UT DALLAS
The University of Texas at Dallas

CENTER FOR VITAL LONGEVITY

Neural Activities

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THE NEWSLETTER OF THE CENTER FOR VITAL LONGEVITY

DIRECTOR'S MESSAGE

Time Flies

Dr. Michael Rugg

It's hard to believe that nearly five years have passed since Dr. Denise Park founded the Center for Vital Longevity, but we will indeed be celebrating our fifth birthday during the current year, with Governor Rick Perry having formally opened our facilities in September 2010. Thanks in large part to Denise's energy and vision, the time since then has been one of tremendous growth and progress.

With the support of the University and substantial funding through competitively awarded grants, mainly from the National Institutes of Health, the Center has expanded from two to six research laboratories, and from a complement of fewer than a dozen people to a vibrant community numbering more than 50. This includes the faculty members who lead each of our six research groups, the postdoctoral researchers, graduate students and research assistants who make up the groups, and our tireless administrative and support staff. To accommodate this growth, we have already undertaken one major remodeling and expansion of our research facilities.

The rationale for the establishment of the CVL was to create a center of excellence for research on the aging mind. We are proud of this accomplishment. First and foremost, research conducted in the Center has a substantial impact. Since it was founded, its researchers have published around 80 peer-reviewed scientific papers, several of which have

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2nd Annual Booziotis Lecture to Feature Dr. Claudia Kawas

On April 30, CVL will hold the second annual Jean and Bill Booziotis Distinguished Lecture at the Communities Foundation of Texas, welcoming for a public talk Dr. Claudia Kawas, a geriatric neurologist and researcher in the areas of aging and dementia.

Dr. Kawas is the Al and Trish Nichols Chair in Clinical Neuroscience and Professor of Neurobiology & Behavior and Neurology at the University of California, Irvine, where her work focuses on the epidemiology of aging and Alzheimer's Disease, the determinants of successful aging, longitudinal and clinical pathological investigations, clinical trials, and most recently, studies in cognitive and functional abilities of the "Oldest Old."

The Oldest Old, defined as being more than 90 years of age, is one of the fastest growing age groups in the United States. Dr. Kawas' "90+ Study," which was featured on CBS News' *60 Minutes* last year, is one of the largest studies of the oldest-old in the world with more than 1,600 people enrolled.

The participants in her study were all once members of The Leisure World Cohort Study (LWCS), which was started in 1981. The LWCS mailed surveys to every resident of Leisure World, a large retirement community in Orange County, California. Using the 14,000 subjects from the LWCS, researchers from the 90+ Study decided to ask an important question: what predicts whether people will live to age 90 and beyond?

In an evening lecture that is completely free to the public, thanks to the generosity of the late Mrs. Jean Booziotis and her husband Bill, Dr. Kawas will share answers to that question and more: How many people aged 90 and older have dementia? Are there ways to remain dementia-free into your 90s? In what ways do the brains of people in their 90s show evidence of memory loss and dementia?

Dr. Claudia Kawas

The aim of these lectures is to highlight distinguished scientific visitors to Dallas, and to facilitate the spread of their knowledge and research through our community, says Mr. Booziotis, also a CVL advisory council member.

The first Jean and Bill Booziotis Distinguished Lecture featured

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WHAT'S INSIDE

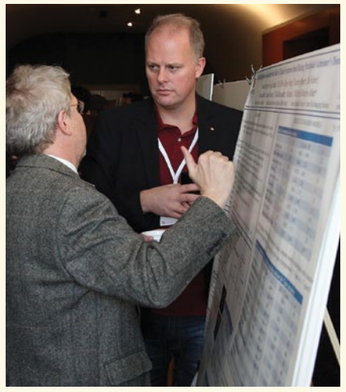
The Center hosted a Texas-themed BBQ the night before to kick-off DACC 2015, as early participants checked in.

2015 Aging & Cognition Conference Brings Unique Group of Scientists to Town

Cognitive neuroscientists from across the United States and Europe met in late January during the Center for Vital Longevity's fourth biennial Aging and Cognition Conference at the W Hotel in downtown Dallas.

The theme for both days was "Imaging the Aging Brain: Studies in Neuroplasticity and the Challenge of Longitudinal Designs."

Some 200 researchers discussed the latest developments in the cognitive neuroscience of aging, including the imaging of brain pathologies thought to play a crucial role in the onset and development of Alzheimer's Disease and other forms of dementia. Other topics included the merits of different study designs for identifying aging effects in the brain and behavior.



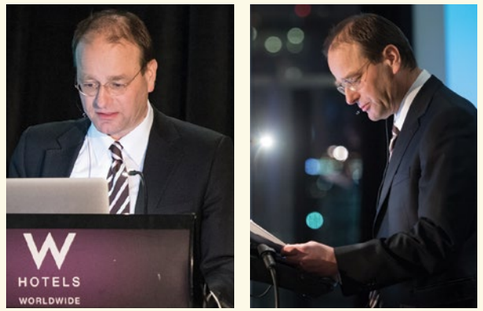
Poster sessions spanned both days.

Scientists presented an array of findings throughout the conference, ranging from how engagement in challenging mental activities can improve cognitive functioning and neuroplasticity in older people to how brain regions differ in their inter-connectivity across the lifespan.

CVL Director of Research Dr. Denise Park, also the organizer of the conference, shared findings from her lab's Synapse Project, that older adults randomly assigned to learn digital photography, quilting or both for 15 hours per week for three months showed enhanced memory both at the end of the study and a year later on follow-up.

"The central question of the conference was, 'how do we interpret changes in brain structures and neural function as individual's age?'" Dr. Park said. "Speakers took a fresh look at the strengths and weaknesses of longitudinal and cross-sectional designs as they relate to this question.

"The meeting was a resounding success, as measured by the quality of the discussion and the number of new collaborations that are already taking shape," Dr. Park added.



Dr. Ulman Lindenberger speaking to a dinner-time audience on the first day of the conference.

DACC 2015 was punctuated by a Director's Research Circle dinner (see p. 7) featuring a talk by Dr. Ulman Lindenberger from the Max Planck Institute for Human Development in Berlin. Dr. Lindenberger spoke about the future implications of rising life expectancy across the world to an evening crowd at the W's Altitude bar atop the hotel.

Even those who may have been fatigued by a long flight left inspired.

"It was a really informative, thought-provoking couple of days," said attendee Dr. Matt Betts, a postdoctoral researcher studying the pathological and behavioral characteristics of age-related disorders such as Parkinson's and Alzheimer's Disease at the Otto-von-Guericke University Magdeburg in Germany. "Hope to be back in the future."

Facial Recognition Ability Could be Potential Barometer of Cognitive Decline

Study shows deposits of amyloid plaque in brains of healthy adults results in less activity in face-recognizing region of the brain.

Jenny Rieck

New brain imaging research from the Park Aging Mind Lab finds that healthy adults with high levels of amyloid plaque on their brain show less activity in a brain region specialized for recognizing faces called the left fusiform gyrus.

It is common for Alzheimer's Disease patients to have difficulty learning and remembering faces and this has been thought to be due to memory difficulties. The new findings from the Dallas Lifespan Brain Study suggest that memory problems may not be the whole story. The recent findings suggest that amyloid degrades the ability to even perceive a face, which would naturally add to difficulty in remembering it later. The results suggest that decreased activity in the left fusiform gyrus could be another early predictor for Alzheimer's Disease.

Researchers at UT Dallas' Center for Vital Longevity published the paper in the latest issue of *Human Brain Mapping*, available online now.

The study relied on recent techniques that allow researchers to measure beta-amyloid in the living human brain, through the use of PET scanning and the imaging agent Florbetapir. Beta-amyloid is a sticky protein that deposits on brains of Alzheimer's patients, and is commonly referred to as the "plaques" associated with Alzheimer's Disease. In Alzheimer's Disease, beta amyloid forms clumps on the brain and destroys synapses, resulting in progressively impaired cognitive function as the amyloid increases.

This finding of decreased activity in face perception regions of the brain was revealed when researchers used a statistical technique referred to as "multivariate pattern analysis." The analysis enabled them to compare broad patterns of neural activity across the brain when participants were viewing faces. The analysis determined how the brain patterns were different for adults with amyloid deposits from those without amyloid. The left fusiform was the only region where adults with and without amyloid showed differences in neural activity.

The work builds on prior studies by senior author Dr. Denise Park, using functional magnetic resonance imaging to show that healthy older adults show a less distinctive pattern of neural activity to faces. The new work from her lab now suggests that brain pathology in the form of amyloid deposition results in the further disruption of specialized neural signals in face regions of the brain.

"Since the current study was focused the basic visual processing of faces, we did not directly measure face-memory. So it's hard to say that the decreased fusiform activity is directly related to behavioral problems recognizing or remembering faces," Rieck cautioned.

"And we need to remember that these

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Bob Wilson Salute

On February 21, the Aging Mind Foundation hosted its inaugural fundraiser at the Joule Hotel. The evening, entitled "Living With Bob: A Salute to Robert A. Wilson," celebrated the leadership and extraordinary accomplishments of former KERA-TV chief executive Robert A. Wilson while raising awareness of the Aging Mind Foundation and its support for research on the aging mind.

The proceeds from this year's sold-out event will be used to create the Aging Mind Foundation Postdoctoral Fellowship, to be held in the Center for Vital Longevity at the University of Texas at Dallas.

The Fellowship will support research into the cognitive neuroscience of aging and also advance the career of a highly promising young scientist.

Special guests for the evening were Mr. Wilson's wife, Laura Wilson, and his son, award-winning actor Owen Wilson. The Honorary Chair was Bill Booziotis and the event was chaired by CVL advisory council member Laree Hulshoff, Barbara Daseke and Barbara Buzzell. Media personality Bob Ray Sanders, associate editor and senior columnist at the Fort Worth *Star-Telegram*, was the master of ceremonies. The Joule Hotel was the Presenting Sponsor.

Barbara Buzzell, Laura Wilson, Barbara Daseke, Owen Wilson and Laree Hulshoff.

CVL Research Sheds New Light on Successful Recollection

Dr. Danielle King

We've all had it: that vague feeling of having met someone before but not remembering where, or seeing the same episode of a sitcom in your home years ago, but not remembering the plot or even who you might have been watching it with.

They are faint memories without context, at best.

Such fragmented remembering raises scientific questions: what constitutes successful recollection? And what does the neural signature of successful remembering look like? How much about a prior event must be remembered for it to be considered a "complete" memory? And what processes in the brain must occur for that memory to be experienced?

Successful recollection means that qualitative details of an event can be recalled, as opposed to familiarity- or gist-based recognition, illustrated in the above examples, which are experienced as "vague" memories.

Harnessing data from three independent experiments, the research published earlier this year in the *Journal of Neuroscience* identifies a widespread set of regions in the brain that consistently showed increases in their connectivity (the sharing of information) with other regions as an event was being successfully recollected.

Functional magnetic resonance imaging (fMRI) data obtained while participants tried to remember previously encountered events allowed researchers to measure changes in connectivity with a set of brain regions previously identified as constituting a core recollection network. The network comprises the left angular gyrus, the medial prefrontal cortex, the posterior cingulate cortex, the hippocampus and the middle temporal gyrus.

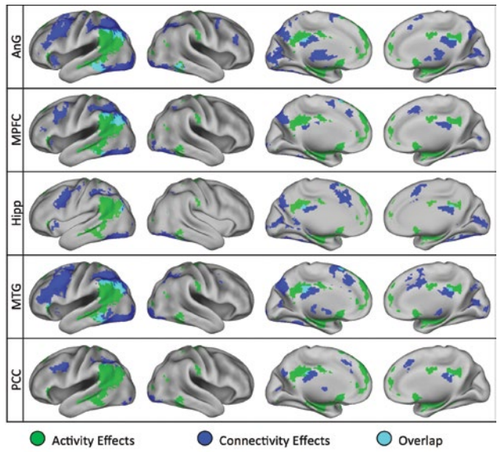
"We reasoned that by examining how these areas show increases in connectivity with regions throughout the rest of the brain during successful compared with unsuccessful recollection, we might gain additional insight into the neural mechanisms underlying memory processes," said Danielle King, Ph.D., a postdoctoral scientist in the lab of Dr. Michael D. Rugg, and the study's lead author.

Researchers first set about determining which brain regions showed consistent changes in activity as events were remembered, and then measured changes in connectivity between these regions and the rest of the brain.

What they found was that a consistent set of brain regions, which were widespread and extended well outside the core recollection network, showed recollection-related increases in connectivity with core recollection regions. In addition, individuals who showed greater memory-related increases in connectivity performed better on memory tasks.

"These findings identify a new and potentially important brain signature of successful recollection," said Dr. Rugg. "They may have important implications for the understanding of memory impairment in a number of clinical conditions, as well age-related memory decline."

The study was supported by the National Institute on Aging, and the National Institute of Mental Health.



Overlap map of recollection-related activity and connectivity effects.
IMAGE COURTESY OF *JOURNAL OF NEUROSCIENCE*

WORK OF DR. KAWAS

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Dr. John Jonides, a memory researcher at the University of Michigan who discussed evidence-based ways one can train the mind to improve cognitive function.

Another key aspect of the lectures is that they form part of CVL's public education mission, particularly among young adults and high-school students interested in science, says CVL Director Dr. Michael Rugg. "We want to inspire aspiring scientists with an engaging yearly lecture such as this one, which showcases top-flight research in cognitive aging in an accessible way."

FACIAL RECOGNITION

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are healthy people with no obvious symptoms of Alzheimer's Disease who are leading full, normal lives. Our work allows us to detect people with very subtle early pathology. We need continued study to see where this leads. We will follow all participants in the Dallas Lifespan Brain Study over the years to see how predictive these findings are of later cognitive decline and progression to Alzheimer's Disease."

Dr. Gagan Wig

"Because the degree of segregation of individuals' networks relates to memory ability, measuring an individual's network segregation may eventually help lead to clinical measures that could predict pathological decline."

Mapping How the Brain Communicates Across a Large-Scale Network

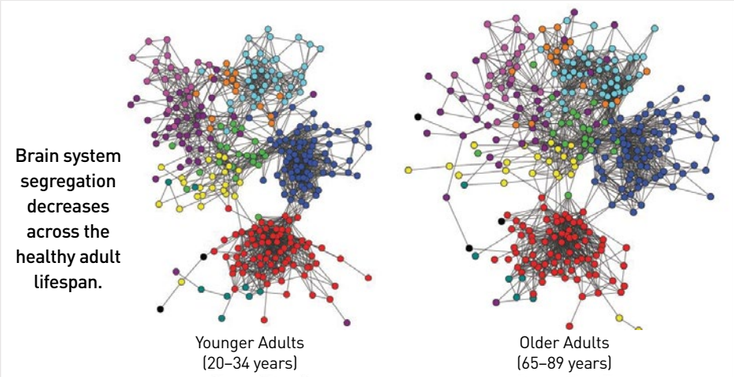
Work emerging from the Cognitive Neuroimaging Laboratory of Dr. Gagan Wig offers a different approach for looking at the way the brain operates on a network level, and could eventually lead to new clinical diagnostic criteria for age-related memory disorders.

Previous work in the field has largely focused on describing age-related differences in function at the level of activity in individual brain areas.

Findings published by the *Proceedings of the National Academy of Sciences* focus on how brain areas communicate with one another to form brain networks, and how brain networks may change as we age.

"Brain networks consist of groups of highly interactive nodes, not much different than social and technological networks," said Dr. Gagan Wig, an assistant professor in the School of Behavioral and Brain Sciences at UT Dallas. "These nodes all communicate with one another in a large-scale brain network. A considerable amount of research has highlighted how older adults use different brain areas than younger adults when performing the same tasks. What the current approach offers is an evaluation of these differences in a broader context. By studying the brain as a network, we are in a sense adjusting our perspective—akin to examining the patterns that make up constellations of stars instead of focusing on each of the individual stars."

Dr. Wig and his colleagues examined how brain networks are composed of segregated sub-networks that mediate specialized functions. They found that increasing age is associated with decreased segregation of brain sub-networks. In addition, they found that less segregation among sub-networks predicts poor long-term memory, regardless of age.



"Because the degree of segregation of individuals' networks relates to memory ability, measuring an individual's network segregation may eventually help lead to clinical measures that could predict pathological decline," Dr. Wig said.

The findings stem from data collected by the Center's Dallas Lifespan Brain Study, where healthy adults aged 20 to 89 completed cognitive assessments and resting-state functional MRI scans (i.e., participants were not doing a task during the scan), which allowed measurement of brain connectivity. A total of 210 adults were scanned and given cognitive assessments.

The data showed that brain networks in younger persons exhibit many intra-network connections for specialized processing of specific tasks, while actually having sparser inter-network connections that aid communication between networks, keeping them distinct. But the picture blurs as we age, with the brain network becoming progressively less specialized and less segregated between networks, Dr. Wig says.

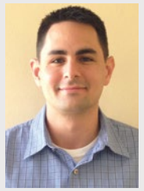
In order to create a new measure of interconnectivity and efficiency on a global scale, Wig's lab used an area of mathematics called graph theory to characterize the segregation of brain networks. This approach has been used to study social networks such as Facebook, the Internet, the flow of public transportation and disease outbreaks.

The study's lead author is Micaela Chan, a graduate student at UT Dallas and member of Dr. Wig's lab at the CVL. Additional co-authors of the paper are Dr. Denise C. Park, and Neil K. Savalia, a research assistant in Dr. Wig's lab, and Dr. Steven Petersen of Washington University in St. Louis.

Funding for the study and the DLBS comes from the National Institute on Aging.

NEW FACES

David Hoagey, Kennedy Lab

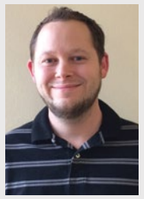


David is interested in how structural brain changes result in cognitive decline during healthy aging, specifically the role of white matter health and degradation in neuronal pathways. In 2011 he earned a bachelor's degree in psychology from Penn State, where he also worked as a research assistant with Dr. Nancy Dennis looking at memory changes across the lifespan. After graduation he worked as a research assistant for Dr. David Madden at Duke University investigating age-related changes in attention.

Manasi Jayakumar, Rugg Lab

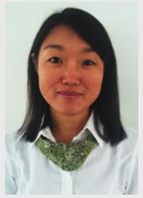
Manasi received her bachelor's degree in Biotechnology Engineering from BITS Pilani, Dubai Campus in 2013. Rather than embark on a path of drug discovery in the lab, however, she realized early on that working with people and potential research subjects was more rewarding. She is currently pursuing her masters at UTD in Applied Cognition and Neuroscience. Outside of her studies, she works in the Rugg Lab twice a week. A self-described adrenaline junky, Manasi plans to try sky-diving soon.

Allan Kalich, Rodrigue Lab



Allan officially joined Rodrigue Lab in the fall, after receiving his bachelor's degree in psychology from UT Dallas. Prior to earning his degree, he worked with Dr. Rodrigue as a volunteer and a research assistant for a year before graduation. His early interests as an undergrad centered on cognitive therapy and individual counseling. His dual interest in the biological and environmental health factors that promote healthy cognitive aging later took hold, however, and he decided he might make more of an impact on neuroscience through research. A native Texan, Allan enjoys spending time with his wife and two sons.

Jingting Zhang, Park Lab



Jingting joined Dr. Denise Park's group as a postdoc in January. Her research interests are in studying the neural mechanisms for various types of cognitive processes, such as memory, language and social signal processing in the aging brain. She obtained her Ph.D. in Cognitive Psychology under the supervision of Dr. Lorraine Tyler from the University of Cambridge, UK. Her Ph.D. research focused on whether and how language comprehension and learning differs as a function of aging using fMRI and behavioral methods. In her spare time, she enjoys spending time with her family and friends, traveling, yoga, meditation and exploring.

Sara Festini, Park Lab

Sara joined the Park lab fresh from the Univ. of Michigan, where last year she earned her Ph.D. in Psychology with a focus on cognition and cognitive neuroscience. While at Michigan, Sara explored the short- and long-term consequences of "directed forgetting" in working memory with Dr. Patricia A. Reuter-Lorenz, an expert in cognitive neuroscience, also at Michigan. Sara is a native Californian, having grown up in the San Francisco Bay Area, and attended Scripps College in Claremont, Calif., where she received her Bachelor's degree in Psychology in 2009. Whenever she has time, she is an avid dancer, with a proclivity for tap dancing.

DIRECTOR'S MESSAGE

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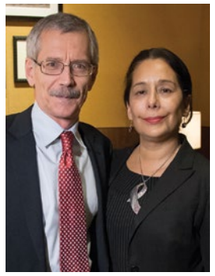
received attention not only in the scientific community, but in local and national media also. We have hosted four international conferences (most recently in January of this year, see page 2). Each conference was attended by leading North American and European researchers, and, together, they have played an important role both in advancing the field and putting Dallas "on the map" as a major focus for aging research. Finally, CVL members have given innumerable national and international presentations describing their research findings at scientific meetings and research institutions, as well as to a wide variety of organizations here in the Dallas community.

We still do not have all the answers to such crucial questions as why some people age more successfully than others, but research at the CVL is advancing knowledge in several important directions. For example, a key part of our research focuses on gaining as complete a picture as possible of how the healthy brain changes with age, and how these changes affect cognition. In addition, we are seeking to understand whether it is possible to slow, or even halt age-related cognitive decline. We are also investigating how the different factors that affect the risk of developing age-related disorders such as Alzheimer's Disease interact with one another, and how soon people most at risk can be identified. We look forward to making substantial progress in answering these questions by the time we celebrate our 10th anniversary.

We hope you share our ambition, and that you will give us your support as we strive to realize it.

Director's Research Circle News

CVL has recently hosted two lecturers, as part of the Director's Research Circle (DRC) speaker series, which was founded by Bill Booziotis and the Center's advisory council. Dr. Beatriz Luna from the University of Michigan spoke in November at The Museum Tower, and Dr. Ulman Lindenberger of the Max Plank Institute in Berlin spoke in January at the W Hotel. The DRC is made up of donors who commit to an annual gift of $2,500 or a minimum donation of $12,500 over five years. If you are interested in joining, please contact Holly Hull Miori at hmiori@utdallas.edu or (972) 883-3728.



Left: Advisory Council Members Janet Bade and Bill Venegoni; *Right:* Dr. Michael Rugg, Center Director, and Speaker Dr. Beatriz Luna.

Speaker Dr. Ulman Lindenberger, Dr. Rugg, Barbara and Don Daseke.

UT Dallas President David Daniel, Susan Daniel, Jerri Hammer and David Pomberg.

Dr. Kristen Kennedy nabs AWARE funding.

Dr. Kristen Kennedy Receives Grant to Further Genetics Study

Dr. Kristen Kennedy of the CVL was among six recipients to recently receive a grant from AWARE, a component fund of The Dallas Foundation dedicated to fighting Alzheimer's Disease. The grant will support her work on genetic factors that influence the aging brain, with the aim of understanding how we can age with minimal cognitive decline. AWARE provides support to the finest Dallas-area organizations engaged in Alzheimer's research or providing services to those suffering from Alzheimer's, their caregivers and families. AWARE President Gail Plummer stated, "AWARE is excited to grant Dr. Kennedy funding on such novel work on genetics. We look forward to recognizing her further at our annual gala, *The AWARE Affair,* on May 9."

Leaving a Legacy

One of our newest supporters learned about the CVL through our newsletter. She is an 84-year-old woman who worked in radiology at UT Southwestern for many years. With four grown children, all in the medical field in Texas, she wanted to leave a legacy through a charitable gift annuity. She gave to the CVL because she is "enthusiastic about the memory studies" being done by researchers at the Center. "[Memory] is where our life is stored," she added. She went on to say her desire was to "further the Center's goals in some small way." Every gift is appreciated. If you wish to donate to CVL, please contact Holly Hull Miori at hmiori@utdallas.edu or (972) 883-3728 regarding the range of gift options to consider.

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CENTER FOR VITAL LONGEVITY

THE SCIENCE OF THE AGING MIND

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