The AMBI is an interdisciplinary group, embedded into the Center on Aging, seeking innovative ways to diagnose, prevent, and delay natural or disease-related cognitive, functional, and mental decline with aging.
The Aging Mind and Brain Initiative continues to seek innovative and interdisciplinary methods for the diagnosis and prevention of the disorders of aging that incur cognitive or functional decline.

**MISSION**

The Aging Mind and Brain Initiative continues to seek innovative and interdisciplinary methods for the diagnosis and prevention of the disorders of aging that incur cognitive or functional decline.

**VISION**

Campus-wide integration of world-class brain research programs that are charged with tackling the neurosensory decline associated aging in partnership with the expertise of the Aging Mind & Brain Initiative and University of Iowa.

A “connectome,” or map of neural pathways and wires, of a human brain (Human Connectome Project)
http://www.humanconnectomeproject.org/gallery/
INTRODUCTION

The Aging Mind and Brain Initiative (AMBI) serves as the research arm of the University of Iowa Center on Aging (COA). The COA also hosts educational and clinical initiatives that support and interact with researchers in both their implementation of projects and outreach in the community. Thus, the collective strengths of AMBI and the COA leadership are represented in this report.

It is projected that by 2050, the number of people >65 years of age will triple and the number of centenarians will increase by 16 fold. The global trends of young children (under 5 years) and seniors (65 and over) suggest a continued decline in the number of children and a dramatic surge in seniors (An Aging World, 2015), leading to increased morbidity while prolonging life. These statistics drive the goals of the Aging Mind & Brain Initiative to help develop better healthy living outcomes for seniors and contribute to policy development in Iowa to achieve these goals.

![Young Children and Older People as a Percentage of Global Population: 1950 to 2050](image)


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**Highlights from the most recent US Census report include:**

- America’s 65-and-over population is projected to double, from 48 million to 88 million by 2050.
- By 2050, global life expectancy at birth is projected to increase from 68.6 (2015) to 76.2 (2050).
- The global population of the “oldest old” — people aged 80 and older — is expected to triple between 2015 and 2050, growing from 126.5 million to 446.6 million.
- Among the older population worldwide, non-communicable diseases are the main health concern.
Reduction in risk factors such as infection, tobacco and alcohol use, consumption of vegetables and fruit, and increased levels of physical activity have contributed to increased life expectancy.

Life expectancy at age 100 has remained constant for the last 100 years.

The longest documented life of 122.5 was reached in 1997 and has not been exceeded since.

These statistics not only affect a person’s ability to live a healthy retirement, but also will have an impact on one’s ability to fund their retirement once they stop earning a paycheck. In fact, according to a CNN Money report, “The world’s richest countries need to drastically hike their retirement ages in order to prevent pension systems from collapsing, according to the World Economic Forum.” (http://money.CNN.com, 5/26/2017) The report goes on to suggest that adults work until at least age 70 and this will likely become the norm. If people are living longer and the average retirement has remained the same over the years, undoubtedly pension funds simply will be unsustainable resulting in a gap of over 300 trillion by 2050 (WEF, 2017).

To develop countermeasures at all levels (bench, bedside, policy, and outreach), the AMBI has assembled an exemplary team of interactive investigators across the following research areas:

✓ Long-term care, family and social welfare policy (K. Arora PhD, CPH)
✓ Social factors in aging and health (S. Ashida, CPH)
✓ Mobile and e-Health systems (O. Chipara, CLAS)
✓ Brainstem homeostatic circuits that are affected in aging (J. Geerling, MD, PhD, CCOM)
✓ Neuroimaging processing and MR imaging (M. Jacob, COE)
✓ Regulation and structure of myelin in neurodegeneration (J. Kamholz, CCOM)
✓ Dementia in long-term care (W. Liu, CON)
✓ Aging, cardiovascular disease, sleep disorders, and cognition (C. Moon, CON)
✓ Cognitive symptoms of Parkinson’s disease (N. Narayanan, CCOM)
✓ Understanding cognitive artifacts in aging (P. Pennathur, COE)
✓ Neuronal control of cellular stress responses (V. Prahlad, CLAS)
✓ Neural mechanisms underlying adaption of behavior and cognition (J. Wessel, CLAS)
✓ Communication in elderly caregiving (K. Williams, CON; recently left)
✓ Neuroscience of aging (M. Voss, CLAS)
✓ Molecular Mechanisms of Aging Synaptic Function (S. Young, CCOM)
GOALS: 2016-17

AMBI continues to gain recognition as a comprehensive center that is truly translational to the community through the integration of the AMBI with geriatric education (GWEP, HRSA), clinical care (Frailty, Huntington’s) and outreach (depression, falls prevention, and dementia care).


- Matt Rizzo, Steven Anderson, and Bernd Fritzsch are editors of a new Handbook of the Aging Mind and Brain, published by John Wiley & Sons Publishing. Participating authors from the Aging Mind & Brain Initiative include Fritzsch, Ashida, Prahlad, Narayanan, Voss, Williams, with numerous other contributors from across multiple UI colleges and disciplines (Nursing, Public Health, Medicine, and Liberal Arts & Sciences) for a total of 36 chapters.

Goal #2: With the Center on Aging, become the central aging hub for the state of Iowa through interactions with other groups to coordinate state-wide basic, translational and outreach programs.

- Initiated contact with Linda Miller, director of the Iowa Department on Aging. Ongoing discussions on how to improve technologies to benefit aging Iowans include ways in which our faculty (Arora, Liu, and Ashida) might participate in evaluating their programs.

- Expanded AAA interactions with Joe Sample, former director of Heritage Agency on Aging and newly appointed director of the i4a (Iowa Association of Area Agencies on Aging).

- Invited University program leaders and chairs to discuss potential collaborations. These guests included:
  - Karim Abdel-Malek from the College of Engineering, the UI Center for Computer Aided Design, and Office of the Provost
  - Richard Shields from the Department of Physical Therapy and Rehabilitation Science
  - Marlan Hansen from the Department of Otolaryngology and the Institute for Clinical and Translational Science (ICTS)
  - Cathy Cole and Alice Wang from the Tippie College of Business
  - Jean Gordon from Speech & Hearing
  - Mercedes Bern-Klug from the Department of Social Work and the Certificate Program in Aging & Longevity Studies
  - Charles Brenner from Biochemistry and the Obesity Research and Education Initiative
  - Margaret Chorazy from the undergraduate program in the College of Public Health

- Leadership attended local, state, and national meetings on aging with an emphasis on Falls Prevention Programs.

- Collaborated on a project entitled, “Healthy Aging Collaboratory” led by Marianne Smith and funded by the Office of the Vice President for Research. More details are later in this report.
Began developing a Falls Prevention research program in collaboration with the Center on Aging.

Worked with the Center on Aging and Joe Sample to develop collaborations in both the College of Public Health and the College of Nursing, as well as contribute to discussions regarding legislative issues with representatives from the Older Iowans Legislature. We have, in turn, incorporated these discussions into planning of the UI Strategic Plan.

Fritzsch and Ted Abel, Director of the Iowa Neuroscience Institute, collaborated on a NeuroNex grant submission in the Fall of 2016, which received favorable reviews, though was not funded. Regular meetings continue with the aim to reapply and develop the basic learning related project for NIH funding, currently aiming for a PPG application to NIA.

Kanika Arora was appointed Director of the STAR (Seniors Together in Aging Research) Registry, a registry of >1700 seniors aged 50+ interested in participating in research.

GOALS: 2017-18 AND BEYOND

Continued funding from the Office of the Provost for the ability to fund four pilot grants for AMBI faculty ($100,000 per year), which have shown excellent return on investment since their inception. Example of this success include:

- **Ashida:** Her R21 proposal that used preliminary data collected through dementia caregiver study funded by the AMBI pilot program scored at the 32nd percentile and will be resubmitted in early-July 2017, and a CDC grant submission is pending. She is currently developing additional research proposal and manuscripts using the data from this pilot study.

- **Chipara:** Dr. Chipara recently submitted a $1.3 million proposal entitled, “A Framework for Optimizing Hearing Aids In Situ Based on Patient Feedback, Auditory Context, and Audiologist Input” to NSF’s Smart and Connected Health Program. The proposal is partly based on the on data and insights derived from his AMBI pilot award.

- **Liu:** She is preparing an R15 for submission later in 2017 that will be based on her pilot data from the Csomay and AMBI pilot awards. She is also working toward establishing and expanding her research collaborations on and off campus with the goal of integrating her research into larger multi-investigator grants.

- **Narayanan:** With the data he received as a result of AMBI pilot funding, Dr. Narayanan and his collaborator, Dr. Fairley, were awarded ICTS pilot funding in the amount of $75,000. In addition, they have applied for a VA pilot grant in the amount of $175,000, and have plans to apply for a collaborative multi-PI R01/VA merit grant in the next few months. He has an ongoing AMBI pilot award (with Mei-ling Joiner) and, as a result applied for an R21, which was not funded, but will be refined and resubmitted. Finally, with the data from his AMBI pilot award, he submitted a multi-PI R01 in the amount of $2.38 million, which just recently scored in the 7th percentile.

- **Prahlad:** Dr. Prahlad’s data collection for her funded R01 in the amount of $1.48 million was supported by her funds from her AMBI pilot grant.
- **Voss:** Dr. Voss is the PI of an R01 that has been awarded (pending IRB approval) which will be a clinical trial to test whether the benefits of physical exercise on the brain lead to improvements in learning and memory (~$2.4 million direct costs over 5 years). Data from her AMBI pilot project was featured in this proposal, and will play a critical role in optimizing innovative neuroimaging outcomes for this clinical trial. She is the PI of another R01 in the amount of $2.2 million direct costs over five years, which is under review, and data from the AMBI pilot grant was also featured in this application. In addition, she is a Co-Investigator on a Phase II SBIR cognitive training trial that has been recommended for funding (~$320,000 direct costs over 3 years).

- **Wessel:** $25,000 investment turned into $300,000 from the Roy J. Carver Charitable Trust and a pending R21 in the amount of $275,000;

- Commence work on a proposal using VirtuSense and VirtuBalance technology to monitor movement inside the home with infrared technology and Alexa (artificial intelligence, AI) to help aging seniors “age in place” with our collaborator, Western Homes of Cedar Falls. This system could alert medical professionals if the senior falls, fails to take their medication, or otherwise endanger themselves. This project utilizes computer and electrical engineers, nursing and public health professionals, as well as psychologists from the University of Iowa, Western Homes, and It’s Never Too Late [IN2L].

- Implement VirtuBalance testing in geriatric patients in the clinical setting at Iowa River Landing.

- Submit an R21/R33 on falls prevention (Fritzsch, Wolinsky).

- Additional grant planning, voice recognition to detect early stages of dementia and depression to initiate preventive measures (Smith et al).

- Continue interactions with the Iowa Department on Aging and Iowa State University and other constituents locally and across the state to develop smart homes.

- Develop the NeuroNex NSF application into an age related auditory learning decline PPG application targeted for NIA, including AMBI faculty Sam Young.

- Increase participation and diversity in the STAR Registry, develop a marketing plan to local researchers, as well as researchers at ISU and UNI to increase utilization and increase recognition of the registry.

- Develop broader grant applications including AMBI faculty with a focus on brain functional decline and its prevention. Leaders should be N. Narayanan and M. Voss.

- Restart the research project on the role of 5HT in activating heat shock proteins now that the P&T application of V. Prahlad is under way.

- Restart elderly outreach program once new faculty is hired at CoN to interact with W. Liu, K. Arora, S. Ashida, and Joe Sample.

- Develop a PPG application with AMBI investigators funded by the NIH, as well as not-yet-NIA-funded investigators with the ultimate goal of a P30/Pepper grant with relevant members of the AMBI faculty running various cores (Arora, STAR Registry; Narayanan, Human Translational Core, etc.).
CENTER ON AGING LEADERSHIP

Bernd Fritzsch, PhD
Director, Aging Mind & Brain Initiative and Center on Aging
Endowed Entrepreneurial Professor
Department of Biology

Gerald Jogerst, MD
Co-Director, Center on Aging
Professor
College of Medicine
Geriatrician and Director of Geriatrics Fellowship Program

Marianne Smith, PhD, RN, FAAN
Co-Director, Education and Outreach
Associate Professor
College of Nursing
Leads Healthy Aging Collaboratory
Director of HRSA/GWEP Education Programs

Ryan Carnahan, PharmD, MS, BCPP
Co-Director, Education and Outreach
Associate Professor
College of Public Health
Improving dementia care in nursing homes

AMBI Executive Committee
Ryan Carnahan, PharmD, MS, BCPP
Gary Christensen, MS., DSc
Bernd Fritzsch, PhD
Keela Herr, PhD, RN, FAAN, AGSF
Mathews Jacob, PhD
Gerald Jogerst, MD
John Kamholz, MD, PhD
Jodie Plumert, PhD
Marianne Smith, PhD, RN, FAAN

AMBI Internal Advisory Committee
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Mercedes Bern-Klug, PhD, MA, MSW
Kathleen Buckwalter, PhD, RN, FAAN
Peter Damiano, DDS, MPH
Bernd Fritzsch, PhD
Keela Herr, PhD, RN, FAAN, AGSF
Robert Philibert, MD, PhD
Jean Robillard, MD
Robert Wallace, MD

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Founding Director
The Stanford Distinguished Careers Institute
Former Dean, School of Medicine
David and Susan Heckerman Professor
John Renger, PhD
Associate Director, Merck
Executive Director, Neuroscience Discovery
Merck & Co., Inc.
Christoph Englert, PhD
Professor of Molecular Genetics
Leibniz Institute on Aging
Fritz Lipmann Institute and Friedrich-Schiller University
Jena, Germany
Aging Mind and Brain Initiative (AMBI)

Since FY11, the inception of the AMBI, total funding awarded to AMBI faculty is $23,378,087, and leadership $18,615,450, for a total of $39,344,056.

In FY17, AMBI Faculty have 13 funded grants as Principal Investigator or Multi-PI for a total of $2.63 million from organizations such as National Institutes of Health, US Department of Defense, National Science Foundation, Department of Education, Ellison Medical Foundation, American Cancer Society, and subcontracts from other academic institutions, as well as internal funding initiatives. There are an additional 5 funded grants as Co-investigator for a total of $2.82 million from the NIH, Fraternal Order of the Eagles, and the Roy J. Carver Charitable Trust.

Additionally, 7 grants are pending for a total of $2.6 million from organizations including the NIH, Brain Research Foundation, and the Michael J. Fox Foundation for Parkinson’s Research.

All AMBI faculty have obtained independent funding of some type since their arrival at the University of Iowa.
Kanika Arora, PhD, is an Assistant Professor in the Department of Health Management and Policy, College of Public Health, and joined the AMBI in August 2015. Dr. Arora’s research focuses on the impact of state and federal policies on caregiving behavior and health outcomes in older adults. She has served a key role with the Institute for Clinical and Translational Science (ICTS) with the Carver College of Medicine, serving on its Evaluation Core and as the representative to the “Lifespan Taskforce” that seeks to engage the special populations of children and the elderly in clinical translational research.

Dr. Arora published three papers in 2016 and has three additional paper in various stages of completion in 2017. She has teamed up with other researchers in the College of Public Health and her most recent work clearly indicates that this is already new data collected and published after her arrival at the University of Iowa. She is actively working to submit her first extramural grant application later in 2017, in addition to her involvement with ongoing participation in multi-investigator grants such as the Clinical and Translational Science Award (CTSA) in the ICTS.

Given her focus on policy evaluation, Dr. Arora received funding from AMBI to examine the effect of the Area Agency on Aging (AAA) consolidation in Iowa. In 2013, Iowa’s 13 AAAs consolidated to six leading to key questions on the effect of such reorganization on access and quality of services. While AAA consolidation is a growing nation-wide trend, no previous study has examined its effect. Dr. Arora and her team have interim findings with a plan to finalize results for publication by August 2017. She plans to use the findings from this project to apply for an R21 examining the effect of AAA consolidation in the larger mid-western region.

Highlighted publications:


Sato Ashida, PhD, is an Assistant Professor in the Department of Community and Behavioral Health, College of Public Health. Dr. Ashida’s research program examines the roles of social networks and relationships in health and health-related behaviors. She contributed to the Iowa Geriatric Education Center a presentation in the Dementia Lecture Series on “Social Relationships, Family Communication, and Well-Being.”

Dr. Ashida has published 36 papers total with nine papers alone in 2016, several manuscripts already accepted for 2017, and three under review -- excellent output from a junior investigator. Her scientific impact in terms citations suggests an h-index of 12 and a total citation around 900 (Google Scholar). Her research output is supported by substantive grant funding over the last few years, including participation on a U48. She is on the Geriatric Education Center’s
HRSA GWEP award, Dr. Ryan Carnahan’s PCORI award, and the UI Prevention Research Center. She was also awarded AMBI pilot funding in early 2017 with co-investigator, Dr. Kanika Arora. In addition, she was recently notified of a grant awarded by the Retirement Research Foundation. Her R21 proposal that used preliminary data collected through dementia caregiver study funded by the AMBI pilot program scored at the 32nd percentile and will be resubmitted in early-July 2017, and a CDC grant submission is pending. She is currently developing additional research proposal and manuscripts using the data from this pilot study.

Dr. Ashida had a great performance in terms of outreach. Her interaction with the Area Agency on Aging, Alzheimer’s Association, as well as other aging-related activities, displaying exactly the kind of outreach the AMBI and Center on Aging needs. Her expertise in this area will enable the University of Iowa outreach to be more effective. She provided outstanding service at the department, college, university and professional level and is well positioned for a promotion to Associate Professor.

Dr. Ashida has inserted herself into the teaching activities of the CPH. As AMBI moves forward to develop an aging related curriculum, such activities by AMBI faculty are essential to have courses that can be bundled to achieve such a curriculum. Her graduate student recently received a Center on Aging Poster Award during the College of Public Health Research Week for presenting the findings from her caregiving study funded by the AMBI pilot program.

Highlighted publications:

Octav Chipara, PhD, is an Assistant Professor in the Department of Computer Science at the University of Iowa and part of the Aging Mind and Brain Initiative. He received his Ph.D. from Washington University in St. Louis and completed his Postdoctoral Fellowship at the University of California San Diego. His research focuses on the systems, networking, and software engineering aspects of developing mobile health (mHealth) systems that continuously monitor and infer the health status of patients despite operating in dynamic environments and on limited battery resources. The central theme of his research is that to harness the full potential of mHealth systems, we must have better tools for programming and analyzing their properties. His work combines the design of communication protocols, middleware, and software tools with large-scale real-world deployments of working systems. Dr. Chipara’s group currently includes three PhD Students, two postdoctoral fellows, and one undergraduate. His research is supported by the National Science Foundation, National Institutes for Health, Department of Justice, and the Roy J. Carver Foundation.

Dr. Chipara’s research performance since his arrival at the University of Iowa in 2011 has had a strong impact on AMBI. Without a doubt, his software development to help hearing impaired people is in line with AMBI research to help mitigate age related communication and associated mental decline.

His grant funding includes a subcontract from Gallaudet University (PI), a DOJ grant (PI), and an NSF grant (PI). In addition, he has received AMBI pilot grant funding.

Dr. Chipara has published 20 papers since his arrival at the University of Iowa. His work has received over 1500 citations providing an h-index of 18. Importantly, four of his papers have been cited over 100 times, clearly indicating a profound impact on his field. He has completed several grants and has currently four active grants and one grant pending. In addition, Dr. Chipara has been engaged in professional mentoring of 11 students, has provided service to the Department, College, the University and his profession.

Dr. Chipara has recently submitted a $1.3 million proposal entitled, “A Framework for Optimizing Hearing Aids In Situ Based on Patient Feedback, Auditory Context, and Audiologist Input” to NSF’s Smart and Connected Health Program. The proposal is partly based on the on data and insights derived from his AMBI pilot grant.

Joel Geerling, MD, PhD, joined AMBI in September 2016 as an Assistant Professor in the Department of Neurology in the Carver College of Medicine. Dr. Geerling previously served as a postdoctoral research fellow and staff neurologist at Harvard Medical School and Beth Israel Deaconess Medical Center in Boston.

Dr. Geerling’s research is related to discovering and characterizing the brain circuits subserving basic, homeostatic functions. His clinical work focuses on diagnosing and treating diseases affecting cognition and behavior, including neurodegenerative diseases like Alzheimer’s, Lewy body dementia, frontotemporal dementia, and multiple systems atrophy. Dr. Geerling has published 30 papers, an outstanding start of his academic career. His scientific impact in terms of citations shows already an h-index of 16 (Google Scholar) a level above most junior faculty.

His initial work on the molecular neuroanatomy of Barrington’s nucleus was published in *Journal of Comparative Neurology* and he had the honor of having his figure published on the cover. This work genetically identifies the neurons responsible for bladder control, which is a growing problem in the aging population.
His K08 from the NINDS was awarded in April. He will have five years of support to pursue his project on upper brainstem control of arousal (level of consciousness) and other homeostatic functions that are impaired in head injury, stroke, and certain forms of dementia.

**Highlighted publications:**


**Mathews Jacob, PhD.** was promoted to Associate Professor in the Department of Electrical and Computer Engineering, College of Engineering in 2015, and has been with the AMBI since 2011. His research interests include reconstruction of image data from magnetic resonance imaging systems, with special focus on dynamic and spectroscopic imaging; development of novel algorithms to exploit the local, semi-local, and global redundancies in the image data to recover them from fewer measurements; development of algorithms to correct for artifacts associated with the non-idealities of the acquisition scheme.

Dr. Jacob has an outstanding publication record, excellent portfolio in grant support and active involvement in student training combined with multiple national and international presentations. He plays a major role in AMBI and, in particular, in the AMBI interactions with the Iowa Neuroscience Institute. He is a member of the AMBI Executive Committee and participated in a large NeuroNex grant application (T. Abel, PI), in which Dr. Jacob’s machine learning is an essential component.

**Highlighted publications:**


**John Kamholz, MD, PhD**, is a Professor in the Department of Neurology, and is the director of the Huntington Disease (HD) Clinic, where he is involved in a number of neuroimaging studies attempting to identify biomarkers for disease progression. He is currently the PI in two clinical trials for Huntington Disease: SIGNAL, sponsored by the Huntington Study Group to evaluate a monoclonal antibody to the protein Semaphorin 4B; and LE GATO, sponsored by TEVA pharmaceuticals to evaluate the compound liquinimod. He is also the director of an adult Neurogenetics Clinic where he is involved in the treatment, genetic diagnosis, and study of the natural history of patients with inherited ataxia syndromes, hereditary spastic paraparesis, and other neurogenetic conditions. He is also PI of a project to analyze the neuroimagining, the molecular pathophysiology, and natural history of Pelizaeus-Merzbacher disease (PMD), an inherited demyelinating disease of the CNS, work supported by the European Leukodystrophy Association (ELA). This work, as a whole, is designed to provide clinical and neuroimaging data for use in the design of treatment trials for patients with neurodegenerative diseases.

His ongoing research in the area of Huntington’s has resulted in six peer reviewed papers this year. Most important is the 2017 Neurology study in which his team demonstrated the high impact of substance abuse on basal ganglia degeneration. The conclusion derived from this work supports the idea that substance abuse is cumulative but may be dose dependent.

**Highlighted publications**


Wen Liu, PhD, RN, is an Assistant Professor in the College of Nursing, appointed in September 2015. Her productivity for her short duration at Iowa has been substantive, with four national presentations of her work, including posters at the GSA Annual Meeting, the MNRS 40th Annual Research Conference (two presentations) as well as the Honor Society of Nursing (Sigma Theta Tau International). It reflects well on AMBI to have her develop a national presence in her area of research. She also has two manuscripts under review and three additional manuscripts published over the last year in peer-reviewed journals.

Without a doubt, Dr. Liu has made great strides to integrate into the ongoing mission of AMBI. Dr. Liu is funded by a grant from the Csomay Center for Gerontological Excellence and an AMBI pilot grant with collaborations. She is working on preparing an R15 for submission later in 2017 that will be based on her pilot data from the Csomay and AMBI pilot awards. She is also working toward establishing and expanding her research collaborations on and off campus with the goal of integrating her research into larger multi-investigator grants.

Dr. Liu is providing a high level of service to the University of Iowa, the College of Nursing, the AMBI and her profession at multiple levels ranking from search committees to grant and paper reviews.

Highlighted publications:


Chooza Moon, PhD, RN, is an Assistant Professor in the College of Nursing commencing August 2017.

Dr. Moon received a PhD in Nursing from the University of Wisconsin-Madison in 2016 and completed postdoctoral fellowship also from the University of Wisconsin-Madison in 2017. Her areas of interest are research on aging, cardiovascular disease, sleep disorders, and cognition to develop person centered interventions. She focuses on understanding how symptoms are related with brain health in individuals with cardiovascular disease and developing interventions to improve symptoms and brain health. Her research also involves using magnetic resonance imaging (MRI), neuropsychological testing, and sleep assessments.
Nandakumar Narayanan, MD, PhD, is an Assistant Professor in Neurology. Dr. Narayanan is extremely engaged in all matters of the AMBI. He is now in his fifth year at the University of Iowa. He has published 49 papers total with ten papers alone in 2016 and seven papers already out in 2017. His scientific impact in terms of citations suggests an h-index of 19 and a total citation around 2377 with 1425 since he arrived in 2012 (Google Scholar). His research output is supported by substantive grant funding over the last few years, including both intramural and extramural support.

With the data he received as a result of AMBI pilot funding, Dr. Narayanan and his collaborator, Dr. Fairley, were awarded an ICTS pilot grant. In addition, they have applied for a VA pilot grant, and have plans to apply for a collaborative multi-PI R01/VA merit in the next few months. He has an ongoing AMBI pilot award (with Mei-ling Joiner) and, as a result applied for an R21, which was not funded, but will be refined and resubmitted. Finally, with the data from his AMBI pilot award, he submitted a multi-PI R01 in the amount of $2.38 million, which just recently scored in the 7th percentile.

Dr. Narayanan provides outstanding service at the department, college, university and professional levels. His expertise and ability to interact with others to find candidates on search committees is impressive. Most notable for his service is his involvement in the clinical Neuroscience Training Program which he serves as Assistant Director.

Highlighted publications:


Priyadarshini Pennathur, PhD, is an Assistant Professor in the Department of Mechanical and Industrial Engineering. Dr. Pennathur’s research program focuses on the impact of technology on human interaction, health care systems models for patient safety and cognitive systems engineering in relation to outcomes in older adults. She was notably honored this year with the 2nd Place Popular Choice Award for her MIE Graduate Student Poster, a reflection of her positive impact in her department. At the national level, she demonstrates an impact with her service on the Clinical and Consumer Health-care IT Track for the 2016 Symposium on Human Factors and Ergonomics in Health Care: Improving the Outcomes.
Dr. Pennathur’s research program focuses on the impact of technology on human interaction, health care systems models for patient safety and cognitive systems engineering in relation to outcomes in older adults. Over the last two years, progress on technologies in senior caregiving well beyond the focus of counteracting mental deterioration has become a major focus for the AMBI, making the work of Dr. Pennathur an even better fit. Dr. Pennathur has one paper published already in 2017, and others are at various stages of completion. Dr. Pennathur’s research performance is solid.

Dr Pennathur is a very engaged teacher. Her teaching area is part of the planned roll out of scientific teaching curriculum we are planning on for 2018 after the impact of the newly developed integrated neuroscience major has been assessed.

**Highlighted publications:**

**Veena Prahlad, PhD.** is an Assistant Professor in the Department of Biology. Dr. Prahlad is extremely well funded with nearly $2 million in active extramural support from multiple sources and funding modes including a multi-PI R01, an R21, and a grant from the Ellison Medical Foundation. In addition she has pending R01 and R21 applications. Data collection for the funded R01 was supported by her funds from her AMBI pilot grant. She has published several outstanding papers during her tenure some of which have already achieved a profound impact in terms of annual citations (her 2015 paper has been cited 31 times). In addition to the two papers Dr. Prahlad published in 2016 she has two more papers in various stages of completion and two book chapters bringing her total to 7 papers in five years, all presenting data gathered and published during her tenure at the University of Iowa.

Dr. Prahlad’s teaching has established a novel course that she teaches now in the third year with good student growth. In addition, Dr. Prahlad team-teaches a high enrollment course. Her student training is progressing well with an MS student already graduated and a PhD student soon to graduate. In addition, Dr. Prahlad has trained two postdoctoral students. She has also provided exemplary service to the University of Iowa, the Department of Biology, the AMBI and her profession.

**Highlighted publications:**
Michelle Voss, PhD, is an Assistant Professor in the Department of Psychological and Brain Sciences. Dr. Voss has developed into a central hub for much of the AMBI activity around brain imaging. Her talents dramatically strengthen the main focus of AMBI in neuroimaging. Dr. Voss has published 76 papers since her arrival at the University of Iowa with 16 alone in 2016. Her work has received 8875 citations providing an h-index of 45. Counting only papers with Dr. Voss as first author shows that she already has 9 papers with over 100 citations. Without a doubt, Dr. Voss’ publication performance is exceptional.

Her lab is currently running three NIH/NIA-funded clinical trials. One study is funded by an R21 that examines whether the brain response to a single session of physical exercise can predict training-related gains in the same brain systems. Two studies are funded by SBIR grants (in collaboration with Dr. Wolinsky) which examine the effects of home-based adaptive cognitive training on cognitive systems known to decline with aging. She is the PI of an R01 that has been awarded (pending IRB approval) which will be a clinical trial to test whether the benefits of physical exercise on the brain lead to improvements in learning and memory (~$2.4 million direct costs over 5 years). Data from her AMBI pilot project was featured in this proposal, and will play a critical role in optimizing innovative neuroimaging outcomes for this clinical trial. She is the PI of another R01 that is under review, and data from the AMBI pilot grant was also featured in this application. In addition, she is a Co-Investigator on a Phase II SBIR cognitive training trial that has been recommended for funding (~$320,000 direct costs over 3 years). This will be a multi-site clinical trial to test the efficacy of home-based adaptive cognitive training for improving cognitive function and reversing biomarkers of brain aging in those at risk for cognitive impairment. She is a frequent invited speaker at national and international meetings, has been invited to serve as a regular member on the NIA-Neuroscience study section, and is highly engaged in mentoring at the undergraduate and graduate levels. Dr. Voss provides service to the Department, College, the University and her profession, including chairing the Curriculum and Evaluation committee of a T32 for graduate training of psychology students at the biomedical-behavioral interface.

Highlighted publications:


Jan Wessel, PhD, Assistant Professor in the Department of Psychological and Brain Sciences, as well as Neurology, joined the AMBI in October 2015. In the short time that he has been at Iowa, he has secured an internal grant of $25,000 in addition to his R03 (2014-16), very good indicators for his future success. He has had the fastest start in terms of publications and new grant applications of any faculty thus far hired which clearly indicates that Dr. Wessel is likely to become a major driving force for the AMBI.

Dr. Wessel had an excellent year with already several papers published on his research conducted at UI and his review in Neuron will likely make sure that his name recognition moves forward in leaps. He has already initiated a first collaborative grant submission that was scored and should have a reasonable chance to be successful in a future submission. His AMBI funded work has provided him with preliminary data and has already resulted in an early draft of a future grant application.

He is in the process of resubmitting an R01 (scored in the first round) which features some data collected from the AMBI pilot grant. In addition, he is submitting an NSF Career grant and will be submitting in June an R21 with Dr. Ryan Carnahan featuring data from his AMBI pilot award.

Finally, he received a Junior Research Program of Excellence Award ($300,000 over 2 years) from the Roy J. Carver Charitable Trust for his research program. The proposal used data collected from his AMBI pilot grant. In addition, he is also an investigator on a collaborative Research Program of Excellence Award from the Carver Trust ($750,000 over 5 years) with Dr. Narayanan and others.

Highlighted publications:


Kristine Williams, BSN, PhD, was an Associate Professor in the College of Nursing. In 2015, Dr. Williams was appointed Director of the Hartford Center of Geriatric Nursing Excellence at the University of Iowa and was the Sally Mathis Hartwig Professor in Gerontological Nursing. She recently returned to her home state of Kansas in January 2017.

She was a research mentor to four students for the Undergraduate Honors and Young Scientist programs, some of whom received awards for their research. She served on the NIH Study Section for Health Disparities and Equity Promotion, on the NIH Special Emphasis Panel SRG, as well as an NIH Special Emphasis Panel SRG Study Section on Aging Systems in Geriatrics.

Highlighted publications:
THE IOWA COLLABORATORY FOR HEALTHY AGING

Successful Aging through Innovative Technologies: Population Health and the Internet of Things

BACKGROUND: COA leadership and AMBI faculty are key partners in this university-wide initiative to promote research and outreach related to optimal aging.

OVERVIEW: Population aging in Iowa and the US is rapidly creating new and increasing demands for strategies to help older adults maintain health, function and well-being in spite of chronic illnesses that tend to cluster in later life. The Iowa Collaboratory for Healthy Aging aims to combine the best models of care with innovative technologies to advance healthy aging by addressing issues before they become problems or crises. These “pre-acute” solutions target successful aging in place – the ability to live in the environment preferred by the older person with a sense of comfort, confidence, safety, and well-being – for the person and his/her family.

OUR QUESTION: What innovative technologies are most effective in promoting population health and successful living among aging adults?

OUR COLLABORATORY: We will develop partnerships with thought-leaders and researchers within diverse colleges at the University of Iowa (UI), and between the University of Iowa and other academic institutions, senior living communities, community-based services, venture partners in technology and related industries, and with state agencies and services. The overall aim of these partnerships is to develop innovative approaches using best models of care and technology to rapidly and effectively address challenges to successful aging in place.

- **Research Partners** in academic settings will develop fresh new ideas through the cross-fertilization of interests and expertise, leading to innovative technologies that are unlikely to emerge in the current landscape of discipline-specific work. These collaborations will open doors to funding that is either untapped or under-utilized by building the “right team” to address pressing questions and needs for older adults, their families and communities.

- **Community Partners** will inform researchers about the most needed and acceptable interventions or approaches, and assist by acting as “test-beds” to quickly evaluate products, services, and models in real-life, real-time environments. Senior living communities, community-based services, and community members living at home or in alternative housing are all essential to informing aging-in-place research to assure its usefulness in daily living.

- **Industry Partners** will commercialize newly developed products and models to assure rapid uptake and dissemination to best assure use in daily living. Collaboration with venture partners will also support on-going research by channeling revenue back to research to advance further innovation and testing.

- **State Agency Partners** will facilitate funding initiatives, policy reform, and broad dissemination of information to support technologies that support healthy and successful aging.

FUNDING SUPPORT: The University of Iowa Office of Research and Economic Development’s Strategic Research Leadership Program has provided funding to support developmental activities that will lead to longer term external funding to support the Collaboratory. The initiative holds considerable promise for being a self-sustaining enterprise at some future point but requires financial support to develop the needed infrastructure for long-term success.
SENIORS TOGETHER IN AGING RESEARCH (STAR) REGISTRY

Kanika Arora was recently appointed Director of the STAR Registry. The STAR Registry is a volunteer registry of over 1700 people age 50 and older who are interested in volunteering for research studies. It was developed in 2006 by Robert Wallace and is maintained by UI Center on Aging. STAR matches research volunteers with studies for which they are likely to qualify, using demographic and health information provided by each volunteer. All data is secure and kept strictly confidential. Since 2007, over 90 studies have used STAR.

Arora plans to make the registry more robust by increasing the overall number of STAR participants and target under-represented populations in our database (e.g., sex, education, race/ethnicity, age, and location), and increase researcher use of the STAR registry across the state. In addition, she plans to develop longitudinal tracking of STAR registry participants for research purposes. Arora and staff from the Center on Aging and ICTS are developing a marketing plan to move the registry into the future.

AMBI’S VEENA PRAHLAD FEATURED IN IOWA NOW

Parkinson’s Disease Protection May Begin in the Gut
UI researchers find intestinal cells’ immune response protects vital neurons

By: Richard C. Lewis, 2016.09.14

Your gut may play a pivotal role in preventing the onset of Parkinson’s disease. And the reason may be its knack for sleuthing.

Researchers at the University of Iowa have found that the gut may be key to preventing Parkinson’s disease. Cells located in the intestine spark an immune response that protects nerve cells, or neurons, against damage connected with Parkinson’s disease. Acting like detectives, the immune intestinal cells identify damaged machinery within neurons and discard the defective parts. That action ultimately preserves neurons whose impairment or death is known to cause Parkinson’s.

“We think somehow the gut is protecting neurons,” says Veena Prahlad, assistant professor in biology at the UI and corresponding author on the paper published Aug. 30 in the journal Cell Reports.

Parkinson’s disease is a brain disorder that erodes motor control and balance over time. It affects some 500,000 people in the U.S., according to the National Institutes of Health. The disease occurs when neurons—nerve cells—in the brain that control movement become impaired or die. Normally, these neurons produce dopamine, and when they are damaged or killed, the resulting dopamine shortage causes the motor-control problems associated with the disease.

Scientists have previously linked Parkinson’s to defects in mitochondria, the energy-producing machinery found in every human cell. Why and how mitochondrial defects effect neurons remain a mystery. Some think the impaired mitochondria starve neurons of energy; others believe they produce a neuron-harming molecule. Whatever the answer, damaged mitochondria have been linked to other nervous disorders as well, including ALS and Alzheimer’s, and researchers want to understand why.

Prahlad’s team exposed roundworms to a poison called rotenone, which researchers know kills neurons whose death is linked to Parkinson’s. As expected, the rotenone began damaging the mitochondria in the worms’ neurons. To the researchers’ surprise, though, the damaged mitochondria did not kill all of the worms’ dopamine-producing neurons; in fact, over a series of trials, an average of only seven percent of the worms, roughly 210 out of 3,000, lost dopamine-producing neurons when given the poison.
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Illustration courtesy of Veena Prahlad.

“That seemed intriguing, and we wondered whether there was some innate mechanism to protect the animal from the rotenone,” Prahlad says.

It turns out there was. The roundworms’ immune defenses, activated when the rotenone was introduced, discarded many of the defected mitochondria, halting a sequence that would’ve led to the loss of dopamine-producing neurons. Importantly, the immune response originated in the intestine, not the nervous system.

“If we can understand how this is done in the roundworm, we can understand how this may happen in mammals,” Prahlad says.

The researchers plan to conduct more experiments, but they’ve got some interesting hypotheses. One is the intestinal immune cells are, according to Prahlad, “constantly surveilling mitochondria for defects.” Even more, those cellular watchdogs may be keeping their eyes on the mitochondria “because they don’t trust them,” Prahlad suggests. The reason has to do with the prevailing theory that mitochondria originated independently as a type of bacterium and were only later incorporated into the cells of animal, plants, and fungi as an energy producer.

If that theory is correct, the intestinal immune responders may be especially sensitive to changes in mitochondrial function not only for its potential damaging effects, but because of the mitochondria’s ancient and foreign past as well.

“How it’s happening is suggestive of the possibility that the innate immune response is constantly checking its mitochondria,” Prahlad says, “perhaps because of the bacterial origin of the mitochondria.” The paper is titled, “The Mitochondria-Regulated Immune Pathway Activated in the C. elegans Intestine Is Neuroprotective.” The first author is Madhusudana Rao Chikka, who was a postdoctoral researcher at the UI during the study and who helped design and execute the experiments. Contributing authors, all from UI’s biology department, include Charumathi Anbalagan, Katherine Dvorak, and Kyle Dombeck.

The nonprofit Ellison Medical Foundation funded the study.
KAMHOLZ FEATURED ON KGAN

In May 2017, John Kamholz, MD, Director of the Huntington’s Disease Center of Excellence, was featured in a story on local Fox affiliate and KGAN in a story about his center’s efforts to educate local law enforcement on the effects of Huntington’s disease since symptoms can sometimes mimic those exhibited by a person who is drunk. See the story by following this link: http://cbs2iowa.com/news/local/educating-law-enforcement-on-huntingtons-disease

FRITZSCH NAMED COLLEGIATE FELLOW

The University of Iowa College of Liberal Arts and Sciences (CLAS) has named Professor of Biology and Director of the Aging Mind & Brain Initiative, Bernd Fritzsch as, Collegiate Fellow, the college’s highest faculty honor, in recognition of his distinguished research, teaching, and service. Fritzsch will serve a renewable five-year appointment as CLAS Collegiate Fellow.

“Professor Fritzsch is a leading neuroscientist internationally,” CLAS Dean Chaden Djalali said, “and it is my great privilege to name him Collegiate Fellow. His influential research has been key to establishing the University of Iowa’s reputation as a vital center of neuroscience, and his teaching and leadership have inspired students at all levels as well as his faculty colleagues. I congratulate him on this latest distinguished achievement.”

Fritzsch, the director of the Center on Aging and the Aging Mind & Brain Initiative, joined the Department of Biology as professor and chair in 2008; he served as chair until 2016. He is a comparative molecular neuroembryologist, with a focus on ear neurosensory development and evolution. His main area of research focuses on the molecular evolution of inner ear neurosensory cells (hair cells and neurons) with the aim to elucidate crucial developmental steps that would allow hearing restoration. To this end, he also works on the molecular developmental evolution of the organ of Corti, the mammalian hearing organ, the spiral ganglion cells, and the brainstem auditory nuclei.

Fritzsch was elected to the Leopoldina—the German National Academy of Sciences—in 2015, and is a fellow of the American Association for the Advancement of Science. He is the author of more than 300 published articles, books, and chapters since 1979. According to his Google Scholar profile, his research has been cited more than 15,500 times, making him one of the most influential scientists at the University of Iowa. He earned his doctoral degree from the Technical University of Darmstadt in 1978.

JAN WESSEL EARNS DISTINGUISHED EARLY CAREER AWARD FOR CONTRIBUTIONS TO PSYCHOPHYSIOLOGY

University of Iowa AMBI Faculty member, Jan Wessel, was the 2016 Early Career Award winner at the recent 56th Annual Meeting of the Society for Psychophysiological Research held in Minneapolis, Minnesota, September 21-25, 2016. Wessel, an Assistant Professor who joined the UI faculty in October 2015, holds appointments in the Department of Psychological and Brain Sciences as well as the Department of Neurology. He presented his talk on September 24, 2016, entitled “Cognitive Control after Surprising Events: A Universal-Fronto-Basal Ganglia Mechanism.” The Center on Aging and the Aging Mind and Brain Initiative congratulate Dr. Wessel on this award.
Aging Mind and Brain Initiative (AMBI)

2011-2017

The Human Connectome Project, http://www.humanconnectomeproject.org/gallery/