

# Ph.D in Biology of Aging Handbook

2017/2018



**USC**  
Leonard  
Davis  
School of Gerontology

**BUCK**  
INSTITUTE  
FOR RESEARCH ON AGING





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**Welcome to the USC Leonard Davis School of Gerontology and the Buck Institute for Research on Aging.** I am pleased that you are joining our community, and I am certain that you will find the Ph.D. program challenging and rewarding. It has been designed to provide you with the basic knowledge and research experience needed to address the complex biological issues and problems of an aging society.

The nation's first formal Ph.D. Program in the Biology of Aging offers graduates unprecedented opportunities to learn from world leaders in the field of aging research – both at the USC Leonard Davis School of Gerontology in Los Angeles, Southern California and at the Buck Institute for Research on Aging, in Marin County, Northern California. The program is enabling the next generation of scientists to enter the field fully prepared to participate and make their own breakthroughs aimed

at extending human healthspan.



The comprehensive interdisciplinary graduate program draws on the strengths of both organizations. A wide breadth of courses will include molecular biology, neuroscience, pro-

tein chemistry, cell biology, endocrinology, metabolomics, stem cell technology and regenerative medicine, pharmacology, mathematics, evolutionary biology and others. Students will study closely with a faculty mentor and have opportunities to collaborate on research and publications, attend colloquia, participate and attend national meetings, and to develop a professional network to support an independent career in the field of research on aging.

The Ph.D. program will provide you with the skills for securing an independent career in the field of aging. The USC Leonard Davis School of Gerontology and the USC Andrus Gerontology Center offers the opportunity to work closely with faculty on research and publications, participate in colloquia, present your research at

meetings of national organizations, acquire teaching experience, learn from your fellow students, serve on policy and planning committees, and to develop your academic network through summer internships or research opportunities. Our experience suggests that the most successful students, those who become leaders in the field, take initiative and engage themselves broadly in these activities.

This handbook has been written to help you move smoothly through the program. It will provide basic information about the curricula, policies, procedures, and the faculty. We hope that it will answer many questions, and we encourage you to keep it and refer to it often. There are always revisions to the policies and procedures as we are constantly improving processes: we will do our best to quickly communicate changes to you. Although revisions may be made to the program during your tenure, degree requirements as published in the University catalogue for your year of program entry define your requirements until your graduation, and the catalogue is the official document for these purposes.

There are three offices that will be important in the administration of your educational program. I am the Director of the Biology of Aging Ph.D. Program. My office is in room 112, and my email is kelvin@usc.edu. The USC Leonard Davis School Student Services Office is located in Room 102; the phone number is (213) 740-5156. You will have regular contact with Jim de Vera (213-740-1729 / edevera@usc.edu); he is the student advisor. The USC Graduate School is located in the Grace Ford Salvatori (GFS), Room 315. The phone number there is 213-740-9033.

I wish you great success in this academic endeavor and look forward to getting to know you.

— Kelvin Davies, Ph.D., D.Sc., FRSC



### BIOLOGY OF AGING AT THE UNIVERSITY OF SOUTHERN CALIFORNIA'S LEONARD DAVIS SCHOOL OF GERONTOLOGY

**P**h.D. students from our own Biology of Aging program, and from many other schools and departments at USC, as well as a large number of post-doctoral fellows, conduct their research at the Andrus Gerontology Center in preparation for research and academic careers in specialized areas of gerontology.

The Ethel Percy Andrus Gerontology Center was established in 1964 as a major research institute for the study of aging. The USC Leonard Davis School of Gerontology opened to students in 1975. Both the instructional mission of the Leonard Davis School, and its research and training roles, are conducted in the Ethel Percy Andrus Gerontology Center. The Andrus Gerontology Center is a multidisciplinary, research and educational institution with faculty members representing the major professional and disciplinary fields related to gerontology. Instruction and training is performed by experts in biology, biochemistry, physiology, molecular biology,

Ph.D. students in other departments at USC, as well as a limited number of post-doctoral fellows, conduct their research at the Andrus Gerontology Center in preparation for research and academic careers in specialized areas of gerontology.

genetics, neurobiology, and geriatric medicine, as well as sociology, psychology, demography, and public policy.

The USC Leonard Davis School was the nation's first school of gerontology and offers instruction at three levels. Besides doctoral training, the USC Leonard Davis School provides undergraduates with a liberal arts education that culminates in a Bachelor of Science in Human Development and Aging. At the master's degree level, we provide professional preparation solely in gerontology or in conjunction with other fields such as business, health administration, or social work. The undergraduate and master's degrees prepare students for work in public and private organizations, which serve the needs of the aging population.

Our Ph.D. program in the Biology of Aging obviously focuses on the biological factors which influence or cause aging phenomena, as well as efforts to extend both the healthspan and lifespan. However, unlike more generalized biology programs, we also provide students with an opportunity to learn about other factors which have major effects on aging processes. These include sociology of aging, psychology of aging, demography of aging, age-related public policy, and even economics of aging. We have world-class faculty in each of these areas who teach our classes and who also regularly interact with graduate students through participation in multidisciplinary seminars and colloquia.

Faculty at the USC Leonard Davis School conduct basic and applied research across multiple disciplines, which provides graduate and postgraduate training in the biological, social, policy, demographic, and behavioral sciences. Specific areas of study for the Biology of Aging include the biochemistry, physiology, molecular biology, genetics, neurobiology, neuroscience, and pathology of aging, as well as cognitive development and decline and geriatric medicine. The USC Leonard Davis School also offers a multi-disciplinary research training program in gerontology. Ph.D. students from other schools departments at USC, as well as a large number of post-doctoral fellows, conduct their research at the Center in preparation for research and academic careers in specialized areas of gerontology. Drawing from these many Ph.D. programs at USC, over 300 doctoral degrees have been awarded to students specializing in aging research.

In addition to the USC Leonard Davis School, the Andrus Center includes the Gerontological Research Institute, the USC Free Radical Institute, the USC/UCLA Center in Biodemography and Population Health, the Center for Global Aging, Center for Digital Aging, Family Caregiver Support Center, and the Fall Prevention Center of Excellence. The research institute also houses many individual research projects.

The USC Leonard Davis School is a dynamic, exciting, and highly respected institution, welcome to our world class academic community.

## BIOLOGY OF AGING AT THE BUCK INSTITUTE FOR RESEARCH ON AGING

The Buck Institute was the nation's first independent research facility focused solely on understanding the connection between aging and chronic disease in pursuit of the mission to increase the healthy years of life.

At the Buck Institute, world-class scientists work in a uniquely collaborative environment to understand how normal aging contributes to the development of conditions specifically associated with getting older such as Alzheimer's and Parkinson's diseases, cancer, stroke, osteoporosis, heart disease, diabetes, macular degeneration and glaucoma. Our interdisciplinary approach brings scientists from disparate fields together to develop diagnostic tests and treatments to prevent or delay these maladies.

The stakes have never been higher. While it's true that people are living longer, those "extra" years are often marked by disability and pain. In addition to personal hardship, there is also a cost to society. The financial burden of treating the chronic diseases of aging is expected to rise steadily as Baby Boomers get older. There is an urgency to our mission.

The Buck Institute is designed for the free flow of information. Discoveries quickly result in new studies. Scientists studying breast cancer are collaborating with researchers examining aging and nutrition. Parkinson's disease is being studied in three different model organisms. A unique inquiry into stem cells and aging is underway. It's an exciting place for science that has the potential to change the way we live.





**T**his degree, the first Biology of Aging Ph.D. in the United States, emphasizes research and education on the molecular, cellular, regenerative medicine, and integrative biology of aging, as well as the causes and treatments of age-related diseases, giving graduates the unparalleled opportunity to be trained by some of the world's foremost experts in the field at both the USC Leonard Davis School of Gerontology in Los Angeles, and at the Buck Institute for Research on Aging in Novato, Northern California. Indeed, two of the greatest concentrations of research scientists specializing in geroscience, the biology of aging, and in age-related diseases are located at the USC's Leonard Davis School and at the Buck Institute. Together, these institutes host over 100 scientists performing aging research with more than 50 of them focusing on the cellular and molecular biology of aging.

We have combined the knowledge and expertise of both these institutions to create a unique Ph.D. program in the Biology of Aging. This comprehensive interdisciplinary graduate program emerged from the unparalleled community of USC and Buck scientists working collaboratively on the biology of aging and age-related diseases. The combined knowledge and expertise of both

organizations results in a one of a kind graduate program that meets the growing need for education and research on the biology of aging and age-related diseases.

We enroll only the highest caliber of students from around the globe seeking training to become leading scientists in the field of biogerontology and geroscience. The program offers the opportunity to select a faculty mentor from either USC or the Buck Institute, and to select Ph.D. committees composed of faculty members from both institutions. Students conduct state of the art research; attend seminars; attend and present at local, national and international biogerontology meetings; acquire teaching experience; and begin to develop an academic, personal, and professional network. These opportunities involve classes, research, and other activities at both the Southern and Northern California institutions.

Balancing rigorous, high-level research training with courses focused on the molecular and cellular biology of aging and on biomedical sciences and age-related diseases, this Biology of Aging Ph.D. program prepares graduates for a successful career in various biomedical fields.

Ph.D. students embark on a unique and comprehensive interdisciplinary graduate program, taking a wide breadth of courses that utilize the strengths of both organizations. Students take core courses in the molecular and cellular biology of aging, and then select a specialization among neuroscience, molecular and cellular biology, stem cell and regenerative sciences, and biomedical sciences.

Age-related disease is arguably the single greatest challenge for biomedicine in the 21st Century. There are two general approaches likely to be employed when facing this challenge. The first is the traditional approach of investigating single disease conditions in isolation. While this approach will undoubtedly continue to yield important information, understanding age-related disease poses a unique set of challenges, as well as opportunities. Scientists at the Buck Institute for Research on Aging in Northern California and the USC Leonard Davis School are focused on truly interdisciplinary geroscience investigations of the basic biology of aging, and on age-related diseases. Based on the observation that aging itself is the most important common risk factor for many of the socially and economically important diseases we face, we offer philosophical change in the way scientists approach disease. By attacking the common cause of chronic diseases ranging from Alzheimer's to type II Diabetes, to macular degeneration, our aging researchers hope to extend healthspan: the functional and disease-free period of life. We believe there is a need to employ this mindset with an interdisciplinary approach to medical science in an effort to make significant progress in effectively dealing with the primary causes of morbidity and mortality in the developed world.

As a major component of our efforts, we offer the USC-Buck Ph.D. Program in the Biology of Aging. This unique, joint graduate program that combines our respective strengths in molecular biology, neuroscience, physiology, medicine, pharmacology, protein chemistry, cell biology, genetics, epigenetics, stem cell biology, endocrinology, mathematics, computational biology, demography, and evolution. We have the common goal of explaining and intervening in age-related diseases by developing our understanding of the biology of aging. The advantages of this comprehensive and unique interdisciplinary graduate program may be compared

with the creation of Neuroscience doctoral programs over the past three decades, which have trained a new generation of scientists with combinations of skills that formerly did not exist. These new researchers now combine knowledge from neuroanatomy, behavioral sciences, neurochemistry, neurophysiology, and other areas to tackle questions that would have been difficult to address prior to the appearance of neuroscience as a discipline. One might argue that the situation for aging is even more striking. Current aging research requires knowledge of biochemistry, molecular biology, physiology, bioenergetics, chemistry, genetics, endocrinology, neuroscience, epidemiology, medicine, and pathology. Such training requires that students have the opportunity to interact with multiple research groups and undertake integrated aging-centric courses. Despite the clear success of neuroscience doctoral programs around the world, the USC-Buck Ph.D. Program in the Biology of Aging is the first in the United States to specifically address this need for biology of aging training.

The objective of this program is to graduate highly specialized research scientists with unprecedented expertise in the biology of aging in order to advance scientific knowledge in this area. Clearly, a better understanding of the basic mechanisms of aging will lead to important progress in the prevention and/or treatment of many diseases associated with age and the aging process. There is a need for scientists to be trained in an interdisciplinary, age-centric environment. This approach to the study of aging and disease is unique and there is growing scientific research to suggest that this approach will yield positive results in addressing age-related disease and aging itself, in biological, societal and economic terms.

### **Target Student Audience:**

This program is designed for students with a demonstrated academic record of excellence in the biological sciences with a strong interest in working in an age-centric laboratory. Ideally, prospective students will have experience working within an interdisciplinary field such as neuroscience or have double majored in a natural science, mathematics, or engineering, and have undergraduate experience working in a laboratory environment.

The faculty advisor will be a primary resource person for the student throughout the program. The student is responsible for consulting with the advisor regarding his or her academic program, course selections, screening, and preparation for the qualifying examination. Because gerontology is a multidisciplinary field, recommended courses and research experiences may vary across students. The faculty advisor will also aid in the student's professional development by encouraging the pursuit of appropriate research and publishing opportunities. After a student has developed relationships with other faculty members through courses and research, the student may request a change of advisor.

In addition to the faculty advisor, the student advisor is the resource for general questions regarding degree requirements and university policies. Generally, any questions not able to be fielded by the faculty advisor should be addressed to the student advisor.

A record of courses completed by each student is kept by the USC Registrar, and an unofficial transcript can be obtained from OASIS at <http://www.usc.edu> by viewing the STARS report. An official file is also maintained in the USC Leonard Davis School office, including all student records from admission to graduation. A copy of the Ph.D. student advisement sheet is included in Appendix A.

The Graduate School provides all of the official forms necessary for documenting the doctoral degree progress; most are on the internet at [www.usc.edu/schools/GraduateSchool/](http://www.usc.edu/schools/GraduateSchool/). All final approvals come from the Graduate School but only after recommendations from the USC Leonard Davis School of Gerontology and Buck Institute on Aging program. Any forms or documents going to the Graduate School should first be reviewed by the student advisor. It is the student's responsibility to see that a copy of all such forms and correspondence from the Graduate School is included in the student file retained by the student advisor located at the USC Leonard Davis School of Gerontology.

The student advisor at the Leonard Davis School of Gerontology is Jim deVera, located in GER 102D. He can be reached by email at [edevera@usc.edu](mailto:edevera@usc.edu) or by phone at (213) 740-1729.



### **Course Requirements:**

The Ph.D. in the Biology of Aging provides students with detailed knowledge and expertise in the biology of aging. Attainment of the Ph.D. degree in the Biology of Aging requires successful completion of the following required or 'core' courses: GERO 600, GERO 601, GERO 602a and 602b, GERO 592, GERO 614L, and GERO 603, plus 8-10 units from the list of suggested electives or other approved courses, of which GERO 500 is strongly recommended. A minimum of 60 units (total) is required, consisting of formal courses, seminars, and research credit. At least 24 of the minimum 60 units are to be formal graduate course work (lecture or seminar courses rather than Laboratory Rotations or Directed Research).

### **Sample Schedule - Biology of Aging Ph.D. Required Courses:**

#### **Fall Semester Year 1 Required Courses – At the USC Leonard Davis School of Gerontology**

GERO 600: Geroscience: Molecular and Cellular Biology (4.0 units – Letter Grade). Emphasizes the molecular and cellular biology of aging and age-related pathology and other aspects of basic aging research, including evolutionary biology, demography, epidemiology and bioinformatics.

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GERO 602a: Seminar on Discoveries in Biogerontology (2.0 units per semester, 4.0 units max – Letter Grade). Critical analyses of primary scientific data and interpretations presented in the literature

GERO 614L: Laboratory Rotations in the Biology of Aging (4.0 - 8.0 units – Pass/Fail only). Mandatory organized laboratory rotation. Allows students to participate in laboratory activities. Designed to help select dissertation advisor and research.

GERO 592: Multidisciplinary Research Seminar in Aging (2.0 units per semester, 8.0 units max, – Letter Grade Fa,Sp) Multidisciplinary perspectives on current research in gerontology, including physiology, neurobiology, health and medicine, psychology, sociology, and public policy. Topics will change each semester.

Suggested total of 12 units for this semester

### Spring Semester Year 1 Required Courses – At the Buck Institute for Research on Aging

GERO 601: Molecular Genetics of Aging (4.0 units – Letter Grade). Explores concepts of molecular and genetic regulation of healthy aging, lifespan, and age-related diseases.

GERO 602b: Seminar on Discoveries in Biogerontology (2.0 units per semester, 4.0 units max total – Letter Grade). Critical analyses of primary scientific data and interpretations presented in the literature.

GERO 603: Research Integrity (2.0 units – Letter Grade). Explores scientific integrity, mentoring, scientific record keeping, authorship, peer review, animal and human experimentation, conflict of interest, data ownership and intellectual property, and genetic technology.

GERO 614L: Laboratory Rotations in the Biology of Aging (4.0 - 8.0 units – Letter Grade). Mandatory organized laboratory rotation. Allows students to participate in laboratory activities. Designed to help select dissertation advisor and research.

Suggested total of 12 units for this semester

### Fall Semester Year 2

GERO 790: Directed research. Research leading up to the doctorate (1.0 – 12 units- Pass/No Pass only).

Electives including GERO 500 (4 units)

### Spring Semester Year 2

GERO 790 Directed research. Research leading up to the doctorate (1.0 – 12 units – Pass/No Pass only).

Electives including GERO 500 – unless already taken in the Fall

### Summer Enrollment:

Although students are not required to register for the summer session, most will find it advantageous to do so. Firstly, Biology of Aging PhD students are expected to be conducting laboratory experiments and building their Dissertation research over most of the summer. It is, therefore, entirely appropriate to register for 3 units of GERO 790 – Directed Research during the summer session. Alternatively, students may wish to take a 3-4 unit classroom course during the summer. As an added incentive, you may well find that the taxes taken out of your Research Assistantship stipend are lower if you do register for the summer session, and retain your USC student status for the full-calendar year. Please note that this comment should not be construed as tax advice. The University encourages you be mindful of your tax situation, and to speak with a financial advisor as necessary, since neither the University nor the student services office is equipped to offer you tax counselling. If you do wish to register for GERO 790, or other USC courses for the summer term, contact the Leonard Davis School student advisor.

### Strongly Suggested Elective Courses:

**GERO 500, Perspectives on a Changing Society: An Introduction to Aging** (4 Units – Letter Grade) is a very strongly recommended elective. This course covers analysis of physical, mental, and social age-related changes as well as implications of population aging trends for individuals and society. Most biologists will never have the chance to learn the fundamental sociological, psychological, public policy, and demographic foundations of the overall field of Gerontology. GERO 500 gives our Biology of Aging students an unique opportunity to become comfortable with the underlying principles of the field of Gerontology. GERO 500 is also offered in both Fall and Spring semesters as both an in-class course and as an on-line course. This makes it particularly attractive as a second-year elective for our Biology of Aging Ph.D. students

**GERO 666 Free Radical Chemistry, Biology, and Medicine in Aging** (4 Units – Letter Grade): Explores the chemical and physical chemical nature of free radicals and related reactive species. Examines the roles of antioxidants and how they work. Considers the potential role(s) of free radicals and oxidative stress in aging processes.

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A wide variety of other elective courses are available so that students and their mentors may devise a plan of specialization within the biology of aging that meets the needs of each individual. These courses are drawn from USC's Leonard Davis School of Gerontology; the College of Letters, Arts, and Sciences (Molecular & Computational Biology, Neurobiology, Integrative & Evolutionary Biology, Marine & Environmental Biology); The Keck School of Medicine (Biochemistry & Molecular Biology, Physiology, Cell & Neurobiology, Pathology, Microbiology & Immunology, Stem Cell Biology & Regenerative Medicine), the School of Pharmacy (Pharmacology, Pharmacokinetics, Molecular Pharmacology & Toxicology); the Herman Ostrow School of Dentistry; the Viterbi School of Engineering (Bioengineering, Biomedicine, Biochemistry); and the Buck Institute for Research on the Biology of Aging. A separate handout listing numerous suggested elective courses is available to students.

### Transfer Credits:

Students with a Master's degree, or significant prior graduate course work in biology can petition to apply the credit toward this degree. Petition for credit will be based on the Graduate School's policies and requirements for "transfer of credit" and on approval by the doctoral advisory committee. Transfer credits toward the Ph.D. requirements will be limited to 20 units and must be credits taken within 10 years of entering the program.

Students must first request for a Transfer Credit Report from the USC Registrar's Office. See the link below for specific details. Choosing from the transferable courses stated in the report, students will submit a Transfer Credit Petition Form (found in the appendix) and syllabus for each course you are petitioning, as well as a copy of the Transfer Credit Report to the student advisor. Students must submit for transfer credit by the end of fall semester of the first year in the program.

<http://arr.usc.edu/services/degree-progress/graduate-transfercredit.html>

### Foreign Language Requirements:

There are no foreign language requirements for the Ph.D. in Biology of Aging program.

Registration for the fall semester begins in July for new students and in May for returning students, and registration for the spring semester begins in early November. Registration continues until the day before classes begin, at which time tuition and all fees must be settled. Students should consult the online schedule of classes at [www.usc.edu](http://www.usc.edu) for the latest information on courses. Copies of course syllabi for gerontology classes are kept in the USC Leonard Davis School office. Students are welcome to review the syllabi from previous semesters.

New students are expected to attend a Graduate School orientation at which time a registration packet will be provided. Returning students will receive updated information on the program as it becomes available. Students should consult with their faculty advisor and/or the student advisor before registering for any courses.

### Registration

On the university website, [www.usc.edu](http://www.usc.edu), students can register by selecting the Web Registration quick link at the bottom of the page. Registration instructions for the system are included in Appendix B. Courses that have a "D" after the five-digit class code in the schedule of classes require departmental clearance; those with an "R" are open registration. For classes taken outside of Gerontology requiring "D" clearance, students must obtain that clearance in the school or department offering the course.

### Evaluation Procedures

USC uses a traditional grading system for courses which includes the plus and minus: A = 4, A- = 3.7, B+ = 3.3, B = 3.0, B- = 2.7, C+ = 2.3, C = 2.0. A C grade is a minimum passing grade at the Ph.D. level. Ph.D. students must maintain a 3.0 GPA throughout their studies and for graduation.

### Incomplete (IN) Grades

A grade of incomplete is given only under unusual circumstances occurring at the end of a semester. It is not to be used for non-emergency situations. Course work must be completed and the IN changed to a letter grade within one year. Failure to finish an incomplete within the time limit will result in the grade being changed to IX, which counts as an "F" grade on transcripts.

### Full-Time Student Status

The Graduate School and financial aid policies deter-

## PROGRAM DETAILS

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mine that full-time Ph.D. student status is six units of graduate credit (generally two classes). The USC Leonard Davis School of Gerontology encourages students to enroll in 8-12 units (two-three classes, depending on research responsibilities in any given semester) in order to facilitate movement through the program within a reasonable time period. Continuous registration is required throughout the program. If a student fails to register for any (fall or spring) semester without prior approval, re-admission to the program and the University is required. The University carefully monitors continuous registration.

Students who have completed all of the required courses must continue to register until completing all degree requirements. During the semester when the Qualifying Examination is taken, students register for GRSC 800, which is considered full time registration. Once the Qualifying Exam is passed and the student is doing dissertation work, registration in GERO 794 (abcd) is required in fall and spring semesters only, and is also considered full time registration.

### **Length of Program/Leave of Absence**

It is anticipated that the Ph.D. program will take four years for most students to complete. Students who need to take time away from the University may request a leave of absence (LOA). A maximum of two one-year LOAs are permitted. However, the degree must be completed within a 10-year time frame. Students who take more than two years leave of absence or whose program lasts longer than 10 years will need to be readmitted to the University and re-evaluated for appropriateness to the program.

### **Academic Integrity:**

Academic integrity is highly regarded and enforced in this program. Academic integrity violations include plagiarism, and turning in papers that were either purchased, written by someone else, or written for another class. Additional information on USC policies on academic integrity is available from several sources, including Scampus and the Office of Student Conduct (for example see Trojan Integrity: A Guide for Avoiding Plagiarism <http://www.usc.edu/student-affairs/SJACS/docs/tig.pdf>). Violations of academic integrity will be reported to the Office of Student Conduct and will result in serious repercussions, possibly including expulsion from the Ph.D. program.

**Requirement to Maintain Good Academic Standing:** *All students enrolled in the Graduate School of the University of Southern California must maintain an overall grade point average, for all graded courses taken at USC, of 3.0 or better ('B' or above) in order to remain in good academic standing.* Students whose overall graduate GPA falls below 3.0 will automatically be placed on academic probation. At the discretion of the Graduate School, such students may be allowed a maximum of three semesters from the date of entry into the program in which to meet this 3.0 minimum overall graduate GPA requirement. Maintaining a minimum 3.0 GPA is a condition for continued financial support, and students whose GPA falls below 3.0 may be denied further support. Students who fail to achieve and maintain the minimum 3.0 graduate GPA will be subject to expulsion from the Ph.D. program.

*In addition, students in the Biology of Aging Ph.D. Program must achieve grades of 3.0 or higher ('B' or above) in each one of the following graded required or 'core' courses GERO 600, GERO 601, GERO 602a and 602b, GERO 592, and GERO 603. Students must also receive passing grades in GERO 614L and GERO 790.*

### **Students with Disabilities:**

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs each semester. A letter of verification for approved accommodations must be obtained from Disability Services, and delivered to the instructors as soon as possible. Disability Services is located at STU 301, phone 213-740-0776.

### **Faculty:**

The primary faculty for this program are drawn from the USC Leonard Davis School and the Buck Institute for Research on Aging. Additional faculty mentors are drawn from USC's Schools of Medicine; Pharmacy; Engineering; and the College of Letters, Arts, and Sciences.

### **Ph.D. Committee**

Under the general oversight of the USC Leonard Davis School faculty and the Buck Institute on Aging, the Ph.D. Committee is the governing body of the Ph.D. program. The Committee typically consists of 6 standing members representing the Davis School and Buck Institute and the Senior Associate Dean, Maria Henke.

## OTHER INFORMATION

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Occasionally faculty outside the Committee as well as the Senior Associate Dean, Maria Henke, are consulted on issues relevant to their specific disciplinary expertise or university policies. The Chair of the Committee is Dr. Kelvin Davies.

The Committee is responsible for all aspects of the instructional program including curriculum review, admission recommendations, petitions, screenings, qualifying examinations, and academic standards.

### **Library:**

Students have access to the entire USC library system as well as specialized libraries devoted to gerontology at the Buck and the Leonard Davis School. In addition, students will have access to any online databases they might need both at USC and at the Buck Institute.

### **Courses and Research both at USC and the Buck Institute:**

Courses are offered both at the USC main University Park campus in Los Angeles, and at the Buck Institute in Novato, Northern California. Founded in 1975, the USC Leonard Davis School of Gerontology is the oldest and largest school of its type in the world. USC offers the most comprehensive selection of gerontology degree programs found anywhere, a variety of outstanding research opportunities and a challenging yet supportive academic environment. The Buck Research Institute was designed by I. M. Pei and offers 17 research labs equipped with state of the art equipment as well as office and meditative spaces. The Buck Institute is located on a 488 acre parcel of land in Novato, California near the San Francisco Bay area. Courses are taught by USC and Buck faculty, with students able to participate from either campus via real-time video-conferencing.

### **Tuition Waiver for PhD Students:**

In general, students admitted in good standing to the Biology of Aging Ph.D. program receive a waiver of tuition fees from the University.

### **Financial Support for Students:**

In addition to the tuition waiver described above, many other forms of financial support are available to all our students. The funds for such support come from a variety of sources, including the Leonard Davis School of Ger-

ontology, the Buck Institute for Research on Aging, the University of Southern California Provost's Office, the USC-Buck Geroscience Training Program in the Biology of Aging (NIH Training Grant), and NIH/NSF/Foundation research grants of individual USC/Buck faculty members.

Firstly, all entering first year students have a guaranteed stipend for 12 months, as Research Assistants, at competitive rates that are regularly increased to meet or exceed those offered by competitive institutions.

By the end of the first year (end of Spring semester or end of summer) students find a Ph.D. Dissertation mentor who is willing to guide and oversee the student's dissertation research in their lab, and willing to pay the student's research assistant stipend from their own research funds. It is very important that students find a laboratory and a faculty mentor in whose research they are sincerely interested. It is equally important for students to verify that prospective faculty mentors have the research funds necessary to support both their experimental work and their research assistantship stipends. In some cases, advanced students may be able to make up for a financial shortfall by taking a teaching assistantship position. The Biology of Aging Ph.D. Program works very hard with all students to make sure that financial needs are prioritized.

## OTHER INFORMATION

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### **Health Service**

Part of each student's fees cover the cost of the Student Health Center. Contact the center if you require medical attention. (Due to an outbreak of measles, the Health Center requires all students to prove that they have either had the disease or have received a vaccination. No one may register until this proof has been provided.)

### **International Students**

International students should contact the Office of International Students (Student Union Building, Room 300) prior to the start of the fall semester.

### **General Assistance**

Students who have questions about procedures should take them to the Student Services Office. The student

## PROCEDURAL REQUIREMENTS

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advisor can answer questions about how to register, complete petitions, secure financial aid, work with the Graduate School, find housing, arrange for campus parking, and access counseling and recreational facilities.

### Financial Aid

The USC Leonard Davis School will attempt to provide a minimum level of financial aid for students without other forms of assistance during their first year in the program. Students are encouraged to seek other forms of financial aid such as research assistantships, traineeships, teaching assistant positions and scholarships. Receipt of such a fellowship provides financial support during your Ph.D. career as well as recognition and distinction that will serve you well during your future career.



### Admission Requirements:

Students will be admitted by the USC Graduate School, upon recommendation by the USC Leonard Davis – Buck Institute Biology of Aging Ph.D. Admissions Committee. The admissions Committee is comprised of three tenure/tenure track faculty members from USC Leonard Davis and three adjunct faculty members from the Buck Institute. Applicants must have a bachelor's degree from an accredited four year college or university preferably in one of the biological sciences. Applicants are evaluated by their transcripts and GPA (minimum 3.0); scores on the GRE General Test, three letters of recommendation, and a statement of interest.

### Laboratory Rotations:

*General Aspects* - Most graduate students in the Ph.D. program take part in an organized laboratory ro-

tation program prior to selecting their dissertation advisor, except for very advanced students with extensive prior lab. experience (see Special Exemption below). This rotation program is a course (GERO 614L) that allows students to participate fully in lab. activities, including handling an individual project, contributing to group meetings and events, and presenting the results of their work at the end of the rotation period. The insight obtained into the inner-workings and personalities of several of their potential research group choices helps students make informed decisions when choosing an advisor with whom to work during their tenure in the department.

Most students spend their first year performing experimental research in the laboratories of faculty members in at least two, semester-long (Fall and Spring) lab. rotations. During the rotations, students interact with individual faculty members and explore possible subjects for future dissertation research. Some students choose to carry out more than one rotation per semester (by undertaking two, one-half semester rotations) or may undertake an additional rotation during the summer following their first year, if they have not yet decided upon a home lab. Each student, thus, arranges for a faculty dissertation advisor and begins dissertation research at the end of the Spring semester of their first year, or by the end of the Summer following their first year.

Laboratory rotations are a major commitment for most students during the first year, involving 8 units (4 in the Fall and 4 in the Spring) of GERO 614L. They provide practical research experience and exposure to different research approaches and techniques. Incoming students are required to rotate through at least two research laboratories in the first year, except for very advanced students with extensive prior lab. experience (see Special Exemption below). These rotations provide broad exposure to the area of research, methods, techniques, rules and regulations of each lab., as well as the general lab. organization and personnel. Each rotation will be either one-semester long, or half a semester long, and will occupy up to 20 hours/week. Students may take as few as 2 full-semester rotations, or as many as 4 half-semester rotations during the regular school year. If needed, a final lab. Rotation may be taken during the Summer following the first year of study.

## PROCEDURAL REQUIREMENTS

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*Special Exemption from Laboratory Rotations for Advanced Students with Extensive Lab. Research Experience* - In exceptional cases, students with extensive prior laboratory research experience may be exempted from undertaking lab. rotations, and may select a lab. for their dissertation research (by mutual assent) upon entering the program, or after just one rotation. Such matters are decided by the Biology of Aging Ph.D. Committee on an individual basis.

Prior lab. experience in undergraduate or graduate laboratory courses, or experience working as an undergraduate lab. helper does not count as extensive prior laboratory research experience for this purpose. To be exempted from the lab. rotations requirement, a student's prior lab. research experience must be judged to be extensive, substantial, meaningful, and truly advanced by the Biology of Aging Ph.D. Committee.

Students directly admitted to a faculty lab are not required to rotate. However, even if exempt from rotating labs, all students must still register for GERO 614L in order to complete the course requirements.

*Laboratory Rotations - Expectations and Responsibilities* - The purpose of laboratory rotations is two-fold. First, it exposes the student to a broad range of research topics and research environments available at the USC Leonard Davis School of Gerontology and the Buck Institute for Aging Research. The faculty represent a diverse group with aging-related research interests including biochemistry, cell biology, molecular biology, molecular genetics, biophysics, physiology, pathology, and medicine. Most students upon entering graduate school will not have been exposed to all these potential research topics and, thus may not really know what will eventually be most interesting to them and what will not, or which projects are reasonable for thesis research and which are not.

Most entering students will have only limited prior laboratory experience, discounting labs. for undergraduate or graduate classes which do not provide sufficient experience. Therefore, we require most students to undertake lab. rotations throughout their first year in the program. Rotations may be of one-semester in length, or half a semester in length (in which case a second half-semester rotation must be taken). Students spend one

semester at the Leonard Davis School of Gerontology and one semester at the Buck Institute in their first year. Therefore, most students go through a total of 2, 3, or 4 rotations during the Fall and Spring semesters of their first year. Some students may undertake an additional rotation during the Summer following their first year, if they have not decided upon a home lab.

Each faculty member runs her/his laboratory in a distinctive way. Labs. may be large, with many postdoctoral research associates, other graduate students, technicians and/or undergraduate students, or they may be much smaller with students responsible for much of the research in the lab. The major professor may be intimately involved in all aspects of research, and may actually work in the laboratory, or he/she may be distant from the lab., primarily functioning to define the broader research goals of the lab. and fund raising. Students may be more comfortable with one style as opposed to another. The rotation allows students to "try-out" a laboratory and, similarly, allows a lab. to "try-out" a student. A student's decision in selection of a laboratory for their thesis research may also depend on how well they mesh with the people in the lab.

At the end of a student rotation, professors are required to complete a form evaluating the student's performance. A copy of the Student Laboratory Rotation Evaluation Form can be found at the end of this description. Student Laboratory Rotation Evaluation Forms become part of the student's permanent record that is considered during the first year evaluation.

The most successful lab. rotations occur when students maintain good communication with the professor. It is the students' responsibility to learn what they are expected to accomplish during their rotations and to learn about the standards by which their performance will be judged. This should be discussed with each professor, even if a student may actually be working under the direct supervision of a postdoc. or senior graduate student. In such a situation, it is in a student's best interest to clarify the chains of command, communication, and responsibility. This initial understanding should be revised as the rotation progresses, since research projects usually take unforeseen turns. Students should also try to learn as much as possible about the different research projects underway in each lab. in which they rotate, from

## PROCEDURAL REQUIREMENTS

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the other members of the group. This requires that students communicate widely with the various members of each group and attend any group meetings held by the laboratory.

### **Screening Review and Oral Assessment:**

After completion of the core Biology of Aging course work (GERO 600, GERO 601, GERO 602a, GERO 602b, GERO 603, GERO 592, and GERO 614) at the end of the first year, the student's degree progress is discussed and evaluated by a screening committee composed of the members of the Biology of Aging Ph.D. Committee. The purpose of the Screening Review is to determine competence to continue graduate study and identify areas that may need to be strengthened prior to taking the qualifying examination.

Students must make arrangements to make themselves available during the Screening Review in case an oral assessment is required. Successful completion of the Screening Review is required for progression to the Qualifying Examination. The Screening Review should occur at the end of the Spring semester of a student's first year, or at the beginning of the Fall semester of a student's second year.

Students are first required to maintain an overall GPA of 3.0 or better ('B' or higher) in all graded USC coursework in order to remain in good academic standing with the Graduate School. Students must also achieve grades of 3.0 or higher ('B' or above) in each one of the following graded required or 'core' courses GERO 600, GERO 601, GERO 602a and 602b, GERO 592, and GERO 603 as preconditions for successful screening. Students are also required to have successfully completed at least two lab. rotations, as evidenced by satisfactory Student Laboratory Rotation Evaluation Forms, unless they have been granted a special exemption from laboratory rotations as an advanced student with extensive lab. research experience (see above).

Students who are clearly making successful and appropriate progress towards the Ph.D. degree, and who have identified a Dissertation mentor who is able and willing to support their dissertation research, and their Research Associate stipends, will be deemed to have successfully completed the screening process and will not be required to take an Oral Assessment.

Failure to pass the screening review is grounds for dismissal from the program, although students may be granted a second chance at the discretion of the Biology of Aging Ph.D. Committee (see below). If granted a second chance, the student will need to retake the Screening Review and also pass an Oral Assessment during the Fall semester of the second year. No extensions of Screening Reviews and Oral Assessments beyond the end of the Fall semester of the second year will be allowed.

Students whose coursework grades and/or lab. rotation reports indicate sub-standard performance or progress, And students who have not successfully identified a Dissertation mentor will undergo a more rigorous examination and may be required to meet with the screening committee for an oral interview and to discuss and review their plans for remedial work. Such students may also undergo an oral assessment of their understanding of the core concepts underlying the biology of aging. Students who have met, or who can meet, the Graduate School's requirements to maintain good academic standing, but who fall slightly short of the specific requirements of the Ph.D. in the Biology of Aging program may be granted an opportunity to stay in the program on a conditional basis and improve their performance. Such conditional approval for continuation will be made on a case-by-case basis, at the discretion of the Ph.D. Committee.

Item to be submitted to the Student Services Office at least two weeks prior to the Screening Review:

### **Completed Course Summary**

- a. Printable through OASIS via my USC web portal*
- b. Spring grades must be included*

### **Qualifying Examinations:**

By the end of the Spring semester of their second year, students should choose a five-member Guidance Committee (also called the Qualifying Exam Committee), consistent with the requirements of the graduate school, composed of USC Leonard Davis School faculty and faculty from the Buck Institute, and other USC faculty if desired. No less than four (4) members of the Qualifying Exam Committee shall hold faculty appointments in the Leonard Davis School and the Buck, with a minimum of at least one faculty member with a primary appointment in each of the two institutions. This com-

## PROCEDURAL REQUIREMENTS

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mittee will conduct the Qualifying Exams and provide guidance during dissertation research. The chair of the committee will serve as the student's principal advisor or mentor. Students should consult extensively with each committee member re-garding subjects to be covered in the exams.

The Qualifying Exams consist of both written and oral portions. Both parts must be finished before the end of the Fall semester of the third year. For the written exam, the advisor will consult with each of the members of the guidance committee. The written part will incorporate evaluation and synthesis of existing knowledge related to the topic areas, creation of a set of experiments to test a relevant hypothesis, and interpretation of anticipated results. The oral exam consists of an oral defense of the written part, and approval of the basic outline of the dissertation research plan, and will be conducted with 60 days of the written part of the Qualifying Exam.

Upon successful completion of both portions of the qualifying exams, students will be advanced to candidacy for the Ph.D. in the Biology of Aging but actual conferral of the Ph.D. degree will require the successful completion and defense of an original dissertation. Students who fail to complete the qualifying exams in a satisfactory manner will be dismissed from the program. In exceptional cases, the Biology of Aging Ph.D. Committee might decide to allow a student a second chance to pass the Qualifying Exam, which must be taken within six months.

Items to be submitted to the Student Services Office by the end of the Spring semester of the second year in order to take the Qualifying Exam:

1. Request to Take Quals form (see Appendix)
2. Appointment of Guidance Committee form (see Appendix)
  - a. *Students should keep a copy of the signed form for their record*

**The Written Qualifying Examination** - The written exam will consist of a research project organized as a mini-grant. The topic, hypotheses, and experiments proposed may be directly related to the planned dissertation research but must explore avenues and opportunities not initially planned for the dissertation. Importantly, the qualifying exam research project must not simply reiterate investigations already planned by a student's mentor,

or contained in a mentor's grants or grant applications. In other words, the student is expected to expand and extend a research topic of interest to their mentor's lab., but not to reproduce an existing topic. This exam is designed to probe the students' depth of knowledge of their field of research, their ability to put their studies in the context of the biology of aging, and articulate the importance and innovative aspects of their proposal.

The written exam generally follows the format of an NIH-style RO1 grant application, except that it is somewhat shorter. For general style and approach, but not for page limitations, students are directed to the following NIH web-site which has a very helpful and quite detailed Quick Guide for Grant.Applications: <http://deainfo.nci.nih.gov/extra/extdocs/gntapp.pdf>. Please note, however, that the page limitations in the NIH Quick Guide should not be followed. Instead, the written exam, which will be rigorously assessed, needs to be exactly 12 pages long (not including references), single-spaced with 0.5-inch margins and an 11-point arial font. The introduction to the project must present a mini-review of the field, corresponding to a shortened version of what will eventually become the first chapter of the student's dissertation. The research proposal is expected to be roughly organized as a 5-year NIH grant, as follows: Introduction – 4 pages; Specific Aims, Significance, and Innovation – 1 page, Research Plan for the 5 years – 5 pages (structured according to the Specific Aims), Potential Difficulties & Alternative Approaches – 1 page (how will you cope with problems), Timetable for the 5 years – 1 page, References—at least 2 pages but with no page limit (literature must be referenced throughout the proposal)

The research proposal must be an independent project generated by the student. The advisor is required to read and approve the proposal. By signing the proposal, both the student and the advisor will assure that the students' proposal has been generated independently from pre-existing grant proposals and other written exams generated by the same lab. Copying even selected parts of a grant proposal of the advisor is unacceptable.

Students must provide their written proposals to all members of their guidance committee, no later than three (3) weeks prior to the scheduled oral qualifying exam. Committee members may require that minor or major revisions to the proposal are made before the oral

## PROCEDURAL REQUIREMENTS

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exam can be taken. If revisions are inappropriate or insufficient, the committee may decide that a student has failed the written qualifying exam.

**The Oral Qualifying Examination** - The oral qualifying examination consists of two main parts: 1) An oral defense of the research proposal previously submitted for the written Qualifying Exam. Students deliver a power point presentation of their proposal and must be prepared to defend it from critical appraisal by the Committee, 2) A power point presentation and defense of a preliminary outline the students' actual proposed dissertation research, including any particularly relevant preliminary results. Those students whose Qualifying Exam. proposal is quite close to the topic of their actual dissertation research will, naturally, spend less time on part 2) than those whose qualifying exam. proposal is very different from their actual dissertation research plans.

Students are expected to have extensive knowledge of the literature related to their project as well as the general literature in their subject area. They are also expected to have extensive understanding of the techniques used in the field, their approaches and preliminary results. They are expected to be able to discuss their research plans in great detail, including a review of potential problems and alternative strategies. Advisors attend the oral exam and participate in discussions and evaluation, but are not permitted to answer questions for their students.

**The Qualifying Exam Committee Form must be completed, approved, and submitted to the USC Leonard Davis School Graduate Office by the end of the Spring semester of the second year. The actual Qualifying Exams can take place as early as the Spring semester of the second year (especially for students who enter with advanced standing). The Written Qualifying Exam must be completed by the end of the Fall semester of the third year. The Oral Qualifying Exam must be taken within 60 days of completing the Written Qualifying Exam.**

### **Annual Dissertation Committee Meetings:**

Upon successful completion of both portions of the qualifying exams, students will be advanced to candidacy for the Ph.D. in the Biology of Aging. Upon admission

to candidacy, a Dissertation Committee consisting usually of five (5) faculty, but certainly no less than three (3) members of the faculty, is established by agreement of each student and their mentor. If desired, the Dissertation Committee may be the same as the Guidance Committee/Qualifying Exam Committee. The Dissertation Committee shall be composed of USC Leonard Davis School faculty and faculty from the Buck Institute, and other USC faculty if desired. **No less than three (3) members of the Qualifying Exam Committee shall hold faculty appointments in the Leonard Davis School and the Buck, with a minimum of at least one faculty member with a primary appointment in each of the two institutions.** The Dissertation Committee has responsibilities for providing guidance and consultation during the research process, approving the Dissertation, conducting the final oral examination, and recommending the candidate to the Graduate School for conferral of the Ph.D. degree in the Biology of Aging.

Good research progress is also required to stay in the graduate program, and should be evaluated by the students' advisor/mentor and the Dissertation Committee at annual meetings to discuss progress. A brief report of these meetings should be completed each year by the student, and signed by all members of the Dissertation Committee. Failure to demonstrate satisfactory research progress may result in expulsion from the program.

### **Doctoral Dissertation:**

The Dissertation is based on original, publishable, and substantial research, that makes a significant contribution to human knowledge. The dissertation research is to be independently conducted by the student under the guidance of their mentor, and the Dissertation Committee.

Students should consult regularly with their Dissertation Committee Chairperson and other Committee members in conducting the research and preparing the dissertation, and be prepared to write multiple drafts of the Dissertation before the formal defense. Doctoral Dissertations must be prepared in accordance with the USC graduate School's dissertation requirements, and will not be finally accepted until they so conform. Doctoral dissertations must be provided to all members of the Dissertation Committee, no less than three (3) weeks prior to any scheduled Oral Dissertation Defense. Committee members may require that minor or major revisions

## PROCEDURAL REQUIREMENTS

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to the proposal are made before the Oral Dissertation Defense can be taken. All members of the Dissertation Committee must agree that the written dissertation is appropriate before the Oral Dissertation Defense can take place.

Students who fail the to submit a satisfactory Dissertation, or who fail the Oral Dissertation Defense, but who have performed well in coursework, and who are judged competent in conducting laboratory experiments under suitable supervision, may be recommended for a terminal Master of Science degree by their committee. The USC Leonard Davis School of Gerontology shall decide whether to propose such students to the Graduate School for conferral of an M.S. degree. In all cases, the Graduate School shall have the final decision on granting degrees.

Students must submit the Dissertation Committee form to the Student Services Office within 60 days after successfully completing the Qualifying Exam. Students should also keep a copy of the signed forms for their record since it will be required during the dissertation submission process.

### **Oral Dissertation Defense:**

Upon notification that the Committee considers the Dissertation ready to be defended, the student must orally defend the Dissertation. The Oral Dissertation Defense consists of a formal (power point) presentation by the student and a question/answer session and discussion to assess the written manuscript and the student's ability to defend it. The oral defense consists of an open meeting of the committee, which is announced to the USC/Buck communities. All interested parties are entitled to attend the presentation and a limited number of questions may be allowed from the general audience, at the discretion of the Dissertation Committee. The Ph.D. Candidate is responsible for scheduling the meeting and arranging for a room. At least one month prior to the oral defense, written notification of the date, time, and place is to be submitted to the Graduate School.

The candidate must defend the dissertation in such a manner as to determine to the unanimous satisfaction of the dissertation committee that the candidate has attained the stage of scholarly advancement and power of investigation demanded for final recommendation to the doctorate. While the oral examination is open to the

general university community, only the members of the dissertation committee shall have the authority to recommend acceptance of the dissertation, which must be unanimous.

Students should be aware that it is very unusual for the version of the Dissertation submitted for defense to end up as the final version. Usually, recommendations of further changes result from the Oral Dissertation Defense. These may require significant work but do not typically require a new defense. Upon successful defense and completion of the dissertation, the student must submit the written dissertation to the University Publications office. Dates for final submission and a schedule of deadlines are listed in the University Catalogue, and in the schedule of classes for each semester. Upon completion, the student must provide a bound copy of the dissertation to their mentor. Other Dissertation Committee members may also request copies. The degree is posted after a degree check and the submission of the signed dissertation cards. The diploma is printed and mailed to the student within six to eight weeks after it is officially granted by the University.

Students should follow Graduate School instruction and create a profile in the Thesis Center system ([http://graduateschool.usc.edu/current\\_thesis\\_dissert.html](http://graduateschool.usc.edu/current_thesis_dissert.html)). Beginning 24 hours before your defense, you may go to the Checklist page in Thesis Center to generate the electronic Approval to Submit form. Your action will prompt Thesis Center to send an email containing a link to the form to all of your dissertation committee members.

Dates for final dissertation submission and formatting edits and a schedule of deadlines are listed in the University Catalogue, the schedule of classes, and on the USC Graduate School website ([http://graduate-school.usc.edu/current\\_thesis\\_dissert.html](http://graduate-school.usc.edu/current_thesis_dissert.html)).

Upon completion, the student must provide a digital copy of the dissertation to the Gerontology Student Advisor.

The degree is posted after a degree check and the submission of all documents, forms, and dissertation corrections. Degrees are posted about a month after all required documents have been submitted. The diploma is printed and mailed to the student within six to eight weeks of posting of the degree.

## DAVIS SCHOOL AND BUCK INSTITUTE FACULTY

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**Julie Andersen, Ph.D.**, Professor at the Buck Institute for Research on Aging.

**B er n ce Benayoun, Ph.D.**, Assistant Professor of Gerontology at USC.

**Chris Benz, M.D.**, Professor at the Buck Institute for Research on Aging.

**Michael A. Bonaguidi, Ph.D.** Assistant Professor of Stem Cell Biology and Regenerative Medicine, Biomedical Engineering, and Gerontology at USC.

**Martin Brand, Ph.D.**, Professor at the Buck Institute for Research on Aging.

**Dale Bredesen, M.D.**, Professor at the Buck Institute for Research on Aging.

**Rachel Brem, Ph.D.**, Associate Professor at the Buck Institute for Research on Aging.

**Enrique Cadenas, M.D., Ph.D.**, Charles Krown Professors of Molecular Pharmacology & Toxicology Biochemistry, and Gerontology at USC.

**Judith Campisi, Ph.D.**, Professor at the Buck Institute for Research on Aging.

**Pinchas Cohen, M.D.**, Dean, USC Leonard Davis School of Gerontology, Executive Director, Andrus Gerontology Center, William and Sylvia Kugel Dean's Chair in Gerontology.

**Lucio Comai, Ph.D.**, Professor of Molecular Microbiology and Immunology, Biochemistry & Molecular Medicine, and Gerontology at USC.

**Sean Curran, Ph.D.**, Associate Professor of Biogerontology, Molecular and Computational Biology, and Biochemistry and Molecular Biology.

**Kelvin Davies, Ph.D., D.Sc.**, Vice Dean, USC Leonard Davis School of Gerontology, James E. Birren Professor of Gerontology, Professor of Biological Sciences (Molecular and Computational Biology) at USC, Director of the USC-Buck Biology of Aging Ph.D. Program

**Lisa Ellerby, Ph.D.**, Associate Professor at the Buck Institute for Research on Aging.

**Caleb Finch, Ph.D.**, ARCO/Keischnick Professor of Gerontology and Biological Science, University Professor.

**Steven Finkel, Ph.D.**, Professor of Biological Sciences (Molecular & Computational Biology) and Gerontology at USC.

**Henry Jay Forman, Ph.D.** Research Professor of Gerontology at USC.

**Bradford Gibson, Ph.D.**, Professor at the Buck Institute for Research on Aging.

**Myron Goodman, Ph.D.**, Professor of Biological Sciences (Molecular & Computational Biology) and Gerontology at USC.

**David Greenberg, Ph.D.**, Professor at the Buck Institute for Research on Aging.

**Pejmun Haghighi, Ph.D.**, Professor at the Buck Institute for Research on Aging.

**Robert Hughes, Ph.D.**, Associate Professor at the Buck Institute for Research on Aging.

**Andrei Irimia, Ph.D.**, Assistant Professor of Gerontology

**Heinrich Jasper, Ph.D.**, Professor at the Buck Institute for Research on Aging.

## PROGRAM GRADUATES

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**Pankaj Kapahi, Ph.D.**, Professor at the Buck Institute for Research on Aging.

**Brian Kennedy, Ph.D.**, Buck Institute CEO and Professor at the Buck Institute for Research on Aging.

**Ralf Langen, Ph.D.**, Professor of Biochemistry & Molecular Biology and Gerontology at USC.

**Changhan David Lee, Ph.D.**, Assistant Professor of Gerontology.

**Gordon Lithgow, Ph.D.**, Professor at the Buck Institute for Research on Aging.

**Valter Longo, Ph.D.**, The Edna M. Jones Professor of Gerontology, Professor in Biological Science.

**Simon Melov, Ph.D.**, Professor at the Buck Institute for Research on Aging.

**Todd Morgan, Ph.D.**, Research Professor of Gerontology at USC.

**David Nicholls, Ph.D.**, Professor at the Buck Institute for Research on Aging.

**Christian Pike, Ph.D.**, Professor of Biogerontology.

**John Tower, Ph.D.**, Professor of Biological Sciences (Molecular & Computational Biology) and Gerontology at USC.

**Eric Verdin, M.D.**, Professor, President, and CEO of the Buck Institute for Research on Aging.

**John Walsh, Ph.D.**, Associate Professor of Gerontology.

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### Class of 2017

**Laura Corrales-Diaz Pomatto**

**Previous Degrees:** BS, University of Southern California, Gerontology and Biomedical Engineering, MS, University of Southern California, Medical Device and Diagnostic Engineering

**Dissertation:** To Adapt or Not to Adapt: The Age Specific and Sex-Dependent Differences in the Adaptive Stress Response

**Position:** Post-doctoral Fellow, University of Southern California

## CURRENT PH.D. STUDENTS

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### Entered in 2013

**Jialin Xiao**, BS, University College London, Biological Sciences

**Amin Haghani**, BS, Shiraz University, Veterinary Medicine; MS, Universiti Putra Malaysia, Molecular Biotechnology

### Entered in 2014

**Azar Asadi Shahmirzadi**, BS, Tehran Medical Science University, Pharmacy

**Devin Humpal**, BA, Pitzer College, Anthropology and Environmental Studies; BS, University of California Davis, Biotechnology

**Maria Konovalenko**, BS, Moscow Institute of Physics and Technology, Physics and Mathematics; MS, Moscow Institute of Physics and Technology, Physics and Mathematics

**Courtney Hudson**, BS, University of California, Santa Barbara, Biopsychology

**Megumi Mori**, BS, McGill University, Neuroscience

**Albina Ibrayeva**, BEng and Tech, LN Gumilyov Eurasian National University, Biotechnology; MS, University of Southern California, Bioengineering

**Kenneth Wilson**, BS, University of California, Berkeley, Molecular Biology and Cell Biology; MS, Dominican University of California, Biological Sciences

**Jiahui Liu**, BS, Peking University, Biological Sciences and Psychology

### Entered in 2015

**Xiaoyu Cai**, BM, Peking University, Nursing; MS, Peking University, Biochemistry and Molecular Biology

**Fleur Lobo**, BS, St. Xavier's College, Life Sciences and Biochemistry; MS, University College of London, Genetics of Human Disease; MS, University of Southern California, Biochemistry and Molecular Biology

**Joshua Kramer**, BS, Georgia State University, Chemistry

**Minna Schmidt**, BS, Brandeis University, Chemistry and Chemical Biology; MS, University of California Santa Cruz, Chemistry and Chemical Biology

**Chisaka Kuehnemann**, BS, University of Maryland Baltimore, Biological Sciences; MS, Johns Hopkins University, Biotechnology

**Kevin Vittayarukskul**, BEng, University of California, Irvine, Biomedical Engineering

**Priya Rangan**, BS, University of California, Davis, Cell Biology

**Joseph Reynolds**, BS, University of Washington, Biochemistry

### Entered in 2017

**Juan Bravo**, BS, Yale University, Life Science

**Stephen Scheeler**, BS, Villa Julie College, Interdisciplinary Studies in Biology and Chemistry

**Serban Ciotlos**, BS, University of California, Santa Cruz, Biological Engineering

### Entered in 2016

**Conscience Bwiza**, BS, Cal Baptist University, Biochemistry

**Andrew Cruz**, BS, California State University Long Beach, Molecular Biology

**Lindsay Gray**, BS, Mills College, Biopsychology; MS, Dominican University of California, Biological Sciences

**Angelina Holcom**, BS, University of Hawaii Manoa, Biology

**Tyler Hilsabeck**, BS, Texas Tech University, Physics; MS, University of Texas San Antonio, Biological Sciences

**Taekyu Kang**, BS, University of California Los Angeles, Microbiology

**APPENDIX A**

**BIOLOGY OF AGING DOCTOR OF PHILOSOPHY ADVISEMENT RECORD**

Catalogue Year 16/17

**Student Name:** \_\_\_\_\_

**Student ID #:** \_\_\_\_\_

**BIOLOGY OF AGING CORE**

TITLE	COURSE	UNITS	SEMESTER	GRADE
GERO 600-Geroscience: Molecular and Cellular Biology		4		
GERO 601-Molecular Genetics of Aging		4		
GERO 602a-Seminar on Discoveries of Biogerontology		2		
GERO 602b-Seminar on Discoveries of Biogerontology		2		
GERO 603-Research Integrity		2		
GERO 614L-Laboratory Rotations in the Biology of Aging		4		
GERO 614L-Laboratory Rotations in the Biology of Aging		4		

**RESEARCH COURSES**

TITLE	COURSE	UNITS	SEMESTER	GRADE

**ELECTIVES**

TITLE	COURSE	UNITS	SEMESTER	GRADE

**QUALS / DISSERTATION**

GRSC 800 during Quals / 4 UNITS minimum 794ab	COURSE	UNITS	SEMESTER	GRADE

**TOTAL UNITS FOR PHD = 64**

Students must take a minimum of 24 academic units (non lab or research units) of the 60 (+4 dissertation) units.

**USC WEB REGISTRATION  
Instructions**

There is a step by step tutorial on the Web Registration website but this will help get you started. There may be a day turnaround time each after submitting the Intent to Enroll form and activating your email account. International students will need to wait until they get here to the U.S. physically to register.

**STEP 1**

Log on to the Web Registration website through the myUSC portal: <https://my.usc.edu/portal/guest.php>. The login for myUSC and USC Web Mail are the same.

**STEP 2**

You may need to request for a registration appointment time. If this is the case, contact the Registration department at (213) 740-8500 or email them at [register@usc.edu](mailto:register@usc.edu). Please have your 10 digit USC ID number handy.

**STEP 3**

Departmental clearance (D-clearance) or Departmental Authorization may be required. Typically online classes, practicum courses or directed research will require this action. Please email Linda Broder at [lbroder@usc.edu](mailto:lbroder@usc.edu) with your request. Be sure to include your name, 10-digit USC ID number, the course name (i.e. GERO 500), and the section number (the 5-digit number associated with the course).

To view the Schedule of Classes, you may go here: <http://classes.usc.edu/>. The actual email that provides the login information to the Blackboard system (the system that will allow you to access the course information online) will not be received until about a week before classes begin so don't be alarmed if you don't get one until then.

If you have questions about what classes to register for or are having problems, please contact the Student Advisor, Jim deVera at [edevera@usc.edu](mailto:edevera@usc.edu) or (213) 740-1729.

**FEE BILL SETTLEMENT**

Information on settling your tuition and fee charges can be obtained online at:

<http://www.usc.edu/dept/finserv/sfs/>

**APPENDIX C**

**USC Leonard Davis School – Buck Institute Ph.D. Program in the Biology of Aging  
Student Laboratory Rotation Evaluation Form – GERO 614L**

Student \_\_\_\_\_ Mentor \_\_\_\_\_ Semester \_\_\_\_\_ Year \_\_\_\_\_

Check one box: Full Semester \_\_\_\_\_ 1<sup>st</sup> Half of Semester \_\_\_\_\_ 2<sup>nd</sup> Half of Semester \_\_\_\_\_

**FINAL GERO 614L GRADE Check One Box Only: CREDIT (Pass) \_\_\_\_\_  
NO CREDIT (Fail) \_\_\_\_\_**

The above named student took the course, GERO 614L, and worked in your laboratory as a rotation student in partial fulfillment of the requirements of the Ph.D. program. We need your evaluation of this student's performance.

**If you wish, please review this evaluation with the student, prior to submitting it to the Ph.D. Program Office. The Ph.D. Program Director will also discuss this evaluation with the student.**

Please evaluate the student's performance in the categories listed below. Use grades of 1 (poor) to 5 (excellent) and include any explanatory or additional comments as useful. Please submit any confidential comments separately.

	Comments	Grade
Laboratory skills		
Knowledge of rationale for experiments		
Ability to apply Knowledge		
Ability to reason		
Ability to function independently		
Responsibility/Maturity		
Motivation		
Creativity		
Relationships with Laboratory personnel		
Potential for career in biomedical research		
Overall evaluation		

## APPENDIX C

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Brief description of rotation project

Additional Comments about the rotation (positive or negative)

**Would you be willing to mentor this student, and offer her/him a funded RA position to pursue her/his dissertation research in your laboratory?**

**Yes with strong enthusiasm \_\_\_\_\_ Yes with limited enthusiasm \_\_\_\_\_ No \_\_\_\_\_**

**Date \_\_\_\_\_**

**TRANSFER CREDIT PETITION FORM**

USC Leonard Davis School of Gerontology / Buck Institute on Aging  
Biology of Aging Ph.D. Program

I. Student completes this section. Please print or type.

Student ID # \_\_\_\_\_ Degree \_\_\_\_\_

Last Name \_\_\_\_\_ First Name \_\_\_\_\_

Telephone \_\_\_\_\_ E-mail \_\_\_\_\_

Request: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Reasons: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(attach additional page if needed)

Student's Signature \_\_\_\_\_ Date \_\_\_\_\_

Endorsements:

Approved (recommended, not recommended, neutral)

Not Approved

\_\_\_\_\_  
(Ph.D. Chair)

\_\_\_\_\_  
(Date)

b.) Comments: \_\_\_\_\_

Additional Endorsement (as necessary)

Approved (recommended, not recommended, neutral)

Not Approved

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

\_\_\_\_\_  
(Title)

c.) Comments: \_\_\_\_\_

\_\_\_\_\_

Date: \_\_\_\_\_

USC Leonard Davis School – Buck Institute PhD Program in the Biology of Aging

### FIRST YEAR STUDENT SCREENING REVIEW & ORAL ASSESSMENT

Student Name: \_\_\_\_\_ Email: \_\_\_\_\_

Student ID #: \_\_\_\_\_ Phone: \_\_\_\_\_ Graduate GPA: \_\_\_\_\_

Can the Ph.D. Committee confirm that all 1<sup>st</sup> year requirements have been completed YES \_\_\_\_\_ NO \_\_\_\_\_

Coursework grades and performance:

Lab Rotations Mentor Evaluations:

Was an Oral Evaluation Necessary? NO \_\_\_\_\_ YES \_\_\_\_\_ Did the student pass the oral evaluation? \_\_\_\_\_

**1<sup>st</sup> Year Screening Overall Evaluation:** Pass \_\_\_\_\_ Pass with Reservations \_\_\_\_\_ Fail \_\_\_\_\_

Ph.D. Committee Recommendations:

\_\_\_\_\_  
Kelvin J. A. Davies, PhD, DSc: Director

Student Signature \_\_\_\_\_ I verify that I have received a completed copy of this form

USC Leonard Davis School – Buck Institute Ph.D. Program in the Biology of Aging  
**GRADUATE ADVISOR SELECTION FORM**

I. STUDENT COMMITMENT

I have chosen to do my Ph.D. dissertation research under the direction of:

Faculty name: \_\_\_\_\_

II. FACULTY COMMITMENT

I currently have sufficient financial resources for at least the next two school years\* to support the stipend (see below) and the research needs and laboratory space requirements of:

Student name: \_\_\_\_\_ in pursuit of his/her Ph.D. dissertation research.

III. USC Department of Animal Resources – Animal Care and Use training and Laboratory safety training.  
<https://dar.usc.edu/training-programs/animal-care-and-use-training/>

Date of completion: \_\_\_\_\_

\_\_\_\_\_  
Kelvin J. A. Davies, Ph.D., D.Sc. Date  
Director, Biology of Aging Ph.D. Program

\_\_\_\_\_  
Faculty Advisor Date

\_\_\_\_\_  
Student Date

ID # \_\_\_\_\_ Phone: \_\_\_\_\_ Email: \_\_\_\_\_

**\*Continuation and Reappointment**

The continuation and/or reappointment of any Research Assistant (RA) position is based on the student’s successful performance of research duties, and satisfactory academic progress. RAs must meet the program’s and PI’s or professor’s expectations as outlined in the contractual offer letter. In some cases, the reappointment of RAs is dependent on the continuation of contract or grant funding. Poor performance or conduct may result in the immediate withdrawal of a RA position.

This Continuation and Reappointment statement is taken from the official policy published by USC’s Graduate School  
[http://www.usc.edu/schools/GraduateSchool/documents/StuServices/GA\\_Handbook.pdf](http://www.usc.edu/schools/GraduateSchool/documents/StuServices/GA_Handbook.pdf)

# USC Graduate School

## Request to Take the PhD Qualifying Examination

When signed by all parties, this form indicates approval to sit for the qualifying examination. Present the completed form to the dean’s office at least 30 days prior to the first day of the exam. The original form is to be kept in the department and a signed copy provided to the student.

Student Name: \_\_\_\_\_ USC ID Number: \_\_\_\_\_  
Last First

Phone: \_\_\_\_\_ Email: \_\_\_\_\_

Program: \_\_\_\_\_ Post Code: \_\_\_\_\_

I request permission to take the Qualifying Examination by my Qualifying Exam Committee in \_\_\_\_\_ semester of 20\_\_\_\_. I understand that both written and oral parts of the Qualifying Examination must be taken on the USC Campus.

Student Signature: \_\_\_\_\_ Date: \_\_\_\_\_

The department or program verifies that the student has satisfactorily completed all pre-Qualifying Examination requirements: GPA: \_\_\_\_\_ (minimum 3.0) Units: \_\_\_\_\_ (minimum of 24 units in residence)

	Printed Name	Signature	Date
Committee Chair	_____	_____	_____
Program Chair	_____	_____	_____
Dean (if necessary)	_____	_____	_____

Students who have completed all coursework for the PhD and who are not otherwise enrolled during the semester in which the Qualifying Examination is to be taken enroll in GRSC 800: Studies for Qualifying Examination. D-clearance for GRSC 800 can be obtained by call the Graduate School at 213-740-9033.

Students may not enroll in 794A until the semester after having passed the Qualifying Examination. However, if a student passes the Qualifying Examination prior to the Add/Drop date of a given semester, then s/he registers for 794A in that semester.

# USC Graduate School

\_\_\_ Appointment or \_\_\_ Change of Qualifying Exam or Dissertation Committee

Please indicate the type of committee:

**Qualifying Exam Committee:** The qualifying exam committee is normally composed of five members, although additional members may be included at the student's and committee chair's discretion. The committee chair and at least two additional members must be affiliated with the student's program. Faculty eligible to serve as committee chairs and members include tenured and tenure track faculty, and non-tenure track faculty of outstanding stature who have a documented record of exceptional expertise and superior achievement in their field, and whose appointment has been approved by the dean of the student's school. At least three members of the committee must be tenured or tenure track. Visiting faculty may not serve on qualifying exam committees. *Schools and programs may have additional requirements. Students should consult with their programs prior to forming a committee.*

**Dissertation Committee:** The dissertation committee must consist of at least three members. Two committee members must be from the home program, at least one of whom must be tenured. Faculty eligible to serve as committee chairs and members include tenured and tenure track faculty, and non-tenure track faculty of outstanding stature who have a documented record of exceptional expertise and superior achievement in their field, and whose appointment has been approved by the dean of the student's school. *Schools and programs may have additional requirements. Students should consult with their programs prior to forming a committee.*

**The original form is to be kept by the program and a signed copy provided to the student.**

Student Name: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ Student I.D.# \_\_\_\_\_  
 Last First  
 Phone: \_\_\_\_\_ E-mail: \_\_\_\_\_ POST Code: \_\_\_\_\_ Major: \_\_\_\_\_ School: \_\_\_\_\_

The program verifies that the student has satisfactorily completed all pre-examination requirements:  
 GPA: \_\_\_\_\_ (minimum of 3.0) Units: \_\_\_\_\_ (minimum of 24 units in residence)

**If the student is changing the committee chair, the signature of the previous chair is required here:  
 For all changes of committee, please list the names of all committee members. Only the new member(s) and committee chair are required to sign.**

<u>Committee Members</u> <i>Printed names</i>	<u>Rank</u>	<u>Appointment Type</u> <i>Tenured/ Tenure track/ Non-tenure track</i>	<u>Home Dept.</u>	<u>Signature</u>	<u>Date</u>
Chair	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

<u>Committee Members</u> <i>Printed names</i>	<u>Rank</u>	<u>Appointment Type</u> <i>Tenured/ Tenure track/ Non-tenure track</i>	<u>Home Dept.</u>	<u>Signature</u>	<u>Date</u>
_____	_____	_____	_____	_____	_____

*Please complete the section below for all appointments and changes of committees.*

	<u>Printed Name</u>	<u>Signature</u>	<u>Date</u>
Student	_____	_____	_____
Department Chair or Program Director	_____	_____	_____
Dean	_____	_____	_____