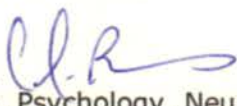


January 10, 2014

MEMORANDUM

TO: Trustees, The McKnight Brain Research Foundation
J. L. Dockery, M.D.
M.L. Dockery, M.D.
N. Ellenbogen Raim, M.D., J.D.
G. Ryerson, M.D.
R.M. Wah, M.D.
M.A. Cianciotto, Corporate Trustee

FROM: C.A. Barnes, Ph.D. 
Regents' Professor, Psychology, Neurology and Neuroscience
Evelyn F. McKnight Chair for Learning and Memory in Aging
Director, Evelyn F. McKnight Brain Institute
Director, ARL Division of Neural Systems, Memory and Aging
Associate Director, BIO5

Please find enclosed six copies of the Annual Report for the University of Arizona Evelyn F. McKnight Brain Institute, which covers the financial reports for the period of July 1, 2012 through June 30, 2013 and scientific reports for the period of January 1, 2013 through December 31, 2013.





**Evelyn F. McKnight
Brain Institute**

Annual Report

**McKnight Brain Research Foundation
Sponsored Institutes and Research Programs**

Scientific Report Period: January 1, 2013 – December 31, 2013

Financial Report Period: July 1, 2012 – June 30, 2013

Institution: University of Arizona

Submitted January 10, 2014

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1. Summary of scientific achievements since last report

The Evelyn F. McKnight Brain Institute at the University of Arizona (EMBI) has made significant progress towards our goal of understanding how aging impacts the circuits responsible for age-related memory decline using sensitive cognitive tests and two primary neurobiological tools that have been developed in the Director's laboratory. The first method is state-of-the-art ensemble electrophysiological recording in behaving animals that can monitor changes in brain networks and cognitive decline in aged rodents and nonhuman primates, and can be combined with live imaging methodologies. The second is a molecular imaging technology (the catFISH method) that allows the examination of individual cells that participate in circuits critical for memory. Application of catFISH in conjunction with methods that can quantify transcriptional and epigenetic activity provides a powerful window into how memory circuits are modified by behavior and altered during aging.

A number of exciting papers were published during 2013, a few among these include:

We know that distinct ensembles of hippocampal cells are active in different contexts, and that this activity plays a critical role in the construction and retrieval of episodic memory. We also know that the reliability of cognitive map retrieval in hippocampal networks is reduced in aging. We were able to show (Schimanski et al., 2013), using high density recording methods, that there is active competition between neural systems for solution of a given behavioral problem. In the case of learning the association between place and eye-lid stimulation (spatial eye-blink conditioning), systems other than the hippocampus can dominate for control of behavior – especially in old rats. The idea supported by our data is that hippocampus-independent systems take on a greater role in memory tasks when hippocampal function is weak, and that animals of advanced age show a shift away from functional engagement of the hippocampus. This is consistent with some human literature that suggests reduced activity in temporal lobe structures in aging and that increased activity bilaterally or in other structures can be associated with better performance. We will now be able to design studies to determine how to facilitate the use of effective alternative strategies in older animals, to produce more optimal behavior.

We also published several manuscripts this year using the catFISH method. One of these demonstrates that hippocampal granule cells have a unique kinetic profile for *Arc* transcription following behavior – one that is not observed in other cell types (Ramirez-Amaya et al., 2013). This sustained transcription may provide a mechanism that ensures that, given the sparse population of granule cells that are recruited during a given behavioral event, these cells are able to be modified. This region of the hippocampus is particularly vulnerable to aging (something that Scott Small and I showed a number of years ago), and it will be interesting to determine whether a defect in sustained *Arc* transcription is one factor that contributes to these aging cognitive defects. Additionally, we were also able to show that RNA transcript levels of the immediate early gene *c-fos* are altered in aging in pyramidal and granule cells in aging rats, and this occurred in spite of stable cellular activation (Chawla et al., 2013), suggesting aging defects in subcellular processing. It will be important to determine whether strategies can be developed to achieve a more balanced regulated state in these aging cells and whether such treatments may benefit cognition. We also completed a study in which the behavior-induced *Arc* catFISH imaging method was used to look at cell activity along the entire proximo-distal

axis of the hippocampal CA1 region in young and old rats. It appears that the link from perirhinal cortex, through lateral entorhinal cortex to CA1 is less functional in old rats than is the medial entorhinal cortical input to CA1 (Hartzell et al., 2013). These data are interesting in light of findings from the Barnes and Ryan labs last year that suggested a specific defect in old rats, monkeys (Burke et al., 2012) and humans (Ryan et al., 2012) in the function of perirhinal cortex, making it a potential therapeutic target in the temporal lobe system.

2. Publications in peer reviewed journals

From Barnes

- Schimanski, L.A., Lipa, P. and Barnes, C.A. (2013) Tracking the course of hippocampal representations during learning: When is the map required? *Journal of Neuroscience*, 33:3094-3106.
- Ramirez-Amaya, V., Angulo-Perkins, A., Chawla, M.K., Barnes, C.A. and Rosi, S. (2013) Sustained transcription of the immediate early gene Arc in the dentate gyrus after spatial exploration. *Journal of Neuroscience*, 33:1631-1639.
- Hartzell, A.L., Burke, S.N., Hoang, L.T., Lister, J.P., Rodriguez, C.N. and Barnes, C.A. (2013) Transcription of the immediate-early gene Arc in CA1 of the hippocampus reveals activity differences along the proximodistal axis that are attenuated by advanced age. *Journal of Neuroscience*, 33:3424-3433.
- Chawla, M.K., Penner, M.R., Olson, K.M., Sutherland, V.L., Mittleman-Smith, M.A. and Barnes, C.A. (2013) Spatial behavior and seizure-included changes in c-fos mRNA expression in young and old rats. *Neurobiology of Aging*, 34:1184-1198.
- Samson, R.D. and Barnes, C.A. (2013) Impact of aging brain circuits on cognition. *European Journal of Neuroscience*, 37:1903-1915.
- Takehara-Nishiuchi, K., Insel, N., Hoang, L.T., Wagner, Z., Olson, K., Chawla, M.K., Burke, S.N. and Barnes, C.A. (2013) Activation patterns in superficial layers of neocortex change between experiences independent of behavior, environment, or the hippocampus. *Cerebral Cortex*, 23:2225-2234.
- Lu, L., Leutgeb, J.K., Tsao, A., Henriksen, E.J., Leutgeb, S., Barnes, C.A., Witter, M.P., Moser, M.-B. and Moser, E.I. (2013) Impaired hippocampal rate coding after lesions of the lateral entorhinal cortex. *Nature Neuroscience*, 16:1085-1093.
- Burke, S.N., Maurer, A.P., Nematollahi, S., Uprety, A., Wallace, J.L. and Barnes, C.A. (2014) Advanced age dissociates dual functions of the perirhinal cortex. *Journal of Neuroscience*, in press.
- Samson, R.D., Venkatesh, A., Patel, D.H., Lipa, P. and Barnes, C.A. (2014) Enhanced performance of aged rats in contingency degradation and instrumental extinction tasks. *Behavioral Neuroscience*, in press.

From Selected Affiliates

- Burns, C.M., Chen, K., Kaszniak, A.W., Lee, W., Alexander, G.E., Bandy, D., Fleisher, A., Caselli, R.J. and Reiman, E.M. (2013) Higher serum glucose levels are associated with cerebral hypometabolism in Alzheimer's regions. *Neurology*, 80:1557-1564.
- Chan, S.H., Ryan, L. and Bever, T.G. (2013) Role of the striatum in language: Syntactic and conceptual sequencing. *Brain and Language*, 125(3):283-94.

- Grilli, M.D. and Glisky, E.L. (2013) Imagining a better memory: Self-imagination in memory-impaired patients. *Clinical Psychological Science*, 1:93-99.
- Kaszniak, A.W. and Kligman, E. (2013) Hospice care for patients with dementia. *Arizona Geriatrics Society Journal*, 18(2), 23-24.
- Nadel, L., Hoscheidt, S. and Ryan, L. (2013) Spatial cognition and the hippocampus: the anterior-posterior axis. *Journal of Cognitive Neuroscience*, 25(1):22-28.
- Protas, H.D., Chen, K., Langbaum, J.B., Fleisher, A.S., Alexander, G.E., Lee, W., Bandy, D., de Leon M.J., Mosconi, L., Buckley, S., Truran-Sacrey, D., Schuff, N., Weiner, M.W., Caselli, R.J. and Reiman, E.M. (2013) Posterior cingulate glucose metabolism, hippocampal glucose metabolism, and hippocampal volume in cognitively normal, late-middle-aged persons at 3 levels of genetic risk for Alzheimer disease. *JAMA Neurology*, 70:320-325.
- Rance, N.E., Dacks, P.A. Mittelman-Smith, M.A., Krajewski, S.K. and Romanovsky, A.A. (2013) Modulation of body temperature and LH secretion by hypothalamic KNDy (kisspeptin, neurokinin B and dynorphin) neurons: a novel hypothesis on the mechanism of hot flushes. *Frontiers in Neuroendocrinology*, 34:211-227.
- Rushton, C.H., Kaszniak, A.W. and Halifax, J.S. (2013) A framework for understanding moral distress among palliative care clinicians. *Journal of Palliative Medicine*, 16:1074-1079.
- Rushton, C.H., Kaszniak, A.W. and Halifax, J.S. (2013) Addressing moral distress: Application of a framework to palliative care practice. *Journal of Palliative Medicine*. 16:1080-1088. 2013.
- Schraml, F., Fleisher, A.S., Chen, K., Ayutyanont, N., Auttawut, R., Langbaum, J.B.S., Lee, W., Liu, X., Bandy, D., Reeder, S.Q., Alexander, G.E., Caselli, R.J. and Reiman, E.M. for the Alzheimer's Disease Neuroimaging Initiative. (2013) Association between an Alzheimer's disease-related hypometabolic index and an apolipoprotein E ϵ 4 gene dose. *PLoS One*, 8:e67163.
- Smith, J.F., Braun, A.R., Alexander, G.E., Chen, K. and Horwitz, B. (2013) Separating lexical-semantic access from other mnemonic processes in picture-name verification. *Frontiers in Psychology*, 4:706.
- Hoscheidt, S.M., Labar, K.S., Ryan, L., Jacobs, W.J., and Nadel, L. (2014). Encoding negative events under stress: High subjective arousal is related to accurate emotional memory despite misinformation exposure. *Neurobiology of Learning and Memory*, in press.
- Yoshimaru, E., Totenhagen, J., Alexander, G.E. and Trouard, T.P. (2014) Design, manufacture and analysis of customized phantoms for quality control in small animal MRI systems. *Magnetic Resonance in Medicine*, in press.

3. Publications (other)

From Barnes

- Schimanski, L.A. and Barnes, C.A. (2013) Insights into age-related cognitive decline: Coupling neurophysiological and behavioral approaches. In: H.A. Bimonte-Nelson and W. Waltz (Eds) The Maze Book: Your Guidebook to Theories, Practice, and Protocols for Testing Rodent Cognition. Springer: New York, in press.
- Barnes, C.A. Op-Ed, AZ Daily Star, Guest Column: "BRAIN initiative may boost Arizona's economy, role in neuroscience", April 16, 2013.

Article featuring Carol Barnes - "When Memories Fade" by Ford Burkhart, Arizona Alumni Magazine, 91(1):22-23, 2013.

Article featuring Carol Barnes – "Award a no-brainer for UA Professor Carol Barnes" by Gabrielle Fernety, Arizona Daily Wildcat, November 6, 2013.

From Selected Affiliates

Kuo, P.H. and Ahern, G.L. Elder Care: A Resource for Interprofessional Providers, Amyloid Imaging for Alzheimer's Disease, The Portal of Geriatrics Online Education (POGOe), May 2013. (Available from: <http://www.pogoe.org/productid/21623>)

4. Presentations at scientific meetings

From Barnes

Barnes, C.A. From aging rats to aging monkeys: New finding, new approaches, Centre for Biology of Memory, Kavli Institute, Norwegian University of Science and Technology, Trondheim, Norway, January 2013. (Invited)

Barnes, C.A. Hippocampal state: Contributions from motor and sensory inputs. Twenty-fifth Winter Conference on Neural Plasticity, Curacao, Netherland Antilles, February 2013. (Invited)

Barnes, C.A. Neural circuits that contribute to age-related cognitive decline. Keynote Lecture, 2013 meeting of The Milwaukee Chapter of the Society for Neuroscience, May 2013. (Invited)

Barnes, C.A. Age-related changes in brain plasticity: Principles derived from medial temporal lobe memory and perceptual systems – are they relevant for understanding the auditory System? Keynote Speaker, NIA Workshop on Auditory Plasticity and Aging, Bethesda, MD, August 2013. (Invited)

Barnes, C.A. Normal brain aging: Impact on circuits critical for memory. Colloquium Series Speaker, Institute of Science and Technology Austria, Klosterneuburg, Austria, September 2013. (Invited)

Barnes, C.A. Some unexpected findings, and new approaches. Systems Neuroscience Lab Meeting, Institute of Science and Technology Austria, Klosterneuburg, Austria, September 2013. (Invited)

Engle, J.R., Archibeque, M.J., Permenter, M.R., Vogt, J.A., Dugger, B.N., Beach, T.G. and Barnes, C.A. Cerebral amyloid deposition and phosphorylated tau: relationships between age and cognitive status in the rhesus macaque. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)

Plange, K., Engle, J.R., Burke, S.N., Gray, D.T. and Barnes, C.A. Changes in sensory function are correlated with cognitive impairments in bonnet monkeys. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)

Thome, A., Chawla, M.K., Ramirez-Amaya, V., Marrone, D.F., Lipa, P., Ellmore, T.M., McNaughton, B.L. and Barnes, C.A. Large scale molecular imaging of hippocampal network activity during real and virtual navigation in freely behaving primates. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)

Maurer, A.P., Thome, A., Bohne, K.M., Archibeque, M.J., Permenter, M.R., Vogt, J.A., Sprawka, K., Engle, J.R. and Barnes, C.A. Telemetric recordings from temporal lobe of a

- freely moving primate. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)
- Chance, F.S., Maurer, A.P., Burke, S.N. and Barnes, C.A. Dual input component models of CA1 activity in young and aged rats. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)
- Lester, A.W., Maurer, A.P., Burke, S.N., Hoang, L.T. and Barnes, C.A. Preserved neural dynamics during reverse locomotion. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)
- Burke, S.N., Maurer, A.P., Cowen, S.L. and Barnes, C.A. Perirhinal cortical interneurons exhibit reduced firing rate with advanced age. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)
- Uprety, A.R., Lipa, P., Thome, A., Espinoza, A.I., Hindley, T.R. and Barnes, C.A. Frontal cortical gamma frequency slowing in aging: Can C6 rescue cortical synchrony and decision speed? 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)
- Xiong, M., Morrison, W., Lister, J.P., Barnes, C.A., Cruz, L.R. and Rosene, D.L. Effect of aging on the microcolumnar structure of entorhinal cortex: correlation with performance on the spatial Morris water maze test. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)
- Lister, J.P., Liang, J. and Barnes, C.A. Effect of age and changing odors on population activity in the medial entorhinal cortex during track running behavior. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)
- Chawla, M.K., Sekhadia, N., Olson, K., Alme, C.B., Moser, E.I., Moser, M.-B., McNaughton, B.L. and Barnes, C.A. Mass trial induced under-expression of Arc mRNA in rat hippocampal neurons. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA. (Abstract)
- Hay, M., Constantopoulos, E., Uprety, A.R., Samareh-Jahani, F., Barnes, C.A. and Konhilas, J.P. Cognitive dysfunction in heart failure and a protective role for angiotensin (1-7). 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)
- Lu, L., Leutgeb, J.K., Tsao, A., Henriksen, E.J., Leutgeb, S., Barnes, C.A., Witter, M.P., Moser, V.-B. and Moser, E.I. Impaired hippocampal rate remapping following lesions in the lateral entorhinal cortex. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)
- Siniard, A.L., Corneveaux, J.J., Allen, A.N., Chawla, M.K., Turk, M.N., Reiman, R.A., Rose, H.E., Barnes, C.A. and Huentelman, M.J. Activity regulated transcript identification in the hippocampus and the genetic association with AD. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)
- Barnes, C.A. Cognitive aging across species. Symposium: Brain, Cognition, and Genetics in Healthy Aging. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Invited)
- Barnes, C.A. The evolving face of neuroscience: Role of women and globalization. Keynote Speaker, Celebration of Women in Neuroscience, 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Invited)
- Barnes, C.A. Effects of aging on behavior and temporal lobe circuits. Neuroscience Seminar Series, Pfizer Inc., Cambridge, MA, November 2013. (Invited)

Barnes, C.A. Effect of aging on brain circuits and behavior, Keynote Speaker, Annual ASU-UA Cognitive Science Conclave, Windmill Suites in St. Philips Plaza, Tucson, AZ, December 2013. (Invited)

From Selected Affiliates

Baena, E. and Ryan, L. The effects of age and increasing task difficulty on the neural correlates of semantic knowledge and episodic memory: An fMRI investigation of functional compensation. 41st Annual Meeting of the International Neuropsychological Society, Waikoloa, Hawaii. February 2013. (Abstract)

Burns, C.M., Kaszniak, A., Chen, K., Lee, W. and Reiman, E.M. Elevated fasting serum glucose levels and brain function: A PET study of younger adults. 41st Annual Meeting of the International Neuropsychological Society, Waikoloa, HI, February 2013. (Abstract)

Wohltmann, J.J. and Glisky, E.L. Facebook for seniors: A pilot study of the effects of online social networking on cognitive functioning in healthy older adults. 41st Annual Meeting of the International Neuropsychological Society, Waikoloa, Hawaii, February 2013. (Abstract)

Kaszniak, A.W. Neuropsychology and consciousness. Zen Brain: Exploring Consciousness-Waking, Sleeping, Dreaming, Dying Retreat/Seminar, Upaya Zen Center and Institute, Santa Fe, NM, February 2013. (Invited)

Alexander, G.E. Applications of neuroimaging in the study of brain aging, Neuroscience Community Data Blitz, University of Arizona, Tucson, AZ, March 2013. (Invited)

Kaszniak, A.W. Mindfulness, spirituality, and the brain. National Forum on Brain Health (part of the 2013 Aging in America Conference, American Society on Aging), Chicago, IL, March 2013. (Invited)

Kaszniak, A.W. The neuroscience of addiction, craving, and desire. Zen Brain: Greed and Generosity – The Neuroscience and Path of Transforming Addiction Retreat/Seminar, Upaya Zen Center and Institute, Santa Fe, NM, April 2013. (Invited)

Kaszniak, A.W. Meditation and aging. Webinar presented as part of the American Society on Aging MindAlert Webinar Series, April 2013. (Invited)

Alexander, G.E. Opportunities and challenges: Multi-site MRI studies of cognitive aging, McKnight Brain Research Foundation Sixth Inter-Institutional Meeting, Birmingham, AL, April 2013. (Invited)

Ryan, L. Behavioral assessment battery follow-up. McKnight Brain Research Foundation Sixth Inter-Institutional Meeting, Birmingham, AL, April 2013. (Invited)

Baena, E. and Ryan, L. Functional compensation in response to increasing task difficulty: Comparing semantic and episodic memory tasks in young and older adults. Annual Conference of the Cognitive Neuroscience Society, San Francisco, California, April 2013. (Abstract)

Buckley, T., Sherman, S., Baena, E. and Ryan L. The effects of caffeine and exercise on implicit and explicit memory performance in younger adults: an investigation of physiological arousal. Annual Conference of the Cognitive Neuroscience Society, San Francisco, California, April 2013. (Abstract)

Wohltmann, J.J. and Glisky, E.L. Cognitive benefits of online social networking in older adults, Neuroscience Community Data Blitz, University of Arizona, Tucson, AZ, April 2013. (Invited)

Kaszniak, A.W. Transformation in long-term meditation. The Future of Meditation Research Conference, Esalen Institute, Big Sur, CA, May 2013. (Invited)

- Kaszniak, A.W. Neuroscientific approaches to consciousness. 2013 Mind and Life Summer Research Institute, Garrison, NY, June 2013. (Invited)
- Polsinelli, A., Martinez, T., Sherman, N., Wohltmann, J. and Glisky, E. Are interpersonal interactions more important in later life? Evidence from emotional autobiographical memories of older and younger adults. American Psychological Association Meeting, Honolulu, HI, July 2013. (Abstract)
- Ryan, L. and Cardoza, J. An fMRI study of age-related differences in complex object discrimination. Annual Meeting of the Canadian Society for Brain, Behaviour and Cognitive Science, Calgary, Alberta, Canada, September 2013. (Invited)
- Glisky, E.L. and Myhre, J.W. Cognitive benefits of online social networking in older adults. Memory Disorders Research Society, Toronto, Canada, October 2013. (Abstract)
- Levy, D. and Kaszniak, A.W. Integrity of practice: Walking the talk. Panel Presentation, 5th Annual Conference of the Association for Contemplative Mind in Higher Education, Amherst, MA, October 2013. (Invited)
- Alexander, G.E. Imaging Working Group Update, McKnight Brain Institute Scientific Program, University of Arizona, Tucson, AZ. (Invited)
- Ryan, L. Assessment clinic and cognitive test battery update, McKnight Brain Institute Scientific Program, University of Arizona, Tucson, AZ. (Invited)
- Baena, E., Wohltmann, J. and Ryan, L. Age related differences in hippocampal response to increasing difficulty in an associative memory retrieval task: An fMRI investigation of face-name pairs. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)
- Cardoza, J., Kawa, K.H., Arnold, W.A., Wallentin-Flores, J., Barense, M.D. and Ryan L. An fMRI study comparing perirhinal cortex, temporal pole, and hippocampus activation during complex object discrimination in younger adults. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)
- Cooke, K.A. and Ryan, L. The differential role of visual context for young and older adults during object item memory and source memory. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)
- Haws, K., Hishaw, G.A., Totenhagen, J.W., Torre, G.A., Gillespie, W.L., Reid, B.A., Nguyen, L.A., Fitzhugh, M.C., Lines, J.W. and Alexander, G.E. (2013) Relation of MRI white matter hyperintensity severity to nocturnal blood pressure variation and hypertension in healthy cognitive aging. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)
- Kawa, K., Stickel, A., Walther, K., Glisky, E., Hackett, N., Huentelman, M.J. and Ryan, L. The effects of *KIBRA*, *APOE*, and hypertension status on measures of memory functioning in older adults. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)
- Lines, J.W., Totenhagen, J.W., Haws, K.A., Fitzhugh, M.C., Hishaw, G.A., Torre, G.A., Gillespie, W.L., Chen, K., Reiman, E.M., Trouard, T.P., Moeller, J.R. and Alexander, G.E. Multivariate regional network of gray matter volume associated with healthy cognitive aging. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)
- Nguyen, L.A., Haws, K.A., Totenhagen, J.W., Torre, G.A., Gillespie, W.L., Fitzhugh, M.C., Hishaw, G.A. and Alexander, G.E. (2013) Effects of memory complaints and hypertension

- status on cognitive performance in the elderly. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)
- Reid, B.A., Haws, K.A., Totenhagen, J.W., Torre, G.A., Gillespie, W.L., Fitzhugh, M.C., Lines, J.W., Hishaw, G.A. and Alexander, G.E. (2013) Effects of self-reported sleep quality on cognitive functioning in healthy older adults. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)
- Stickel, A., Kawa, K. and Ryan, L. The effects of BMI on executive functioning in young-older adults versus old-older adults. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)
- Totenhagen, J., Lines, J.W., Bergfield, K.L., Torre, G.A., Gillespies, W.L., Haws, K.A., Fitzhugh, M.C., Reid, B.A., Nguyen, L.A., Hishaw, G.A., Trouard, T.P., Alexander, G.E. (2013) Resting state MRI functional connectivity differences in healthy middle-aged to elderly adults. 2013 Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2013. (Abstract)
- Rance, N.E. Endocrine Grand Rounds, Massachusetts General Hospital and Visiting Professor, Reproductive Endocrine Sciences Center, Massachusetts General Hospital, Boston, MA, 2013. (Invited)

5. Presentations at public (non-scientific) meetings or events

From Barnes

- Barnes, C.A. Memory and the aging brain, Canyon Ranch Brain Camp: An Integrative Approach to Brain & Body Wellness, Canyon Ranch, Tucson, AZ, January 2013. (Invited)
- Barnes, C.A. Closing the healthspan/lifespan gap: Scientific contributions from UA faculty, First Annual Conference on Successful Aging, University of Arizona, Tucson, AZ, January 2013. (Invited)

From Selected Affiliates

- Alexander, G.E. Viewing the aging brain: New findings from neuroimaging research, Jewish Community Center, Tucson, AZ, 2013. (Invited)
- Alexander, G.E. Exercise: The surprising links between your brain and body, First Annual Conference on Successful Aging, University of Arizona, Tucson, AZ, January 2013. (Invited)
- Kaszniak, A.W. Wisdom and emotional balance: Unwrapping the gifts of age, First Annual Conference on Successful Aging, University of Arizona, Tucson, AZ, January 2013. (Invited)
- Glisky, E.L. Brain fitness: Cognitive training strategies. Annual Conference on Successful Aging, University of Arizona, Tucson, AZ., January 2013. (Invited)
- Ryan, L. Good for the heart, good for the brain: Enhancing cognitive function as we age, First Annual Conference on Successful Aging, University of Arizona, Tucson, AZ, January 2013. (Invited)
- Ahern, G.L. Practical aspects of diagnosis and treatment of Alzheimer's disease and other dementias, current clinical practice; psychopharmacology review, University of Arizona Department of Psychiatry, Westin La Paloma, Tucson, AZ, February 2013. (Invited)
- Kaszniak, A.W. Consciousness, neuroscience, and meditation practice. Upaya Zen Center and Institute, Santa Fe, NM, February 2013. (Invited)

Glisky, E.L. Focus on Aging I. Osher Lifelong Learning Institute, Green Valley, AZ, Green Valley, AZ, March 2013. (Invited)

Glisky, E.L. Memory changes with age: What to do about it? Osher Lifelong Learning Institute, Green Valley, AZ, March 2013. (Invited)

Kaszniak, A.W. Aging, meditation, and the brain, Tucson Medical Center Annual Brain Week Conference, Tucson, AZ, April 2013. (Invited)

Kaszniak, A.W. Moderator, Panel Discussion, Arizona Alzheimer's Consortium Annual Public Conference, Peoria, AZ, May 2013. (Invited)

Ahern, G.L. Diagnosis of dementia, evaluation, and assessment, National Academy of Elder Law Attorneys, Doubletree Hotel, Tucson, AZ, October 2013. (Invited)

Ryan, L. Eating your way to a healthy brain, Osher Lifelong Learning Institute, Green Valley, AZ, October 2013. (Invited)

Glisky, E.L. Focus on Aging II. Osher Lifelong Learning Institute, Green Valley, AZ, October 2013. (Invited)

Glisky, E.L. Memory changes with age: What to do about it? Osher Lifelong Learning Institute, Green Valley, AZ, October 2013. (Invited)

Kaszniak, A.W. Wisdom, growth, and resilience in care partnership. Keynote Speaker, 18th Annual Caregiver Conference, Tucson, AZ, November 2013. (Invited)

Halifax, J. and Kaszniak, A.W. A day of meditation and discussion. Retreat/Seminar, Upaya Sangha of Tucson, Tucson, AZ, December 2013. (Invited)

6. Awards (from McKnight Affiliates)

Barnes, C.A. 2013 Ralph W. Gerard Prize in Neuroscience, Society for Neuroscience.

Gothard, K.M. 2013 Excellence in Teaching Award, UA College of Medicine.

Huentelman, M.J. 2013 Phoenix Business Journal 40 Under 40 Award.

Koshy, A.A. 2013 co-recipient of the Department of Neurology Outstanding Faculty Educator Award.

Nadel, L. 2013 Sisley-Jerome LeJeune International Prize for Research on Intellectual Disability.

Reiman, E.M. 2013 Potamkin Prize in Pick's, Alzheimer's and Related Diseases, American Academy of Neurology and American Brain Foundation.

7. Faculty

There are two levels of faculty participation in the Evelyn F. McKnight Brain Institute at the University of Arizona: the Scientific Advisory Board (all of whom are Affiliate Faculty members), and Affiliate Faculty members. The Scientific Advisory Board consists of Dr. Geoff Ahern, Dr. Gene Alexander, Dr. Carol Barnes (Director), Dr. Betty Glisky, Dr. Al Kaszniak, Dr. Naomi Rance and Dr. Lee Ryan. The Advisory Board's one-year abbreviated curriculum vitae are included in the following pages.

BIOGRAPHICAL SKETCH

NAME Carol A. Barnes, Ph.D.	POSITION TITLE Regents' Professor		
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
University of California, Riverside, CA	B.A. (Honors)	1971	Psychology
Carleton University, Ottawa, Ontario, Canada	M.A.	1972	Psychology
Carleton University, Ottawa, Ontario, Canada	Ph.D. (Cum laude)	1977	Psychology

Positions

1978	Research Associate , Dalhousie University, Dept. Psychology, Halifax, Canada
1979 - 1980	NRSA Postdoctoral Fellow , Institute of Neurophysiology, Oslo, Norway
1981	NATO Postdoctoral Fellow , Cerebral Functions Group, Univ College, London, England
1982 - 1985	Assistant Professor , Department of Psychology, University of Colorado, Boulder
1985 - 1989	Associate Professor , Department of Psychology, University of Colorado, Boulder
1989 - 1990	Professor , Department of Psychology, University of Colorado, Boulder
1990 - 1996	Professor , Departments of Psychology and Neurology, University of Arizona, Tucson
2006 -	Regents' Professor , Departments of Psychology and Neurology, University of Arizona, Tucson
2006 -	Director , Evelyn F. McKnight Brain Institute, University of Arizona, Tucson
2006 -	Evelyn F. McKnight Endowed Chair for Learning and Memory in Aging , University of Arizona, Tucson
2008 -	Director , ARL Division of Neural Systems, Memory and Aging, University of Arizona, Tucson
2009 -	Regents' Professor , Department of Neuroscience, University of Arizona, Tucson
2009 -	Associate Director , BIO5 Institute, University of Arizona, Tucson

Honors, Awards and Advisory Committees

1969	NSF Summer Research Fellowship
1971	Phi Beta Kappa
1972 – 1974	Ontario Graduate Fellowship
1979 – 1981	NRSA Individual Postdoctoral Fellowship
1981 – 1982	NATO Fellowship in Science
1984 – 1989	Research Career Development Award, N.I.H.
1987 – 1991	Neuroscience, Behavior and Sociology of Aging Committee A, N.I.A.
1989 – 1994	Research Scientist Development Award, Level II, N.I.M.H.
1991 – 1997	Medical and Scientific Advisory Board, Alzheimer's Association
1994 – 1999	Research Scientist Award, N.I.M.H.
1994 – 1997	National Advisory Council on Aging, N.I.H.
1995 – 1999	National Science Advisory Council, American Federation for Aging Research
1996 – 2000	Councilor, Society for Neuroscience
1997 – 2000	Medical and Scientific Advisory Council, Alzheimer's Association
1999 – 2004	Board of Scientific Counselors, N.I.M.H.
2000 – 2002	Secretary, Society for Neuroscience
2003 – 2006	President-Elect (2003-04), President (2004-05), Past-President (2005-06), Society for Neuroscience
2004 – 2014	MERIT Award, National Institute on Aging, NIH
2004	Elected Norwegian Royal Society of Sciences and Letters
2007	Elected Fellow, American Association for the Advancement of Science

- 2007 Elected Executive Committee, Dana Alliance for Brain Initiatives
- 2008 – 2011 Chair, Society for Neuroscience International Affairs Committee – US National Committee (Incoming Chair 2007-2008)
- 2008 APA Division 6 D.B. Marquis Behavioral Neuroscience Award for Behavioral Neuroscience
- 2010 Mika Salpeter Lifetime Achievement Award
- 2010 Elected, Galileo Fellow, College of Science, University of Arizona
- 2010 – 2014 Elected: Chair, Gruber Foundation Neuroscience Prize Advisory Board
- 2011 APA Division 6 D.B. Marquis Behavioral Neuroscience Award for Behavioral Neuroscience
- 2013 Ralph W. Gerard Prize in Neuroscience

2013 Publications

- Chawla, M.K., Penner, M.R., Olson, K.M., Sutherland, V.L., Mittleman-Smith, M.A. and Barnes, C.A. (2013) Spatial behavior and seizure-included changes in c-fos mRNA expression in young and old rats. *Neurobiology of Aging*, 34:1184-1198.
- Schimanski, L.A., Lipa, P. and Barnes, C.A. (2013) Tracking the course of hippocampal representations during learning: When is the map required? *Journal of Neuroscience*, 33:3094-3106.
- Ramirez-Amaya, V., Angulo-Perkins, A., Chawla, M.K., Barnes, C.A. and Rosi, S. (2013) Sustained transcription of the immediate early gene Arc in the dentate gyrus after spatial exploration. *Journal of Neuroscience*, 33:1631-1639.
- Hartzell, A.L., Burke, S.N., Hoang, L.T., Lister, J.P., Rodriguez, C.N. and Barnes, C.A. (2013) Transcription of the immediate-early gene Arc in CA1 of the hippocampus reveals activity differences along the proximodistal axis that are attenuated by advanced age. *Journal of Neuroscience*, 33:3424-3433.
- Samson, R.D. and Barnes, C.A. (2013) Impact of aging brain circuits on cognition. *European Journal of Neuroscience*, 37:1903-1915.
- Takehara-Nishiuchi, K., Insel, N., Hoang, L.T., Wagner, Z., Olson, K., Chawla, M.K., Burke, S.N. and Barnes, C.A. (2013) Activation patterns in superficial layers of neocortex change between experiences independent of behavior, environment, or the hippocampus. *Cerebral Cortex*, 23:2225-2234.
- Lu, L., Leutgeb, J.K., Tsao, A., Henriksen, E.J., Leutgeb, S., Barnes, C.A., Witter, M.P., Moser, M.-B. and Moser, E.I. (2013) Impaired hippocampal rate coding after lesions of the lateral entorhinal cortex. *Nature Neuroscience*, 16:1085-1093.
- Burke, S.N., Maurer, A.P., Nematollahi, S., Uprety, A., Wallace, J.L. and Barnes, C.A. (2014) Advanced age dissociates dual functions of the perirhinal cortex. *Journal of Neuroscience*, in press.
- Samson, R.D., Venkatesh, A., Patel, D.H., Lipa, P. and Barnes, C.A. (2014) Enhanced performance of aged rats in contingency degradation and instrumental extinction tasks. *Behavioral Neuroscience*, in press.
- Schimanski, L.A. and Barnes, C.A. (2014) Insights into age-related cognitive decline: Coupling neurophysiological and behavioral approaches. In: H.A. Bimonte-Nelson and W. Waltz (Eds) The Maze Book: Your Guidebook to Theories, Practice, and Protocols for Testing Rodent Cognition. Springer: New York, in press.

BIOGRAPHICAL SKETCH

NAME Geoffrey Lawrence Ahern, M.D., Ph.D.	POSITION TITLE Professor		
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
SUNY, Purchase College	B.A.	1976	Psychology
Yale University, New Haven	M.S.	1978	Psychology
Yale University, New Haven	Ph.D.	1981	Psychology
Yale University, New Haven	M.D.	1984	Medicine
Waterbury Hospital, Waterbury	Intern	1984-1985	Medicine
Boston University, Boston	Resident	1985-1988	Neurology
Beth Israel Hospital, Boston	Fellow	1988-1990	Behavioral Neurology

Positions

1977 - 1980	Lab Director , Human Psychophysiology Laboratory, Yale University, New Haven
1985 - 1988	Teaching Fellow , Department of Neurology, Boston Univ School of Medicine, Boston
1988 - 1990	Instructor , Department of Neurology, Harvard Medical School, Boston
1988 - 1990	Attending Neurologist , Beth Israel Hospital, Boston
1990 - 1996	Assistant Professor , Neurology and Psychology, University of Arizona, Tucson
1990 -	Attending Neurologist , University Medical Center, Tucson, Arizona
1990 - 1996	Medical Director , Behavioral Neurology Unit, University of Arizona, Tucson
1990 -	Director , Neurobehavioral Laboratory, University of Arizona, Tucson
1990 -	Member , Committee on Neuroscience, University of Arizona, Tucson, Arizona
1996 - 1999	Associate Professor , Neurology and Psychology, University of Arizona, Tucson
1996 -	Director , Behavioral Neuroscience & Alzheimer's Clinic, Univ of Arizona, Tucson
1999 - 2002	Associate Professor , Neurology, Psychology, Psychiatry, Univ of Arizona, Tucson
2002 -	Professor , Neurology, Psychology, and Psychiatry, University of Arizona, Tucson
2007-	Professor , Evelyn F. McKnight Brain Institute, University of Arizona, Tucson
2007-	Bruce and Lorraine Cumming Endowed Chair in Alzheimer's Research

Honors and Awards

1994-1995	Cited in S Naifeh & GW Smith(eds.), The Best Doctors in America, 2 nd Edition, Woodward/White
1996-1997	Cited in S Naifeh & GW Smith(eds.), The Best Doctors in America, Pacific Region, Woodward/White
1997	Elected, American Neurological Association
1998-1999	Cited in S Naifeh & GW Smith(eds.), The Best Doctors in America, 4th Edition, Woodward/White
2003	Cited in S Naifeh and GW Smith (eds.), The Best Doctors in America, 2003-2004
2005	Cited in S Naifeh and GW Smith (eds.), The Best Doctors in America, 2005-2006
2007	Cited in S Naifeh and GW Smith (eds.), The Best Doctors in America, 2007-2008
2007	Peer Review Circle of Honor Award, Journal of Clinical Psychiatry
2009	Cited in S Naifeh and GW Smith (eds.), The Best Doctors in America, 2009-2010
2010	Cited in S Naifeh and GW Smith (eds.), The Best Doctors in America, 2011-2012
2013	Cited in S Naifeh and GW Smith (eds.), The Best Doctors in America, 2013

2013 Publications

Kuo, P.H. and Ahern, G.L. Elder Care: A resource for interprofessional providers: Amyloid imaging for Alzheimer's disease. POGOe - Portal of Geriatrics Online Education; 2013 Available from: <http://www.pogoe.org/productid/21623>

BIOGRAPHICAL SKETCH

NAME Gene E. Alexander, Ph.D.	POSITION TITLE Professor		
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Pomona College, Claremont, CA	B.A.	1983	Psychology
Loyola University of Chicago, Chicago, IL	M.A.	1987	Clinical
Loyola University of Chicago, Chicago, IL	Ph.D.	1992	Clinical

Positions

1988-1989	Clinical Psychology Intern , Dept. of Psychiatry & Behavioral Sciences, Univ. of Washington, Seattle, WA
1989-1992	Research Fellow , Dept. of Brain Imaging, NYSPI and Columbia University, NY, NY
1991-1993	Research Scientist I , Dept. of Brain Imaging, NYSPI and Columbia University, NY, NY
1993-1999	Staff Fellow to Sr. Staff Fellow , Lab. of Neurosciences, NIA, NIH, Bethesda, MD
1993-1999	Chief Neuropsychology Unit , Lab. of Neurosciences, NIA, NIH, Bethesda, MD
1999-2003	Research Associate Professor , Dept. of Psychology, Arizona State University, Tempe
1999- date	Director , MRI Morphology Core, Arizona Alzheimer's Disease Research Ctr, Phoenix
2001-2009	Director , Data Management Program/Core, NIA Az Alzheimer's Disease Core Center
2001- date	Member , Executive Committee, NIA Arizona Alzheimer's Disease Core Center, AZ
2003-2007	Associate Professor to Professor , Psychology Dept., Arizona State University, Tempe
2007-date	Professor , Psychology & Evelyn F. McKnight Brain Institute, Univ of Arizona, Tucson
2007-date	Director , Brain Imaging, Behavior, & Aging Lab, Univ of Arizona, Tucson, AZ

Honors, Awards and Advisory Committees

1995- date	Ad Hoc Reviewer, 20 journals in Neuropsychology, Psychiatry, Neurology, & Neurosci.
1996-1999	Staff Recognition Awards (annual), Laboratory of Neurosciences, National Inst. on Aging
2000- date	Reviewer, Alzheimer's Association Research Grant Program
2003-2007	Member, Study Section, Clinical Neuroscience and Disease, IRG, CSR, NIH
2003	Member, SEP, Women's Health Initiative Memory Study, Review Branch, NHLBI, NIH
2004	Member, Special Emphasis Panel, Alzheimer's Disease Center Grant Review, NIA, NIH
2004-2009	External Advisor, Aging Brain: Vasculature, Ischemia & Behav. Prog Proj, UCSF/Davis
2005-2007	Member, Specialist Peer Review Comm, Psychology: Exp/Clin, Fulbright Scholar Prog
2006	Chair, Special Emphasis Panel, Clin Neurosci & Disease, ZRG1 BDCN-E, IRG, CSR, NIH
2008	Member, SEP, Prog Proj Review Group, Recovery from Illness, ZAG1 ZIJ-8 O1, NIA, NIH
2008	Member, Study Section, Brain Injury & Neurovasc. Path., ZRB 1 BDCN-L (07), CSR, NIH
2008	Member, Special Emphasis Panel, SPRINT Ctr Review, ZHL1 CCT-B C2 1, NHLBI, NIH
2008-date	Member, Neuroimaging Workgroup, International Conf. on Alzheimer's Disease/ISTAART
2009	Reviewer, Special Emphasis Panel, Challenge Grant Panel 10, ZRG1 BDA-A 58 R, CSR, NIH
2009	Member, SEP, P30 Faculty Recruitment in Biomedical Research Core Centers, NIA, NIH
2009	Member, SEP, RC2 Grand Opportunity Grants in Genetics, Epigenetics & Genomics, NIA
2009	Member, SEP, Program Project Review Group, Brain Dopamine, ZAG1 ZIJ-8 J3, NIA, NIH
2009	Member, SEP, Program Project Review Group, Neuroimaging & Aging, ZAG1 ZIJ-5 JF, NIA
2009-date	Member, Faculty Annual Performance Comm, Psychology Dept., Univ. of Arizona
2010	Member, Neurological Sciences & Disorders K Review Committee, NSD-K, NINDS, NIH
2010	Member, Neuroscience of Aging Review Committee, NIA-N, NIA, NIH

- 2010 Member, SEP, Program Project Review Group, Exercise, Motor Deficits, & Aging, ZAG1-ZIJ-9, NIA, NIH
- 2010 Member, SEP, Program Project Review Group, Dopaminergic Dysfunction in Aging, ZAG1 ZiJ-6 J3, NIA, NIH
- 2010-2013 Member, Executive Committee, Neuroscience GIDP, University of Arizona
- 2010 Member, Academic Program Review Faculty Committee, Psych. Dept., Univ of Arizona
- 2010-2013 Elected to NIH Continuous Submission Status for substantial rev. service over the past 3 yrs
- 2011 Chairperson, Member Special Emphasis Panel, ZAG1 ZIJ-7 (J1), NIA, NIH
- 2011 Member, Neuroscience of Aging Review Committee, NIA-N, NIA, NIH
- 2011-date Advisory Editor, Neurobiology of Aging, Elsevier.
- 2011-2012 Member, Cognitive Aging Working Group, Evelyn F. McKnight Brain Institute
- 2011 Member, VA MHBB Merit Review Subcommittee, Veterans Administration
- 2011 Member, SEP, Loan Repayment Program, ZNS1 SRB-M (76), NIA, NIH
- 2011 Member, SEP, Biobehav. Res. Awards for Innovative New Scientists (BRAINS), ZMH1 ERB-L-04, NIMH, NIH
- 2011 Reviewer, Alzheimer's Disease Pilot Grant Program, Arizona Alzheimer's Disease Center
- 2011-date Fellow, Association for Psychological Science
- 2012 Member, Neurological Sciences & Disorders K Review Committee, NSD-K, NINDS, NIH
- 2012 Member, Neuroscience of Aging Review Committee, ZAG1 ZIJ-4 (J1), NIA, NIH
- 2012-date Member, Cognitive Workgroup, Evelyn F. McKnight Brain Institute
- 2012-date Member, MRI Standardization Workgroup, Evelyn F. McKnight Brain Institute
- 2012-date Director, Annual Conference on Successful Aging, University of Arizona
- 2013 Member, SEP, Neurodegen. & Neurodevelopmental Dis., ZRG1BDCN-Y(02), NIA, NIH
- 2013 Member, SEP, Psychol. Health, Development & Aging, 10 ZRG1 BBBP-D (02), NIA, NIH
- 2013 Member, Development Committee, Department of Psychology, University of Arizona
- 2013 Member, MRI Operations Committee, University of Arizona
- 2013 Member, Alzheimer's Disease Research Centers Review, ZAG1ZIJ4J1, NIA, NIH
- 2013-2019 Member, Neuroscience of Aging Review Comte, NIA-N, NIA, NIH (elected to 6 yr term)

2013 Publications

- Burns, C.M., Chen, K., Kaszniak, A.W., Lee, W., Alexander, G.E., Bandy, D., Fleisher, A., Caselli, R.J. and Reiman, E.R. (2013) Higher serum glucose levels are associated with cerebral hypometabolism in Alzheimer's regions. *Neurology*, 80:1557-64.
- Protas, H.D., Chen, K., Langbaum, J.B., Fleisher, A.S., Alexander, G.E., Lee, W., Bandy, D., de Leon M.J., Mosconi, L., Buckley, S., Truran-Sacrey, D., Schuff, N., Weiner, M.W., Caselli, R.J. and Reiman, E.M. (2013) Posterior cingulate glucose metabolism, hippocampal glucose metabolism, and hippocampal volume in cognitively normal, late-middle-aged persons at 3 levels of genetic risk for Alzheimer disease. *JAMA Neurology*, 70:320-5.
- Schraml, F., Fleisher, A.S., Chen, K., Ayutyanont, N., Auttawut, R., Langbaum, J.B.S., Lee, W., Liu, X., Bandy, D., Reeder, S.Q., Alexander, G.E., Caselli, R.J. and Reiman, E.M. for the Alzheimer's Disease Neuroimaging Initiative. (2013) Association between an Alzheimer's disease-related hypometabolic index and an apolipoprotein E ϵ 4 gene dose. *PLoS One*, 8:e67163.
- Smith, J.F., Braun, A.R., Alexander, G.E., Chen, K. and Horwitz, B. (2013) Separating lexical-semantic access from other mnemonic processes in picture-name verification. *Frontiers in Psychology*, 4:706.
- Yoshimaru, E., Totenhagen, J., Alexander, G.E. and Trouard, T.P. (2014) Design, manufacture and analysis of customized phantoms for quality control in small animal MRI systems. *Magnetic Resonance in Medicine*, in press.

BIOGRAPHICAL SKETCH

NAME Elizabeth L. Glisky, Ph.D.	POSITION TITLE Professor		
EDUCATION/TRAINING <i>(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)</i>			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
University of Toronto, Ontario, Canada	B.A.	1958-1962	Psychology
University of Toronto, Ontario, Canada	Ph.D.	1978-1983	Psychology
University of Toronto, Ontario, Canada	Postdoc	1983-1987	Psychology

Positions

1987 - 1989	Visiting Assistant Professor , Dept of Psychology, University of Arizona, Tucson
1989 - 1995	Assistant Professor , Department of Psychology, University of Arizona, Tucson
1995 - 1999	Associate Professor , Department of Psychology, University of Arizona, Tucson
2000 - 2002	Head , Interdisciplinary Program in Gerontology, University of Arizona, Tucson
1999 -	Professor , Department of Psychology, University of Arizona, Tucson
2004 - 2008	Associate Head and Graduate Coordinator , Department of Psychology, University of Arizona, Tucson
2007 -	Professor , Evelyn F. McKnight Brain Institute, University of Arizona, Tucson
2008 – 2009	Acting Head , Department of Psychology, University of Arizona, Tucson
2010 -	Head , Department of Psychology, University of Arizona, Tucson

Honors, Awards and Advisory Committees

1980 - 1981	Natural Sciences and Engineering Research Council postgraduate scholarship
1981 - 1982	University of Toronto open fellowship
1982 - 1983	Ontario Government scholarship
1983 - 1886	University of Toronto postdoctoral award to research fellow
1989 - 1990	University of Arizona, Provost's Teaching Award
2003	Social and Behavioral Sciences Research Professorship
2007	Fellow of the Association for Psychological Science
2011	Elizabeth Hurlock Beckman Award

2013 Publications

Grilli, M.D. and Glisky, E. L. (2013) Imagining a better memory: Self-imagination in memory-impaired patients. *Clinical Psychological Science*, 1:93-99.

BIOGRAPHICAL SKETCH

NAME		POSITION TITLE	
Alfred W. Kaszniak, Ph.D.		Professor of Psychology, Neurology & Psychiatry	
EDUCATION/			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
University of Illinois, Chicago	B.S.	1970	Psychology
University of Illinois, Chicago	M.A.	1973	Clinical Psychology
University of Illinois, Chicago	Ph.D.	1976	Clinical Psychology
Rush Medical College, Chicago	Postdoc	1973-1974	Clinical

Positions

- 1976 - 1979 **Assistant Professor**, Department of Psychology, Rush College of Medicine, Chicago
- 1979 - 1985 **Assistant to Associate Professor**, Department of Psychiatry, University of Arizona, Tucson
- 1985 - 1987 **Associate Professor**, Departments of Psychology and Psychiatry, University of Arizona, Tucson
- 1987 - present **Professor**, Departments of Psychology, Psychiatry and, Neurology, University of Arizona, Tucson
- 2002 - 2010 **Head**, Department of Psychology, University of Arizona, Tucson
- 2007 - present **Professor**, Evelyn F. McKnight Brain Institute, University of Arizona, Tucson

Fellowships, Honors and Awards

- 1978 Distinguished Contribution Award (for dissertation research), Division 20 (Adult Development and Aging), American Psychological Association
- 1989 Commendation for special contributions as a member of the Veterans Administration Geriatrics and Gerontology Advisory Board, Washington, DC
- 1989 Fellow, American Psychological Assoc; 1988 Fellow, Amer Psychological Society
- 1995 President, Section on Clinical Geropsychology, Div 12, Amer Psychological Assoc
- 2004 Koffler Prize for Outstanding Accomplishments in Public Service/Outreach
- 2006 University of Arizona Alumni Association Extraordinary Faculty Award
- 2007 Distinguished Contribution to the Science of Psychology Award, Arizona Psychological Association
- 2008 Contemplative Practice Fellow, Center for Contemplative Mind in Society

2013 Publications

- Burns, C.M., Chen, K., Kaszniak, A.W., Lee, W., Alexander, G., Bandy, D., Fleisher, A., Caselli, R.J. and Reiman, E.R. (2013) Higher serum glucose levels are associated with cerebral hypometabolism in Alzheimer's regions. *Neurology*, 80:1557-1564.
- Kaszniak, A.W. and Kligman, E. (2013) Hospice care for patients with dementia. *Arizona Geriatrics Society Journal*, 18(2):23-24.
- Rushton, C.H., Kaszniak, A.W. and Halifax, J.S. (2013) A framework for understanding moral distress among palliative care clinicians. *Journal of Palliative Medicine*, 16:1074-1079.
- Rushton, C.H., Kaszniak, A.W. and Halifax, J.S., (2013) Addressing moral distress: Application of a framework to palliative care practice. *Journal of Palliative Medicine*. 16:1080-1088.

BIOGRAPHICAL SKETCH

NAME Naomi E. Rance, M.D., Ph.D.	POSITION TITLE Professor of Pathology		
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
University of Maryland, College Park	B.S.	1973	Psychology
University of Maryland, Baltimore	Ph.D.	1981	Physiology
University of Maryland, Baltimore	M.D.	1983	Medicine
The Johns Hopkins Hospital	Fellowship	1989	Neuropathology

Positions

1976 -1981 **Predoctoral Fellow**, Department of Physiology, University of Maryland, Baltimore, MD
 1983 -1986 **Resident**, Anatomic Pathology, The Johns Hopkins Hospital, Baltimore, MD
 1986 -1987 **Chief Resident**, Anatomic Pathology, The Johns Hopkins Hospital, Baltimore, MD
 1987 -1989 **Clinical and Research Fellow**, Neuropathology Lab, Johns Hopkins Hospital, Baltimore
 1989 -1995 **Assistant Professor**, Dept of Pathology College of Medicine, Univ of Arizona, Tucson, AZ
 1989 - **Chief**, Division of Neuropathology, University Medical Center, Tucson, AZ
 1989 - **Neuropathology Consultant**, Forensic Science Center, Pima County, Tucson, AZ
 1995 - **Associate Professor**, Dept of Pathology College of Medicine, Univ of Arizona, Tucson, AZ
 1996 - **Associate Chairperson**, Dept of Pathology College of Medicine, Univ of Arizona, Tucson
 2000 - **Professor**, Department of Pathology, Univ of Arizona College of Medicine, Tucson, AZ
 2007 - **Professor**, Evelyn F. McKnight Brain Institute, University of Arizona, Tucson, AZ

Honors, Awards and Advisory Committees

1973 Phi Beta Kappa
 1983 Rudolph Virchow Prize for Research in Pathology, University of Maryland
 1993 Advisory Group, Workshop on Menopause, NIH, Bethesda
 1994, 1997 Ad Hoc member, Biochemical Endocrinology Study Section, NIH, Bethesda
 1995 John Davis Outstanding Residency Teaching Award, Dept. of Pathology, Univ of Arizona
 1995, 1997 Ad Hoc Reviewer, National Science Foundation
 1998 - 2004 Site Visit Review Committees, NIH, NIA Program Project Grants
 1999, 2000, 2001 Basic Science Educator of the Year, University of Arizona College of Medicine
 2001 Advisory Group, NIA Workshop on Primate Models of Menopause, NIH, Bethesda
 2002 Basic Science Educator of the Year Lifetime Award, Univ of Arizona College of Medicine
 2007 Vernon and Virginia Furrow Award for Excellence in Innovation in Teaching, Univ Arizona
 2009 Ad Hoc Reviewer, ICER Study Section, NIH Bethesda
 2010 Ad Hoc Reviewer, Burroughs Welcome Trust
 2011 Ad Hoc Reviewer, ICER Study Section, Chicago Illinois

2013 Publication

Rance, N.E., Dacks, P.A. Mittelman-Smith, M.A., Krajewski, S.K. and Romanovsky, A.A. (2013)
 Modulation of body temperature and LH secretion by hypothalamic KNDy (kisspeptin, neurokinin B and dynorphin) neurons: a novel hypothesis on the mechanism of hot flushes. *Frontiers in Neuroendocrinology*, 34:211-227.

BIOGRAPHICAL SKETCH

NAME		POSITION TITLE	
Lee Ryan, Ph.D.		Associate Professor, Psychology, Neurology, and Neurosciences Program	
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
University of Toronto, Toronto, Canada	BMus	1979	Music
University of Toronto, Toronto, Canada	MA	1981	Music
University of Toronto, Toronto, Canada	BS	1988	Psychology/Neuroscience
University of British Columbia, Vancouver, Canada	Ph.D.	1992	Clinical/Cognitive Psychology
University of California, San Diego, CA	Postdoctoral	93-95	Neuropsychology

Positions

1992 - 1993	Clinical Internship , Department of in Neuropsychology, VA Medical Center, La Jolla, and University of California at San Diego, San Diego, CA
1993 - 1996	Research Scientist , Department of Psychiatry, University of California, San Diego, CA
1998	Participant , Summer Institute on Aging Research, National Institute on Aging
1996 - 2003	Assistant Professor , Departments of Psychology and Neurology, University of Arizona, Tucson, AZ
1996 - present	Director , Cognition & Neuroimaging Laboratories, University of Arizona, Tucson, AZ
2003 - present	Associate Professor , Departments of Psychology and Neurology, University of Arizona, Tucson, AZ
2007 - present	Associate Professor , Evelyn F. McKnight Brain Institute, University of Arizona, Tucson, AZ
2008 - present	Associate Head , Department of Psychology, University of Arizona, Tucson, AZ

Honors

1988 - 1992	National Science & Engineering Research Council of Canada Graduate Fellowships
1993 - 1995	National Science & Engineering Research Council of Canada Postdoctoral Fellowships
2000	Member, Memory Disorders Society

2013 Publications

- Nadel, L., Hoscheidt, S. and Ryan, L. (2013) Spatial cognition and the hippocampus: the anterior-posterior axis. *Journal of Cognitive Neuroscience*, 25(1):22-28.
- Chan, S.H., Ryan, L. and Bever, T.G. (2013) Role of the striatum in language: Syntactic and conceptual sequencing. *Brain and Language*, 125(3):283-294.
- Hoscheidt, S.M., Labar, K.S., Ryan, L., Jacobs, W.J. and Nadel, L. (2014) Encoding negative events under stress: High subjective arousal is related to accurate emotional memory despite misinformation exposure. *Neurobiology of Learning and Memory*, in press.

7. Faculty (continued)

The full Affiliate faculty list is given below:

- Geoffrey L. Ahern, M.D., Ph.D., Professor, Neurology, Psychology and Psychiatry; Medical Director, Behavioral Neuroscience and Alzheimer's Clinic, Bruce and Lorraine Cumming Endowed Chair in Alzheimer's Research, University of Arizona
- Gene E. Alexander, Ph.D., Professor of Psychology, University of Arizona
- E. Fiona Bailey, Ph.D., Assistant Professor of Physiology, University of Arizona
- Carol A. Barnes, Ph.D., Regents' Professor, Psychology and Neurology; Director, Evelyn F. McKnight Brain Institute; Evelyn F. McKnight Chair for Learning and Memory in Aging; Director, ARL Division of Neural Systems, Memory and Aging, Associate Director, BIO5 Institute, University of Arizona
- Heather Bimonte-Nelson, Ph.D., Associate Professor, Honors Disciplinary Faculty. Behavioral Neuroscience Program Director, Arizona State University
- Richard R. Bootzin, Ph.D., Professor of Psychology and Psychiatry; Director, Insomnia Clinic and Sleep Research Laboratory, University of Arizona
- Paul Coleman, Ph.D., UA Associate, Evelyn F. McKnight Brain Institute, University of Arizona; Co-Director and Senior Scientist, J. Roberts Center for Alzheimer's Research; Professor of Neurobiology and Anatomy, University of Rochester Medical Center
- Stephen Cowen, Ph.D. Assistant Professor, Department of Psychology, University of Arizona
- Ralph F. Fregosi, Ph.D., Professor of Physiology, University of Arizona
- Andrew J. Fuglevand, Ph.D., Associate Professor of Physiology, University of Arizona
- Elizabeth Glisky, Ph.D., Professor, Department of Psychology, University of Arizona
- Katalin M. Gothard, M.D., Ph.D., Associate Professor of Physiology, University of Arizona
- Meredith Hay, Ph.D., Professor of Physiology, University of Arizona
- Matthew J. Huentelman, Ph.D., UA Associate, Evelyn F. McKnight Brain Institute, University of Arizona; Investigator, Neurobehavioral Research Unit, Translational Genomics Research Institute
- Anita Koshy, M.D., Assistant Professor of Neurology, University of Arizona
- Alfred W. Kaszniak, Ph.D., Head, Department of Psychology; Director, Coordinated Clinical Neuropsychology Program, University of Arizona
- Lalitha Madhavan, MBBS, Ph.D., Assistant Professor, Department of Neurology, University of Arizona
- Diano Marrone, Ph.D., UA Associate, Evelyn F. McKnight Brain Institute; Assistant Professor, Psychology, Wilfrid Laurier University
- Matthias R. Mehl, Ph.D., Associate Professor, Department of Psychology, University of Arizona
- Lynn Nadel, Ph.D., Regents' Professor of Psychology, University of Arizona
- Janko Nikolich-Zugich, M.D., Ph.D., Professor and Chairman, Department of Immunobiology; Co-Director, Arizona Center on Aging, University of Arizona
- Mary-Frances O'Conner, Ph.D., Assistant Professor of Psychology, University of Arizona
- Mary Peterson, Ph.D., Professor of Psychology, University of Arizona

- Naomi E. Rance, M.D., Ph.D., Professor, Neurology, Cell Biology and Anatomy, and Pathology; Associate Head, Department of Pathology, University of Arizona
- Steve Rapcsak, M.D., Professor of Neurology, Psychology, and Speech, Hearing and Language Pathology, University of Arizona; Chief, Neurology Section, VA Medical Center
- Eric M. Reiman, M.D., Ph.D., Professor of Psychiatry; Associate Head for Research and Development (Phoenix Campus), University of Arizona; Director, Arizona Alzheimer's Disease Consortium; Executive Director, Banner Alzheimer's Institute; Clinical Director, Neurogenomics Program, Translational Genomics Research Institute (TGen)
- Linda L. Restifo, M.D., Ph.D., Professor, Neurology, Neuroscience, Cell Biology & Anatomy, and BIO5 Institute, University of Arizona
- Lee Ryan, Ph.D., Associate Professor, Psychology; Director, Cognition and Neuroimaging Labs, University of Arizona
- David A. Sbarra, Ph.D., Associate Professor and Director of Clinical Training, Department of Psychology, University of Arizona
- Paige E. Scalf, Ph.D., Assistant Professor, Department of Psychology
- Anne C. Smith, Ph.D., Neurophysiology Researcher, EMBI, University of Arizona
- Ted P. Trouard, Ph.D., Associate Professor, Biomedical Engineering
- Pixuan 'Joe' Zhou, Ph.D., Adjunct Research Professor of Optical Sciences, University of Arizona

We added four new affiliate members to the Evelyn F. McKnight Brain Institute at the University of Arizona in the past year, Drs. Zhou, Koshy, Smith and Hay.

Dr. Zhou is a collaborator on the development of a scalable array confocal fluorescent microscope system designed to rapidly acquire 3D confocal fluorescent images of very large specimens (our goal is to go up to the size of primate brains). Along with this we are developing software for rapid display, manipulation, and managing terabyte-image acquisition. Dr. Zhou, myself and Dr. LaComb have received an SBIR grant for this development work. The implementation of this microscope will be very helpful for our goal of development of whole brain imaging with single cell resolution.

Dr. Koshy, Dr. Nikolich-Zugich (already an affiliate faculty) and I are planning a program project grant for possible submission in 2015 aimed at understanding how CNS immune responses, such as those elicited by small intracellular parasites (such as *Toxoplasma gondii*), affect brain function and cognition, and how these inflammatory responses change over the aging process. This program project grant will explore how the brain response to a common parasite may provide clues on how to promote immunological responses that result in healthy brain aging. The hypothesis that I am particularly excited about is that the mechanisms involved in one's ability to fight chronic CNS infections may be partly responsible for individual differences in successful cognitive aging.

Dr. Smith is a mathematician and computational neuroscientist with whom I have collaborated previously. She is an expert in developing analytic approaches to evaluate large ensemble recording datasets, and has developed very impressive algorithms for assessing behavioral data

– much more sensitive than other approaches typically used to examine cognitive data. Dr. Smith has agreed to join my team as co-PI for the competitive renewal of one of my RO1 grants that will be submitted March 2014.

Dr. Hay and I have conducted an experiment on the effects of heart failure on cognition in a mouse model of heart failure. We were able to show that heart failure treatment produces impaired spatial learning in these mice, and that six week administration of an angiotensin 1-7 inhibitor attenuates the cognitive effect, although the heart damage remained. We presented these data at the Society for Neuroscience meeting this year (Hay et al., 2013). Because it may be possible to reverse cognitive effects in older adults who experience heart failure, this could be clinically very important. We applied to the Sarver Heart Center for a seed grant to develop data to support an RO1, and were awarded that grant. We have submitted a grant to the American Heart Association that was favorably reviewed, and we will submit a revised application in January 2014. We have also submitted two other grants to NIH that were reviewed, not funded, and we will revise sometime in 2014.

Additionally, the search for a person to fill the position within the Clinical and Translational Science Institute (BIO5) that is targeted at an M.D./Ph.D. clinician/scientist (for which Dr. Dubal unexpectedly declined), was re-opened, and we interviewed 3 candidates. Our top choice (Dr. Keith Vessel from UCSF) is currently negotiating with BIO5 Director Dr. Fernando Martinez. We are very hopeful that this search will be successful, as he also has interests in memory and aging that would fit very well within the Tucson Institute.

8. Trainees (advisor in brackets)

Postdoctoral

Sara Burke, Ph.D. (Barnes)

Area of Interest: Ensemble recording approaches to determine age-related changes in perirhinal cortical function. (Accepted Faculty Position at the University of Florida 11/13).

Monica Chawla, Ph.D. (Barnes)

Area of Interest: Immediate early gene expression in aging in the rat.

James Engle, Ph.D. (Barnes)

Area of Interest: Interactions between peripheral sensory systems and cortical association areas as contributors to age-related memory declines in primates.

Andrew Maurer, Ph.D. (Barnes)

Area of Interest: Temporal lobe circuits involved in memory.

Rachel Samson, Ph.D. (Barnes)

Area of Interest: Age-related changes in the amygdala and emotional perception in the rat.

John Totenhagen, Ph.D. (Alexander)

Area of Interest: Development and implementation of MRI methods for small animal models and human studies of aging.

Preddoctoral

Dev Ashish (Kaszniak)

Area of Interest: Aging, mindfulness, attention, and memory.

Elsa Baena (Ryan)

Area of Interest: fMRI studies of memory function in normal older adults.

Kaitlin Bergfield (Alexander)

Area of Interest: Imaging and cognitive functioning associated with pathological and healthy aging in humans.

Christine Burns (Kaszniak)

Area of Interest: Ethnicity, metabolic syndrome, and AD genetic risk as predictors of PET regional glucose metabolism in middle-aged and older adults.

Andrew Busch (Barnes) (Graduated August 2013)

Area of Interest: How ensembles of hippocampal neuron activity predict memory decline in aged rats.

Joe Cardoza (Ryan)

Area of Interest: fMRI studies of memory and aging.

Marina Cholanian (Rance)

Area of Interest: Morphology and electrophysiology of Neurokinin B neurons in the hypothalamic arcuate nucleus.

Megan Fitzhugh (Alexander)

Area of Interest: Translation of human neuroimaging methods to animal models of aging.

Daniel Gray (Barnes)

Area of Interest: Circuits involved in working memory and their decline with age in a non-human primate model of aging.

Kari Haws (Alexander)

Area of Interest: Cognition and neuroimaging in cognitive aging.

Mingzhu Hou (Glisky)

Area of Interest: Source memory and aging.

Kevin Kawa (Ryan)

Area of Interest: Brain imaging, genetics, and cognitive changes in normal older adults.

Adam Lester (Barnes)

Area of Interest: Spatial computations made by the entorhinal cortex and how this changes in aging rats.

Molly Memel (Ryan)

Area of Interest: Aging and memory.

Suzanne Moseley (Glisky)

Area of Interest: Self-referential processing and metamemory in normal aging.

Laura Nguyen (Alexander)

Area of Interest: Relation of cognitive complaints in relation to cognition and aging in the elderly.

Rose Marie O'Donnell (Kaszniak)

Area of Interest: Developing stress resiliency in middle-aged and older adult caregivers of persons with neurodegenerative disorders.

Angelina Polsinelli (Glisky)

Area of Interest: Emotion and autobiographical memory in normal aging.

Brooke Reid (Alexander)

Area of Interest: Effects of sleep on cognition.

Ruth Robbins (Glisky)

Area of Interest: Social interaction and cognitive function in normal aging.

Ariana Stickel (Ryan)

Area of Interest: Brain imaging, genetics, and cognitive changes in normal older adults.

Autumn Wiley (Kaszniak)

Area of Interest: Mindfulness and attention in younger and older adults.

Janelle Wohltmann (Glisky)

Area of Interest: Social networking in normal aging; memory and executive function; source memory.

Cindy Woolverton (Glisky)

Area of Interest: Self-referential processing in young and older adults.

Undergraduate Students (from Barnes' lab with graduate student, postdoctoral or staff mentor in brackets)

Sandra Arnautovic (Gray/Plange)

Alison Comrie (Gray)

Arturo Espinosa (Uprety)

Marcus Fimbres (Gray)

Tricia Hindley (Thome)

Adele Koutia (Lester)

Sabhya Kumar (Lister)

Juliana Liang (Lister)

Amanda Richards (Uprety)

Daniel Sweeney (Thome)

Chelsea Takamatsu (Lester)

Erin Trageser (Plange)

Anu Venkatesh (Samson)

Monica Xiong (Lister)

Staff

Caroline Garcia, Associate Vice President for Research

Kojo Plange, Research Specialist, Non-human Primates

Luann Snyder, Department Administrator

9. Clinical/translational programs

2011- A Phase 2, Multicenter, 24-Month, Randomized, Third-Party Unblinded, Placebo-Controlled, Parallel-Group Amyloid Imaging Positron Emission Tomography (PET) and Safety Trial of AAC-001 and QS-21 Adjuvant in

Subjects with Early Alzheimer's Disease. Protocol # B2571010. Pfizer.
Total grant: \$56,031 / patient. 2% salary support, 2% effort.

- 2013- A Placebo-controlled, Double-blind, Parallel-group, Bayesian Adaptive Randomization Design and Dose Regimen-finding Study to Evaluate Safety, Tolerability and Efficacy of BAN2401 in Subjects With Early Alzheimer's Disease. Protocol # BAN2401-G000-201. Eisai. Total grant: \$107,194/patient. 2% salary support, 2% effort.
- 2013 - Effect of Passive Immunization on the Progression of Mild Alzheimer's Disease: Solanezumab (LY2062430) versus Placebo. Protocol # H8A-MC-LZAX. Lilly Pharmaceuticals. Total grant: \$32,863/patient. 2% salary support, 2% effort.
- 2013 - A Randomized, Double-Blind, Placebo-Controlled, Parallel-Group, 26-Week, Phase 3 Study of Two Doses of EVP-6124 or Placebo in Subjects with Mild to Moderate Alzheimer's Disease Currently or Previously Receiving an Acetylcholinesterase Inhibitor Medication. Protocol # EVP-6124-025. EnVivo Pharmaceuticals. Total grant: \$27,944/patient. 2% salary support, 2% effort.
- 2013 - A Phase III, Randomized, Double-Blind, Placebo-Controlled, Parallel Group, Double-Blind Clinical Trial to Study the Efficacy and Safety of MK-8931 (SCH 900931) in Subjects with Amnesic Mild Cognitive Impairment Due to Alzheimer's Disease (Prodromal AD). Protocol # 019-00. Merck Sharp & Dohme. Total grant: \$37,069/patient. 2% salary support, 2% effort.

10. Technology transfer

None

11. Budget update

Last year's budget and actual results - July 1, 2012 to June 30, 2013

Evelyn F. McKnight Brain Institute

	Budget	Expenditures
Personnel	\$ 675,000	\$ 686,670
Operations	<u>\$ 275,000</u>	<u>\$ 298,450</u>
Total	<u>\$ 950,000</u>	<u>\$ 994,679</u>

Cowen Recruitment Account

	Budget	Expenditures
Cowen start-up	\$ 273,409	\$ 9,558

(a) **Status of matching funds**

Not Applicable.

(b) **Projected budget for coming year (FY 13/14)**

Evelyn F. McKnight Brain Institute

Personnel	\$ 500,000
Operations	<u>\$ 250,000</u>
Total	\$ 750,000

Cowen Recruitment Account

Cowen start-up	\$ 263,851
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(c) **Extramural funding (covering period July 1, 2012 to June 30, 2013)**

Grants Received – from Barnes

5 RO1 AG003376-29 (P.I.: Barnes)

Title: Neurobehavioral Relations in Senescent Hippocampus

Dates: 05/01/13 – 4/30/14 (5/10 – 4/15 project period)

Amount: \$637,763/year (\$561,856 direct)

5 R37 AG012609-19 (P.I.: Barnes)

Title: Cell Assemblies, Pattern Completion and the Aging Brain

Dates: 07/01/12 – 06/30/13 (7/09 – 6/14 project period)

Amount: \$292,967/year (\$195,076 direct)

1 R44 AG035446-03 (P.I.: LaComb; co-PI: Barnes)

Title: Whole-brain fluorescence and brightfield imaging at single-cell level

Dates: 09/01/12 – 07/31/13 (9/10 – 7/15 project period)

Amount: \$72,787/year (\$48,044 direct)

2 P30 AG019610-12 (PI: Reiman – Barnes, Director, Ad Hoc Review Program)

Title: Arizona Alzheimer's Disease Core Center Ad Hoc Review

Dates: 08/01/12 – 06/30/13 (7/11 – 6/16 project period)

Amount: \$20,502/year (\$13,533 direct)

State of Arizona, DHS Grant (PI: Barnes)

Title: Arizona Alzheimer's Consortium - UA Evelyn F. McKnight Brain Institute

Date: 07/01/12 – 06/30/13

Amount: \$20,309/year (direct costs)

1 F32 NS070464-02 (Sponsor: Barnes; NRSA to A. Maurer)
Title: Hippocampal ensemble dynamics during active ambulation, passive movement
& rest
Date: 07/01/12 – 06/30/13 (07/11 – 06/14 project period)
Amount: \$53,942 (direct costs)

Grants Received - From Selected Affiliates

State of Arizona, DHS Grant (PI: Ryan)
Title: Arizona Alzheimer's Consortium - Risk factors for brain aging and cognitive
health
Date: 07/01/12 – 06/30/13
Amount: \$100,333/year (direct costs)

State of Arizona, DHS Grant (PI: Alexander)
Title: Arizona Alzheimer's Consortium - Risk factors for brain aging and cognitive
health
Date: 07/01/12 – 06/30/13
Amount: \$109,983/year (direct costs)

State of Arizona, DHS Grant (PI: Ahern)
Title: Arizona Alzheimer's Consortium - Risk factors for brain aging and cognitive
health
Date: 07/01/12 – 06/30/13
Amount: \$6,000/year (direct costs)

2 P30 AG019610 (PI: Reiman; co-PI: Ahern)
Title: Arizona Alzheimer's Disease Core Center (UA Clinical Core)
Dates: 07/01/12 – 06/30/13 (7/11 – 7/16 project period)
Amount: \$68,175/year (\$45,000 costs)

2 P30 AG019610 (PI: Reiman; co-PI: Kaszniak)
Title: Arizona Alzheimer's Disease Core Center (Education and Information Core)
Dates: 07/01/12 – 06/30/13 (7/11 – 6/16 project period)
Amount: \$75,432/year (\$51,487 direct costs)

2 P30 AG019610 (PI: Reiman; co-PIs: O'Conner, Kaszniak)
Title: A Randomized Controlled Trial of Virtual Reality Support Group for AD
Caregivers (ADC Pilot Grant)
Dates: 07/01/12 – 06/30/13 (7/01 – 6/16 project period)
Amount: \$41,950/year (\$30,000 direct costs)

1 R01 AG025526 (PI: Alexander)
Title: Neuroanatomical Substrates of Aging & Cognitive Decline
Dates: 07/1/12 – 6/30/13 (7/98 – 7/14 project period w/ no cost extension)
Amount: \$1,066,581/total costs (\$798,381 direct costs)

RO1 AG032315 (PI: Rance)

Title: The Role of Neurokinin B in the Generation of Menopausal Flushes

Dates: 07/01/12 – 06/30/13 (8/08 – 6/14 project period)

Amount: \$277,576 (\$183,325 direct costs)

Grants Submitted – from Barnes

Sarver Heart Center (PI: Hay; co-PIs: Barnes, Konhilas, Huentelman)

Title: Heart Failure and Cognitive Impairment: Ang-(1-7) Cognitive Protective Therapy

Dates: 01/01/14 – 12/31/17

Amount: \$120,000 (direct)

Status: Awarded with a January 1, 2014 start date

National Institute on Aging (PI: Barnes; co-PIs: Alexander, Billheimer, Huentelman, Trouard)

Title: Neural System Dynamics and Gene Expression Supporting Successful Cognitive Aging

Dates: 08/01/13 – 07/31/18 (requested dates of project)

Amount: \$4,602,655 (\$3,750,167 direct)

Status: Under review (disaggregated program project grant)

National Institute on Aging (PI's: Coleman, Barnes, Alexander; co-PIs: Billheimer, Huentelman, Trouard)

Title: Epigenetic, Neuroimaging and Behavioral Effects of Hypertension in the Aging Brain

Dates: 08/01/13 – 07/31/18 (requested dates of project)

Amount: \$3,141,968 (\$2,690,142 direct)

Status: Under review (disaggregated program project grant)

National Institutes of Health (PI: Machado; co-PI: Barnes)

Title: Temporal Characteristics of Pharmacogenetic Neural Manipulation

Dates: 07/01/14 – 06/30/17 (requested dates of project)

Amount: \$86,706 (\$57,232 direct)

Status: Under review

National Institutes of Health (PIs: Barnes, Liang)

Title: Novel Confocal Fluorescence Microscope for Mapping Behavior-Driven Brain Circuits

Dates: 07/01/14 – 06/30/16

Amount: \$394,024 (\$275,000 direct)

Status: Under review

2 R01 AG012609-21 (PI: Barnes)

Title: Cell Assemblies, Pattern Completion and the Aging Brain
Dates: 07/01/14 – 06/30/19 (requested dates of project)
Amount: \$1,860,725 (\$1,250,000 direct)
Status: Not funded – revised proposal to be submitted March 2014

1 RO1 AG046546-01 (PIs: Barnes, Huentelman, Billheimer)

Title: Classification of Immediate Early Genes as Risk Factors for Neurological Disease
Dates: 09/01/13 – 08/31/19 (requested dates of project)
Amount: \$1,631,061 (\$1,076,607 direct)
Status: Not funded – will revise proposal for resubmission

1 F32 AG042240-01A1 (Sponsor: Barnes; NRSA to James Engle)

Title: The Contribution of Degraded Sensory Systems on Memory Function in the Aged
Dates: 07/01/13 – 03/31/15 (requested dates of project)
Amount: \$161,802 (direct)
Status: Not funded

American Heart Association (PI: Hay; co-PI: Konhilas; consultant: Barnes)

Title: Ang-(1-7) in Heart Failure Induced Cognitive Impairment
Dates: 01/01/14 – 12/31/15
Amount: \$140,000 (\$127,272 direct)
Status: Not funded – revised proposal to be submitted January 2014

National Institutes of Health (PI: Hay; co-PIs: Barnes, Konhilas)

Title: Central Renin Angiotensin Intervention in Age Related Cognitive Decline
Dates: 07/01/13 – 06/30/15
Amount: \$416,625 (\$275,000 direct)
Status: Not funded – will revise proposal for resubmission

National Heart, Lung and Blood Institute (PI: Hay; co-PIs: Barnes, Brooks, Nikolich-Zugich)

Title: Estrogen Therapy in Hypertension and Memory: Central Inflammatory Mechanisms
Dates: 09/01/13 – 08/31/18
Amount: \$1,876,647 (\$1,374,875 direct)
Status: Not funded – will revise proposal for resubmission

National Institutes of Health (PI: Madhavan; co-PIs: Barnes, Alexander, Trouard)

Title: Neural Stem Cells and the Aging Trajectory
Dates: 04/01/13 – 03/31/18
Amount: \$1,694,440 (\$1,150,000 direct)
Status: Not funded - revised proposal to be submitted March 2014

Grants Submitted - From Selected Affiliates (McKnight affiliate faculty underlined)

National Institute on Aging (PI: Barnes; co-PIs: Alexander, Billheimer, Huentelman,
Trouard)

Title: Neural System Dynamics and Gene Expression Supporting Successful
Cognitive Aging

Dates: 08/01/13 – 07/31/18 (requested dates of project)

Amount: \$4,602,655 (\$3,750,167 direct)

Status: Under review (disaggregated program project grant)

National Institute on Aging (PI's: Coleman, Barnes, Alexander; co-PIs: Billheimer,
Huentelman, Trouard)

Title: Epigenetic, Neuroimaging and Behavioral Effects of Hypertension in the
Aging Brain

Dates: 08/01/13 – 07/31/18 (requested dates of project)

Amount: \$3,141,968 (\$2,690,142 direct)

Status: Under review (disaggregated program project grant)

2 R01 MH57899 (PI: Reiman; co-PIs: Alexander)

Title: PET, APOE, & the Preclinical Course of Alzheimer disease

Dates: 07/01/13 – 06/30/18 (requested dates of project)

Amount: \$89,290 TC (\$58,940 direct)

Status: Under review

NIH (PI: Alexander; co-PIs: Bootzin, Glisky, Hishaw, Raichlen, Ryan)

Title: NREM Sleep in the Aging Brain, Cognitive Decline & Preclinical Risk for AD

Dates: 07/01/14 – 06/30/19 (requested dates of project)

Amount: \$3,768,470 TC (\$2,612,745 direct)

Status: Under review

Arizona Biomedical Research Commission (PI: Alexander)

Title: Impact of Sleep and Blood Pressure Variation on Brain and Cognitive Health
in the Elderly

Dates: 07/01/14 - 06/30/17 (requested dates of project)

Amount: \$749,332 TC

Status: Under Review

RO1 (PI: Rance; co-PI: McMullen)

Title: Role of NK3B in the generation of menopausal flushes

Dates: 07/01/13 – 06/30/2018 (requested dates of project)

Amount: \$2,610,215 TC (\$1,795,297 direct)

Status: Not funded

National Institutes of Health (PI: Madhavan; co-PIs: Barnes, Alexander, Trouard)

Title: Neural Stem Cells and the Aging Trajectory

Dates: 04/01/13 – 03/31/18 (requested dates of project)

Amount: \$1,694,440 TC (\$1,150,000 direct)

Status: Not funded - revised proposal to be submitted March 2014

Department of Defense (PI: Alexander; co-PIs: Glisky, Gries, Hishaw, Rhee, Ryan, Trouard)

Title: Neuroimaging biomarkers of mild TBI-related risk for cognitive aging & dementia

Dates: 10/01/13 – 9/30/16 (requested dates of project)

Amount: \$757,500 TC (\$500,000 direct)

Status: Not Funded

NIH (PI: Alexander; co-PIs: Glisky, Gries, Hishaw, Rhee, Ryan, Trouard)

Title: Multimodal Imaging & Cognitive Measures for Detection of Mild TBI in the Elderly

Dates: 12/01/13 – 11/30/15 (requested dates of project)

Amount: \$416,625 TC (\$275,000 direct)

Status: Not funded

12. Educational programs focusing on age related memory loss (January 1, 2013 – December 31, 2013)

Scientific

Event: UA Evelyn F. McKnight Brain Institute Site Visit Scientific Program

Date: October 23, 2013

Venue: Keating Building room 103, University of Arizona

Summary: The half-day scientific program, which focused on the foundations of the UA Institute, new affiliate faculty, updates on ongoing inter-institutional projects and planned future directions of the Institute, was well attended by ~ 70 members of the University community.

Public

Event: Annual Conference on Successful Aging – Closing the healthspan/lifespan gap

Date: January 18, 2013

Venue: Grand Ballroom, Student Union, University of Arizona

Summary: This one day conference (sponsored by the Department of Psychology, Evelyn F. McKnight Brain Institute and Pima Council on Aging) was attended by 350 members of the Tucson community and health-care workers.

13. Collaborative programs with McKnight institutions and research programs

Huentelman/Coleman/Barnes

We have begun to explore the possibility of using laser capture microdissection technologies for isolating specific cells in the hippocampus. Barnes provided the tissue from young and aged rats to Huentelman and Coleman who are developing methodologies for examining transcriptional fidelity and methylation processes that can be successfully applied following our specific brain extraction techniques. Additionally, we are working out the details for a method that will allow us to select out single *Arc*-positive and *Arc*-negative cells in the hippocampus of young and old rats. If we can achieve this, it will enable, for the first time, quantification of experience-driven gene expression levels in the precise cells that are activated by specific behaviors. The preliminary data will be used to apply for grants to support this work.

Trouard/Alexander/Barnes

Dr. Trouard has conducted a number of pilot experiments on a group of young and old rats with his small animal 7T magnet here at the University of Arizona. We are attempting to optimize the pulse sequences and the duration of the scanning to times that will allow scanning of larger numbers of rats to make rat brain templates, against which the effects of aging can be tracked. Dr. Alexander has begun to do the network analysis that he has developed for humans on these preliminary rat brain data, and remarkably, the patterns of volumetric change in rats mimics those observed in the human remarkably well. We used these data as preliminary data for one of the grants that is in line for funding (from the disaggregated Program Project grant), and Dr. Alexander is taking the lead in writing up the full experiment for publication.

Trouard/Alexander/Burke/Barnes

We were able to conduct thorough MRI measurements on our 14 bonnet macaques. Even with anesthetic treatment for over 2 hours, which accommodated the pulse sequences used in the experiment, we had no recovery issues with the older monkeys. We look forward to using these images in several ongoing studies, and the ones that we have submitted for publication, or intend to submit soon are mentioned below.

Gothard/Barnes/Burke/Thome/Trouard

Sara Burke and Kojo Plange finished a behavioral study with the young and old bonnet macaques that implicate changes in the function of the amygdala and orbitofrontal cortex. We have now finished a detailed volumetric analysis of these two cortical structures in relation to these behaviors, and the manuscript that was submitted received favorable reviews. We are currently working on revisions, including some further analyses. We hope to have this complete, and the revisions finished early in 2014.

Engle/Burke/Barnes

Dr. Engle came out to Tucson to administer auditory evoked potential and visual evoked response tests to our young and old bonnet macaques. He is a postdoctoral fellow in my laboratory out at the Primate Center in Davis, and he has expertise in sensory system function with aging. These electrophysiological methods are well-studied clinical measures of auditory and visual function. Drs. Engle and Burke have done volumetric analysis from the MRIs obtained from these animals of primary auditory and visual cortex, to determine if there are any

relationships between the physiology obtained and brain structure. We were able to submit an abstract on these data and present a poster at the Society for Neuroscience meeting this year (Plange et al., 2013). We are currently writing a manuscript describing these data.

Sweatt/Foster/Barnes/Huentelman

When planning for the submission of a request to the McKnight Brain Research Foundation to support an Epigenetics Core, we had a number of exciting ideas involving Inter-institutional collaborations using these methods. Because of the delays in obtaining agreements among institutions for the implementation of this Core, on our recent Leadership Council Conference call we agreed that we should revisit our specific plans for experiments in light of any new ideas that may have arisen during the past six months. Dr. Sweatt has set up a conference call on this topic to set priorities, and this will take place January 10, 2014.

14. Collaborative programs with non-McKnight institutions:

Fanselow/Chawla/Barnes

We have used our catFISH single cell imaging method on a problem that requires circuit analysis across wide regions of the brain with Dr. Michael Fanselow from UCLA. This collaboration involves an investigation of how context-activated neuronal ensembles change when a context has been fear conditioned. Dr. Fanselow behaviorally prepared the animals for us, and Dr. Chawla sectioned and conducted *in situ* hybridization of the tissue for this experiment. We trained Dr. Fanselow's graduate student, Moriel Zelikowsky, to conduct the cell segmentation and gene product cell localization analysis using our 3D catFISH software. The data from neurons in the hippocampus, amygdala and medial prefrontal cortex are analyzed, we submitted the manuscript, and are currently conducting an additional experiment before resubmission of the paper, which we hope to have finished early in 2014.

Gazzaley/Burke/Plange/Barnes

Gazzaley has investigated the ability of young and healthy older adults to ignore information that is not relevant to the performance of simple working memory tasks. He noted that the elderly that he interacts with as a Neurologist often complain that they are much more distractible than they were when younger, and there have been many psychological experiments that have shown that older individuals are disproportionately affected by distractors in a variety of tasks. While Gazzaley has obtained behavioral, fMRI and event related potential data that show that healthy older adults have a deficit in suppression of cortical activity that is associated with task-irrelevant representations, it remains an open question what underlying mechanisms are responsible for these changes in memory and attention. To understand this better, nonhuman primate aging models will be extremely helpful. We have conducted a series of behavioral studies that were designed and completed in our young and old bonnet macaques that examined the effects of distraction and interruption forms of interference on delay non-matching to sample task performance. These were all conducted using the manual version of the Wisconsin General Testing Apparatus for the interference tasks. We are currently training our bonnet macaques to perform additional interference tasks using a touch screen apparatus that will transfer nicely to the electrophysiological studies we have planned for next year. The animals are learning to touch objects on the screen at present, and in fact, are learning this

“game” quite effectively. I hope to have preliminary data from them on this task for a grant submission in March 2014.

Small/Coleman/Barnes

A gene involved in transcriptional silencing was identified that increases over age in Dr. Small’s normal aged human population. Barnes looked across the lifespan in the rat, and found that RbAp48 also changes over age in rats, and that lower expression of RbAp48 was correlated with defective spatial memory. Additionally, Barnes provided brain tissue from hippocampus and entorhinal cortex from young and old behaviorally-characterized monkeys to Dr. Coleman to perform the RbAp48 RNA analysis (this is perfused tissue). Coleman has been able to use his newly developed laser capture technology to facilitate measurement of mRNA content in the fixed tissue that Barnes provided, and has found a procedure that works for this tissue, and is doing the analysis. If all turns out well when the final data analysis is complete, then we hope to publish these data in the next year.

Beach/Barnes/Engle

Although it appears that no other animal other than humans develop the hallmark neuropathological markers of Alzheimer’s disease (amyloid plaques and neurofibrillary tangles), a variety of animals have been found to have some amyloid accumulation, and others scattered intraneuronal tangles. Because of Barnes’ tissue bank of behaviorally-characterized rhesus macaques, a systematic analysis can be done in these animals of the distribution and extent of the appearance of these markers in the monkey brain in relation to memory. Barnes identified tissue that was sent to Beach, and he finished the amyloid and tau counts in 19 animals. We presented these data at the Society for Neuroscience meeting this year (Engle et al., 2013). We have added 3 more animals to the database, and after these data are analyzed, we can begin to prepare these data for publication.

Maier/Barnes/Barrientos/Hoang

At the second Cognitive Aging Summit I heard a talk given by a colleague that I had had in Boulder, when I was at the University of Colorado from 1982-1990, Steve Maier. The gist of his talk was that older organisms are more vulnerable to the consequences of a peripheral immune challenge (such as peripheral injection of *E. coli*) than are younger animals. I was amazed to see that not only do the old rats have memory deficits that suggest that consolidation of hippocampus-dependent memory processes are disrupted, but that when they went on to do the physiology, the durability of long-term potentiation, the presumed biological mechanism of memory was also altered. The idea that a negative life event such as an infection can produce memory impairments, and may contribute to the variability noted in older animals, is intriguing – especially since these effects may be great therapeutic targets for protecting animals from age-related cognitive deterioration. We conducted an experiment with the Maier lab to assess what brain regions are affected by the immune challenge, using the catFISH method. We prepared the animals, trained them and tested their memory, and sacrificed them and removed their brains. We sectioned the brains in Tucson, performed *in situ* hybridization for *Arc*, and have collected data from the high resolution confocal microscope. The data need to be organized and summarized so that we can start writing a publication. This is a long-term investment – but the study may be very “high pay off”, and we may use the data to apply for funding to start trying to test agents that may prevent this negative cognitive outcome in older organisms.

15. Plans for future research

Future research will include continuation and completion of the collaborations mentioned above, but in addition to those experiments, and we will continue with the cognitive testing in the young and old bonnet macaques on the touch screen tasks as well as continued technological developments for electrophysiological recording and brain imaging with single cell resolution. We hope to begin electrophysiological recording of the bonnet macaques in 2014. The Director of the Tucson Institute will also be actively involved in putting together proposals for Obama's Brain Initiative in 2014.

16. Endowment investment results (July 1, 2012 to June 30, 2013)

Endowed Chair

Summary for 12 months ending June 30, 2013

Account Name: Evelyn F. McKnight Chair for Learning and Memory in Aging

A. Beginning Balance on July 1, 2012	\$ 820,604
B. Investment Growth	\$ 76,198
C. Distributions (to Endowed Chair Expendable Account)	\$ (33,240)
D. Additional Contributions	\$ 0
E. Ending Balance on June 30, 2013	\$ 863,562

Institute

Summary for 12 months ending June 30, 2013

Account Name: Evelyn F. McKnight Brain Institute

A. Beginning Balance on July 1, 2012	\$ 3,327,103
B. Investment Growth	\$ 295,810
C. Distributions (to Institute Expendable Account)	\$ (949,997)
D. Additional Contributions	\$ 0
E. Ending Balance on June 30, 2013	\$ 2,672,916

17. Where any funds used for a Prohibited Purpose during the report period?

No

18. Do you recommend any modification to the Purpose or mandates in the Gift Agreement?

No

19. Did all activities during the report period further the Purpose?

Yes

20. Negative Events

No

21. Additional comments

This was a great year in terms of research output from the Tucson Evelyn F. McKnight Brain Institute, and there was excellent progress with respect to the collaborations across Institutes on the creation of an "Epigenetics Core" to facilitate inter-institute collaborative experiments, which we will plan and implement at the beginning of 2014. Hopefully these experiments will lead to preliminary data that will facilitate grants submitted in upcoming years.

Additionally, Dr. Tolbert (who was the VPR at that time), Mr. Jim Moore, and the Director of the Tucson EMBI were able to have initial discussions with a subset of Trustees of the MBRF in Gainesville concerning a potential second gift. As the discussions progressed through the year, it was decided that the strong preference of the MBRF would be to have this second gift and the match, go into a McKnight Brain Institute Permanent Endowment. The Tucson EMBI was site visited, and had a successful meeting, with most of the Trustees in attendance. On our exit meeting with the Trustees, Provost and Interim Vice President for Research, we agreed that some expendable funds would also be made available in the first years of the new gift so that the income to the Institute would be more stable until the Permanent Endowment is fully funded. Additionally, after the site visit, Mr. Moore received permission from the VPR to hire a Development Director for the Institute, who will assist in fund raising activities that will be required to achieve the 5 million dollar match. The agreements between the MBRF and the University of Arizona will hopefully be complete before the submission of this report.

22. 

Carol A. Barnes, Ph.D.
Director, Evelyn F. McKnight Brain Institute

January 10, 2014
Date