The University of Arizona
Instructions and Approval Sheet
Proposal for New Academic Organizational Unit
or Re-organization of Existing Academic Unit(s)

Directions:
1. Provide information regarding the proposed unit in the form requested on the attached pages. Respond to each item individually using "not applicable" where appropriate. Attach this approval sheet to the front of the proposal.
2. Obtain signatures of the proposed unit administrator and department or committee head.
3. Forward the original and one copy to the college office for the dean's signature and retain a copy for departmental files.
4. The dean should forward the original to Curricula and Registration, Academic Programs, Attn: Sandra Beeler, CCT 337, and retain the remaining copy for college files.

Note: In some situations signatures of more than one dean or department head may be required. If you have any questions, please contact Sandra Beeler, CCT 357, 621-1847.

Initiating college, department, or committee: Arizona Research Laboratories / Vice President for Research

Description of the proposed organizational unit change:
New department ( )
New committee ( )
New laboratory, center, institute, or bureau ( X )
Reorganization ( )
Other ( )

Title: Evelyn F. McKnight Brain Institute

Unit Administrator (title and signature) 

Department Head 

Dean 

Date 2/26/04

Date 2/26/04

Date 3/2/04

1
I. Description of the Proposed Organizational Unit Change

A. Identify the name of unit(s) affected by the change and its place in the organizational structure of the university.

The Evelyn F. McKnight Brain Institute will be a new research unit under the Arizona Research Laboratories at the University of Arizona. The Evelyn F. McKnight Brain Institute will foster interdisciplinary research that is focused on understanding the neural basis for cognitive changes that occur during normal aging.

B. Explain the nature of the change; i.e., formation of a new unit or reorganization of an existing unit.

The Evelyn F. McKnight Brain Institute will be a new non-academic unit funded by a 5 million dollar grant from The McKnight Brain Research Foundation, as well as institutional and external sources. Centers on Aging currently exist at each of the three state universities. The focus of these centers is primarily on health care, outreach and social policy. The focus of the Evelyn F. McKnight Institute will be basic research focused on biological mechanisms of brain aging. Thus, the proposed Institute is complementary to the established Centers, and will broaden the state's efforts towards achieving a multidimensional understanding of the aging process.

II. Purpose and Activities of the Unit

A. Explain the rationale for the change and the relationship to the Mission and Scope Statements adopted by the Board.

The mission of the Evelyn F. McKnight Brain Institute is aligned with the mission and strategic goals of the Arizona Board of Regents, the University of Arizona and the Arizona Research Laboratories. As the Report to the Provost of the Cognitive Science and Neuroscience Focused Excellence Study Team stated, "we predict exciting national and international growth in several areas of cognitive science and neuroscience ... in which the University could excel, taking into consideration the health needs of the citizens of Arizona, economic considerations such as extramural funding availability and commercial opportunities ...". Four areas of potential growth were identified by this report within cognitive science and neuroscience that, "with targeted growth, could be made truly world-class." The named areas were: aging; development, cognitive and neural engineering, and affect. The Evelyn F. McKnight Brain Institute would serve to create experimental synergy on the issue of memory and normal aging within and between cognitive and basic neuroscience and clinical science faculty at the University of Arizona. The interdisciplinary work facilitated by the Institute will utilize molecular, electrophysiological, imaging and translational experimental methods to tackle questions concerning the neural basis of cognitive change during normal aging. The University of Arizona has on its faculty a critical mass of researchers devoted to the study of normal age-related memory change and its disorders, at levels of analysis including molecular, neural systems, human cognition and clinical intervention. The proposed Institute will both support the research activities of these highly productive investigators and will serve as a focal point for cross-disciplinary interactions of the University, State and National
levels. The institute will also be engaged in significant technological development to create research tools to facilitate its work.

The concept of an Evelyn F. McKnight Brain Institute also fits well within the proposed strategic vision and focus for Neuroscience outlined in the Finn Battelle reports. Arizona’s Bioscience Roadmap, as reported by the Battelle Memorial Institute, specifically identified the importance of research spanning the range from clinical researchers to basic scientists who will enable technologies developed in Arizona to stimulate statewide collaborations, building towards specific areas of research excellence. The strategic plan for the Biosciences identified the need to strengthen neuro-imaging research and bioinformatics infrastructure to fully utilize the multi-consortium efforts already underway in the state. A salient example of this type of interdisciplinary interaction in “Neurological Sciences” is the Arizona Alzheimer’s Disease Consortium. It is made up of the Arizona Alzheimer’s Research Center, which is a statewide research laboratory without walls, and the National Institute on Aging-sponsored Arizona Alzheimer’s Disease Core Center, which is a national core facility. The Consortium exemplifies the collaborative environment required for Arizona to become a center for national and international excellence in the scientific understanding, early detection, treatment and prevention of Alzheimer’s Disease. The Evelyn F. McKnight Brain Institute is poised to contribute centrally to this effort. A requirement for understanding pathological conditions associated with aging is an appreciation of normal age-related changes that are distinct from such diseases. In this regard, the Institute will add significant strength in the area of memory and normal aging to ongoing efforts in the Biosciences Map for the state.

Another major effort in the state of Arizona that will significantly impact the Biosciences Roadmap is the initiative by the College of Medicine to create a Center for Human Neuroscience that will focus on basic and translational investigation. The Center for Human Neuroscience will provide a structure to foster multidisciplinary research. The faculty will reside both in Tucson, and in the new medical school facilities being created in Phoenix. The Phoenix campus will be close to major research Centers including Sun Health Research Institute, Barrow’s Neurological Institute, Banner Health System, Mayo Clinic, Translational Genomics Research Institute and Arizona State University. This development in the College of Medicine provides another bridge, along with the Arizona Alzheimer’s Disease Consortium, where potential points of interaction with the Evelyn F. McKnight Brain Institute are likely to be productive.

Why is it important to understand normal aging and the neurobiological factors that control cognition during the aging process? From 1990-2000 Arizona’s population expanded by 40%, with the age group of 65 years and greater increasing faster than all other age groups. By 2020, approximately one in four Arizonans will be over 60 years of age. To achieve the goal of a healthy baby boom generation, the State of Arizona’s scientific and entrepreneurial talent needs to be mobilized, to ensure that this generation will be energetic contributors to our state’s population base. A first step will be to understand the biological and cognitive changes that accompany aging well enough, so that these processes can be optimized.

B. Identify the basic goals and objectives of the new reorganized units.

The focus of the McKnight Brain Institute at the University of Arizona will be to understand the neural basis for cognitive changes that occur during the process of normal aging. In 2011, the first of the very large Baby Boom generation (1946-64) will begin turning 65 years of age. A major source of anxiety of this generation is whether
aging itself inevitably results in loss of mental competence. One of the greatest challenges facing brain science in coming decades is to understand the biological basis of cognition and how these processes change over time, so that methods to reduce the negative impact of such changes can be developed. To be prepared for the dynamic shift in population demographics on the horizon, expectations for this period of life must be given from a platform of information rather than myth or conjecture. The goal of the proposed Institute is both to develop the tools necessary for reaching such an understanding of the aging brain, using appropriate animals models as well as humans, and to implement these tools in well-designed studies that will characterize the nature of brain changes during normal aging and distinguish such normal changes in memory from those that reflect pathological conditions. Understanding normal aging is a prerequisite both to early detection and treatment of disease states and to the development of approaches that optimize cognitive function in healthy older persons through to the oldest ages an individual is fortunate enough to live.

C. Describe the activities, projects, and programs that will be conducted by the new or reorganized units. Identify the curricular implications of the activities, projects, and programs.

The McKnight Brain Research Foundation has designated $1,000,000 to the Institute for an endowed chair.

The Evelyn F. McKnight Brain Institute will foster and fund research projects and collaborations that build upon the current personnel, strengths and technology developed at the University of Arizona.

Examples of projects that will be supported include:

- Functional imaging of neural network activity at cellular resolution
- High-density multi-neuron recording
- Development of "memory prosthesis" systems to enhance the memory consolidation process in the elderly

Some experimental questions that will be addressed include:

- Effects of aging on representational plasticity in the temporal lobe of nonhuman primates and rats
- Effects of aging on the coordinate regulation of neuroplasticity-related genes in temporal and frontal lobes of rats
- Effects of aging on the neurophysiology of memory consolidation
- Effects of aging on the encoding of spatial memories and the development of stable cognitive maps of the environment
- Effects of aging on prefrontal cortical mechanisms of working memory, executive function and motor control
- Examination of the neurophysiological correlates of pharmacological treatments for normal age-related memory impairment.

In addition to the specific projects outlined above, a number of other activities of the Institute should significantly enrich the scientific environment in this State. First, we intend to host a series of short to medium-length visits by distinguished scientists, specifically chosen to enhance the Institute’s conceptual and methodological base, and to cement national or international collaborations on questions of brain aging and memory. Because there is already an active Seminar Series in both the Cognitive Science and Neuroscience Programs, these visiting guests could give seminars in one of these settings, acting to augment scientific exchange in these venues, rather than competing
with them. Furthermore, we would like to develop a format for a national meeting to be held in the state of Arizona, the specific emphasis of which would be directed towards current breakthroughs in the area of aging and cognitive processes.

D. Identify the unit(s) that will assume the responsibilities of any units that are recommended for elimination.

n/a

E. For instructional units, project the number of majors for the next three years.

n/a

III. Resources

A. Faculty and Staff

1. List the name, rank, highest degree, and estimate of the level of involvement of all current faculty and professional staff who will participate in the new or reorganized unit. Also indicate the position each person will hold in the new unit.

Members of the Institute are faculty whose research emphasis has a strong focus on normal aging, and form a natural collaborative grouping here in Tucson. It is expected that, as the group begins to interact regularly, that we will incorporate more Affiliate members suggested by specific research projects.

Carol A. Barnes, Ph.D., Professor, Psychology and Neurology, Research Scientist, ARL Division of Neural Systems, Memory and Aging – Director, Evelyn F. McKnight Brain Institute.

Geoffrey Ahern, Ph.D. Professor, Neurology, Psychology and Psychiatry - Affiliate Research Scientist, Evelyn F. McKnight Brain Institute

Alfred W. Kaszniaik, Ph.D., Head of Psychology, Professor, Psychology, Neurology and Psychiatry - Affiliate Research Scientist, Evelyn F. McKnight Brain Institute

Elizabeth L. Glisky, Ph.D., Professor, Psychology - Affiliate Research Scientist, Evelyn F. McKnight Brain Institute

Bruce L. McNaughton, Ph.D. Professor, Psychology and Physiology, and Research Scientist, ARL Division of Neural Systems, Memory and Aging – Affiliate Research Scientist, Evelyn F. McKnight Brain Institute

Naomi E. Rance, Ph.D., Professor, Pathology - Affiliate Research Scientist, Evelyn F. McKnight Brain Institute

Lee Ryan, Ph.D., Associate Professor, Psychology and Neurology, Affiliate Research Scientist, Evelyn F. McKnight Brain Institute
Carol A. Barnes, Ph.D.
Professor, Psychology & Neurology
Research Scientist, ARL Division of Neural Systems, Memory & Aging
Director, Evelyn F. McKnight Brain Institute

Dr. Barnes has used several experimental approaches to study the neurobiological mechanisms of memory changes that occur during normal aging. Primarily these approaches have been electrophysiological, but recently she has used a new single cell imaging method that has been developed here in Tucson that promises to identify the cellular and circuit basis for individual differences in memory performance that characterizes normal aging in mammals.

Bruce L. McNaughton, Ph.D.
Professor, Psychology & Physiology
Director, ARL Division of Neural Systems, Memory & Aging
Affiliate Research Scientist, Evelyn F. McKnight Brain Institute

Dr. McNaughton studies how the hippocampus plays a critical role in linking together memory items that are stored in a distributed fashion in the neocortex by means of their spatial context. His studies of the neural encoding properties of ratent hippocampal neurons have provided deep insight into the nature and mechanism of memory impairment during normal aging, as well as developing important advances in multiple single cell recording methods for assessing how brain circuitry is changed during aging.

Naomi E. Rance, M.D., Ph.D.
Professor, Neurology, Cell Biology & Anatomy, & Pathology
Associate Head, Department of Pathology
Affiliate Research Scientist, Evelyn F. McKnight Brain Institute

Dr. Rance works on human and animal models of aging associated with changes in endocrine function. The most dramatic and consistent endocrine event in aging women is the menopause, the mid-life degeneration of the ovaries that leads to a profound loss in estrogen secretion. Because menopause affects a well-characterized system and has consistent and substantial changes in hormone levels, her research program has been able to correlate alterations in hormone secretion with structural and neurochemical changes in the human hypothalamus, and provides evidence of compensatory structural plasticity in the aging human brain, and she has also studies these effects in other animals.

Alfred W. Kasznik, Ph.D.
Professor, Psychiatry, Psychology, & Neurology
Affiliate Research Scientist, Evelyn F. McKnight Brain Institute

Dr. Kasznik’s research focus is on how cognition is changed during aging, particularly memory and emotional components of cognition. He has also developed analogous spatial memory tasks for the study of non-human and human aging which are strong tests of medial temporal lobe function. He also studies the role of the frontal lobes in memory changes in human aging, and approaches to understanding individual variability in memory abilities among older adults.

Elizabeth L. Gilszry, Ph.D.
Professor, Psychology
Affiliate Research Scientist, Evelyn F. McKnight Brain Institute

Dr. Gilszry uses a neuropsychological approach to the study of memory in normal aging. This approach highlights individual differences in the cognitive and neural correlates of memory and aging. One focus of her work is on the individual differences in strategic executive functions, which depend on premontual brain regions. Another important focus is to compare and contrast individual differences in frontal lobe function with those in the more fundamental memory processes dependent on medial temporal brain structures.

Lee Ryan, Ph.D.
Associate Professor, Psychology
Director, Cognition & Neuroimaging Laboratories
Affiliate Research Scientist, Evelyn F. McKnight Brain Institute

Dr. Ryan's research focuses on understanding the neural basis of memory, and how memory changes that are experienced by older adults relate to changes in brain function across the adult lifespan. Functional magnetic resonance imaging (fMRI) methods are used to measure activity in brain structures while participants are engaged in memory tasks. Differential patterns of fMRI activation and memory performance in subgroups of older adults have been found that suggest that not all older adults “age” in the same way — some individuals appear to engage compensatory mechanisms at the level of brain function that results in memory performance comparable to younger individuals.

Geoffrey L. Atem, M.D., Ph.D.
Professor, Neurology, Psychology, & Psychiatry
Director, Behavioral Neuroscience & Alzheimer’s Clinic
Affiliate Research Scientist, Evelyn F. McKnight Brain Institute

Dr. Atem has worked with Alzheimer’s disease and other dementias in the Behavioral Neuroscience and Alzheimer’s Clinic. His research on dementia in Alzheimer’s disease and provides him with particularly strong expertise on how to share methodologies of behavioral assessment in disease and normal states. He will be a particularly pivotal member of this Institute, providing a link between the work of both basic and clinical researchers to identify the basis for distinguishing successful from pathological aging.
2. List the clerical and support staff positions that will be included in the new unit.

Program Coordinator, Sr, part-time (10 hours per week)
Business Support from the Arizona Research Labs Business Office

3. Indicate the number of graduate assistants who will be assigned to the new unit.

We estimate that the Institute will have resources to support 5 graduate student trainees per year.

4. Project the number and type of new faculty and staff positions that will be needed by the unit during each of the next three years.

Bioinformatics Research Faculty member – 1.0 FTE
Professional Research Staff (approximately 4 postdocs will be supported per year @ 1.0 FTE)

B. Physical Facilities and Equipment

1. Identify the physical facilities that will be required for the new unit and indicate whether those facilities are currently available.

No new space is required for the institute. The space currently assigned to ARL NSMA will be designated as institute space. The research conducted by the other affiliate faculty will take place in their existing space assignments.

2. List all additional equipment that will be needed during the next five years and the estimated cost.

Recent advances at the ARL NSMA have made possible the development of a technology that will provide unprecedented insights into the manner in which brain cells collectively represent and store and act upon information about events in the world. This technology is based on the observation that the expression of a class of genes called immediate-early genes (IEGs) is closely and dynamically coupled to neural activity associated with active information processing. The IEGs of interest are not expressed as a consequence of neural activity during rest, but are induced in a cell-specific fashion by neural activity associated with attentive, active behavior and information processing. By making use of the differential time-course of the post-activity appearance of specific IEG products, we can identify by a method called ‘fluorescence in situ hybridization (FISH)’ and confocal microscopy, which neurons were activated in each of two separate sessions of behavior, separated by a rest period of about 20 min. Such a methodology could revolutionize the ability to decode neural substrates of cognitive activity and to understand and develop treatments for dysfunctions of these processes that occur, for example, during normal aging.

We have demonstrated the potential power of these methods in studies that have addressed important aspects of information processing in restricted regions of the rodent brain; however, full exploitation of this important breakthrough will require the development and application of automated tissue sectioning, staining (FISH) and confocal imaging and analysis methods that will enable routine large-scale sampling of the brain in animal models. We plan to set up a confocal imaging facility including semiautomated tissue processing, image acquisition, image analysis and data reduction and databaseing (bioinformatics).
Major equipment and approximate budget:

**Zeiss laser scanning microscope** (LSM) 510 Meta with 405 nm and 594 nm Laser and Axiomager Z1 Confocal Microscope $497,000

**Digital macrophotography imaging system and automated cryomicrotome** (to be developed in collaboration with DJ-Metrix, Inc. Tucson) for preparing serial sections and registering them into 3-D brain coordinate framework. $150,000

**Automated in situ hybridization instrument:** The Ventana Discovery instrument developed by a Tucson-based company, is a fully-automated flexible and scalable staining system offering flexibility in target hybridizations such as in situ hybridization, immunohistochemistry and microarray techniques. It can minimize technique-dependent errors, increase reproducibility as well as productivity by performing these time consuming procedures under controlled conditions. $160,000

**Bioinformatics Server:** Imaging whole rodent brains at subcellular resolution will require a dedicated data server with very large capacity, on the order of 500 Gbytes per brain. Once the system is fully developed, we expect to process 10-20 brains per year, giving an estimated maximum mass storage requirement of approximately 5 Tbytes. Once the data are processed, they can be archived to a more economical medium. Current mass storage costs run at about $10,000 per Tbyte. $50,000

C. Library Resources, Materials, and Supplies
   1. Identify any additional library acquisitions that will be needed during the next three years and the estimated cost.
   n/a
   2. List any special materials or supplies, other than normal office supplies, that will be required by the new unit.
   n/a

D. Other Information
   1. Identify any implications of the proposed change for regional or programmatic accreditation.
   n/a
   2. Provide any relevant information, not requested above, that will assist reviewers in evaluating the proposed change.
   n/a

E. Financing
1. Explain the university's plan for providing adequate financing for the unit.

The University has selected the Evelyn F. McKnight Institute as a priority for FY 07 Federal Earmark. Proposals for funding for major pieces of equipment to the TRIF Optic Bioimaging and TRIF BIOS are under review and have been identified as a high priority by the Institution.

2. Identify potential sources for external funding for the unit.

McKnight Brain Research Foundation; Arizona Alzheimer's Disease Consortium; Federal appropriations program.

3. If state funds will be used, indicate whether new appropriations will be requested or existing appropriations will be reallocated.

No state funds will be used.

4. Complete the New Organizational Unit Budget Projections sheet, projecting the operating budget for the proposed unit for the next three years.

See attached

5. Estimate the amount of external funds that may be received by the unit during each of the first three years.

FY 07: $1,000,000 from McKnight Brain Research Foundation

FY 08: $1,000,000 from McKnight Brain Research Foundation

FY 09: $1,000,000 from McKnight Brain Research Foundation

IV. Other Information

A. For new centers, institutes, laboratories, and bureaus, indicate the sunset date as required by Regents' policy 2-301.G.

n/a

B. Provide any other information not requested above that may be useful in evaluating the proposal.

n/a