
Associate Professor
Surgery
Medicine

Daniel Gallego-Perez, PhD
Assistant Professor
Biomedical Engineering
Engineering

Jonathan Godbout, PhD
Professor
Neuroscience
Medicine

Chen Gu, PhD
Associate Professor
Biological Chemistry and Pharmacology
Medicine

Yousef Hannawi, MD
Assistant Professor
Neurology
Medicine

Andrew Hartwick, OD, PhD
Associate Professor
Optometry

Kristin Hoskinson, PhD
Assistant Professor
Center for Biobehavioral Health
Nationwide Children’s Hospital

Deb Kegelmeyer, DPT
Professor
Health & Rehabilitation Sciences
Medicine

Anne Kloos, PhD, PT
Professor
Health & Rehabilitation Sciences
Medicine

Christine Katerba, PhD
Assistant Professor
Center for Biobehavioral Health
Nationwide Children’s Hospital

John Lannutti, PhD
Professor
Material Science & Engineering
Engineering

Deborah Larsen, PhD, PT
Professor & Associate Dean
Health & Rehabilitation Sciences
Medicine

Kathryn Lenz, PhD
Associate Professor
Psychology
Medicine

Benedetta Leuner, PhD
Associate Professor
Psychology
Arts & Sciences

Jennifer Lundine, PhD
Assistant Professor
Speech & Hearing Sciences
Arts & Sciences

Dana McGivney, PhD
Professor & Associate Dean
Neuroscience
Medicine

W. Jerry Mysiw, MD
Professor
Physical Medicine & Rehabilitation
Medicine

Juliana Nemeth, PhD
Assistant Professor
Health Behavior & Health Promotion
Public Health

Shahid Nimjee, MD, PhD
Assistant Professor
Neurological Surgery
Medicine

Jose Otero, MD, PhD
Associate Professor
Pathology
Medicine

Phillip Popovich, PhD
Professor & Chair
Neuroscience
Medicine

Catherine Quatman-Yates, PhD, DPT
Assistant Professor
Health & Rehabilitation Sciences
Medicine

Karen Rose, PhD
Professor
Nursing

Sean Rose, MD
Assistant Professor
Neurology
Nationwide Children’s Hospital

Andrew Sas, MD, PhD
Assistant Professor
Neurology
Medicine

Hudson ‘Gerry’ Taylor, PhD
Professor
Center for Biobehavioral Health
Nationwide Children’s Hospital

Lise Worthen-Chaudhari, PhD, MFA
Research Scientist
Physical Medicine & Rehab
Medicine

Ginger Yang, PhD, MPH
Professor
Center for Injury Research & Prevention
Nationwide Children’s Hospital

Phillip Yuhas, OD, PhD
Assistant Professor
Optometry

Min Zhou, MD, PhD
Associate Professor
Neuroscience
Medicine
Acknowledgements

This report was compiled by the CBI Program Staff: Kedar Hiremath, Julie Hannahs, Jenna McCloskey & Jonathan Godbout.

Images provided by:

Andrea Tedeschi, PhD
Lise Worthen-Chaudhari, PhD
Ohio State Insights

Chronic Brain Injury Program
190 N. Oval Mall, Suite 08A
Columbus, OH 43210
Phone: 614-292-9023

© 2022. All rights reserved.