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January 3, 2011

MEMORANDUM

TO: Trustees, The McKnight Brain Research Foundation
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J. L. Dockery, M.D.
M.L. Dockery, M.D.
N. Ellenbogen Raim, M.D., J.D.
J.A. Salerno, M.D.
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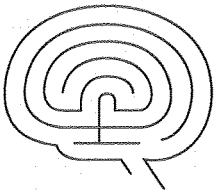
FROM: C.A. Barnes, Ph.D.
Regents' Professor, Psychology and Neurology
Evelyn F. McKnight Chair for Learning and Memory in Aging
Director, Evelyn F. McKnight Brain Institute
Director, ARL Division of Neural Systems, Memory and Aging
Associate Director, BIO5

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, 2009 through June 30, 2010 and scientific reports for the period of January 1, 2010 through December 31, 2010.



Evelyn F. McKnight
Brain Institute

Annual Report

McKnight Brain Research Foundation
Sponsored Institutes and Research Programs

Scientific Report Period: January 1, 2010 – December 31, 2010
Financial Report Period: July 1, 2009 – June 30, 2010
Institution: University of Arizona

Submitted January 3, 2011

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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. The Director has pioneered and developed two primary scientific tools that are used by her laboratory and in collaboration with others. The first involves the ability to monitor cognitive decline in aged rodents and nonhuman primates, in combination with live imaging methodologies, and state-of-the-art ensemble electrophysiological recording in behaving animals. The second is a molecular imaging technology (the catFISH method) that allows the examination of individual cells that participate in circuits critical for memory, and in combination with other methods, can detect transcriptional and epigenetic factors that are altered in these circuits by behavior and aging.

A number of exciting papers were published during 2010, among these include:

A very important manuscript was published, and arose because of a collaboration between the University of Arizona and University of Alabama Evelyn F. McKnight Brain Institutes. In this paper, the network composition and transcriptional participation of individual cells activated by behavior were examined in young and old rats, using the catFISH imaging methods and brain-region selective RT-PCR developed in Tucson, in combination with an assessment of DNA methylation methods developed in Alabama. The result was the first demonstration that methylation of the Arc gene may be responsible for age-related decreases in behaviorally-induced *Arc* transcription in the hippocampus, and that the subregion-specific epigenetic and transcriptional changes may be an important target for memory enhancement.

Along with my collaborators in Trondheim, Norway, at the Center for the Biology of Memory, we published a series of electrophysiological and catFISH experiments that suggest an entirely new hypothesis for the function of granule cells in the hippocampus. The data indicate that only a very small number of granule cells participate in many experiences during any given time window, with most not participating in any. Based on these and previous data, we believe that it is likely that this population is primarily drawn from adult born granule cells, with possibly 90-95% of granule cells being effectively "retired". This has generated significant interest in the community, and calls for substantial revisions in older ideas about how memory is formed in the hippocampus.

Dr. Sara Burke published a manuscript that describes data indicating that age-related impairments in object recognition arise from old animals behaving as if novel objects are familiar. These experiments are consistent with the hypothesis that alterations in the perirhinal cortex may be responsible for reducing aged animals' ability to distinguish new stimuli from ones that have been encountered previously – suggesting that targeted treatment to this brain region may be effective in reducing age-associated recognition memory impairments. This paper was awarded the Division 6 D.B. Marquis Behavioral Neuroscience Award by the American Psychological Association.

With my collaborators at the University of California at Davis, Mt. Sinai School of Medicine and Columbia University, we assessed young and aged rhesus monkeys on a spatiotemporal memory procedure and a recognition memory procedure that requires the integrity of the prefrontal cortex and medial temporal lobe regions. The manuscript that resulted from these studies used MRI

analysis to reveal a distributed brain network that was associated with declining performance across the different memory tasks in the old monkeys. These findings emphasize the importance of examining wide regions of brain function to understand the neural underpinnings of age-related changes in memory.

With Canadian affiliate of the UA McKnight Brain Institute, Dr. Diano Marrone, we undertook a study to examine how our catFISH methods may be able to detect long-term correlates of the biological events that mediate memory consolidation in both young and aged rats. The findings are consistent with weaker gene expression in the hippocampus of old compared with young rats at long intervals after a behavioral experience. The data suggest that this may be one of the defective elements in the neural circuits that support durable memory.

The EMBI speaker series at the University of Arizona continues to be an effective tool for facilitating interaction among the affiliate members, when they present their data, as well as adding to the educational benefits that arise from bringing scientists to the Institute from outside Arizona who can inform our future directions for cutting-edge research. A number of the members of the Scientific Advisory Board continued our conversation with Dr. Molly Wagster over the past year who continued to advise us on the development of a Program Project (PO1) grant that will be submitted to NIA. We continued to meet throughout this past year, and to collect the preliminary data needed for a strong proposal. The project focuses on the mechanisms underlying individual differences that result in successful rather than unsuccessful cognitive aging in a given organism. The grant involves both human and animal experiments that will define and examine mechanisms conducive to cognitive competence. Dr. Gene Alexander will be PI, Barnes co-PI, and affiliate members Drs. Ryan, Huentelman, Coleman and Trouard all have Projects and/or Cores. Our target submission date is January 25, 2011.

Additionally, Barnes has submitted an R01 with Dr. Matt Huentelman in response to a Program Announcement "Collaborative Research for Molecular and Genomic Studies of behavior in Animal Models" entitled "Hippocampal Circuit-specific Molecular Changes in Normal Cognitive Aging". We have joined forces in this grant to investigate the role that aging may play on specific sub-regions of the hippocampal formation. This grant was not funded this round, and we are preparing to update our preliminary data, and resubmit for March 5, 2011. Barnes also submitted a collaborative application with Drs. Coleman and Huentelman in response to a Request for Proposals "Epigenomics of Human Health and Disease", entitled "Methylation and Transcription Patterns Associated with Differential Cognitive Phenotypes Across Age". Our focus in this grant will be on several specific hippocampal neuronal cell types known to make fundamental contributions to the function of memory circuits in the brain, and to age selectively and independently. We will receive the results from that review in February 2011. Barnes is also in the discussion phase with Dr. Gothard on a joint R01 grant involving memory, emotion, and single unit electrophysiology in the nonhuman primate that we hope to submit for the June 5, 2011 deadline.

2. Publications in peer reviewed journals

From Barnes

Alme CB, Buzzetti RA, Marrone DF, Leutgeb JK, Chawla MK, Schaner MJ, Bohanick JD, Khoboko T, Leutgeb L, Moser EI, Moser MB, McNaughton BL and Barnes CA. (2010) Hippocampal granule cells opt for early retirement. Hippocampus, 20:1109-1123.

Burke SN, Wallace JL, Nematollahi S, Uprety A and Barnes CA. (2010) Pattern separation deficits contribute to age-associated recognition impairments. Behavioral Neuroscience, 124:559-73.

Henriksen EJ, Colgin LL, Barnes CA, Witter MP, Moser M-B and Moser EI. (2010) Spatial representation along the proximodistal axis of CA1. Neuron, 68:127-137.

Marrone DF, Satvat E, Schaner MJ, Worley PF and Barnes CA. (2010) Attenuated long-term Arc expression in the aged fascia dentata. Neurobiology of Aging, epub: doi:10.1016/ j.neurobiolaging.2010.07.022.

Penner MR, Roth TL, Chawla MK, Hoang LT, Roth ED, Lubin FD, Sweatt DJ, Worley PF and Barnes CA. (2010) Age-related changes in *Arc* transcription and DNA methylation within the hippocampus. Neurobiology of Aging, epub: doi:10.1016/j.neurobiolaging.2010.01.009.

Burke SN, Maurer AP, Nematollahi S, Uprety AR, Wallace JL and Barnes CA. (in press) The Influence of Objects on Place Field Expression and Size in Distal Hippocampal CA1. Hippocampus.

Shamy JL, Habeck C, Hof PR, Amaral DG, Fong SG, Buonocore MH, Stern Y, Barnes CA, and Rapp PR. (in press) Volumetric correlates of spatiotemporal working and recognition memory impairment in aged rhesus monkeys. Cerebral Cortex.

Tsai C-L, Lister JP, Bjornsson CJ, Smith K, Shain W, Barnes CA and Roysam B. (in press) Robust, globally consistent, and fully-automatic multi-image registration and montage synthesis for 3-D multi-channel images. Journal of Microscopy.

Maurer AP, Burke SN, Lipa P and Barnes CA. Greater running speeds result in increased hippocampal sequence compression. Hippocampus, in press.

Stoub TR, Barnes CA, Shah RC, Ferrari C and deToledo-Morrell L. Age-related changes in parahippocampal white matter in the region of the perforant pathway. Revision Submitted.

From Selected Affiliates

Bergfield KL, Hanson KD, Chen K, Teipel SJ, Hampel H, Rapoport SI, Moeller JR, Alexander GE. Age-Related Networks of Regional Covariance in MRI Gray Matter: Reproducible Multivariate Patterns in Healthy Aging. Neuroimage, 49:1750-9.

Chen K, Langbaum JB, Fleisher AS, Ayutyanont N, Reschke C, Lee W, Liu X, Bandy D, Alexander GE, Thompson PM, Foster NL, Harvey DJ, de Leon MJ, Koeppe RA, Jagust WJ, Weiner MW, Reiman EM (2010) Twelve-month metabolic declines in probable Alzheimer's disease and amnestic mild cognitive impairment assessed using an empirically pre-defined statistical region-of-interest: findings from the Alzheimer's Disease Neuroimaging Initiative. Neuroimage, 51:654-64.

Corneveaux JJ, Liang WS, Reiman EM, Webster JA, Myers AJ, Zismann VL, Joshipura KD, Pearson JV, Hu-Lince D, Craig DW, Coon KD, Dunckley T, Bandy D, Lee W, Chen K, Beach TG, Mastroeni D, Grover A, Ravid R, Sando SB, Aasly JO, Heun R, Jessen F, Kolsch H, Rogers J, Hutton ML, Melquist S, Petersen RC, Alexander GE, Caselli RJ, Papassotiropoulos A, Stephan DA, Huentelman MJ. (2010) Evidence for an association between KIBRA and late-onset Alzheimer's disease. Neurobiology of Aging, 31:901-909.

Dacks PA and Rance NE. (2010) Effects of estradiol on the thermoneutral zone and core temperature in ovariectomized rats. Endocrinology, 151:1187-1193.

Ho A, Hua X, Lee S, Leow AD, Yanovsky I, Gutman B, Dinov ID, Lepore N, Stein J, Toga AW, Jack CR, Bernstein MA, Reiman EM, Harvey DJ, Kornak J, Schuff N, Alexander GE, Weiner MW, Thompson PM. (2010) Comparing 3 Tesla and 1.5 Tesla MRI for Tracking Alzheimer's Disease Progression with Tensor Based Morphometry. Human Brain Mapping, 31:499-514.

Hoscheidt SM, Nadel L, Payne J, Ryan L (2010) Hippocampal activation during retrieval of spatial context from episodic and semantic memory. Behavioural Brain Research, 212:121-32.

Hua X, Lee S, Hibar DP, Yanovsky I, Leow AD, Toga AW, Jack CR, Bernstein MA, Reiman EM, Harvey DJ, Kornak J, Schuff N, Alexander GE, Weiner MW, Thompson PM and the Alzheimer's Disease Neuroimaging Initiative. (2010) Mapping Alzheimer's Disease Progression in 1309 MRI Scans: Power Estimates for Different Inter-Scan Intervals. Neuroimage, 51:63-75.

Krajewski SJ, Burke MC, Anderson MJ, McMullen NT and Rance NE. (2010) Forebrain projections of arcuate neurokinin B neurons demonstrated by anterograde tract-tracing and monosodium glutamate lesions in the rat. Neuroscience, 166:1187-1193.

Langbaum JBS, Chen K, Caselli RJ, Lee W, Reschke C, Bandy D, Alexander GE, Burns CM, Kaszniak AW, Reeder SA, Corneveaux JJ, Allen AN, Pruzin J, Huentelman MJ, Fleisher AS and Reiman EM (2010) Hypometabolism in Alzheimer-affected brain regions in cognitively healthy Latino individuals carrying the Apolipoprotein E4 allele. Archives of Neurology, 67:462-468.

Rance NE, Krajewski SK, Smith MA, Cholanian M and Dacks PA. (2010) Neurokinin B and the hypothalamic regulation of reproduction. Brain Research, 1364:116-128.

Reiman EM, Chen K, Langbaum JB, Lee W, Reschke C, Bandy D, Alexander GE, Caselli RJ. (2010) Higher serum total cholesterol levels in late middle age are associated with glucose hypometabolism in brain regions affected by Alzheimer's disease and normal aging. Neuroimage, 49:169-76.

Ryan L, Lin CY, Ketcham K, Nadel L (2010) The role of medial temporal lobe in retrieving spatial and nonspatial relations from episodic and semantic memory. Hippocampus, 20:11-18.

Ryan L, Walther K, Bendlin BB, Lue L-F, Walker DG, Glisky EL. (2010) Age-related differences in white matter integrity and cognitive function are related to APOE status. NeuroImage, doi:10.1016/j.neuroimage.2010.08.052.

Smith JF, Alexander GE, Chen K, Husain FT, Kim J, Pajor N, Horwitz B.(2010) Imaging systems level consolidation of novel semantic-like memories: A longitudinal neuroimaging study. Neuroimage, 50:826-36.

Walther K, Birdsill AC, Glisky EL, Ryan L. (2010) Structural Brain Differences and Cognitive Functioning Related to Body Mass Index in Older Females. Human Brain Mapping, 31:1052-64.

Williams H, Dacks PA, and Rance NE. (2010) An improved method for recording tail skin temperature in the rat reveals changes during the estrous cycle and effects of ovarian steroids. Endocrinology, 151:5389-5394.Grilli MD and Glisky EL (2010). Self-imagining enhances recognition memory in memory-impaired individual with neurological damage. Neuropsychology, 24: 698-710.

Wu X, Chen K, Yao L, Ayutyanont N, Langbaum JB, Fleisher A, Reschke C, Lee W, Liu X, Alexander GE, Bandy D, Foster NL, Thompson PM, Harvey DJ, Weiner MW, Koeppe RA, Jagust WJ, Reiman EM. (2010) Assessing the reliability to detect cerebral hypometabolism in

probable Alzheimer's disease and amnestic mild cognitive impairment. Journal of Neuroscience Methods, 192:277-85.

Caselli RJ, Dueck AC, Locke DEC, Sabbagh MN, Ahern GL, Rapcsak SZ, Baxter LC, Yaari R, Woodruff BK, Snyder CH, Rademakers R, Findley S, and Reiman EM. (in press) Cerebrovascular risk factors influence preclinical memory decline in cognitively normal APOE ε4 homozygotes. Neurology.

Walther K, Bendlin B, Glisky E, Trouard T, Lisse J, Posever J, Ryan L. (in press) Anti-inflammatory drugs reduce age-related decreases in brain volume in cognitively normal older adults. Neurobiology of Aging.

Ewers M, Walsh C, Trojanowski JQ, Shaw LM, Petersen RC, Jack CR, Jr., Feldman HH, Bokde AWL, Alexander GE, Scheltens P, Vellas B, Dubois B, Weiner M, Harald Hampel H, in collaboration with the North American Alzheimer's Disease Neuroimaging Initiative (ADNI). (in press) Prediction of conversion from mild cognitive impairment to Alzheimer's disease dementia based upon biomarkers and Neuropsychological Test Performance, Neurobiology of Aging.

3. Publications (other)

From Barnes

Burke SN and Barnes CA. (2010) Senescent synapses and hippocampal circuit dynamics. Trends in Neurosciences, 33:153-161.

Penner MR, Roth TL, Barnes CA and Sweatt JD. (2010) An epigenetic hypothesis of aging-related cognitive dysfunction. Frontiers in Aging Neuroscience, 2:9.

Schimanski LA and Barnes CA. (2010) Neural protein synthesis during aging: Effects on plasticity and memory. Frontiers in Aging Neuroscience, 2:26.

From Selected Affiliates

Glisky EL (2010) Forgetting. In J. S. Kreutzer, J. DeLuca, & B. Caplan (Eds.), Encyclopedia of Clinical Neuropsychology. New York: Springer.

Glisky EL (2010) Implicit memory. In J. S. Kreutzer, J. DeLuca, & B. Caplan (Eds.), Encyclopedia of Clinical Neuropsychology. New York: Springer.

Glisky EL (2010) Incidental memory. In J. S. Kreutzer, J. DeLuca, & B. Caplan (Eds.), Encyclopedia of Clinical Neuropsychology. New York: Springer.

Glisky EL (2010) Memory. In J. S. Kreutzer, J. DeLuca, & B. Caplan (Eds.), Encyclopedia of Clinical Neuropsychology. New York: Springer.

Glisky EL (2010) Method of vanishing cues. In J. S. Kreutzer, J. DeLuca, & B. Caplan (Eds.), Encyclopedia of Clinical Neuropsychology. New York: Springer.

Kaszniak AW and Edmonds E. (2010) Anosognosia and Alzheimer's disease: Behavioral studies. In G. Prigatano (Ed.), The study of anosognosia (pp., 189-228). New York: Oxford University Press.

Kaszniak AW (in press) Meditation, mindfulness, cognition, and emotion: Implications for community-based older adult programs. In P. Hartman-Stein & A. LaRue (Eds.), Enhancing cognitive fitness in adults: A guide to the use and development of community programs. New York: Springer

Kihlstrom JF and Glisky EL (in press) Amnesia. In V. S. Ramachandran (Ed.), Encyclopedia of human behavior (2nd Ed). Oxford: Elsevier.

4. Presentations at scientific meetings

From Barnes

Barnes CA. Memory and the Hippocampus, Adler Symposium on Biomarkers, Neural Networks and Plasticity in Health and Dementia, The Salk Institute, February 2010 (Invited)

Barnes CA. Neural Correlates of Age-Related Memory Deficits in Rats and Monkeys, Colloquium Speaker, Center for Neuroscience @ UC Davis, Sacramento, CA, March 2010 (Invited)

Barnes CA. Memory and the Aging Brain, NIH Lecture Series, Bethesda, MD, March 2010 (Invited)

Barnes CA. The Impact of Aging on Temporal Lobe Circuits Critical for Memory", Francis Crick Symposium on Neuroscience, Suzhou, China, April 2010 (Invited)

Barnes CA. Understanding Circuits Critical for Normal Memory Function: Impact of Aging, New Concepts in Neuroscience Meeting, Bergen, Norway, May 2010 (Invited)

Barnes CA., Plenary Session Speaker: Inflammation, Aging of the Immune System, and Age-Related Disease, 39th Annual Meeting of the American Aging Association, Portland, Oregon, June 2010 (Invited)

Barnes CA. Cognitive Consequences of Aging Neural Networks, First Gordon Conference on the Neurobiology of Cognition, Waterville Valley Resort, NH, August 2010 (Invited)

Barnes CA. Impact of Aging on Hippocampal Circuits Neurobiology of Aging Seminar Series Speaker, University of California, San Diego, September 2010 (Invited)

Zelikowsky M, Chawla M, Barnes CA and Fanselow MS. Visualizing contextual fear: differential activation of neuronal and medial prefrontal cortex. The Pavlovian Society Annual Meeting, Baltimore, MD, September 2010 (Abstract)

Barnes CA. Plenary Speaker: Cognitive Aging: What do we know? What's next? Cognitive Aging Summit. Washington DC, October, 2010 (Invited)

Stoub TR, Shah RC, Barnes CA, and deToledo-Morrell L. Age-related changes in cortical thinning. Program No. 204.3. Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, Online, November 2010. (Abstract)

Plange K, Burke SN, Nematollahi S, Huerta D, Lind K and Barnes CA. Use of Lego objects to create perceptual ambiguity on the object discrimination task: Testing for perceptual changes across the life span of bonnet macaques. Program No. 204.4. Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, Online, November 2010. (Abstract)

Hartzell A, Wallace JL, Burke SN and Barnes CA. The effect of perceptual difficulty and age on spontaneous object recognition. Program No. 204.5. Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, Online, November 2010. (Abstract)

Schimanski LA, Broersma BM, Lipa P and Barnes CA. Hippocampal CA1 firing rates vary with spatial training and place field stability in young and old rats. Program No. 204.6. Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, Online, November 2010. (Abstract)

Thome A, Schimanski LA, Lipa P and Barnes CA. Weakening of slow gamma/theta coupling strength in CA1 of senescent rats. Program No. 204.7. Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, Online, November 2010. (Abstract)

Insel N, Patron L, Wagner Z, Vega J and Barnes CA. Micro-scale coupling, macro-scale antagonism between excitation and inhibition during a decision-making task. Program No. 204.8. Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, Online, November 2010. (Abstract)

Maurer AP, Burke SN, Wallace JL and Barnes CA. A characterization of perirhinal cortical interneurons in quiet rest and active exploration. Program No. 204.9. Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, Online, November 2010. (Abstract)

Burke SN, Hartzell A, Hoang LT, Wallace JL, Maurer AP, Chawla MK and Barnes CA. Transcription of the immediate-early gene Arc in the perirhinal cortex does not show a response decrement following repeated exposures to novel objects. Program No. 204.10. Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, Online, November 2010. (Abstract)

Lister, J.P., Clasen, S.J., and Barnes, C.A. (2010) Changing objects encountered during track running alters expression patterns of the immediate early gene *Arc* in the lateral entorhinal cortex of the rat. Program No. 204.11. Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, Online.

Inglis A, Lister JP, Anand K, Richards C, Cruz, LR, Barnes CA and Rosene DL. Quantification of microcolumn structure in the frontal, parietal, and occipital cortices of the Fischer 344 rat. Program No. 204.12. Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, Online, November 2010. (Abstract)

Penner MR, Hoang LT, Thome A, Lister JP, Wann EG and Barnes CA. Age-related changes in the plasticity of the *Arc* transcriptional response. Program No. 204.13. Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, Online, November 2010. (Abstract)

Hoang LT, Egurrola AM, Wann EG, Uprety AR, Fellous JM and Barnes CA. Characterization of Arc-expression in GABAergic neurons of the ventral tegmental area during aging. Program No. 204.14. Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, Online, November 2010. (Abstract)

Chawla MK, Bello-Medina PC, Sandoval J, Ramirez-Amaya V and Barnes CA. Location of Arc mRNA expressing granule cells following spatial exploration in the rat dentate gyrus. Program No. 204.15. Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, Online, November 2010. (Abstract)

Marrone DF, Sandoval J, Schaner MJ, Ramirez-Amaya V and Barnes CA. Functional neurogenesis in the senescent fascia dentata. Program No. 204.16. Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, Online, November 2010. (Abstract)

Henriksen EJ, Barnes CA, Witter MP, Moser M-B and Moser EI. Spatial representation along the proximo-distal axis of CA1. Program No. 101.6. Abstract Viewer/Itinerary Planner. Washington, DC: Society for Neuroscience, Online, November 2010. (Abstract)

From Selected Affiliates

Edmonds EC, Rapcsak SZ and Glisky EL. Face memory loss and face memory distortion in frontotemporal dementia. International Neuropsychological Society, Acapulco, Mexico, February 2010. (Abstract)

Glisky EL. Discussant for Symposium on "Recent Advances in Prospective Memory and Aging: From the Laboratory to Daily Life." International Neuropsychological Society, Acapulco, Mexico, February 2010. (Invited)

Grilli MD and Glisky EL. Using an imagination technique to enhance prospective memory in individuals with neurologically-based memory deficits. International Neuropsychological Society, Acapulco, Mexico, February 2010. (Abstract

Kaszniak AW. Emotion response and regulation in long-term Zen and Mindfulness meditators. Presentation at the conference on Meditation: Neuroscientific Approaches and Philosophical Implications, Munzingen, Germany, February 2010. (Invited)

Kaszniak AW. The self and selflessness in Buddhism and neuroscience. Arizona Meditation Research Interest Group, Tucson, AZ, March 2010. (Invited)

Kaszniak AW. Psychological interventions derived from Buddhist meditative practice: Theory and empirical research. Plenary presentation at the 2010 Integrative Mental Health Conference, Phoenix, AZ, March 2010. (Invited)

Kaszniak AW. Empathy and compassion: The convergence of Buddhist and social neuroscience views. Presentation at the 2010 Integrative Mental Health Conference, Phoenix, AZ, March 2010. (Invited)

Rance, NE. Menopause and the Human Hypothalamus: Evidence for a Role of Neurokinin B in the Regulation of the Reproductive Axis. Department of Neuroscience, University of Arizona, March 2010.

Caselli RJ, Dueck AC, Locke DEC, Sabbagh MN, Ahern GL, Baxter LC, Rapcsak SZ, Yaari R, Woodruff BK, Hoffman-Snyder C, Findley S, Reiman EM. Cerebrovascular Risk Factors Influence Age-Related Memory Decline. Presented at the 62nd Annual Meeting of the American Academy of Neurology, Toronto, Ontario, April 2010. (Abstract)

Duke D, Lin CY, Kawa K, Nadel L, Ryan L. Distinguishing the roles of parahippocampal cortex and hippocampus during object-scene recognition. Poster presented at the 17th Annual Cognitive Neuroscience Society Meeting, Montreal Quebec, April 2010. (Abstract)

Hoscheidt SM, Ryan L, Nadel L. Common Brain Regions Associated with Retrieval of Spatial Relations from Episodic & Semantic Memory. Poster presented at the 17th Annual Cognitive Neuroscience Society Meeting, Montreal Quebec, April 2010. (Abstract)

Kaszniak AW. Empathy and compassion: Contemplative and neuroscientific perspectives. Colloquium, Department of Psychology, University of Arizona, Tucson, AZ, April 2010. (Invited)

Kawa K, Duke D, Parch J, Cardoza J, Nadel L, & Ryan L. The effects of semantic relatedness on context-specific object recognition. Poster presented at the 17th Annual Cognitive Neuroscience Society Meeting, Montreal Quebec, April 2010. (Abstract)

McFarland CP and Glisky EL. Implementation intentions and imagery: Individual and combined effects on prospective memory. Cognitive Aging Conference, Atlanta, GA, April 2010. (Abstract)

McFarland CP and Glisky EL. The relation between implementation intentions and frontal lobe function in prospective memory. Cognitive Aging Conference, Atlanta, GA, April 2010. (Abstract)

Rance, NE. Neurokinin B and the Hypothalamic Regulation of Reproduction, University of West Virginia, Morganstown, West Virginia, April 2010.

Ryan L, Walther K, Glisky EL. Age-related differences in white matter diffusion and their relation to cognitive function are determined by APOE status. Poster presented at the Cognitive Aging Conference, Atlanta GA, April 2010. (Abstract)

Walther K, Glisky E, Ryan L. Longitudinal changes in memory and executive functioning in cognitively healthy APOE ε4 carriers. Poster presented at the Cognitive Aging Conference. Atlanta GA, April 2010. (Abstract)

Walther K, Ryan L. White matter integrity is altered with increased body weight in older females. Poster presented at the Cognitive Aging Conference. Atlanta GA, April 2010. (Abstract)

Alexander, GE. Neuroimaging in Aging and Alzheimer's Disease: Implication for Translational Studies of Brain Aging. Advanced Research Institute for Biomedical Imaging Workshop, Tempe, AZ, May 2010. (Invited)

Glisky EL and Grilli MD. Self-imagination enhances memory in individuals with memory impairment. 12 Annual Conference of the Arizona Alzheimer's Consortium, Glendale, AZ, May 2010. (Invited)

O'Donnell R, Kaszniak AW, Ziebell SI and Menchola M. The effectiveness of mindfulness-based stress reduction as an intervention among middle-aged and older family caregivers of persons with neurocognitive disorders. Poster presented at the Arizona Alzheimer's Consortium Annual Conference, Glendale, AZ, May 2010. (Abstract)

O'Donnell R, Kaszniak AW, Ziebell SI, Menchola M. Evaluating mindfulness-based stress reduction for older family caregivers of persons with neurocognitive disorders. Poster presented at the annual Mind and Life Summer Research Institute, Garrison, NY, May 2010. (Abstract)

Rance, NE. Menopause and the human hypothalamus: evidence for a role of Neurokinin B in the neuroendocrine regulation of reproduction. Arizona Alzheimer's Consortium Annual Conference, Glendale, Arizona, May 2010. (Invited)

Lin C-Y, Lester A, Reynolds J, Ryan L. Frontal and posterior repetition suppression in perceptual/conceptual priming and recognition tasks. Poster presented at the annual meeting of the Organization of Human Brain Mapping, Barcelona, Spain. June 2010. (Abstract)

Alexander GE. (2010) Networks of regional covariance in MRI gray matter: Reproducible multivariate patterns in AD, MCI, and healthy aging. International Conference on Alzheimer's Disease, Honolulu HI, July 2010. (Invited)

Kaszniak AW. Impermanence made visible: Alzheimer's disease caregiving from the perspectives of neuroscience and Zen practice. Presentation given at the Zen Practice and the Emerging Science of Alleviating Suffering retreat/seminar, Upaya Zen Center, Santa Fe, NM, July 2010.

Kaszniak AW. Attention, meditation, and the brain: Basic and applied science. Presentation given at the Zen Practice and the Emerging Science of Alleviating Suffering retreat/seminar, Upaya Zen Center, Santa Fe, NM, July 2010.

Kaszniak AW. Wisdom, neuroscience, and aging. Presentation at the Wisdom and time: Composing a Life, Composing a World retreat/seminar, Upaya Zen Center, Santa Fe, NM, August 2010. (Invited)

Levy DM, Kaszniak AW. Contemplative multitasking: A first report. Presentation at the Second Annual Conference of the Association for Contemplative Mind in Higher Education), Amherst, MA, September 2010. (Invited)

Kaszniak AW. Contemplative multitasking: An oxymoron? Presentation given to the Arizona Meditation Research Interest Group (AMRIG). Tucson, AZ, September 2010. (Invited)

Kaszniak AW, O'Donnell RM, Ziebell SI. Mindfulness-based stress reduction for family caregivers of persons with dementia: Initial results from a randomized controlled trial. Presentation given to the Arizona Meditation Research Interest Group (AMRIG). Tucson, AZ, November 2010.

Alexander GE, Hanson KD, Bergfield KL, Hishaw GA, Bowen TA, Vargas IM, Lin L, Valfre ME, Aiken LS, Luecken LJ, Chen K, Reiman EM, Ahern GL, Huentelman MJ, Trouard TP, Moeller JR. Impact of hypertension and aerobic fitness on brain and cognitive aging: A network analysis of MRI gray matter in healthy late middle-aged and older adults Poster presented at the annual meeting of the Society for Neuroscience, San Diego, CA, November 2010.

Rance, NE. Chair, Nanosymposium entitled "Kisspeptin and Company, Annual Meeting of the Society for Neuroscience, San Diego, CA, November 2010. (Symposium)

Ryan L Walther K. Using factor analysis to determine the structure of age-related white matter changes that predict cognitive change in older adults. Poster presented at the annual meeting of the Society for Neuroscience, San Diego, CA, November 2010. (Abstract)

Walther K, Kawa K, Pu L, Baena E, Alexander GE, Ryan L. Varying task difficulty in younger and older adults in an fMRI source memory task. Poster presented at the annual meeting of the Society for Neuroscience, San Diego, CA, November 2010. (Abstract)

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

From Barnes

Barnes CA. Myths vs. facts about brain changes to be expected during normal aging, Humanities Seminar Series, University of Arizona, February 25, 2010.

Hartzell AL, Wallace JL, Nematollahi S, Burke SN (Presenter), Barnes CA. Older Animals Unable to Distinguish Similar-Looking Objects. Society for Neuroscience Press Conference on "Navigating the Brain and Virtual Reality", San Diego, CA, November 14, 2010

Barnes CA (Moderator) Society for Neuroscience Press Conference on "Personal Accountability: Behavior and Health", San Diego, CA, November 15, 2010.

From Selected Affiliates

Ahern GL. Alzheimer's Disease: Diagnostic and Treatment Options, Part 2. Grand Rounds Presentation, Section of Neurosurgery, Department of Surgery, University of Arizona, Tucson, AZ, January 2010.

Ahern GL. Practical Aspects of Diagnosis and Treatment of Alzheimer's Disease and Other Dementias. Lecture for PGY 1&2 Residents, Department of Psychiatry, University of Arizona, Tucson, AZ, January 2010.

Ahern GL. Alzheimer's Disease: What Women Need to Know. 9th Annual Women's Health Symposium. University of Arizona Department of Psychiatry, UA Student Union, Tucson, AZ, January 2010.

Alexander GE. Imaging the brain in healthy and pathological aging, Humanities Seminar Series, University of Arizona, Tucson, AZ, February 2010.

Glisky EL. Memory systems and processes: How do they change with age? Humanities Seminar Series, University of Arizona, Tucson, AZ, January 2010.

Kaszniak AW and Thompson E. Zen, non-self, and brain. Invited public presentation given at the Upaya Zen Center, Santa Fe, NM, January 2010.

Kaszniak AW. Self-awareness and the brain: Contributions from the study of neurological illness. Presentation given at the Upaya Zen Center retreat/seminar on The Self and Selflessness in Buddhism, Philosophy, and Neuroscience. Santa Fe, NM, January 2010.

Ahern GL. Diagnosis of Dementia, Evaluation and Treatment. Current Clinical Practice; Psychopharmacology Review. University of Arizona Department of Psychiatry, Ventana Canyon Resort, Tucson, AZ, February 2010.

Kaszniak AW. Memory self-awareness, Alzheimer's disease, and the brain. Invited lecture given as part of the Spring University of Arizona Humanities Lecture Series, Tucson, AZ, February 2010.

Ryan L. Rethinking psychotherapy from a cognitive neuroscience perspective. Symposium on Clinical Neurosciences, Canadian Society for Brain, Behaviour and Cognitive Science. Dalhousie University, Halifax Nova Scotia, February 2010.

Glisky EL. Memory changes with age: What to do about it? Humanities Seminar Series, University of Arizona, Tucson, AZ, March 2010.

Kaszniak AW. Metamemory: How does the brain predict itself? Invited lecture given as part of the University of Arizona College of Science Spring Public Lecture Series, Tucson, AZ, http://www.youtube.com/watch?v=9zMlPpEi1kw, March 2010.

Kaszniak AW. The emerging neuroscience of attention, emotion, and meditation. Invited lecture given as part of the 2010 Science Fridays lecture series, The Learning Curve, Tucson, AZ, April 2010.

Kaszniak AW. Neuropsychological assessment of dementia. Invited lecture given as part of the Tucson Medical Center Brain Week, Tucson, AZ, April 2010.

Ryan L. Humanities Series: Memory, Aging and the Brain. Dr. Ryan organized a series of 10 lectures given at the UA Poetry Center for 80 community members. The series discussed memory, how memory (and the brain) changes with age, and what we know so far about ways to stay cognitively healthy as we age. Along with guest speakers, Dr. Ryan gave four of the lectures. Tucson, AZ, January – May 2010.

Kaszniak AW. Organizer and Chairperson, Public Awareness Forum. Presented at the Arizona Alzheimer's Consortium Annual Conference, Glendale, AZ, May 2010.

Kaszniak AW. Understanding behavioral and emotional aspects of Alzheimer's disease. Presented at the Arizona Alzheimer's Consortium Annual Conference, Glendale, AZ, May 2010.

Kaszniak AW and Shapiro SL. From cushion to clinic: Meditation and healthcare. Presentation given at the Zen Practice and the Emerging Science of Alleviating Suffering retreat/seminar, Upaya Zen Center, Santa Fe, NM, July 2010.

Fonda J, Bateson MC, and Kaszniak AW. Time and wisdom. Presentation given at the Wisdom and time: Composing a life, composing a world retreat/seminar, Upaya Zen Center, Santa Fe, NM, August 2010.

Kaszniak AW. Mindfulness for transplant patients. Invited community presentation given to the organ transplant support group, University Medical Center, Tucson, AZ, October 2010

Ryan L. Functional compensation: Varying levels of difficulty in a source memory task. Colloquium speaker, Dept. of Psychology, University of Toronto, October 2010.

Ryan L. The Aging Brain: Neuroimaging studies of memory, aging, and risk for Alzheimer's Disease. Keynote speaker, Southern Arizona Psychological Association, Tucson AZ, October 2010.

Ryan L. Aging, Alzheimer's, and Brain Health. Invited address, Harvard Club of Arizona. Tucson AZ, October 2010.

6. Awards

Barnes, C.A., Society for Neuroscience Mika Salpeter Lifetime Achievement Award 2010

Barnes, C.A., Elected Galileo Fellow, College of Science, University of Arizona

APA Division 6 D.B. Marquis Behavioral Neuroscience Award for Behavioral Neuroscience, 124:559-573, 2010 (Burke SN, Wallace JL, Nematollahi S, Uprety A and Barnes CA)

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 curricula vitae are included in the following pages.

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Carol A. Barnes, Ph.D.	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, University 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**, Psychology, Neurology, ARL Div Neural Systems, Memory & Aging, Univ. Arizona, Tucson
2006 -	**Regents' Professor**, Psychology, Neurology, Bio5, ARL Division of Neural Systems, Memory & Aging, University of Arizona, Tucson
2006 -	**Director**, Evelyn F. McKnight Brain Institute, University of Arizona, Tucson, AZ
2006 -	**Evelyn F. McKnight Endowed Chair for Learning and Memory in Aging**, University of Arizona
2008 -	**Director**, ARL Division of Neural Systems, Memory and Aging, University of Arizona, Tucson
2009 -	**Associate Director**, Bio5, 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	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	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

2010 Publications

Burke, S.N. and Barnes, C.A. (2010) Senescent synapses and hippocampal circuit dynamics. Trends in Neurosciences, 33:153-161.

Penner, M.R., Roth, T.L., Barnes, C.A. and Sweatt, J.D. (2010) An epigenetic hypothesis of aging-related cognitive dysfunction. Frontiers in Aging Neuroscience, 2:9.

Alme, C.B., Buzzetti, R.A., Marrone, D.F., Leutgeb, J.K., Chawla, M.K., Schaner, M.J., Bohanick, J.D., Khoboko, T., Leutgeb, L., Moser, E.I., Moser, M.B., McNaughton, B.L. and Barnes, C.A. (2010) Hippocampal granule cells opt for early retirement. Hippocampus, 20:1109-1123.

Schimanski, L.A. and Barnes, C.A. (2010) Neural protein synthesis during aging: Effects on plasticity and memory. Frontiers in Aging Neuroscience, 2:26.

Henriksen, E.J., Colgin, L.L., Barnes, C.A., Witter, M.P., Moser, M.-B., and Moser, E.I. (2010) Spatial representation along the proximodistal axis of CA1. Neuron, 68:127-137.

Burke, S.N., Wallace, J.L., Nematollahi, S., Uprety, A., and Barnes, C.A. (2010) Pattern separation deficits contribute to age-associated recognition impairments. Behavioral Neuroscience, 124:559-73

Penner, M.R., Roth, T.L., Chawla, M.K., Hoang, L.T., Roth, E.D., Lubin, F.D., Sweatt, D.J., Worley, P.F. and Barnes C.A. (2010) Age-related changes in *Arc* transcription and DNA methylation within the hippocampus. Neurobiology of Aging, in press.

Marrone, D.F., Satvat, E., Schaner, M.J., Worley, P.F. and Barnes C.A. (2010) Attenuated long-term Arc expression in the aged fascia dentata. Neurobiology of Aging, in press.

Shamy, J.L., Habeck, C., Hof, P.R., Amaral, D.G., Fong, S.G., Buonocore, M.H., Stern, Y., Barnes, C.A., and Rapp, P.R. (2010) Volumetric correlates of spatiotemporal working and recognition memory impairment in aged rhesus monkeys. Cerebral Cortex, in press.

Burke, S.N., Maurer, A.P., Nematollahi, S., Uprety, A.R., Wallace, J.L., and Barnes, C.A. The Influence of Objects on Place Field Expression and Size in Distal Hippocampal CA1. Hippocampus, in press.

Tsai, C.-L., Lister, J.P., Bjornsson, C.J., Smith, K., Shain, W., Barnes, C.A., and Roysam, B. Robust, globally consistent, and fully-automatic multi-image registration and montage synthesis for 3-D multi-channel images. Journal of Microscopy, in press.

Maurer, A.P., Burke, S.N., Lipa, P., Barnes, C.A. Greater running speeds result in increased hippocampal sequence compression. Hippocampus, in press.

Stoub, T.R.., Barnes, C.A., Shah, R.C., Ferrari, C., and deToledo-Morrell, L. (2010) Age-related changes in parahippocampal white matter in the region of the perforant pathway. Revision Submitted.

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Geoffrey Lawrence Ahern, M.D., Ph.D.	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, 2nd 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

2010 Publications

Caselli RJ, Dueck AC, Locke DEC, Sabbagh MN, Ahern GL, Rapcsak SZ, Baxter LC, Yaari R, Woodruff BK, Snyder CH, Rademakers R, Findley S, Reiman EM. Cerebrovascular risk factors influence preclinical memory decline in cognitively normal APOE ε4 homozygotes. Neurology, 2010, in press.

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Gene E. Alexander, Ph.D.	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, 15 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- date External Adv, Aging Brain:Vasculature, Ischemia & Behav. Prog Proj, USC, 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 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 Member, Executive Committee, Neuroscience GIDP, University of Arizona
2010 Member, Academic Program Review Faculty Committee, Psych. Dept., Univ of Arizona
2010 Member, Faculty Search Committee, Cognitive & Neural Systems, Psychology Dept., University of Arizona

2010 Publications

Bergfield KL, Hanson KD, Chen K, Teipel SJ, Hampel H, Rapoport SI, Moeller JR, Alexander GE. (2010) Age-Related Networks of Regional Covariance in MRI Gray Matter: Reproducible Multivariate Patterns in Healthy Aging. Neuroimage, 49:1750-1759.

Chen K, Langbaum JB, Fleisher AS, Ayutyanont N, Reschke C, Lee W, Liu X, Bandy D, Alexander GE, Thompson PM, Foster NL, Harvey DJ, de Leon MJ, Koeppe RA, Jagust WJ, Weiner MW, Reiman EM; Alzheimer's Disease Neuroimaging Initiative. (2010) Twelve-month metabolic declines in probable Alzheimer's disease and amnestic mild cognitive impairment assessed using an empirically pre-defined statistical region-of-interest: findings from the Alzheimer's Disease Neuroimaging Initiative. Neuroimage, 51:654-64.

Corneveaux JJ, Liang WS, Reiman EM, Webster JA, Myers AJ, Zismann VL, Joshipura KD, Pearson JV, Hu-Lince D, Craig DW, Coon KD, Dunckley T, Bandy D, Lee W, Chen K, Beach TG, Mastroeni D, Grover A, Ravid R, Sando SB, Aasly JO, Heun R, Jessen F, Kolsch H, Rogers J, Hutton ML, Melquist S, Petersen RC, Alexander GE, Caselli RJ, Papassotiropoulos A, Stephan DA, Huentelman MJ. (2010) Evidence for an association between KIBRA and late-onset Alzheimer's disease. Neurobiology of Aging, 31:901-909.

Ho A, Hua X, Lee S, Leow AD, Yanovsky I, Gutman B, Dinov ID, Lepore N, Stein J, Toga AW, Jack CR, Bernstein MA, Reiman EM, Harvey DJ, Kornak J, Schuff N, Alexander GE, Weiner MW, Thompson PM.(2010) Comparing 3 Tesla and 1.5 Tesla MRI for Tracking Alzheimer's Disease Progression with Tensor Based Morphometry. Human Brain Mapping, 31L499-514.

Hua X, Lee S, Hibar DP, Yanovsky I, Leow AD, Toga AW, Jack CR, Bernstein MA, Reiman EM, Harvey DJ, Kornak J, Schuff N, Alexander GE, Weiner MW, Thompson PM and the Alzheimer's Disease Neuroimaging Initiative. (2010) Mapping Alzheimer's Disease Progression in 1309 MRI Scans: Power Estimates for Different Inter-Scan Intervals. Neuroimage, 51:63-75.

Langbaum JBS, Chen K, Caselli RJ, Lee W, Reschke C, Bandy D, Alexander GE, Burns CM, Kaszniak AW, Reeder SA, Corneveaux JJ, Allen AN, Pruzin J, Huentelman MJ, Fleisher AS, Reiman EM. (2010) Hypometabolism in Alzheimer's-affected brain regions in cognitively healthy Latino individuals carrying the Apolipoprotein E ε4 allele. Archives of Neurology, 67:462-468.

Reiman EM, Chen K, Langbaum JB, Lee W, Reschke C, Bandy D, Alexander GE, Caselli RJ. (2010) Higher serum total cholesterol levels in late middle age are associated with glucose hypometabolism in brain regions affected by Alzheimer's disease and normal aging. Neuroimage, 49:169-176.

Smith JF, Alexander GE, Chen K, Husain FT, Kim J, Pajor N, Horwitz B. Imaging systems level consolidation of novel semantic-like memories: A longitudinal neuroimaging study. Neuroimage, 50:826-836.

Wu X, Chen K, Yao L, Ayutyanont N, Langbaum JB, Fleisher A, Reschke C, Lee W, Liu X, Alexander GE, Bandy D, Foster NL, Thompson PM, Harvey DJ, Weiner MW, Koeppe RA, Jagust WJ, Reiman EM; Alzheimer's Disease Neuroimaging Initiative. (2010) Assessing the reliability to detect cerebral hypometabolism in probable Alzheimer's disease and amnestic mild cognitive impairment. Journal of Neuroscience Methods, 192:277-285.

Ewers M, Walsh C, Trojanowski JQ, Shaw LM, Petersen RC, Jack CR, Jr., Feldman HH, Bokde AWL, Alexander GE, Scheltens P, Vellas B, Dubois B, Weiner M, Harald Hampel H, in collaboration with the North American Alzheimer's Disease Neuroimaging Initiative (ADNI). Prediction of conversion from mild cognitive impairment to Alzheimer's disease dementia based upon biomarkers and Neuropsychological Test Performance, Neurobiology of Aging, in press.

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Elizabeth L. Glisky, Ph.D.	Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

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

2010 Publications

Walther K, Birdsill A, Glisky E and Ryan L (2010) Structural brain differences and cognitive functioning related to body mass index in older females. Human Brain Mapping, 31:1052-1064.

Grilli MD and Glisky EL (2010) Self-imagining enhances recognition memory in memory-impaired individual with neurological damage. Neuropsychology, 24:698-710.

Glisky EL (2010) Forgetting. In J. S. Kreutzer, J. DeLuca and B. Caplan (Eds.), Encyclopedia of Clinical Neuropsychology. New York: Springer.

Glisky EL (2010) Implicit memory. In J. S. Kreutzer, J. DeLuca and B. Caplan (Eds.), Encyclopedia of Clinical Neuropsychology. New York: Springer.

Glisky EL (2010) Incidental memory. In J. S. Kreutzer, J. DeLuca and B. Caplan (Eds.), Encyclopedia of Clinical Neuropsychology. New York: Springer.

Glisky EL (2010) Memory. In J. S. Kreutzer, J. DeLuca and B. Caplan (Eds.), Encyclopedia of Clinical Neuropsychology. New York: Springer.

Glisky EL (2010) Method of vanishing cues. In J. S. Kreutzer, J. DeLuca and B. Caplan (Eds.), Encyclopedia of Clinical Neuropsychology. New York: Springer.

Ryan L, Walther K, Bendlin BB, Liu L-F, Walker DG and Glisky EL (2010) Age-related differences in white matter integrity measured by diffusion tensor imaging and cognitive function are related to APOE status. NeuroImage, doi:10.1016/j.neuroimage.2010.08.052.

Kihlstrom, J. F., & Glisky, E. L. (in press). Amnesia. In V. S. Ramachandran (Ed.), Encyclopedia of human behavior (2nd Ed). Oxford: Elsevier.

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

2010 Publications

Kaszniak AW and Edmonds E (2010) Anosognosia and Alzheimer's disease: Behavioral studies. In G. Prigatano (Ed.), The study of anosognosia (pp: 189-228). New York: Oxford University Press.

Langbaum JBS, Chen K, Caselli RJ, Lee W, Reschke C, Bandy D, Alexander GE, Burns CM, Kaszniak AW, Reeder SA, Corneveaux JJ, Allen AN, Pruzin J, Huentelman MJ, Fleisher AS and Reiman EM (2010. Hypometabolism in Alzheimer-affected brain regions in cognitively healthy Latino individuals carrying the Apolipoprotein E4 allele. Archives of Neurology, 67:462-468.

Kaszniak AW (in press. Meditation, mindfulness, cognition, and emotion: Implications for community-based older adult programs. In P. Hartman-Stein & A. LaRue (Eds.), Enhancing cognitive fitness in adults: A guide to the use and development of community programs. New York: Springer.

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Naomi E. Rance, M.D., Ph.D.	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

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

2010 Publications

Dacks PA and Rance, N.E. (2010) Effects of estradiol on the thermoneutral zone and core temperature in ovariectomized rats. Endocrinology, 151:1187-1193.

Krajewski SJ, Burke MC, Anderson MJ, McMullen NT and Rance NE. (2010) Forebrain projections of arcuate neurokinin B neurons demonstrated by anterograde tract-tracing and monosodium glutamate lesions in the rat. Neuroscience, 166:1187-1193.

Rance NE, Krajewski SK, Smith MA, Cholanian M and Dacks PA. (2010) Neurokinin B and the hypothalamic regulation of reproduction. Brain Research, 1364:116-128.

Williams H, Dacks PA and Rance NE. (2010) An improved method for recording tail skin temperature in the rat reveals changes during the estrous cycle and effects of ovarian steroids. Endocrinology, 151:5389-5394.

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

2010 Publications

Ryan L, Lin CY, Ketcham K and Nadel L (2010) The role of medial temporal lobe in retrieving spatial and nonspatial relations from episodic and semantic memory. Hippocampus, 20:11-18.

Walther K, Birdsill AC, Glisky EL and Ryan (2010). Structural Brain Differences and Cognitive Functioning Related to Body Mass Index in Older Females. Human Brain Mapping, 31:1052-1064.

Hoscheidt SM, Nadel L, Payne J and Ryan L (2010) Hippocampal activation during retrieval of spatial context from episodic and semantic memory. Behavioural Brain Research, 212:121-232.

Ryan L, Walther K, Bendlin BB, Lue L-F, Walker DG and Glisky EL. Age-related differences in white matter integrity and cognitive function are related to APOE status. NeuroImage, in press

Walther K, Bendlin B, Glisky E, Trouard T, Lisse J, Posever J and Ryan L. Anti-inflammatory drugs reduce age-related decreases in brain volume in cognitively normal older adults. Neurobiology of Aging, in press.

Walther K and Ryan L. White matter integrity in older adults is altered by increased body fat. Obesity, submitted.

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, University of Arizona
- Heather Bimonte-Nelson, Ph.D., Associate Professor, Honors Disciplinary Faculty. Behavioral Neuroscience Program Director, Arizona State University
- Paul Coleman, Ph.D., UA Associate: Research Scientist, 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
- Jean-Marc Fellous, Ph.D., Associate Professor 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
- Marco Herrera-Valdez, Ph.D., UA Associate: Assistant Research Scientist, Evelyn F. McKnight Brain Institute, University of Arizona; Assistant Research Professor, Mathematical, Computational and Modeling Sciences Center, Arizona State University
- Matthew J. Huentelman, Ph.D., UA Associate: Assistant Research Scientist, Evelyn F. McKnight Brain Institute, University of Arizona; Investigator, Neurobehavioral Research Unit, Translational Genomics Research Institute
- Alfred W. Kaszniak, Ph.D., Head, Department of Psychology; Director, Coordinated Clinical Neuropsychology Program, University of Arizona
- Diano Marrone, Ph.D., UA Associate: Assistant Research Scientist, Evelyn F. McKnight Brain Institute; Assistant Professor, Psychology, Wilfrid Laurier University
- 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 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, 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
- Robert S. Sloviter, Ph.D., Professor of Pharmacology and Neurology, University of Arizona
- Ted P. Trouard, Ph.D., Associate Professor, Biomedical Engineering
- Andrea J. Yool, Ph.D., UA Research Associate, Department of Physiology; Professor, Molecular and Biomedical Science, University of Adelaide

There was one new affiliate member appointed in 2010, Dr. Heather Bimonte-Nelson. She was one of the speakers at the McKnight Brain Research Foundation site visit in October, and her interest is in brain hormones and how the changes that occur across the lifespan make impact cognition. In addition, Dr. Dena Dubal is in the final negotiations with Dr. Martinez, Director of the BIO5 Institute, for a position as one of the 5 new M.D./Ph.D. faculty hires in the recently established Clinical and Translational Science Institute at the University of Arizona. Should Dr. Dubal accept our offer at the University of Arizona (and decline offers from the University of California, San Francisco and Stanford University), I have promised to accommodate the space needs for her, her students and her research program in the Evelyn F. McKnight Brain Institute on the third floor of Life Sciences North. This assignment of space has been approved by the College of Medicine, the Department of Neurology, the Arizona Research Laboratories, and the Office of the Vice President for Research at the University of Arizona. Naturally, Dr. Dubal will also become an affiliate member of the 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.

Monica Chawla, Ph.D. (Barnes)
Area of Interest: Immediate early gene expression in aging in the rat.

Lan Lin, Ph.D. (Alexander)
Area of Interest: Development and implementation of MRI methods for small animal models and human studies of aging.

James Lister, Ph.D. (Barnes)
Area of Interest: Large-scale genetic imaging.

Andrew Maurer, Ph.D. (Barnes)
Area of Interest: Temporal lobe circuits involved in memory.

Marisa Menchola, Ph.D. (Kaszniak)
Area of Interest: Aging and the Psychophysiology of Emotion Response; Aging and Frontal Lobe Changes.

Marsha Penner, Ph.D. (Barnes)
Area of Interest: Selectivity of gene expression changes across hippocampal regions in aging.

Rachel Samson, Ph.D. (Barnes)
Area of Interest: Age-related changes in the amygdala and emotional perception in the rat.
Lesley Schimanski, Ph.D. (Barnes)
Area of Interest: Ensemble recording of aged rat hippocampus: evaluation of map dynamics.
Katrin Walther, Ph.D. (Ryan)
Area of Interest: Brain imaging and cognitive changes in normal older adults.

Predoctoral

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.
Molly Bisbee (Glisky)
Area of Interest: Executive function, memory, and APOE status in normal aging
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)
Area of Interest: How ensembles of hippocampal neuron activity predict memory decline in aged rats
Marina Cholanian (Rance)
Area of Interest: Third year graduate student with interest in the morphology and electrophysiology of Neurokinin B neurons.
Emily Connally (Glisky)
Area of Interest: Source memory, neuroimaging, in normal aging
Penny Dacks (Rance)
Area of Interest: Age-related changes in temperature regulation in menopause.
Emily Edmonds (Glisky)
Area of Interest: Metamemory, decision-making, face recognition in normal aging and dementia. (Glisky)
Alaina Glatting (Barnes)
Area of Interest: Mechanisms of sleep disturbance that can affect memory.
Matt Grilli (Glisky)
Area of Interest: Self-referential processing, self-imagination, prospective memory, and memory rehabilitation (in normal aging and patient populations).
Krista Hanson (Alexander)
Area of Interest: Imaging and cognitive functioning associated with healthy aging and age-related neurodegenerative disease.
Kari Haws (Alexander)
Area of Interest: Cognition and neuroimaging in cognitive aging.

Lan Hoang (Barnes)
Area of Interest: Age-related changes in dopaminergic systems.
Siobhan Hoscheidt (Ryan)
Area of Interest: The neural basis of memory and emotion..
Nathan Insel (Barnes)
Area of Interest: Prefrontal cortical function in aging rats.
Kevin Kawa (Ryan)
Area of Interest: fMRI studies of memory and aging.
Thabelo Khoboko (Barnes)
Area of Interest: Age-related changes in population dynamics of hippocampal granule cells.
Gittan Mansson (Glisky)
Area of Interest: Prototype learning (of faces) in older adults.
Craig McFarland (Glisky)
Area of Interest: Executive function in older adults; prospective memory.
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.
Melinda Smith (Rance)
Area of Interest: Role of neurokinin B in menopausal flushes and the hypothalamic regulation of gonadotropin.
Alex Thome (Barnes)
Area of Interest: Age-related changes in alpha and gamma oscillations in primate neocortex.
Autumn Wiley (Kaszniak)
Area of Interest: Mindfulness and Attention.
Janelle Wohltmann (Glisky)
Area of Interest: Integration, inhibition, and strategic processing in source memory in normal aging; executive function

Undergraduate Students (from Barnes' lab with graduate student or postdoctoral mentor in brackets)
Keshav Anand (Lister)
Neha Bandekar (Chawla)
Sarah Clasen (Lister)
Ana Egurrola (Hoang)
Andrea Hartzell (Burke)
Danah Huerta (Burke)
Lauren Johnston (Lister)
Julia Liang (Lister)
Kim Lind (Burke)
Anthony Murata (Lister)
Dhara Patel (Samson)
Janssen Puracan (Chawla)

Amanda Richards (Hoang)
Nima Sekhadia (Chawla)
Khoa Truong (Chawla)
Jennifer Vega (Insel)
Anu Venkatesh (Samson)
Zachary Wagner (Insel)
Toby Weinstein (Samson)

Staff

Caroline Garcia, Assistant to the Vice President for Research
Kojo Plange, Research Specialist, Non-human Primates
Luann Snyder, Department Administrator

9. Clinical/translational programs

2008-present Ahern, PI: A Phase 3, Multicenter, Randomized, Double-Blind,Placebo-Controlled, Parallel-Group, Efficacy and Safety Trial of Bapineuzumab (AAB-001, ELN115727) in Patients with Mild to Moderate Alzheimer's Disease Who Are Apolipoprotein Eε4 Non-Carriers. Protocol # ELN115727-301. Elan Pharmaceuticals, Inc.

2008-present Ahern, PI: A Phase 3, Multicenter, Randomized, Double-Blind,Placebo-Controlled, Parallel-Group, Efficacy and Safety Trial of Bapineuzumab (AAB-001, ELN115727) in Patients with Mild to Moderate Alzheimer's Disease Who Are Apolipoprotein Eε4 Carriers. Protocol # ELN115727-302. Elan Pharmaceuticals, Inc.

2008-present Ahern, PI: A Randomized, Double-Blind, Placebo-Controlled, Dose-Ranging, Safety and Efficacy Study of Oral ELND005 (AZD-103) in Alzheimer's Disease. Protocol # ELND005-AD201. Elan Pharmaceuticals, Inc.

2009-present Ahern, PI: Immunoglobulin Intravenous (IgIV) for Treatment of Alzheimer's Disease. Protocol # ADC-031. National Institute on Aging - Alzheimer's Disease Cooperative Study.

2009-present Ahern, PI: Observational Study of Long-Term (18 Month) Cognitive Outcomes in Healthy Volunteers, Patients with Mild Cognitive Impairment (MCI) and Patients with Alzheimer's disease (AD) Who Have Previously had PET Imaging with Florpiramine F 18 (^{18}F-AV-45) Injection. Protocol # ^{18}F-AV-45-A11. Avid Radiopharmaceuticals, Inc.

2009-present Ahern, co-PI (Hishaw PI): CONCERT: A Phase 3 Multicenter, Randomized, Placebo-Controlled, Double-Blind Twelve-Month Safety and Efficacy Study Evaluating Dimebon in Patients with Mild-to-Moderate Alzheimer's Disease on Donepezil. Protocol # DIM18. Medivation, Inc.

2010-present Ahern, PI. A Phase 3 Extension, Multicenter, Double-Blind, Long Term Safety and TolerabilityTreatment Trial of Bapineuzumab (AAB-001, ELN115727) in Subjects with Alzheimer's Disease who Participated in Study ELN115727-301 or in Study ELN115727-302. Protocol # ELN115727-351. Elan Pharmaceuticals, Inc.

10. Technology transfer

None

11. Budget update

(a) **Last year's budget and actual results - July 1, 2009 to June 30, 2010**

	Budget	**Expenditures**
Personnel	$ 700,000	$ 775,491
Operations	$ 300,000	$ 241,750
Recruitment	$ 281,036	$ 707
Total	$1,281,036	$1,017,948

(b) **Status of matching funds – FY 07, 08, 09, 10**

Year	**MBRF Gift**	**Match**
FY 06-07	$1,000,000	$1,779,500
FY 07-08	$1,000,000	$ 851,918
FY 08-09	$1,300,000	$1,251,309
FY 09-10	$1,000,000	$1,097,732
Total	$4,300,000	$4,980,459

(c) **Projected budget for coming year (FY 10/11)**

Personnel	$ 750,000
Operations	$ 250,000
Recruitment	$ 280,329
Total	$1,280,329

d) **Extramural funding (covering period July 1, 2009 to June 30, 2010)**

Grants Received – from Barnes

2 RO1 AG003376-26A2 (P.I.: Barnes)
Title: Neurobehavioral Relations in Senescent Hippocampus*
Dates: 05/01/10 – 4/30/11 (5/10 – 4/15 project period)
Amount: $764,386/year ($660,658 direct costs)

5 R37 AG012609-16 (P.I.: Barnes)
Title: Cell Assemblies, Pattern Completion and the Aging Brain*
Dates: 07/01/09 – 06/30/10 (7/09 – 6/14 project period)
Amount: $306,873/year ($205,000 direct)

1 RC1 AG036053-01 (P.I.: Barnes)
Title: Functional Activity Mapping of Brain Networks
Date: 09/30/09 – 08/31/10 (9/09 – 8/11 project period)
Amount: $407,217/year (323,615 direct costs)

1 R44 AG035446-01(P.I.: LaComb; co-PI Barnes)
Title: Whole-brain fluorescence and brightfield imaging at single-cell level
Dates: 09/01/10 – 08/31/11 (9/10 – 8/12 project period)
Amount: $29,983/year ($19,791 direct)

1 P30 AG019610-08 (PI: Reiman – Barnes, Director, Ad Hoc Review Program)
Title: Arizona Alzheimer's Disease Core Center Ad Hoc Review
Dates: 07/01/09 – 06/30/10 (7/06 – 6/11 project period)
Amount: $20,100/year ($13,331 direct)

State of Arizona, DHS Grant
Title: Arizona Alzheimer's Consortium - UA Evelyn F. McKnight Brain Institute
Date: 07/01/09 – 06/30/10
Amount: $66,500/year (direct costs)

State of Arizona, DHS Grant
Title: Arizona Alzheimer's Consortium – ISAC Support
Date: 07/01/09 – 06/30/10
Amount: $14,250/year (direct costs)

Canadian Institutes of Health Research
Postdoctoral Fellowship to Dr. Rachel Samson
Title: Age-related changes in network activity of the amygdale during emotional learning
Date: 07/01/09 – 3/31/10 (7/08 – 6/11 project period)
Amount: $50,000 Canadian dollars

1 F32 AG033460-01A1 (Sponsor: Barnes; NRSA to J. Lister)
Title: Age effects on grid cell and scene recognition systems of entorhinal cortex"
Date: 09/01/09 – 08/31/10 (September 2009 – August 2011)
Amount: $50,054 (direct costs)

Grants Received - From Selected Affiliates

1 P30 AG019610-08 (PI: Reiman – Ahern co-PI, UAHSC Clinical Core)
Title: Arizona Alzheimer's Disease Core Center
Dates: 07/01/09 – 06/30/10 (7/06 – 7/11 project period)
Amount: $60,748/year ($46,853direct costs)

State of Arizona, DHS Grant (PI: Reiman – Ahern: co-PI)
Title: Clinical Core
Date: 07/01/09 – 06/30/10
Amount: $34,200/year (direct costs)

1 R01 AG025526 (PI: Alexander)
Title: Neuroanatomical Substrates of Aging & Cognitive Decline
Dates: 4/01/09-6/30/10 (4/07 – 6/30 project period)
Amount: $1,066,581/year ($798,381 direct costs)

2 R01 MH57899 (PI: Reiman – Alexander co-PI)
Title: PET, APOE, & the Preclinical Course of Alzheimer disease
Dates: 07/1/09 – 6/30/10 (7/98 – 6/13 project period)
Amount: 164,417/year ($116,769 direct costs)

State of Arizona, DHS Grant (PI: Reiman – Alexander co-PI)
Title: Magnetic Resonance Imaging of Amyloid Plaques in a Mouse Model of Alzheimer's Disease
Dates: 7/1/09-6/30/10
Amount: $19,136/year (direct costs)

State of Arizona, DHS Grant (PI: Reiman – Glisky: co-PI)
Title: Longitudinal study of neuropathologic markers in Alzheimer's disease
Date: 07/01/09 – 06/30/10
Amount: $19,136/year (direct costs)

AG 014792 (PI: Van Petten – Glisky: co-PI)
Title: Cognitive and Neural Bases of Aging and Memory
Date 09/01/09 –08/31/10 (9/08 – 8/11 project period)
Amount: $169,377 direct costs)

9 RO1AG 031581 (PI: Reiman; Kaszniak: co-PI)
Title: PET, APOE and the Preclinical Course of Alzheimer's Disease
Date: 07/01/09 – 06/30/10 (7/07 – 6/12 project period)
Amount: $45,181 (subcontract total costs)

2 P30 AG019610 (PI: Reiman – Kaszniak co-PI, Education and Information Core)
Title: Arizona Alzheimer's Disease Core Center
Dates: 07/01/09 – 06/30/10 (7/06 – 7/11 project period)
Amount: $75,562/year ($51,187 direct costs)

State of Arizona, DHS Grant
Title: Arizona Alzheimer's Consortium (PI: Reiman – Kaszniak: co-PI)
Diversity Education and Outreach Program
Date: 07/01/09 – 06/30/10
Amount: $12,825/year (direct costs)

State of Arizona, DHS Grant
Title: Arizona Alzheimer's Consortium (PI: Reiman – Kaszniak: co-PI)
Outreach and Information Dissemination Program
Date: 07/01/09 – 06/30/10
Amount: $51,300/year (direct costs)

P30 AG19610
Postdoctoral Fellowship for Marisa Menchola, Ph.D. (Advisor: Dr. Al Kaszniak)
Title: Research Supplement to Promote Diversity in Health-Related Research
Dates: 07/01/09 – 06/30/10 (08/08 – 06/10 project period)
Amount: $80,872/year ($53,558 direct costs)

RO1 AG032315 (PI: Rance)
Title: The Role of Neurokinin B in the Generation of Menopausal Flushes
Dates: 08/01/09 – 06/30/10 (8/08 – 6/13 project period)
Amount: $277,576 ($183,325 direct costs)

State of Arizona, DHS Grant
Title: Arizona Alzheimer's Consortium (PI: Reiman – Ryan: co-PI)
Cognition & Neuroimaging Laboratories
Date: 07/01/09 – 06/30/10 (07/98 – 06/10 project period))
Amount: $164,170/year direct costs (w/$164,170 institutional match)

Grants Submitted – from Barnes

Postdoctoral fellowship application for Dr. Drew Maurer (Barnes sponsor)
Title: Hippocampal ensembles dynamics during active ambulation, passive movement & rest
Dates: 04/01/11 – 03/31/14 (requested dates of project)
Amount: $50,474/year (requested direct costs)
Status: Priority Score: 21; 11% percentile (notification of grant award pending)

2 T32 AG007434-11A2 (P.I.: Zinsmaier; co-PI: Barnes)
Title Predoctoral Training Program in Neuroscience
Dates: 05/01/11 – 04/30/16 (requested dates of project)
Status: Not funded.

1 RO1 AG039990-01 (P.I.: Huentelman; co-PI: Barnes)
Title: Hippocampal Circuit-Specific Molecular Changes in Normal Cognitive Aging
Dates: 04/01/11 – 03/31/16 (requested dates of project)
Amount: $182,498/year (requested direct costs)
Status: Not funded. Revised application in preparation.

1 RO1 ES 020228-01 (P.I.: Barnes; co-PIs: Huentelman and Coleman)
Title: Methylation and Transcription Patterns Associated with Differential Cognitive Phenotypes Across Age
Date: 07/01/11 – 06/30/16 (requested dates of project)
Amount: $879,864/year (requested direct costs)
Status: Under Review

1 R21 MH094540-01 (P.I.: Galbraith; co-PI; Barnes)
Title: Epigenomics within single cell types of the Central Nervous System
Dates: 07/01/11 – 06/13/13
Amount: $10,893/year (requested direct costs)
Status: Under review

Grants Submitted - From Selected Affiliates

National Institute on Aging (PI: Glisky; co-PI: Ryan)
Title Longitudinal Analysis of Cognitive and Neural Changes in Normal Aging
Dates: Submitted June 2010
Status: Under review

National Institute on Aging (PI: Ryan)
Title Differences in Brain Structure and Cognitive Functioning Related to Increased Body Fat in Middle-Aged and Older Adults"
Dates: Submitted June 2010
Status: Under review

12. Educational programs focusing on age related memory loss (July 1, 2009 – December 31, 2010)

Event: *Evelyn F. McKnight Brain Institute Seminar Series*
Summary: This Seminar Series is designed to bring together people across campus as well as the EMBI affiliates to hear state of the art presentations from leading investigators in the field of normal aging, and provide opportunities for one-on-one interactions that may foster future collaborations.

Date: October 28, 2009
Title: Reading Processes of Older Readers, Beginning Readers, and Chinese Readers
Presenter: Keith Rayner, Ph.D., Professor of Psychology, University of California at San Diego

Date: November 2, 2009
Title: Molecular and Functional Imaging in Early Alzheimer's Disease
Presenter: Reisa Sperling, M.D., Associate Professor of Neurology, Harvard Medical School; Director of Clinical Research, Memory Disorders Unit, Brigham and Women's Hospital

Date: February 22, 2010
Title: Spatial and Temporal Coding by Entorhinal Grid Cell
Presenter: Marianne Fyhn, Ph.D., Postdoctoral Research Associate, Department of Physiology, University of California, San Francisco
Title: Mapping and Remapping of Place Cells and Grid Cells
Presenter: Torkel Hafting, Ph.D., Postdoctoral Research Associate, Department of Physiology, University of California, San Francisco

Date:	March 29, 2010
Title:	How the Brain's Memory Systems Compensate for Impairment
Presenter:	Michael Fanselow, Ph.D., Professor, Department of Psychology, University of California, Los Angeles
Date:	April 26, 2010
Title:	The Arc of Synaptic Memory
Presenter:	Clive Bramham, M.D., Ph.D., Professor, Department of Biomedicine, Neuroscience Research Group, University of Bergen, Norway
Date:	October 18, 2010
Title:	A population-based approach to cognitive aging: the Northern Manhattan Study
Presenter:	Clinton Wright, M.D., M.S., Scientific Director, Evelyn F. McKnight Brain Institute; Associate Professor, Departments of Neurology and Epidemiology & Public Health, Leonard M. Miller School of Medicine, University of Miami
Date:	October 21, 2010
Title:	Cooperation of the entorhinal and medial prefrontal cortices in long-term memory retrieval
Presenter:	Kaori Takehara-Nishiuchi, Ph.D., Assistant Professor, Department of Psychology, University of Toronto
Date:	November 2, 2010
Title:	The Monkey and the Seahorse Revisited: Learning, Executive Function, and Aging
Presenter:	Mark B. Moss, Ph.D., Professor and Chairman, Department of Anatomy and Neurobiology, Boston University School of Medicine
Date:	November 22, 2010
Title:	Studies of the Aging Brain: The Effect of Age and Disease
Presenter:	Asta Håberg, M.D., Ph.D., Professor, Department of Neuroscience, Trondheim fMRI Group, Norwegian University of Science and Technology
Date:	December 6, 2010
Title:	The Hand that Rocks the Cradle Rules the Brain: The impact of familial left-handedness on cognitive behaviors and neurological organization in right handers
Presenter:	Tom Bever, Ph.D., Professor, Department of Linguistics & Roland Hancock. Graduate Student, Department of Psychology, University of Arizona
Date:	December 7, 2010
Title:	Targeting Arc mRNA to Synapses
Presenters:	Oswald Steward, Ph.D., Director, Reeve-Irvine Research Center. University of California at Irvine School of Medicine

Event: *32nd Annual Meeting of the Japan Neuroscience Society*
Date: September 16-18, 2009
Venue: Nagoya Congress Center, Nagoya, Japan
Symposium: The Awake and Sleeping Brain - Processing of Sequential Information and Memory Consolidation
Chair: Carol A. Barnes (University of Arizona)
Presentations: The organization of hippocampal theta oscillations
Thanos Siapas (California Institute of Technology)

Spontaneous changes of neocortical code for associative memory during consolidation
Kaori Takehara-Nishiuchi (University of Toronto)

Dissociable roles for cortical and subcortical structures in memory encoding and retrieval
Mark G. Baxter (University of Oxford)

Weakening of replay of temporal patterns may result in memory consolidation failures in older animals
Carol A. Barnes (University of Arizona)

Neocortical memory reactivation during UP states and gradual change of its compression rate
Masami Tatsuno (University of Lethbridge)

Computational study of memory formation through dynamical interplays in the cortico-hippocampal system
Yoko Yamaguchi (RIKEN Brain Science Institute)

Abstract: Storing information as memory is a critical step for the brain to process future external inputs properly. It is hypothesized that spontaneous reactivation of recent neuronal activity patterns in the subsequent sleep is involved in the process of memory consolidation, but the details still remain unknown. The aim of this symposium is to provide new experimental and theoretical insights into how information is represented and processed in the awake and sleeping brain. The first three speakers will discuss information representation in hippocampus, prefrontal cortex and connected structures during the waking state. The next two speakers focus on the sleeping brain, and will describe the effect of aging on memory consolidation and the detailed properties of memory reactivation during UP states. The last speaker will provide theoretical insights into processing of sequential information and its memory formation.

Event: *McKnight Inter-Institutional Meeting*
Date: April 28-30, 2010
Venue: Evelyn F. McKnight Brain Institute, University of Florida, Gainesville
Participating Institutions:
UA Evelyn F. McKnight Brain Institute, University of Arizona,
UAB Evelyn F. McKnight Brain Institute, University of Alabama
Evelyn F. McKnight Brain Institute, University of Florida,
Evelyn F. McKnight Center for Age-Related Memory Loss, Univ of Miami
Summary: 22 members of the University of Arizona Evelyn F. McKnight Brain Institute attended the McKnight Brain Research Foundation 3rd Inter-Institutional Meeting in Gainesville, Florida.

Event: *39th Annual Meeting of the American Aging Association*
Date: June 6, 2010
Venue: Portland, Oregon
Plenary Session: Inflammation, Aging of the Immune System, and Age-Related Diseases
Presenters: Introduction and Overview
Dr. Carol Barnes, University of Arizona

Neuro-inflammation and Gene Expression Involved in Synaptic Plasticity and Memory: Pharmacological Approaches to Restore Neuronal-Microglia Communication
Dr. Susanna Rosi, University of California at San Francisco

Nutritional Support for Aging Stem Cells
Dr. Paul Bickford, University of South Florida

Brain Aging: Influence of Inflammation and Obesity
Dr. Donald Ingram, Laboratory of Neuroscience, NIA

Persistent Oxidative Stress Through NFkB Induction of Proinflammatory Genes and Oxidases That Lead to Age Related Brain Degeneration
Dr. Fulton Crews, University of North Carolina at Chapel Hill

Inflammatory Processes Begin Before Birth and Extend Throughout the Lifespan
Dr. Caleb Finch, University of Southern California

Resveratrol Supplementation Supports Mitochondrial Function and Improves Associative
Dr. M. Hasan Mohajeri, DSM Nutritional Products, Basel, Switzerland

Abstract: Understanding of the neurobiological mechanisms that underlie normal aging and age-related diseases is important for achieving a better quality of life. Under normal conditions neurons respond to biological mediators produced by glial cells and are able to control glia activity and thus modulate neuron-glia or neuron-neuron communications (cross-talk) by releasing proinflammatory factors. This complex interplay is guided by transcription and translation of innate immune genes that can be severely altered during aging and age-related disease. Innate immune gene products can negatively affect neuronal activity and therefore contribute cognitive dysfunctions associated with aging. For this reason, therapeutic benefits may be realized by targeting innate immune gene expression, both for normal aging and age-related disease states. This session will discuss immune gene-mediated responses in the brain during aging, models of age-related disease and actual disease states, and will discuss various therapeutic approaches as well as nutritional interventions that may restore brain health.

Event: *Cognitive Aging Summit II*
Date: October 4-5, 2010
Venue: J.W. Marriott, Washington, DC
Plenary Speaker: Cognitive Aging: What Do We Know? What's Next?
Presenter: Carol A. Barnes, Ph.D., Director, Evelyn F. McKnight Brain Institute, University of Arizona

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 has provided the tissue from young and aged rats to Huentelman and Coleman who are testing whether to determine whether their methodologies for examining transcriptional fidelity and methylation processes 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, experience-driven gene expression in the precise cells that are activated by specific behaviors.

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 remarkably well those observed in the human. We will use these data as preliminary data for the Program Project Grant that we submit in 2011, but with more data, it should also result in a strong publication, especially if we are able to scan enough animals and observe sufficient variability to see behavioral correlations.

Peterson/Ryan

We are just now beginning to understand how normative aging processes affect regions of the medial temporal lobe that are involved in recognition memory – both in humans and animal models (such as rats – e.g., Burke et al., 2010). Drs. Ryan and Peterson are collaborating on an MRI experiment supported by the EMBI in Tucson that will use Dr. Ryan's MRI sequences and her elderly subjects, and Dr. Peterson's figure-ground perceptual displays that should allow them to examine perirhinal cortex function with functional imaging methods as well as with sophisticated psychophysical behavioral methods. They plan to submit a grant next summer using the data collected from this pilot experiment as preliminary 'proof of principle' that older humans, like aged rats (Burke et al., 2010) show age-related object recognition impairments that are a result of a diminished ability in advanced age to pattern separate between complex stimuli that share common features, and that this deficit is likely to be mediated by the perirhinal cortex.

14. Collaborative programs with non-McKnight institutions:

Fanselow/Barnes

To begin to use our catFISH single cell imaging method on a problem that requires circuit analysis across wide regions of the brain, Dr. Michael Fanselow has begun a collaboration with us to investigate how context-activated neuronal ensembles change when a context has been fear conditioned. He has behaviorally prepared the animals for us, and Dr. Chawla has sectioned and conducted *in situ* hybridization of the tissue for this experiment. Additionally we have trained Dr. Fanselow's graduate student, Moriel Zelikowsky, to conduct the cell segmentation and gene

product cell localization analysis using our 3DcatFISH software. The data are currently being analyzed at UCLA, and involves analysis of neurons in the hippocampus, amygdala and medial prefrontal cortex. Cell analysis in these regions allows us to examine the structures responsible for forming contextual representations and associating these representations with aversive events.

Adam Brickman/Scott Small/Gene Alexander/Carol Barnes

Small and Barnes previously assessed basal levels of metabolism in the temporal lobe of Barnes' population of young and old rhesus macaques at the California National Primate Research Center in Davis. Adam Brickman was interested in expanding the analysis of these data to the frontal cortex. He performed univariate voxelwise statistical parametric mapping to derive CBV maps of frontal cortex and to examine the metabolic correlates across age and performance on a spatiotemporal memory test, a delayed response task, and a delayed non-matching to sample task. Correlations between age and CBV were observed bilaterally in prefrontal cortex, and CBV in prefrontal regions was also significantly correlated with performance on the delayed non-matching to sample task. Brickman is currently developing additional analytic methods to examine these results in more depth.

Leyla de Toledo-Morrell/Travis Stoub/Emily Rogalski/Carol Barnes

A prediction from rat aging models is that normal aging leads to axonal pruning of the entorhinal cortical projection cells to the hippocampus. This has been verified electrophysiologically by Barnes and others, as well as anatomically (Geinisman and colleagues). Dr. de Toledo-Morrell and her colleagues have demonstrated that the fiber tract from the entorhinal cortex to the hippocampus declines in Alzheimer's disease patients compared to age-matched controls. The question remained as to whether normal aged individuals would show declines in this important temporal lobe projection pathway to the hippocampus when compared with young subjects. We were able to report that, in fact, there is a white matter volume loss that occurs in humans as a result of the normal aging process, using two different imaging methods. The manuscript reporting the results of this analysis has been reviewed, and is currently being revised for resubmission.

Adam Gazzaley/Sara Burke/Kojo Plange/Carol 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 in 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. Over the past two years, a series of behavioral studies 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. The results have been reported in last year's Society for Neuroscience meeting, the data suggesting that, like humans, monkeys do show disrupted memory performance in conditions in which interfering variables required attention. We will continue with these studies, and may have enough data for publication within the next year.

A. David Redish/Andrew Maurer/Joe Bohanick/Carol Barnes

Dr. Redish and his students have reported that neural representations of space exist at fast time scales when animals are at decision points on mazes. These location representations reflect future possible choices rather than recently traveled paths. This suggests that the hippocampus is involved in active, forward-shifted spatial representations, as well as instantaneous local neural representations. We continue to collaborate with Dr. Redish to examine whether aged rats show these transient nonlocal representations at critical choice points, and whether the decisions made by the animals at such choices are reflected in an individual animal's ability to accurately represent these nonlocal activity patterns in hippocampal cells. The older rats that we have trained had some difficulty at learning the multiple-choice T maze task in which many decision points can be examined within recording sessions. With a scaled back the number of decision points, the older animals are now able to learn this task. We are gearing up for a major effort on this project in the upcoming year. Our prediction for the outcome of this experiment is that old rats may never be as accurate as younger rats, and that the sweeping forward of spiking activity that reflects future spatial locations at decision points will be defective in the old animals and correlated with deficits in spatial behavioral tasks.

Scott Small/Paul Coleman/Carol 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. We are waiting to publish these data until results from monkey brain tissue can also be analyzed. Barnes has provided brain tissue from hippocampus and entorhinal cortex from young and old behaviorally-characterized monkeys to Dr. Coleman to perform this analysis. 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. For additional sensitivity, fluorescent quantum dots have been attached to the RbAp48 probe which was hoped to increase sensitivity for detection of age-related changes. The quantum dot labeling procedures proved to be problematic, and even after enlisting the assistance of Dr. Eberwine at SUNY (one of the pioneers of this technology), we were unsuccessful in optimizing quantification with this method. Over the past year, however, Dr. Coleman has found a procedure that does work. Hopefully in the next year the entire set of monkeys will be complete, so that we can combine the rat, monkey and human RbAp48 data together for publication.

DeCarli/Barnes

Dr. DeCarli has been interested in the use of MRI methodologies that quantify characteristic hippocampal shape parameters, and that have been useful in detecting early Alzheimer's disease pathology and in children with autism spectrum disorder. The question with respect to our collaboration is whether there are hippocampal deformations that specifically identify memory-related performance variables in young and/or aging human populations, and specifically whether we could see evidence for changes in hippocampal shape in a population of nonhuman primates that were imaged and behaviorally characterized. We will explore the possibility with the monkey data over the next year.

Beach/Barnes

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 has identified tissue to send to Beach, and we will hopefully finish the analysis of the data in the coming year.

15. Plans for future research

Cognitive Testing of Young and Old Bonnet Macaques

We continue to conduct behavioral experiments on the 5 young and 5 old bonnet macaques acquired in 2007 and the additional 2 young and 2 old monkeys acquired in 2009 to screen for age-related cognitive impairment. We have completed seven tasks: reinforcer devaluation, reversal learning, object discrimination, delayed response, a delayed nonmatching to sample memory task with delays from 10 seconds to 10 minutes, a delayed nonmatching to sample task with interference in the first batch of monkeys, and an object discrimination task in which the object pair to be discriminated shares features. The four monkeys received in 2009 are currently being tested on the reinforcer devaluation task. In the coming year, an automated behavioral testing system will be set up in order to examine executive function in young and old monkeys with a conceptual set shifting task. We will also continue to behaviorally train these animals in our cognitive assessment battery over the coming year, and hope to begin to conduct MRI scanning procedures on these animals.

Technological Innovations

Electrophysiological Methods:

Our plans for the telemetered recordings in freely behaving monkeys is moving forward with our collaborators at Neuralynx. We have decided to do the first test on the telemetry system at the California National Primate Research Center in Davis, rather than at the Yerkes Primate Center in Atlanta, where Barnes has a young monkey that has been identified as a good candidate for this project. We have taken the "Falcon" telemetry system constructed by Neuralynx out to Davis to test in this environment directly. It performed very well, but we still have concerns that the unit is larger than we would like. We had discussions with Neuralynx here in Tucson right before the San Diego Neuroscience meeting, and at the meeting concerning miniaturization of the device. The president of the company Casey Stengel is working on a design modification now, which we hope will be finished within the next couple of months. Meanwhile, are moving forward in several different ways. First, we have also been in discussions with Triangle Biosystems about their telemetry system that interfaces with the Neuralynx amplifiers and data acquisition system. Even though it shows significantly more noise than does the Falcon system, they have promised to let us borrow a system and test it out at Davis to see how it operates in the environment in which it will be used. We are also training the monkey for this pilot project to run back and forth along a long hallway track – and to adapt to and tolerate the putting on and taking off of a jacket, that can hold a battery pack, if this telemetry system cannot be miniaturized sufficiently. We will continue with this process of training, will implant him with a headpost so that he can be head restrained to lower the recording electrodes, and will work with our engineering collaborators to move forward. Once

the system is tested – we will be able to make the decision on whether to use this new technology for recording from the bonnet macaques.

Whole Brain Imaging with Single Cell Resolution
My collaborator at Rensselaer Polytechnic Institute in New York, Dr. Badri Roysam and I received funding to optimize the data analysis for large areas of brain for the catFISH method. This funding should allow us to move more quickly towards solutions to the next steps that need to be made in brain tissue montaging that will allow us to accurately put tissue sections back together in 3 dimensions. This step is essential before the algorithms for identifying the fluorescent gene product can be implemented over significant portions of the brain. The new associative image analysis procedures that are being developed should allow us to make joint registration possible with little error accumulation that would otherwise limit image registration methods. Dr. Lister in Barnes' went out to Rennselear to get training on the software developments in September this year, and it was a very productive interaction, with clear milestones identified for moving ahead on this project.

Program Project Grant Development
My colleagues and I (all Affiliate Members of the Evelyn F. McKnight Institute in Tucson) have worked very diligently over the past year to develop our ideas for submission of a major program project grant from the University of Arizona. The overall goal of the project is to advance understanding of the mechanisms underlying why some individuals experience "successful" cognitive aging and others do not. The research approach is to use human and non-human animal models of "normal" aging to elucidate the factors that influence individual differences leading to optimal cognitive aging. We propose a model of "Normal" Cognitive Aging, and for the focus on the medial temporal and frontal cortical regions as key brain structures preferentially affecting in aging. The methods used will involve a well-selected cognitive test battery for humans and animal studies that can be examined in relation to health status, various types of brain imaging methodologies, and examination of normal genetic variation, gene expression and epigenetic profiles of individuals. We will use large cohorts over a wide adult age continuum in both animal and human experiments so that high and low performers can be identified. Furthermore, in terms of gene candidates associated with aging, we will target genes in an hypothesis-driven manner, emphasizing those involved in synaptic function and white matter integrity. We (Gene Alexander, Lee Ryan, Ted Trouard, Matt Huentelman, Paul Coleman and Carol Barnes) are very excited to see this project submitted in January, and have just received official approval to submit the Program Project Grant (which is required, before submission is possible) by Dr. Molly Wagster.

16. Endowment investment results (July 1, 2009 to June 30, 2010)

Evelyn F. McKnight Chair for Learning and Memory in Aging

Endowment Account		
Beginning Balance/Market Value as of July 1, 2009	$	749,926
Fiscal Year Change in Market Value (7/09 - 6/10)	$	42,839
Year-end Balance (6/30/10)	$	789,765

Income to Chair (Expendable Account)		
Beginning Balance as of July 1, 2009	$	33,358
Payout from the Endowment	$	39,321
Personnel Expenditures (7/09 - 6/10)	$	(41,396)
Year End Balance (6/30/10)	$	31,283

Evelyn F. McKnight Brain Institute

Beginning Balance/Market Value as of July 1, 2009	$	1,508,781
2009/2010 MBRF allocation to the Institute	$	1,000,000
6% Development Fund	$	(60,000)
Entry to the Endowment	$	131,824
Fiscal Year Change in Market Value	$	135,998
Year-end Balance (6/30/09)	$	2,716,603

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

There are 4 recruitments ongoing that, depending on their outcome, could greatly benefit and strengthen the University of Arizona Evelyn F. McKnight Brain Institute. The first is the re-opening of the recruitment of Dr. John Guzowski for the McNaughton replacement – Dr. Gail Lewandowski (John's wife) has had positive interactions with the Department of Neurology, and the Vice President for Research has allowed her recruitment into Neurology to proceed. Because of the viral technologies that Gail uses, she will be an outstanding collaborator, and of course we would be thrilled to have John as a colleague. Dr. Dena Dubal is in negotiation with BIO5 Director Fernando Martinez – she is simply a world class scientist *and* is interested in aging, and exploring potential therapeutic strategies for memory declines in aging. Dr. Lalitha Madhaven was also identified in the Clinical Translational Science Institute search – she was an outstanding candidate,

but was the Search Committee's second choice. Given that we are likely to be successful in attracting Dr. Dubal here, Barnes explored an alternate route for recruiting Lalitha independently into the Neurology Department – and was given permission to do so. Dr. Madhaven is also interested in aging, and will provide critical cell culture model expertise to the group in Arizona.

In addition to this update on recruitment, I have prepared a **Table** of "Research Interactions" generated by the University of Arizona Evelyn F. McKnight Brain Institute (Appendix A). This overview serves as a summary of the breadth and scope of scientific outreach conducted by the EMBI since its inception in 2006 - all enabled by the gift from the McKnight Brain Research Foundation.

22. C. A. B. 1/3/11

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

Research Interactions at the UA Evelyn F. McKnight Brain Institute
2006 - 2010

Collaborator	Project	Outcome
Alexander/Barnes (UA)	Network analysis of monkey prefrontal cortex	Alexander et al., *Journal of Neuroscience*, 2008
Rosi/Barnes (UCSF/UA)	Examination of the effect of inflammatory responses on hippocampal circuit dynamics using catFISH	Rosi et al., *Brain*, 2009
Small/Barnes (Columbia/UA)	Transcription silencing in aged behaviorally characterized rats	Rat data collected
Small/Coleman/Barnes (Columbia/BSHRI/UA)	Transcription silencing in aged behaviorally characterized monkeys	Ongoing
Ahern/Hischaw (UA)	Behavioral neurology assessments in aging cognitively characterized individuals	Ongoing
Moser/Moser/McNaughton/ Barnes (NTNU/UA)	catFISH analysis of hippocampal granule cell activity across different environments	Alme et al., *Hippocampus*, 2010
Bimonte-Nelson/ Huentelman/Reiman/ Barnes (ASU/TGen/BAI/UA)	Manipulating the Kibra Pathway Improves Memory in Aged Rats	Huentelman et al., *Behavioral Neuroscience*, 2009
deToledo-Morrell/Stroub/ Barnes (Rush/UA)	Does normal aging lead to axonal prunning in humans as it does in rats?	Stroub et al., (revised manuscript submitted and in review); Stroub et al., SfN Abstract 2009, Stroub et al., SfN Abstract 2010
Chen/Gothard/Barnes (UA)	Effects of age on emotional memory and social perception in rhesus macaques	NRSA Postdoctoral Fellowship to Dr. Haiyen Chen "Contribution of Emotional Memory to Social Cognition in Aging" (10/07 - 9/08)

Collaborator	Project	Outcome
Dacks/Rance (UA)	The hypothalamus and thermal regulation in aging. A model for hot flashes in rats?	Dacks and Rance, *Neuroendocrinology* 2010; Dacks and Rance, SfN Abstract 2008; Dacks et al., SfN Abstract 2009
Walther/Ryan (UA)	Effects on anti-inflammatory drugs on brain volume in aging	Walter et al., *Neurobiology of Aging epub*, 2009
Samson/Barnes (UA)	Effects of Aging on Amygdala circuits in the rat	CIHR Postdoctoral Fellowship to Rachel Samson "Age Related Changes in Network Activity of the Amygdala during Emotional Learning" (1/08 - 3/11)
Hoang/Fellous/Barnes (UA)	Influence on aging on dopaminergic reward systems of the ventral tegmental area	Hoang et al. (manuscript submitted and under review); Hoang et al., SfN Abstract 2009; Hoang et al., SfN Abstract 2010
Bohbot (McGill)	Spatial memory training in older humans to promote growth in hippocampal circuits	Bohbot, et al., *Journal of Neuroscience*, 2007; Dahman et al., SfN Abstract 2010; Bohbot et al., SfN Abstract 2010
Lister/Barnes (UA)	Applying whole brain image analysis to questions about temporal lobe aging	NIA NRSA Postdoctoral Fellowship to Dr. James Lister "Age Effects on Grid Cell and Scene Recognition Systems of the Entorhinal Cortex" (9/09 - 8/11); Lister et al., SfN Abstract 2010
Henriksen/Moser/Moser/ Barnes (NTNU/UA)	Ensemble recordings along the proximal distal axis of the hippocampus	Henriksen, et al., *Neuron*, 2010; Henriksen SfN Abstract 2010
Brickman/Small/Alexander/ Barnes (Columbia/UA)	Cerebral blood volume network analysis reveals change with age in prefrontal cortex in monkeys	Brickman et al., SfN Abstract 2008

Collaborator	Project	Outcome
Roysam/Barnes (Rensselaer/UA)	catFISH single cell image analysis software tools for whole brain imaging	RC1 Grant: "Functional Activity Mapping of Brain Networks" (9/09 - 8/11); Tsai et al., *Journal of Microscopy*, in press; Tsai et al., SfN Abstract 2008
de Toledo Morrell/Rogalski/ Barnes (Rush/UA)	Diffusion tensor imaging of the perforant path in normal aged adults	Rogalski et al., SfN Abstract 2008
Redish/Maurer/Barnes (U Minnesota/UA)	Fast time scale neural representation of space during decision making in aging	Ongoing
Penner/Roth/Sweatt/Barnes (UA/Alabama)	Region selective gene expression changes during aging: epigenetic regulation	Penner et al., *Neurobiology of Aging* epub, 2010; Penner et al., SfN Abstract 2008
Huentelman/Coleman/ Barnes (TGen/BSHRI/UA)	Laser micro-dissection technology to extract specific cell types during aging	Ongoing
Marrone/Barnes (Wilfred/UA)	catFISH analysis of age related hippocampal consolidation defects	Marrone et al., *Neurobiology of Aging* epub, 2010.
Trouard/Alexander/Barnes (UA)	High strength magnet pulse sequences and network analysis development for aging rodents	Ongoing
Lubin/Penner/Barnes (Alabama/UA)	Differential methylation of immediate early genes activated by behavior during aging	Penner et al., SFN Abstract 2009
Maurer/Barnes (UA)	Development of methods for ensemble recordings in freely behaving monkeys	NINDS NRSA Postdoctoral Fellowship to Dr. Drew Maurer "Hippocampal ensembles dynamics during active ambulation, passive movement & rest" (award pending)

Collaborator	Project	Outcome
Gazzaley/Burke/Plange/ Barnes (UCSF/UA)	Effects of interference variables on memory performance in aged bonnet macaques	Plange et al., SfN Abstracts 2009
Shamy/Rapp/Barnes (Mt Sinai/UA)	Volumetric correlates of recognition memory impairment in aged rhesus macaques	Shamy et al., *Cerebral Cortex*, in press
DeCarli/Barnes (UC Davis/UA)	Shape variations in hippocampus of young and aged non-human primates as predictor's of memory status	Ongoing
Fanselow/Barnes/Chawla/ Zelikowsky (UCLA/UA)	catFISH analysis of circuits involved in contextual fear conditioning	Zelikowsky et al., Pavlovian Society Abstract, 2010
Marrone/Barnes (Wilfred Laurier/UA)	Impact of reduced neurogenesis in aged hippocampal circuits	Marrone et al. (Submitted and under review)
Beach/Barnes (BSHRI/UA)	Determination of the extent to which normal aged non-human primates show neuropathological hallmarks of Alzheimer's disease	Ongoing