



The Physiologist

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Targeting Relevance: The Challenges of Interdisciplinary Teaching and Learning

Barbara E. Goodman

**Arthur C. Guyton Educator of the Year 2011
Sanford School of Medicine of the Univ. of South Dakota**

One of my most unhappy experiences as an undergraduate at Duke Univ. was my English composition class first semester freshman year. After excelling in high school, I fully expected to be Phi Beta Kappa in college. Imagine my chagrin when I received an F on my first theme in English comp! I carefully prepared my second theme on which I also received an F (but it was "much better than the first"). This traumatic experience certainly validated my choice to major in chemistry instead of the humanities.

Interdisciplinary Undergraduate Courses

Recently, this chemistry major turned physiologist has been involved in the development and implementation of a truly interdisciplinary course for undergraduate students of all majors. During the fall of 2010, the Univ. of South Dakota (USD) embarked on a new course for all upper-class students that would meet the requirements of the South Dakota Board of Regents for an upper level writing course with an emphasis on globalization. I was chosen to be one of the faculty facilitating the course,



Barbara E. Goodman

known as XDIS for cross-disciplinary, with two faculty members from different disciplines and a graduate student from English as the writing fellow working as a team. In order to strengthen student writing skills in the course, the teaching faculty had to grade essays (108 students and three faculty or about 36 essays every two weeks). This kind of interdisciplinarity was not something that I had ever trained for or

thought that I would be needed for! As the student who eventually got a C in English comp in college, who would have thought that I would become the grader for this interdisciplinary class of students of numerous majors at USD (natural science, social science, education including physical education, business, fine arts, and humanities). This opportunity has certainly drawn out the "renaissance woman" aspects in this physiologist!

Traditionally, many basic biomedical scientists have been trained in very specific areas in the research laboratory as either graduate students or postdoctoral fellows and then have been lucky enough to find academic positions with varying requirements for teaching. Those of us trained as
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systems physiologists may bemoan the fact that many of the younger cellular and molecular physiologists have a weak understanding of the physiology of the whole organism. Thus, they may be less secure in preparing to teach physiology broadly than the systems physiologists have been. However, the realities of today's curricula are that often times faculty are asked to teach in interdisciplinary blocks or courses. This not only challenges us to become more broadly trained physiologists and biomedical scientists but also more broadly trained scholars.

In 2009, the Association of American Medical Colleges and Howard Hughes Medical Institute released a report of their partnership to examine the natural science competencies of graduating physicians by the Scientific Foundations for Future Physicians (SFFP) Committee that they formed including educators from small colleges, large universities, and medical schools (1). One of the goals of the SFFP in regards to premedical course requirements is to allow undergraduate institutions to develop more interdisciplinary and integrative science courses that will break down departmental barriers and foster interdisciplinary approaches to science education. This competency-based approach is designed to develop entering medical students who are more evenly prepared for the study of medicine and to allow medical school curricula to concentrate more on the growing scientific knowledge needed for the practice of medicine. Similarly, the Committee on Undergraduate Biology Education to Prepare Research Scientists for the 21st Century of the National Research Council of the National Academy of Science recognized in its 2003 Bio 2010 report on Transforming Undergraduate Education for Future Research Biologists that additional concepts in mathematics, physical, and information sciences should be emphasized in biology courses and life science examples should be used in mathematics and physical science courses (2). The report recommends that university administrators support the development of an interdisciplinary course in biology with collaboration between mathematics and science faculty. In addition in the report of the 2009 national conference entitled "Vision and Change in Undergraduate Biology Education: A Call to Action" organized by the American Association

for the Advancement of Science with support from the National Science Foundation, four action items were identified: the need for integrating core concepts and competencies throughout the undergraduate science curriculum; the requirement for greater focus on student-centered learning; the mandate

disciplinary learning augments critical thinking and the ability to learn at a higher cognitive level. The third ability enhanced is student integration of conflicting insights from different disciplines. Different interpretation of issues by different disciplines expands the perspective of the learner in being

"Research in cognition and instruction has found that interdisciplinary learning strongly enhances four different cognitive abilities."

to promote campus-wide curricula for change; and the encouragement to fully engage the biology community in implementing change (10). The Vision and Change report identifies several models of interdisciplinarity, including an evidence-based interdisciplinary approach to undergraduate biology education incorporating concepts of physics, chemistry, and mathematics into biology courses and using case-study approaches that help to integrate social, environmental, and ethical concerns into the life sciences (10). Furthermore, the SFFP committee believes that at both the level of undergraduate schools and of medical schools, interdisciplinary approaches will be important to these new directions in science education (1). Thus, graduates of PhD programs in the biomedical sciences who become future faculty will need to be able to expand their teaching personas to be able to communicate with diverse scholars and to develop courses far different from the disciplines in which they were trained.

So why is there a growing emphasis on interdisciplinary teaching and learning? Research in cognition and instruction has found that interdisciplinary learning strongly enhances four different cognitive abilities (6). The first ability that is fostered is recognizing and understanding alternate viewpoints. It is easier for the learner to understand and analyze problems from different points of view when exposed to different perspectives during the learning process. The second ability strengthened is being able to develop better structural knowledge of problems and being able to analyze them at a higher level of Bloom's taxonomy (applying, analyzing, evaluating). The broader understanding of the issues from inter-

able to deal more knowledgeably with issues. The fourth ability strengthened is helping students to develop an interdisciplinary understanding of problems and questions. Interdisciplinary learners are better at evaluating how they learn and what they learn. In summary, the gains for students from interdisciplinary learning include a broader understanding of the problem due to a more comprehensive and holistic treatment of key concepts, an advancement of metacognitive skills (knowing about knowing) and critical thinking, and ability to integrate and assimilate knowledge transfer to other contexts (4). Thus, interdisciplinary learning leads to the strong critical thinking and writing skills that are generally touted as major goals of most teaching efforts in higher education.

Faculty members are being asked to become more involved in designing curricula that are interdisciplinary and integrative. The National Center for Science and Civic Engagement has sponsored Science Education for New Civic Engagements and Responsibilities (SENCER) institutes since 2001 to support faculty curriculum initiatives through a National Science Foundation's Course, Curriculum, and Laboratory Improvement Program national dissemination track (7). The Univ. of South Dakota sent a team of six faculty members to a SENCER summer institute in 2003 to design a new two-semester laboratory course for non-science majors on the theme of Science: The Core of Discovery based on the Missouri River Institute at USD and the explorations of Lewis and Clark. The faculty team included a physiologist (me), two chemists, a physicist, an historian, and a science education faculty member. The course was initially

designed to have two natural science faculty members and a social science faculty member team-teaching (not tag-team teaching) the course throughout

XDIS course since its inception and have now taught three semesters (with one more coming up spring 2012), I would like to mention some of the

“....curricular changes need the support of an institution’s administration to be given appropriate time to evaluate reasonable student outcomes to see if they have succeeded or failed in meeting their goals.”

the semester. While the curriculum-design team spent many hours designing the student learning objectives, the teaching and learning activities, and the student assessments, unfortunately the course was never offered due to both equipment and faculty costs. The institution found it to be not cost effective to allocate three faculty members for teaching one course.

The XDIS course mentioned above was designed by a team of approximately a dozen faculty members from different disciplines over the summer to replace a signature program at USD known as IdEA (Interdisciplinary Education and Action). The IdEA program initially required students to take three courses outside of their major based on a theme (generally a foundation course, a specialty course, and a small enrollment capstone course with an action component: service learning, research, or creative activity). Over the years, due to student dissatisfaction and the large demand for faculty involvement, the program changed to require only the foundation and capstone courses. By the summer of 2010, the IdEA program had been disbanded and the XDIS course had been created. A new active learning classroom for 108 students was built; 12 students sit at each of nine U-shaped tables. Each table has monitors at the end that can project individual computers. Students are divided into teams of six for the entire semester and work together on several projects and numerous in-class discussions. While the XDIS course is still evolving into a course that is less demanding on both the students and the faculty, a decision was recently made by the administration to cancel the course in favor of the major programs offering their own upper-level courses with the requirement for a research paper and a globalization component.

Since I have been involved in the

advantages and disadvantages of this approach to truly interdisciplinary teaching and learning. The primary reality that XDIS has faced is that our upper-class undergraduate students believe that any course (particularly any required course) that does not apply directly to their major is a waste of time. Thus, even though changes have been made every semester to make the course more palatable and more useful to the students’ future careers, student course evaluations have continued to be unfavorable. The first semester of XDIS was facilitated by a physiologist (me) and a political scientist (with a strong interest in neuroscience). The topic was happiness and we had the students read cognitive psychologist’s Daniel Gilbert’s *Stumbling on Happiness* as the basis for discussion and essays (3). The semester had too many essays and assignments to be written by students and graded by the faculty and having the students work in groups to write a research paper on some aspect of happiness was rather disastrous for achieving a cohesive end product. Two issues for course evaluations were also the previous student negative reputation of the IdEA program and the failure of the faculty to convince the students that working together in cross-major groups would really help them with skills that they need for jobs after college.

The second semester, I was paired with a philosophy professor who had majored in chemistry in college. We cut many of the writing assignments but kept the same textbook and theme and still required the groups to write a group paper on happiness. Even though we kept mentioning skills that the students were learning that would be useful to them in the future, they were still not convinced that the course was worth their time. The third semester, I was still paired with the philoso-

phy professor and we once again cut the number of assignments as we instituted a new pedagogy that has been better received by some of the students. The course theme this semester was based on being able to evaluate resources to see if they are fact or fiction and no textbook was used. The class was divided into formal teams and the principles of team-based learning were being used including requiring readings before class followed by individual and group readiness assessment tests (4). Each component of the course was much more carefully tied to the overall goals of having the students write an individual research paper and having them learn how to work in interdisciplinary teams. After the readiness assessment tests on the major topics (finding and evaluating information and arguments; Modern Language Association (MLA) rules and relativism; writing, rhetoric, and Powerpoint; and teamwork, freedom, and compromise), the students in the class voted on topics in the news to be investigated and discussed during class time using online and provided resources (evolution, cutting state support for education and increasing tuition, alcohol on Native American reservations, fashion, smoking on campus, drinking age of 18 for 3.2% beer, etc.). While the course just finished, the students complained much less frequently this semester and were definitely engaged in the discussions in the classroom. Thus, it is possible that modifications in XDIS over the three semesters may have made it a less onerous requirement. However, in conclusion, curricular changes need the support of an institution’s administration to be given appropriate time to evaluate reasonable student outcomes to see if they have succeeded or failed in meeting their goals.

Interdisciplinary Medical Student Courses

In addition to encouraging interdisciplinary teaching and learning efforts at the undergraduate level, the SFFP suggests that faculty integrate the teaching of physical, chemical, mathematical, and biological sciences in medical schools through integrated, non-departmental approaches (1). The Liaison Committee for Medical Education, the accrediting body for US medical schools, has long been encouraging increased active learning oppor-

tunities for medical students including case-based and problem-based learning activities to add clinical relevancy to the foundational basic science information. Here at the Sanford School of Medicine of the Univ. of South Dakota, we are in the middle of a curriculum reform that will result in merging the course material from the traditional first two years of medical school (first-year courses based on normal, healthy humans; second-year courses based on unhealthy humans) into about a year-and-a-half of two cores of foundation material followed by system blocks that address the learning objectives formerly found in physiology, histology, pharmacology, pathology, and microbiology. In this new curriculum, the faculty teams are required to offer no more than 16 hours of lecture per week and to incorporate team-based, problem-based, and case-based learning approaches to assist student learning. The students will also have weekly opportunities throughout the 18 months to participate in clinical experiences. While every basic science faculty member is aware that adding clinical relevance to one's presentation to the medical students is a must, this integrative interdisciplinary approach to facilitating learning is aimed at enhancing student learning by providing obvious connections to their future careers the first time that medical students learn the material. The Sanford School of Medicine is a community-based medical school, and there are no clinical faculty members located on the basic science campus while the clinical campuses are 25, 60 or 400 miles away. The new curriculum design effort is requiring that teams of teaching faculty from the multiple disciplines included in each block talk with and plan the blocks in conjunction with clinical faculty members. This has proven to be a very time-consuming endeavor.

Along with all of these strongly encouraged changes in pre-medical and medical curricula, the assessment tools including the Medical College Admissions Test for undergraduates and the US Medical Licensing Exam for future doctors have also been changing. The MR5 Committee (MR5: 5th Comprehensive Review of the Medical College Admission Test® (MCAT®)) revising the MCAT has proposed changes that will reflect changes in medical education (7). The test will evaluate student understanding of concepts in the

natural sciences generally taught in biology, general chemistry, organic chemistry, physics, and biochemistry. There is a new second section on social and behavioral sciences that will include concepts from introductory psychology, sociology, and behavioral sciences including mental processes and behavior. The new third section will require analysis of information from passages from the social sciences and humanities which may address various issues such as ethics and philosophy, cross-cultural studies and population health. The USMLE Step 1 exam has already been modified to feature a number of integrative vignette-type questions to assist the medical students in blending the material from a number of different disciplines taught during the first two years of medical school. "Step 1 (of the USMLE) is constructed from an integrated content outline that organizes basic science content according to general principles and individual organ systems" (9).

These varied experiences have taught me several useful requirements for faculty members to consider before becoming involved in curricula reform and redesign. When one embarks on curricular redesign projects, the curriculum team should be guaranteed support from the administration for the outcomes of the project for at least three to five years after the design and implementation phase. Financial commitments to the pedagogical and faculty requirements and support during student adjustment to the new initiatives must be solid in order to get past the early growth phases of the new curricula. Furthermore, throughout one's higher education career, faculty members from multiple disciplines and career paths need to be able to interact regularly to broaden everyone's perspectives on teaching and learning. When diverse faculty cannot speak the same language of education, introduction of interdisciplinary curricular changes becomes much more difficult. One way to encourage faculty from different disciplines to interact in educational venues is to have strong administrative support and appropriate rewards for faculty who commit extra time and effort into becoming outstanding teachers. Thus, time and effort spent sharing how to enhance student learning will be more valued by individual faculty and by their supervisors. Graduate students who are seeking careers as future faculty should be

strongly encouraged to learn about teaching and to practice teaching while still graduate students or early post-doctoral fellows. These trainees should also continue to relate to trainees from other disciplines in order to gain an appreciation for the similarities and differences in approaches to teaching and learning. Trainees and junior faculty should be challenged to participate in honors seminars and other topic-based courses outside of their disciplines in order to maintain their broad undergraduate understandings of problem solving to enhance their future interdisciplinary and integrative teaching. The professional scientists of the future may be required to teach topics outside of their discipline area with non-science colleagues who approach scholarship in different ways.

Many physiologists are already being required/encouraged to participate in the design and implementation of interdisciplinary and integrative teaching and learning experiences with other natural science colleagues, as well as social science and humanities colleagues in undergraduate programs. Some of the reasons behind these endeavors involve attempts at improving student learning and others involve external factors such as governing and accreditation bodies. Various assessment tools are being developed and used to evaluate specific advances in student cognitive learning due to interdisciplinary teaching. In addition, many medical schools utilize various activities requiring team-based, problem-based, and case-based learning to enhance the critical thinking and life-long learning skills of the future doctors. Thus, medical school physiologists are also working closely with colleagues in other biomedical science disciplines and with clinicians to modify curricula in medical schools. All of these initiatives support strong education/training in liberal arts for future careers as faculty members in many institutional settings. Even the former undergraduate chemistry majors might find themselves grading research papers written in the Modern Language Association (MLA) format about the deterrent effect of capital punishment vs. life in prison. Interdisciplinary teaching is clearly challenging and requires willingness among faculty members to sometimes succeed and sometimes fail as one attempts to approach student learning

from multiple perspectives. Thus, assessment of student outcomes from interdisciplinary and integrative teaching efforts is a must before new curricula are finalized.

It is a great honor for me to have been chosen the Arthur C. Guyton Educator of the Year for 2011. As an undergraduate chemistry major at Duke Univ., I initially planned on going on to either medical or veterinary school. I was lucky enough to have a work-study job running the Egyptian sand rat breeding facility for noted animal physiologist Knut Schmidt-Nielsen during my sophomore through senior years; however, I never had time to take a physiology course as an undergraduate. I had my first physiology course in 1973 at Auburn Univ. where we used Guyton's Textbook of Medical Physiology as the required text. That course really turned me on to physiology! Based on these initial exposures to physiology, I decided that what I really

wanted to be when I grew up was a physiologist and not a practitioner. Thus, I began applying to PhD programs in physiology and the rest is history. Thank you Dr. Schmidt-Nielsen and Dr. Guyton! ♦

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Plan Now to Attend APS Career Development Sessions at EB2012

Trainee Symposium: E-Media Tools for the Professional Scientist

(sponsored by the Trainee Advisory Committee)
Organizers: Jennifer Bomberger and Erica Dale-Nagle
Wednesday, April 25; 10:30 AM-12:30 PM

Using e-media to Find Funding Opportunities

Christopher Dant (Dartmouth Univ.)

E-medial Tools for Teaching

Aaron Bunker (Morningside College)

Social Media in the Life Sciences

Kristy Meyer (Sigma-Aldrich)

Ethical Implications of Social Media

Natalie Brown (Happy Place Marketing)

Mentoring Symposium: Conflict Resolution: How to Keep Everyone Happy!

Organizers: Roy L. Sutliff and Angela J. Grippo
Wednesday, April 25; 8:00-10:00 AM

Squashing Squabbles

Patrick O. Smith (Univ. of Mississippi Medical Center)

Disagree and Advance Your Career: Nonviolent Approaches for Dealing With Your Superior

Barbara A. Horwitz (Univ. of California, Davis)

Overcoming Laboratory Disagreements From a Trainee Perspective

Jennifer Sasser (Univ. of Florida)

Careers Symposium: Do I Need Another Degree?

Organizers: John D. Imig and Sonya D. Coaxum
Monday, April 23, 10:30 AM-12:30 PM

Benefits and Opportunities in Science for a JD Degree

Blair Taylor, (San Diego, CA)

Opportunities in Academia for Scientists With an MBA degree

Matthew Kluger, (George Mason Univ.)

Physiology and Public Health: What Can an MPH Degree Do?

Robert Carter III, (US Army)

Public Policy and Career Opportunities in Physiology

Sarah K. England (Univ. of Iowa)

APS Council Holds Fall Council Meeting in Jacksonville, FL

The APS Council held their fall meeting at the Sawgrass Marriott in Ponte Vedra Beach, FL November 3-4, 2011. Council received reports from the Publications, Finance, Membership, Education, and other Committees. APS staff members Marsha Matyas, Robert Price, Alice Ra'anani, and Rita Scheman joined the meeting to assist with the committee report presentations.

The Publications Committee reported that Gary Sieck, Mayo Clinic College of Medicine, has been appointed as the next Editor of *Physiology*. Dennis Brown, Editor, *Physiological Reviews* was reappointed for a second three-year term.

The Publications Committee reported that the 2010 Journal Impact Factors for PRV was 28.417, which was ranked highest among all physiology journals (and one of the highest ranked among all biomedical journals, at 6th place). The Committee also reported that *AJP-Heart* has published 18 audio podcasts (<http://ajpheart.physiology.org/>) and *AJP-Renal* has published four audio podcasts (<http://ajprenal.physiology.org/>).

The Finance Committee presented Council with the projected final 2011 budget and the proposed 2012 budget, both of which were accepted and approved by Council.

The Education Committee reported that the next Professional Skills Training Course will be held in January 2012 and is entitled "Writing and Reviewing for Scientific Journals." This four-day course teaches participants about the manuscript writing, submitting, and reviewing processes as

participants receive critiques on their first-author draft manuscripts. A new Professional Skills course will be presented in March—"Networking at a Scientific Meeting."

Based on a recommendation from the Daggs Award Committee, Council approved the selection of APS member Barbara Horwitz, Univ. of California, Davis, as the 2012 Daggs Awardee. She will receive her award at the 2012 APS Business Meeting on Tuesday, April 24 at EB12.

In January 2011, APS convened a strategic planning meeting with representation from the APS Council, Section Advisory Committee, Trainee Advisory Committee, and APS staff. Based on the Strategic Plan Report developed from the meeting (<http://www.the-aps.org/publications/tphys/tphys8x11.pdf>), five task forces were formed to address each key area identified in the Strategic Plan report. The five task forces formed addressed the following strategic priority areas: 1) develop strategies to strengthen the Society's publications in a changing world; 2) enhance opportunities for scientific interaction and exchange; 3) actively work to attract, meet the needs of, engage, and retain membership subgroups; 4) increase efforts to ensure awareness of, and advocacy for, the discipline of physiology; and 5) increase the exposure to physiology in life sciences and health sciences education. Each task force had an initial conference call and presented a preliminary report to Council.

Additional details of the Council's 2011 fall meeting will be presented to the membership at the 2012 APS Business Meeting. The Business Meeting will be held at EB12 on Tuesday, April 24, at 6:00 PM in the San Diego Convention Center. All APS members are encouraged to attend.

Council Action Items

- Council approved the recommendations of the Finance Committee accepting the 2011 estimated budget and approved the 2012 proposed budget.
- Council unanimously approved a recommendation from the Publications Committee to increase the honoraria paid to the Editor-in-Chief and the Associate Editors of the APS journals.
- Council unanimously approved a motion to transfer 26 regular members to emeritus membership status.
- Council unanimously approved the selection of Barbara Horwitz as the 2012 Daggs Awardee.
- Council unanimously approved submitting a symposium proposal to the FEPS meeting as organized by APS President Joey Granger.
- Council unanimously approved a motion to donate \$10,000 to the FASEB centennial fund to support FASEB's advocacy efforts.
- Council unanimously approved a motion to maintain a US affiliation with the IUPS and to pay \$20,785 to the IUPS to cover the Society's share of the IUPS dues. ♦



Back Row (l-r): Ken Baldwin, Ann Schreihof, Ida Llewellyn-Smith, Ron Lynch, John Chatham, JR Haywood, David Brooks, Alan Sved, Jane Reckelhoff, Thomas Pressley, Usha Raj, Jeff Sands. Front Row (sitting l-r): Pam Carmines, Peter Wagner, Sue Barman, Joey Granger, Patricia Molina.

Reporting of Studies Using Animal and Human Subjects in APS Journals: How the Society Protects Authors from Ethical Minefields

Bill Yates, Department of Otolaryngology, Univ. of Pittsburgh, PA
and Kim E. Barrett, Department of Medicine, Univ. of California, San Diego, La Jolla, CA

Why does APS care about ethical standards?

As a scholarly publisher, APS has a responsibility to ensure not only the novelty, but also the integrity of the research that is published in the pages of our journals. Integrity of the scientific literature is vital for a number of reasons. First, science is an iterative process, and physiology is no exception to this rule. Thus, advances must rest on the research that came before. If the latter is untrustworthy for any reason, it may hamper our ability to move the field forward and to uncover insights into the mechanisms of health and disease. Second, many, if not most, physiologists are dependent on funding from federal and other sources to pursue their research goal. Often very substantial sums are expended, and the taxpayers that finance a considerable portion of biomedical research are entitled to expect application of the highest ethical standards to the work that is so supported. As the tangible end product of such funded research, papers published in APS and other journals should be beyond reproach. Third, in many countries, federal, as well as local, regulations govern the conduct of research, and especially the use of animal and human subjects therein.

Animal subjects research is a particular concern for the APS. Not only does the subject matter of physiology often mandate testing of our hypotheses in integrative, such as animal, models, but this imperative also makes the Society, and its publications, subject to special scrutiny. Indeed, activist groups that are vocal in their opposition to animal experimentation routinely scan our journals to detect any studies that they consider may have been conducted using inappropriate approaches. These issues have led the APS to be especially vigilant in ensuring that animal studies are consistent with all appropriate policies and standards.

Physiologists also often conduct studies using human subjects, be they patients with a specific condition or healthy volunteers. Even if studies are performed in the context of routine clinical care and/or can be considered to represent a minimal, if any, risk to the

subjects, it is still important that readers can appreciate that all appropriate measures were taken to protect the subjects involved from risks both to their safety and their privacy. However, for both human and animal experimentation, the APS is usually not in a position to judge directly whether the work reported is in accordance with appropriate standards and regulations. We rely heavily on the opinion of institutional bodies, particularly to explain the acceptability of the study in question in the local context.

APS' ethical standards for experiments conducted on animal and human subjects

APS' ethical standards for experiments performed on animals are articulated in the "APS Guiding Principles for the Care and Use of Vertebrate Animals in Research and Training" (http://www.the-aps.org/pa/resources/policyStmnts/paPolicyStmnts_Guide.htm). These principles require that procedures conducted on animal subjects must be prospectively approved by an oversight body such as an institutional animal care and use committee (IACUC), unless the laws in place in the country where the research is performed specifically exclude the species utilized in the study. For example, in the United States, it is expected that research conducted on vertebrate animals will be approved by an IACUC prior to the work being initiated. APS requires that authors include a statement in their manuscript stipulating that the relevant oversight body approved the research conducted on animals. Furthermore, APS requires that appropriate anesthetics be used during animal surgeries, and that analgesics and/or other techniques be used to minimize discomfort and pain (including postsurgical pain) except when the intervention would compromise experimental goals. In such cases, the oversight body must specifically approve the exclusion of measures to alleviate pain. Furthermore, it is expected that appropriate endpoints will be selected for the study, and that animals will be humanely euthanized in accordance with the American Veterinary Medical Association's Guidelines on

Euthanasia prior to death related to experimental manipulations. APS will only publish experiments with death as an endpoint if euthanasia would compromise the experimental goals and the oversight body has specifically approved this exception.

Research on human subjects published in APS journals must conform to the most recent revision of the World Medical Association's "Declaration of Helsinki—Ethical Principles for Medical Research Involving Human Subjects" (<http://www.wma.net/en/30publications/10policies/b3/>). The most fundamental principle is respect for the individual (Article 8), their right to self-determination and the right to make informed decisions (Articles 20, 21 and 22) regarding participation in research, both initially and during the course of the research. Furthermore, the relevant ethics committee in the country where the work is conducted must approve research performed on human subjects. In the United States, this ethics committee is called an "institutional review board" or IRB. APS expects authors to include a statement in their manuscript stating that approval of the ethics committee was obtained before the work commenced.

Identification and review of ethical issues related to research conducted on animal and human subjects

A reviewer, editor, or staff member in the Publications Office can identify potential ethical concerns related to animal or human subjects research in a manuscript submitted to an APS journal (or indeed, one that has already appeared in print). These concerns are then brought to the attention of the Editor-in Chief of the journal, who is required to inform the Chair or Vice-Chair of the APS Publications Committee as well as the APS Ethics Officer. The latter two individuals manage any needed investigation arising from the initial concern. At this point, review of a submitted manuscript is suspended until the ethical concern is resolved. Typically the Ethics Officer consults confidentially with experts to determine the validity of the concern;

the Chair of the APS Animal Care and Experimentation Committee is involved when concerns relate to the use of animals in a study. The most common issue that triggers an ethical review is omission of a statement that the work was reviewed and approved by the relevant oversight committee. Concerns have also been raised about animal studies that failed to adequately describe anesthetics used during surgery or analgesics administered to relieve postsurgical pain, as well as studies that used death as an endpoint. Other possible issues that may trigger an ethical review of studies on animals are the use of prolonged restraint or atypical housing or husbandry conditions.

In some cases, the concern is rapidly dismissed because it is determined to be erroneous. For example, if concerns were raised by a reviewer about the lack of IACUC approval for a study conducted on *Drosophila* in the United States, the concern would be dismissed because the use of this invertebrate species is not regulated. In other cases, the concern is relayed to the authors, who are asked to address the issue. For instance, if the use of postsurgical analgesia was not described in the manuscript, the authors may be queried about this omission. If it is determined that the concern was related to an insufficient level of detail in describing procedures that were conducted, such as the omission of a description of the postsurgical care of animals, the authors are asked to revise the paper to clarify precisely how the study was conducted. In some circumstances, authors may be asked to submit a copy of their protocol approved by the oversight body or a letter from the director of the oversight body (e.g., the Chair of an IACUC) to verify their assertions that the procedures had been prospectively approved. It is common for APS to request such verification for studies employing death as an endpoint, studies that excluded postsurgical analgesia, or those that incorporated non-standard procedures such as prolonged restraint. Documentation provided by an author is handled confidentially, and is never released to a third party. Once APS is satisfied that the study was conducted ethically and in accordance with procedures approved by the oversight body, the scientific peer review of the manuscript will continue.

Minimizing the risk of an ethical concern being identified regarding procedures conducted on animal and human subjects

It is understandably distressing for an author to be questioned about the procedures that he/she has employed in working with animal or human subjects. However, in the vast majority of cases, ethical concerns raised during the review of a manuscript submitted to an APS journal are dismissed because it is determined that the problem was related to an inadequate or incomplete description of the relevant procedures. As noted above, an ethical review is automatically triggered if relevant manuscripts fail to include a statement indicating that the appropriate oversight body approved the work. Thus, most ethical concerns can be avoided by disclosing salient information. For example, when reporting a study conducted on animals, all pharmaceutical agents that were administered, including pre- and post-operative treatments, should be indicated, and the time course of treatment should be described. Any nonpharmaceutical methods used to alleviate pain and distress, such as gradual acclimation for studies involving restraint, should also be discussed. A complete description of the methodology used during a study, including techniques included to assure animal welfare, will allay most potential ethical concerns of reviewers, editors, and readers. Of course, this will also permit others to repeat the work or build upon it. If a study includes non-standard procedures conducted on animal or human subjects, it is prudent to consult with the journal editor prior to submission of the manuscript for

advice on how to describe the work, as well as assurances that can be prospectively provided to avoid ethical concerns that could be raised during the review process.

Possible sanctions when ethical problems are identified

In rare cases, concerns are not alleviated following consultation with the authors of a submitted or published manuscript, despite the receipt of animal or human protocols and supporting information. In these cases, the APS has reason to believe that the studies reported were not in compliance with APS guiding principles and/or the legal framework that regulates such studies in the country or countries where the work was completed. Under these circumstances, the APS usually has a legal, as well as a moral, obligation to pursue the investigation further, including by directly communicating with the relevant authorities at the institution(s) where the work was completed. An example of such a situation would be when the manuscript specifies that a particular technique or treatment was employed, but a review of the protocol reveals that the use of the technique was not approved by the IACUC, IRB or equivalent. Discovery

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of such an infraction may prompt rejection of the manuscript in question if still under review, or retraction if the paper has been published. In severe cases, the APS may choose to sanction the authors involved by imposing a ban on submissions from the authors, as well as the ability to serve as a reviewer, for any APS journal for a specified period (typically one to two years). While punitive, these measures protect both the society, as well as the integrity of the literature we publish, and can be an important proactive measure in deflecting the attentions of animal rights activists.

Why APS' strict adherence to ethical guidelines benefits authors

Authors react to questions about their animal and human subjects protocols with a range of emotions ranging from mild dismay to considerable anger and indignation. However, it is important to remember that our procedures protect not only the APS and its publi-

cations, but also the authors themselves. Particularly in the case of simple errors and omissions, an ounce of prevention in terms of clarifying the work actually performed can easily avoid many pounds of grief when readers or, worse, activists and/or the media raise concerns about the work once it is in the public arena. In our view, authors should be reassured by the fact that APS so carefully scrutinizes manuscripts for their compliance with our policies before the work has appeared in print. While we cannot catch everything, the combined review by editors, peer reviewers, editorial staff and copyeditors, and members of the Publications and/or Animal Care and Experimentation Committees represents a powerful approach to avoiding at best embarrassment, and at worst legal challenges. Inquiries can likewise represent a useful trigger to initiate a conversation with students and trainees about standards for conducting and reporting work with human or

animal subjects. Even if a more serious issue is identified that leads ultimately to rejection and/or sanctions, it is far preferable to relay this to one's institution in a timely fashion, such that corrections to process can be made and any liability for repayment of federal funds that may have supported unapproved research can promptly be addressed without penalties. Certainly, those charged with research compliance within an institution, if not the authors themselves, should be grateful for an early warning of looming problems.

Bill Yates is Chair of the APS Animal Care and Experimentation Committee.

Kim Barrett is the former Chair and current Vice-Chair of the APS Publications Committee.

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APS Promotes Physiology to Mid-Level Educators at National Convention

The APS highlighted physiology for middle school science teachers and administrators at the annual National Middle School Association/Association of Middle Level Education (NMSA/AMLE) Conference that was held in Louisville, KY November 10-12. This was the first time for an APS presence at this conference attended by over 4,000 teachers, administrators, and counselors from across the country. The APS Booth was extremely busy and well received with many questions about the Frontiers Program, the

Archive, and Careers material.

APS member Jeff C. Falcone, Univ. of Louisville Department of Physiology and Biophysics helped lead a hands-on workshop with Margaret Shain, Project Coordinator, and Tonya Smith (2004 Frontiers Research Teacher) that gave teachers the opportunity to explore the digestive system in a new and exciting way. Teachers were challenged to build a digestive system using only household items in a teacher developed unit, *Junkyard Digestion* (Diana Hill, 2002). The


standing room only crowd used the rubric to rate each of the systems outputs in a competitive and fun closing activity. Jeff then challenged teachers to critique what part of the digestive system failed modeling the questioning techniques that help students in upper level thinking strategies. Teacher reviews of the workshop were excellent and commented on the need for more hands on learning workshops that helped teachers understand inquiry teaching methods. ♦



Tonya Smith (2004 Frontiers Teacher) manned the busy booth at the NMSA National Conference in Louisville, KY.



Jeff Falcone, Univ. of Louisville Dept. of Physiology and Biophysics, questions teachers on their design method during the Junkyard Digestions Workshop, at the NMSA Conference in Louisville, KY.




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As a result, there are more than 300 students seeking mentors in all fields, especially physiology...and not enough mentors to go around.

APS Presents Awards for the Best Physiology Projects at Local Middle and High School Science Fairs

APS members continue to judge and present Science Fair Awards on behalf of the APS at local and regional science fairs for precollege students across the nation. The student selected to have the best physiology-

related project receives an APS t-shirt, an APS researcher pin, and a certificate. The student's teacher receives the APS Women Life Scientists book and a K-12 resource packet.

Any APS member who participates as a judge in a local or regional science fair at an elementary, middle, or high school in their community is eligible to apply and receive an APS award packet. For more information, visit: <http://www.the-aps.org/education/sciencefair/index.htm> or contact Scarlettta Whitsett (swhitsett@the-aps.org) in the APS Education Office.

Daniel Alborn, an eighth grader at Howard Bishop Middle School in Gainesville, FL, received an APS award for the best physiology project at the school's science fair. APS member Deborah Scheuer of the Univ. of Florida was the judge who presented the award. Daniel's project, "Investigating the Honeybees Sensory Capabilities Using their Ability to Learn," was also selected to present at the regional science fair. The teachers and sponsors were Dr. Doherty and Mr. Jost.

James Kalan, a fifth grader at Preston Hollow Elementary School in Dallas, TX received an APS award for the best physiology project at the Preston Hollow Elementary School Science Fair. APS member Connie Hsia of the Univ. of Texas Southwestern Medical Center was the judge who presented the award. James' project, "The Status of Status Quo," tested which type of music would assist people in memorizing a set of numbers better. The teacher and sponsor is Dawn Pratt. ❖



APS member Deborah Scheuer presented an APS Science Fair award to Daniel Alborn at the Howard Bishop Science Fair. Pictured are Dr. Doherty (head of Science Fair), Deborah Scheuer, Daniel Alborn, Mr. Jost (Daniel's teacher) and Mr. Lynch, another science teacher who helps run the fair.

People & Places

Rasgado-Flores Presents Lectures

Hector Rasgado-Flores, Associate Professor of the Department of Physiology and Biophysics of the Rosalind Franklin University in North Chicago imparted the 2011 Santiago Ramon y Cajal lectures at the School of Medicine of the National Autonomous Univ. in Mexico City. He gave three concert/lectures entitled "Brain, Music and Sense." The lectures explored why music is such a powerful mood modifier, and the connections between mathematics, creativity, discovery, language, neurotransmitters and music.

Frontera Named Inaugural Chair

Walter Frontera, has been named the inaugural chair of Vanderbilt Univ. Medical Center's newly created Department of Physical Medicine and Rehabilitation. He will join VUMC on April 1, 2012. From 2006 through 2011, Frontera was professor of Physical Medicine and Rehabilitation at the Univ. of Puerto Rico (UPR), and served as dean of the Faculty of Medicine. Currently, he is principal investigator for the Puerto Rico Clinical and Translational Research Consortium. <http://www.mc.vanderbilt.edu/reporter/index.html?ID=11674>.

Flix R. Shardonofsky is Professor Pediatrics in the Div. of Pediatric Respiratory Medicine, Scott and White Children's Hospital, Temple, TX. Prior to this move, Shardonofsky was Professor of Pediatrics at the Univ. of Texas Health Sciences Center, Houston, TX.

Phyllis M. Wise is now Vice President, Univ. of Illinois and Chancellor, Champaign, IL. Prior to this move Wise was Provost & Vice President of Academic Affairs, Univ. of Washington, Seattle, WA. ❖

Why and How to Get Involved with the American Physiological Society

Jane F. Reckelhoff

Univ. of Mississippi Medical Center, Jackson, MS

Why Should You Get Involved With APS?

As a graduate student, postdoctoral fellow, or junior faculty member, you may not think this is important, especially if you haven't yet decided what area of research you plan to study or whether you will stay in academics or go to industry or some other non-traditional career. However, no matter your chosen career path or stage of your career, there are several reasons to be active with the APS that you should consider.

Develop a network of scientists.

First of all, it is important to develop a network of scientists. It's never too soon to get to know as many scientists as possible in your field or a field of your potential future interest. This will help you as you look for your next position, whether it will be to find a postdoctoral position in academics or industry or to begin a career (as a faculty member, in an industry position, or in another career choice). The APS is made up of more than 10,000 scientists, academicians, industry employees, and individuals who are members of many other careers and who are from the United States and around the world. You will get to know people at your same career stage and field of interest with whom you will likely come into contact frequently during your whole career. In addition, you will get to know other scientists who could become mentors and friends as you progress through your career life. Many promotion and tenure committees at universities require letters of recommendation from individuals at other institutions who know you and your work, but are not your postdoctoral or predoctoral advisors. Junior investigators may not be thinking about promotions and tenure this early in their career. However, involvement in APS committee work could allow you to meet more senior individuals who could impact your career many years later and even provide these recom-



Jane F. Reckelhoff

mendations for your promotion and tenure packets.

Recommendation letters. Knowing investigators from around the world will be important as you go on to your next position, whether that be a postdoctoral position or a faculty position, a position in industry, or a non-traditional career choice. You will need recommendations for these positions, and meeting individuals who are also members of APS will give you something in common with them. These individuals will be more willing to write letters of recommendation if they know you and your work and can attest to the quality of your work. Furthermore, most awards given by APS or other societies require recommendation letters, and developing relationships with other scientists who know your work will help you when applying for these types of programs.

Grant funding success. Another reason is related to grant funding success.

In case you haven't noticed, obtaining grants is very competitive, regardless of whether the funding is from a national source, such as the NIH or NSF, or from a foundation, such as the Juvenile Diabetes Association or American Heart Association. This means that any advantage that one can have, in addition to being able to write a really great grant, could be helpful in getting funded. It is always helpful if your study section members know who you are, and your pedigree. This could put you in a more favorable funding bracket ahead of others with equally good grants. Do not underestimate the importance of your peers knowing who you are.

Have a voice in APS. A third reason to get involved with APS is that it allows you to have a voice in what the Society is doing. If there is an area of science (or politics) that you feel passionate about, whether it is advocacy or education, there is likely to be an APS committee that is devoted to that endeavor. Importantly, the APS has a Trainee Advisory Committee (TAC) that is made up of trainees appointed by the sections of the APS. In addition, most standing APS committees have

Jane F. Reckelhoff, PhD, is a Professor in the Department of Physiology at the University of Mississippi Medical Center in Jackson, MS. She received a B.S. in Chemistry from the College of William & Mary, and a Ph.D. in Biochemistry from the Medical College of Virginia/Virginia Commonwealth University in 1985. She did two postdoctoral fellowships, one at the University of Texas HSC in Dallas and the other at West Virginia University. In 1991 she received her appointment as Assistant Professor in the Department of Physiology & Biophysics at the University of Mississippi, followed by tenure and promotion to Associate Professor in 1996 and full professor in 2001. She is the former Chair of the APS Women in Physiology Committee. She currently serves as one of APS' elected Councillors.

positions for trainees, both postdoctoral and pre-doctoral candidates. Because APS is a society that is committed to mentoring, most section steering committees have positions for trainees, both postdoctoral and pre-doctoral students. In addition, there are often positions on section steering committees for junior faculty members.

Committees are fun! Finally, getting involved and serving on APS committees is fun! While there will be work involved, you will have lots of fun interacting with other scientists. Seeing how different committees work will provide insight into how the APS works.

Things to Consider Before You Volunteer to Participate in APS Committees

This may seem like a strange paragraph to include in an article asking you to serve APS or any other society. There are many rewarding reasons to becoming involved in APS committees, as described in the previous section. However, there are two main conditions under which you should reconsider volunteering. The first reason not to get involved is if you simply want to “pad” your curriculum vitae. Being an active participant in a society means that you will be working on behalf of that society. If you are only volunteering because it looks good on your record, it will become apparent to others on the committee and at the APS, and you will be doing a disservice to the society and to yourself. This leads to the second reason.

Because being active in a society requires work, it is important that when you volunteer you are committed to not only do the work of the committee to which you are assigned, but that you are able to do this in addition to, not in place of, the commitments that you already have as a graduate student or postdoctoral fellow. Be honest with yourself about your reasons for volunteering and whether you can truly make the required commitment.

So How Do You Get Involved With APS?

The answer is to volunteer!
Volunteer for committees. This time of year, sections are calling for nominees to the various standing committees in the APS. The list is available online at www.the-aps.org/committees. This site has a list of committees, what the committee does in the Society, and what qualifications, if any, are necessary to be a member of the committee. There is also a list of current committee members. In addition, at this website, there is a nomination form, an endorsement form, and a list of positions available on committees for the upcoming year (click on the-aps.org/committees/nominate.htm). Fill out your Nomination Form, get an APS member to fill out the Endorsement Form on your behalf, and submit it to nominations@the-aps.org. Only one endorsement form should be submitted for each candidate form submitted. These forms are due in mid January (for 2013 committee appointments, the nominations/endorsements have to be in by January 17, 2012).

How does the process work? In early February, the Committee on Committees (CoC) receives a copy of all the candidate and endorsement forms to review. The CoC, which is comprised of one representative from each of the APS sections and chaired by one of the APS Councillors, meets on Saturday morning before the EB meeting begins. At this meeting, nominations are discussed for each committee, and the final slate of candidates for all committee vacancies is selected. The list of candidates is then submitted to Council for final approval. All nominees are notified in late May/early June regarding the status of their nomination. The committee assignments start on January 1 of the following year.

Volunteer with your section. Each section steering committee has a Trainee Advisory Committee member that sits on the APS society-wide TAC. Some sections even have their own trainee-organized subcommittee to

involve more trainees. These section trainee-focused committees do all kinds of things for the section, such as monitor and update the Facebook and Twitter sites for the section, help plan trainee receptions and trainee abstract-driven awards sessions sponsored by the section. To be involved with your section, contact your section chair—if you don’t know who that is, look at the website at www.the-aps.org/sections and click on your section. There is a link to the section steering committee members and the chair is listed there. Don’t be afraid to contact this person and volunteer.

Does It Cost?

If you’re worried about how much it costs to be on an APS committee, don’t! Pay your APS dues [graduate students: \$10 for 1st year, \$25 for subsequent years up to 5 years total; postdoctoral fellows: \$77.50 (half of regular membership for 5 years)] to be a member of the Society. You will likely attend EB with your mentor (remember the travel and other awards that you could apply for from APS if you’re a member; more information about EB awards is available at this website: www.the-aps.org/meetings/eb12/awards/index.htm). Most standing APS committees and sections have a face-to-face meeting at EB. If the committee meets again during the year, they will meet either by teleconference or by face-to-face, which is supported by the Society.

Make APS Your Scientific Home

The APS can be your scientific home throughout your career, and getting involved in the APS makes you an integral part of how your society works. So start thinking about the APS committees you would like to be nominated for next year. Who knows, you may someday be President of APS, and it starts by volunteering for a committee now! ♦

Acknowledgments

The author would like to acknowledge Drs. Michael Ryan, Barbara Alexander, and Christine Maric, from the Univ. of Mississippi Medical Center, for careful reading and suggestions for this article.

APS Leadership Meets with NIH Officials

On October 19, 2011, APS President Joey Granger, President-elect Sue Barman, Past President Peter Wagner and Science Policy Chair John Chatham met with officials at the NIH to discuss several issues of concern to APS members.

The first meeting was with National Heart, Lung and Blood Institute (NHLBI) Acting Director Susan Shurin, Acting Deputy Director Carl Roth and several division directors. Discussion centered on the important role that basic scientists in general and physiologists in particular play in advancing translational research. Other topics addressed included training and workforce issues and the peer review process, particularly NHLBI's use of stratified paylines for A0, A1 and A2 applications.

At the Division of Program Coordination, Planning and Strategic Initiatives (DPCPSI) the APS leadership met with DPCPSI Director James Anderson and Deputy Director of the Office of Strategic Coordination Elizabeth Wilder. Anderson outlined the role that DPCPSI plays in identifying emerging scientific opportunities, administering the Common Fund and developing resources for portfolio analysis and program evaluation. He also highlighted funding opportunities available through the Common Fund

(<http://commonfund.nih.gov/>), including the NIH Director's Early Independence Awards, New Innovator Awards, Pioneer Awards and Transformative Research Awards.

At the Center for Scientific Review, the APS leadership met with Acting Director Richard Nakamura, as well as Director of the Division of Translational and Clinical Sciences Joy Gibson and Director of the Division of Physiology and Pathological Sciences Sy Gaarte. Discussion touched on the importance of recruiting reviewers from underrepresented minority groups, the consequences of eliminating the A2 application, and the challenges presented by the new numerical scoring system, which does not always accurately reflect comments offered by reviewers.

At the National Institute for General Medical Sciences (NIGMS), the APS leadership met with Acting Director Judith Greenberg. Greenberg highlighted the recent NIGMS Strategic Plan for training, which includes recommendations for increasing diversity in the biomedical research workforce and preparing students for careers outside of academic bench science. Discussion also touched on the NIGMS policy for carefully reviewing applications from grantees with more than \$750,000 in research support.

Granger, Barman, Wagner and Chatham invited all of the NIH officials to submit articles on relevant topics of interest for publication in *The*

Physiologist. In addition, all four directors have been invited to participate in a symposium at EB 2012 that will feature some of the issues discussed at the meetings.

IOM Offers More Guidelines for Chimpanzee Research

NIH to Review its Portfolio

The IOM report sets a high bar for chimpanzee studies while at the same time recognizing areas of research where chimpanzees are still needed.

On December 15, 2011, the Institute of Medicine (IOM) released its long-awaited report, "Assessing the Necessity of Chimpanzees in Biomedical and Behavioral Research." (http://www.nap.edu/catalog.php?record_id=13257). Following a briefing where the key findings (<http://www.iom.edu/~media/Files/Report%20Files/2011/Chimpanzees/chimpslides.pdf>) were presented, NIH Director Francis Collins announced that NIH accepted the report and would begin implementing its recommendations.

Noting the two-edged sword represented by chimpanzees' closeness to humans, the IOM panel recommended additional guidelines for when to permit research involving chimpanzees. The panel's criteria are intended to determine whether the research is absolutely *necessary* to answer an important research question, as opposed to when it is *useful*. The criteria address issues such as the public health importance of the research question, availability of non-chimpanzee research models, whether the animals are housed in a species-appropriate habitat, whether the research can be performed ethically in human subjects, and whether forgoing chimpanzee research would significantly slow or prevent important research advancements.

Based on a review of current NIH-funded grants, the panel estimated that half of currently funded research might not meet these criteria and ought to be phased out. The panel also believes the need for chimpanzee research will decrease further in the



APS leadership visits NIH. John Chatham, Sue Barman, Joey Granger and Peter Wagner in front of Building 1 at the NIH.

future. However, it did not endorse a ban on chimpanzee research. Rather, it said that current and future research that meets the criteria should continue, and that the US should retain the capacity for chimpanzee research to address future health threats in cases where there is no other research model.

NIH to Implement Recommendations

Immediately after the IOM report was issued, NIH Director Francis Collins released a statement (<http://www.nih.gov/news/health/dec2011/od-15.htm>) endorsing its recommendations. Collins also announced an interim moratorium on new grants for chimpanzee research while NIH reviews current and proposed research using the new criteria. He said that the criteria will be applied to research with chimpanzees owned by NIH, supported on NIH grants, or housed in NIH funded facilities. According to the IOM panel, there are 937 chimpanzees at five NIH-supported facilities, including four National Primate Centers and the Alamogordo Primate Facility. Of this total, 612 animals are owned by the NIH, and many of the others have been part of various NIH-funded research projects. At present there are 27 extramural and 10 intramural research grants involving chimpanzees.

In accepting the report, NIH Director Collins said the agency will develop “a complete plan for implementation of the IOM’s guiding principles and criteria.” A working group within NIH’s Council of Councils will be asked to develop implementation plans and to “consider the size and placement of the active and inactive populations of NIH-owned or supported chimpanzees.” In response to a question about whether NIH would retire chimpanzees not on active research protocols meeting the IOM criteria, Collins pointed out that “retired” chimpanzees cannot be returned to research. For that reason, he will ask the NIH working group to assess what chimpanzee population should be maintained to meet current and future research needs. Collins also said that the working group would consider research projects individually and would not recommend rapid termination of projects where additional data can readily be collected to complete the study. A subsequent NIH policy announcement ([http://grants.nih.gov/grants/guide/notice-files/NOT-OD-](http://grants.nih.gov/grants/guide/notice-files/NOT-OD-12-025.html)

[12-025.html](http://grants.nih.gov/grants/guide/notice-files/NOT-OD-12-025.html)) stated that any research projects not deemed acceptable under the new criteria would be phased out “in a fashion that preserves the value of research already conducted.”

Further Criteria Proposed

Although all proposals for research with chimpanzees already undergo an ethical review, there are no uniform criteria to evaluate the absolute necessity of such research. Therefore, the panel proposed a broad set of principles to apply to all research with chimpanzees, as well as specific criteria for biomedical research as well as behavioral and comparative genomics research.

General Principles:

1. The knowledge gained must be necessary to advance the public’s health.
2. There must be no other research model by which the knowledge could be obtained, and the research cannot be ethically performed on human subjects.
3. The animals used in the proposed research must be maintained in either ethologically appropriate physical and social environments or in natural habitats.

Criteria for Biomedical Research:

1. There is no other suitable model available, such as in vitro, non-human in vivo, or other models, for the research in question; and
2. the research in question cannot be performed ethically on human subjects; and
3. forgoing the use of chimpanzees for the research in question will significantly slow or prevent important advancements to prevent, control and/or treat life-threatening or debilitating conditions.

Criteria for Behavioral and Comparative Genomics Research:

1. Studies provide otherwise unattainable insight into comparative genomics, normal and abnormal behavior, mental health, emotion, or cognition; and
2. all experiments are performed on acquiescent animals, in a manner that minimizes pain and distress, and is minimally invasive.

These recommendations seem to differ from current practice in two particular areas. They would not allow basic research even if it poses minimal risk, and they would preclude research to

benefit of chimpanzees and other apes, such as recent effort to develop an Ebola vaccine. The omission of research to benefit animal health is understandable since the panel was charged with evaluating NIH-supported research. However, NIH Director Collins decided to apply the guidelines not only to the research NIH funds, but also to animals it owns and research conducted in facilities it supports. The omission of minimally invasive basic research is more significant. Although comparative genomics research was mentioned in the criteria, comparative biology, comparative psychology, and comparative medicine were not. Inquiries in these areas may be beneficial to both human and chimpanzee health and ought to be permitted when the impact on the animal would be minor.

Summary of Findings

The panel concluded that although the chimpanzee “has been a valuable animal model in past research, most current use of chimpanzees for biomedical research is unnecessary, based on the criteria established by the committee.” These criteria distinguished between instances where chimpanzees were necessary to the research, as opposed to whether they were useful. Areas of research that the panel thought could be phased out include the study of malaria, HIV/AIDS, basic immunology, and a therapeutic vaccine and anti-viral drugs for chronic hepatitis C infection. Other current research areas likely to meet the new criteria include the development of certain monoclonal antibodies and a vaccine to prevent hepatitis C infection. However, even in these areas there are caveats. With respect to the development of monoclonal antibodies, the panel believes that new technologies will obviate the need for chimpanzees in the future, but those technologies still have to be refined and disseminated. With respect to a prophylactic vaccine for hepatitis C, the panel was evenly split on the question of whether continued chimpanzee research was necessary, leaving it up to an NIH working group to make the final assessment.

Nevertheless, the panel cautioned that in the future an emerging or re-emerging disease “may present challenges to treatment, prevention, and/or control that defy non-chimpanzee models.” In addition, the committee endorsed comparative genomics

research with chimpanzees since their genetic proximity to humans may shed light on human development, disease mechanisms, and susceptibility. The panel also noted that such research is more likely to be acceptable when it requires only blood or other biological samples that have already been collected or that will cause minimal pain and distress to collect. In addition, the panel acknowledged a need for some research on social and behavioral factors related to disease development, prevention and treatment.

NIH commissioned the IOM study at the request of Senators Tom Harkin (D-IA), Tom Udall (D-NM) and Jeff Bingaman (D-NM) in the wake of controversy over NIH's decision to move 176 chimpanzees from the Alamogordo facility to the Texas Biomedical Research Institute in San Antonio. In developing the report, the 12-member panel received expert testimony, existing and anticipated alternatives to chimpanzees in biomedical and behavioral research, and reviewed scientific evidence, including the literature. The panel also commissioned a paper on the topic, "Comparison of Immunity to Pathogens in Humans, Chimpanzees, and Macaques" that was published as a 70-page appendix to the 90-page report. In addition, the panel considered nearly 6,000 comments from sources ranging from scientific experts to members of the public concerned about the treatment of chimpanzees. Finally, it applied its new criteria to current chimpanzee research identified in NIH's RePORT database.

Congress Finalizes FY 2012 Research Budgets

On December 17, 2011, Congress passed an omnibus spending bill containing fiscal year (FY) 2012 funding for most of the federal government, including the National Institutes of Health (NIH) and VA medical and prosthetic research.

The bill provides \$30.6 billion for NIH, an increase of \$240 million (0.8%) over FY 2011. The bill also includes \$576 million in funding for the National Center for Advancing Translational Sciences (NCATS) and eliminates the National Center for Research Resources (NCRR). Most of the funding for NCATS comes from the

transfer of existing programs from NCRR and the other institutes and centers. Ten million dollars in new funding is provided for the Cures Acceleration Network within NCATS. The bill also lowers the salary cap on extramural grants from Executive Level I (\$199,700) to Executive Level II (\$179,700). Language accompanying the bill strongly urges the NIH to continue devoting nearly 90% of its budget to extramural research, and to establish safeguards to ensure that current spending on basic research across the institutes is maintained.

The bill also provides \$581 million for medical and prosthetic research at the VA. This is the same level that the program was funded at in FY 2011.

Funding for the National Science Foundation (NSF) and NASA was included in a smaller package of legislation signed into law in November. The NSF received \$7 billion, a \$173 million increase over FY 2011, and NASA received \$17.8 billion, \$648 million below FY 2011.

NIH to Adopt New Guide January 1, 2012

On December 1, 2011, NIH announced that the new 8th edition of the *Guide for the Care and Use of Laboratory Animals* would go into effect for all animal care and use programs on January 1, 2012. After that date, institutions conducting PHS-supported activities involving animals must apply the recommendations of the 8th edition to all activities covered under their Animal Welfare Assurances. During the next 12 months institutions will also be required to complete at least one semi-annual program review and facilities inspection using the new *Guide* and to develop a plan to implement any necessary changes. This implementation plan must be in place by December 31, 2012 even if the required changes themselves take longer than that to implement.

The APS website has a set up a webpage at <http://www.the-aps.org/pa/policy/animals/Guide.htm> with additional information on OLAW and AAALAC's implementation plans for the new *Guide*.

On February 24, 2011, NIH published an initial request for public comments on its plan to adopt the new *Guide*. Under this proposal, institutions would have been required to com-

plete a semiannual inspection with the new *Guide* by March 31, 2011. However, what was to have been a 30-day comment period on this plan was subsequently extended first to 60 and then to 90 days.

NIH received some 800 comments about the new *Guide*, including one from the APS which is posted at <http://www.the-aps.org/pa/resources/archives/comments/GuideResponse.pdf>. Before announcing its final implementation plan, NIH reviewed these comments and posted a summary and analysis on its website. According to NIH's analysis, while "a majority of respondents opposed the adoption of the 8th Edition of the *Guide*," many supported significant sections while objecting to specific issues. NIH's Office of Laboratory Animal Welfare (OLAW) sought to address these concerns in a commentary in which it affirmed the role of outcome-oriented performance standards along with practice standards developed by experts in laboratory animal care. OLAW also posted a series of Position Statements to "describe the ways in which OLAW expects institutions to implement the 8th Edition of the *Guide*." Topics covered include:

- Cost "cannot be the overriding factor" in animal welfare issues and compliance with the new *Guide*

AAALAC Announces Implementation Plans for the Guide

On November 3, 2011, AAALAC announced that it will grant institutions a phase-in period to make the necessary program modifications to conform to new "must" statements in the 8th edition of the *Guide*. For a one-year period through September 1, 2012, AAALAC will classify any findings based upon new requirements in the *Guide* as "Temporary Suggestions for Improvement." However, AAALAC expects that these issues will be resolved by September 1, 2012. After that date, uncorrected Temporary Suggestions for Improvement (with the exception of significant purchases such as new caging) will be considered Mandatory items for correction and may affect accreditation status. For additional details see the AAALAC announcement at <http://www.aaalac.org/news/index.cfm>.

- Performance standards may be used in determining appropriate housing
- Circumstances where pharmaceutical-grade chemicals may be required, and where non-pharmaceutical grade drugs such as investigational compounds, veterinarian- or pharmacy-compounded drugs, and/or Schedule I controlled substances can be used to meet scientific and research goals.
- When multiple surgical procedures are acceptable
- Applicability of the Guide to farm animals

A 61-day period public comment period on these position statements ends January 30, 2012.

On December 1, 2011 OLAW also updated 23 FAQs and issued six new ones. Of particular interest to researchers are the following updated topics concerning animal use and management:

- Is the use of carbon dioxide an acceptable euthanasia agent?
- May investigators use non-pharmaceutical-grade compounds in animals?
- What are the requirements for conducting rodent survival surgery?
- Are multiple major survival surgical procedures permitted on a single animal?
- Can performance standards be used in determining rodent housing practices including management of rodent breeding colonies?
- Are laparoscopic procedures considered major surgery?
- Is social housing required for nonhuman primates when housed in a research setting?
- Should positive reinforcement training be used for nonhuman primates?

In addition, OLAW issued new FAQs on the following topics:

- May performance standards determine housing issues?
- May performance standards determine environmental enrichment issues?
- Can performance standards be used in determining rabbit housing practices?
- May investigators restrict animals' food and fluid?

Director for Extramural Research Sally Rockey issued a request for input on how best to manage resources in fiscally challenging times. The APS submitted a response recommending that the NIH carefully consider the long term consequences of any changes to funding policy and focus on maintaining success rates at a level of at least 30%. APS also recommended using a diversity of approaches to alleviating the funding crunch, and continuing to prioritize funding for early stage investigators.

The current economic and political climate makes it unlikely that the NIH will see a substantial increase in funding over the next few years, and as a result the agency is looking to the scientific community for input on how best to balance scientific priorities with a limited pool of resources. The full recommendations of the APS appear below.

Recommendation #1: Consider long-term consequences of funding policy changes

Of primary importance when considering any changes to the current system of research funding is taking a long-term view of the outcomes. It will be extremely important to evaluate any funding policy changes under consideration to see how they affect the current biomedical workforce, as well as the next generation of scientists. The APS sees it as essential to maintain a workforce that has the skills and knowledge required to solve our nation's current and future biomedical and health problems.

Recommendation #2: Maintain Success Rates

To assure survival of the biomedical research enterprise, we recommend that steps be taken to maintain success rates for research project grants at a level no less than 30% in the current economy. That goal should be the primary driver of any other financial adjustments that need to be made. Steps should also be taken to maintain the total number of research project grants that are offered.

The last 10 years have seen a steady drop in grant success rates from the 30-35% range to the 20-25% range. It is important for investigators to have a reasonable chance of obtaining funding. Without that, a large body of excellent research will not be able to be done, and even more importantly, new investigators will be discouraged from entering the biomedical research arena

and will seek other careers. This would have a disastrous long term effect on biomedical research in the United States, and move the country away from its traditional position of leadership in this field.

We realize that success rates and paylines are determined both by the available funds for awards and by the number of applications. In order to maintain success rates at or above 30%, we recognize and support the concept that other financial adjustments will have to be made including some of the scenarios that were explored in the data slides "Ways of Managing NIH Resources."

Recommendation #3: Utilize a Diversity of Approaches to Manage Resources

Each of the scenarios outlined in the data slides carries a number of negative consequences for the scientific community. Individually the proposed changes (i.e., the size of grants, number of grants or total funding allowed per investigator, amount of salary covered by grants, etc.) will only marginally improve the situation. We encourage NIH to consider making multiple adjustments and then evaluate the outcomes to determine which pose the least threat to the survival of both the current and future biomedical research enterprise. We continue to feel that maintaining reasonable success rates is paramount, even if the size of grants and total funding allowed per investigator are smaller.

Funding policy should continue to emphasize meritorious science. Any limitations placed on the number of grants or total funding allowed per investigator should not be absolute rules, but rather incorporate flexibility provisions to allow funding the best science. We understand that this is the case at the National Institute of General Medical Sciences, where the Council takes a careful look at applications from investigators when their total research support reaches \$750,000. Another important consideration is how to account for situations involving multiple principal investigators on a grant, collaborations, and program project grants if NIH establishes limitations on the number of grants or total funding per investigator.

The APS encourages NIH to look beyond the current portion of the budget that is spent on research project

APS Comments on Managing NIH Resources

On October 17, 2011, National Institutes of Health (NIH) Deputy

grants (RPGs). Historically the percentage of NIH funds devoted to RPGs, and more specifically R01s, has been a few points higher than it is now. We recommend looking for ways to gradually rebalance the NIH portfolio to increase resources for investigator-initiated research project grants.

The APS also notes that many research-intensive institutions are not equipped to deal with a sudden loss or decrease in research funding and salary support for their investigators. Gradual implementation and subsequent evaluation will be important to determine how the research enterprise is being impacted.

Recommendation #4: Continue to Prioritize Support for Early Stage Investigators

Over the past few years, the NIH has taken steps to increase success rates for investigators beginning their independent careers. The APS is fully supportive of those efforts and recommends continuing to prioritize funding for early stage investigators.

The recent request for information from the NIH Working Group on the future of the biomedical workforce explored important questions concerning the appropriate size of the workforce. While adjustments to the current system of training may be necessary, we urge you to give consideration to ensuring balance between disciplines. Some fields of research may have too many students entering training programs for the available number of post-graduate career opportunities, while others have too few students entering the pipeline.

It is also important to consider that major changes to the way students are recruited and trained could have unintended long-term consequences. Attempts at reducing the pipeline of investigators by just a few percent in any area may cause a drastic decline in the workforce that would be difficult to recover from.

Recommendation #5: Minimize Administrative and Regulatory Burden Wherever Possible

Federally-funded researchers are subject to a growing set of regulations that cover everything from personal financial holdings and effort reporting to ensuring the humane care and use of animals in research. These regulations serve an important purpose in protect-

ing research integrity. However, complying with regulatory and administrative requirements takes significant time and resources on the part of investigators, institutions and funding agency staff. Looking for ways to minimize administrative and regulatory burden wherever possible will allow some of those resources to be applied to research.

APS Comments on the 21st Century Bioeconomy

On October 7, 2011, the Office Science and Technology Policy (OSTP) issued a request for information (RFI) on Building a 21st Century Bioeconomy. The purpose of the request was to solicit recommendations for “harnessing biological research innovations to meet national challenges in health, food, energy and the environment while creating high-wage, high-skill jobs.” The RFI posed a series of 17 questions. Excerpts of the APS response follow.

(1) Identify one or more grand challenges for the bioeconomy in areas such as health, energy, the environment, and agriculture, and suggest concrete steps that would need to be taken by the Federal government, companies, non-profit organizations, foundations, and other stakeholders to achieve this goal.

Years of research into the molecular components of biological systems have provided the raw materials for understanding the functions of cells, tissues, organ systems, intact organisms and even whole populations. However, despite tremendous gains in biomedical research there remains a need to integrate what we know about biology on the molecular and cellular levels with the function of organisms in all their physiological complexity. Doing so will lead to a better understanding of human health and disease, and facilitate the development of new treatments and prevention strategies. The scientific community is poised to move forward into these exciting new areas, but doing so will require funding support and recognition within funding agencies of how this work is critical to translational research. Federal agencies could further these translational goals through requests for applications and other funding mechanisms.

Importantly, additional support much greater than currently available will be necessary to speed progress and take advantage of scientific opportunities.

Another major challenge facing biomedical researchers is the integration and analysis of multi-dimensional data sets. Technologies developed in the last two decades have generated large amounts of different types of data. In order to take full advantage of this growing resource, the scientific community needs researchers with the necessary skills to harness the data, trained in both the biomedical and computer sciences. Research-intensive engineering and computer science universities should be encouraged to collaborate with health science partners to train researchers for work in this area.

(2) Constrained Federal budgets require a focus on high-impact research and innovation opportunities. With this in mind, what should be the Federal funding priorities in research, technologies, and infrastructure to provide the foundation for the bioeconomy?

Trying to identify “high impact research and innovation opportunities” may be counterproductive because it is difficult to identify such research in its early stages. It can often take years for the impact of a research discovery to become apparent. A narrow focus on identifying and funding high-impact research may not be an effective use of resources and could result in missed opportunities to fund research that may have unanticipated long-term impacts.

(3) What are the critical technical challenges that prevent high throughput approaches from accelerating bioeconomy-related research? What specific research priorities could address those challenges? Are there particular goals that the research community and industry could rally behind (e.g., NIH \$1,000 genome initiative [1])?

The National Institutes of Health (NIH) is trying to focus on translational research with the goal of accelerating the application of basic research findings. Basic physiological research has an important role to play in this process through target validation, efficacy testing and the identification of biomarkers. For example, one area of emphasis in the plan to streamline translational research is using high throughput techniques to identify tar-

get molecules and compounds that can potentially point the way to a new drug. This approach will require further research to validate the effect of these compounds in physiological systems.

Physiologists can place data generated from high throughput techniques into the context of physiological systems and aid in the development of pre-clinical models. Although working with animal models is expensive, time-consuming, and challenging, this work remains an important safeguard in the drug development process. We can maximize the benefit of high throughput technologies by continually improving validation models whether they are *in vivo*, *in vitro*, or *in silico*.

To solve large scale problems, collaborations will be necessary to bring together scientists with the appropriate expertise. One example of fostering collaboration to address major challenges comes from the National Institute of Allergy and Infectious Disease, which is funding three major HIV/AIDS research ventures targeting eradication of the disease, each characterized by investigators at several institutions and crossing traditional boundaries. This effort, the Martin Delaney Collaboratory, aims to accelerate progress toward a cure for AIDS by facilitating research partnerships among government, academia and industry.

(5) What are the barriers preventing biological research discoveries from moving from the lab to commercial markets? What specific steps can Federal agencies take to address these shortcomings? Please specify whether these changes apply to academic labs, government labs, or both.

The APS supports efforts to promote a better exchange of ideas and materials between researchers in academia and industry. As part of the NIH effort to advance translational sciences, the agency has been trying to develop agreements giving academic scientists access to unused or underutilized compounds. These are IP-protected compounds that pharmaceutical companies may have developed for one purpose that could serve another or else the company decided not to pursue because it did not work as expected or toxicity problems arose. The Drug Rescue and Repurposing initiative is part of the Chemical Genomics Center

Pharmaceutical Collection. This effort is designed to determine whether the compounds that have been approved for market and the thousands of compounds that never made it to market might be useful for diseases other than their intended purpose. The bio-industry and universities could play a big part in bioinformatics, development of new high-throughput screens, and safety and efficacy assessment of these compounds. There are numerous issues still to be worked out, including how to deal with intellectual property (IP) issues.

The APS also recommends that the government look carefully at financial conflict of interest policies to ensure that they are not unnecessarily inhibiting productive scientific relationships between federally-funded researchers and their colleagues in industry. It may be advantageous to look for ways to incentivize research partnerships between sectors in the “pre-IP” space.

(10) What roles should community colleges play in training the bioeconomy workforce of the future?

The APS recommends improving the quality of science education at community colleges and aligning science curricula with the needs of four-year colleges and universities. This will allow community college students to make a fluid transition to programs in biological, biomedical and bioengineering programs.

There are a large number of qualified individuals graduating from high school who cannot afford the costs of a four-year education at leading colleges and universities. Thus, by creating cutting edge science programs at the community college level, which are inherently more affordable compared to the college and university setting, it will be possible to enable more qualified individuals to move through the pipe line to meet future needs for scientists and physicians. This system is in place in the state of California where certain community colleges have been aligned with the Univ. of California campuses to create such a feeder system.

(11) What role should the private sector play in training future bioeconomy scientists and engineers?

The APS supports the idea of offering career training to pre-doctoral students. To ensure that the next generation of scientists has the skills to meet

the needs of the workplace, it would be advantageous to encourage the development of training programs that involve partnerships between industry and academia. It is especially important for graduate students and faculty to be informed of what industry is looking for in science. The drive for translational research, as well as academia’s growing involvement in the drug discovery process, requires that university scientists gain a solid understanding of the important questions that need to be addressed, for example, target validation, target engagement, developability and selectivity of drug candidates, biomarkers, potential companion diagnostics etc.

Many graduate programs bring in scientists from the pharmaceutical industry to speak with students about the drug discovery process, working in industry and interviewing for industry jobs. These efforts should be encouraged and expanded.

(13) What specific regulations are unnecessarily slowing or preventing bioinnovation? Please cite evidence that the identified regulation(s) are a) slowing innovation, and b) could be reformed or streamlined while protecting public health, safety, and the environment.

Currently, federal public health service (PHS) regulations require review of animal protocols every three years. However, most research grants provide support for four years. Harmonizing the review cycles for federal grants and animal research protocols would substantially reduce regulatory burden and free up resources at the level of the individual investigator, institutional administration, and federal agencies.

(14) What specific steps can Federal agencies take to improve the predictability and transparency of the regulatory system? (Please specify the relevant agency.)

Federally-funded researchers are typically subject to regulatory requirements from more than one federal agency. It would be advantageous to harmonize the regulations between agencies to reduce burden on individual investigators.

In addition, oversight agencies such as the USDA should take a constructive approach with respect to enforcing the Animal Welfare Act (AWA). Research institutions monitor their own compli-

ance with the AWA through an Institutional Animal Care and Use Committee or IACUC that reports to a designated Institutional Official. This often results in the prompt identification and correction of problems. We strongly urge that the USDA avoid taking a punitive stance when an IACUC does its job. In other words, a self-identified and self-corrected problem that is documented by the institution should not result in a USDA citation unless it represents serious and continuing noncompliance.

(17) What are the highest impact opportunities for pre-competitive collaboration in the life sciences, and what role should the government play in developing them? What can be learned from existing models for pre-competitive collaboration both inside and outside the life-sciences sector? What are the barriers to such collaborations and how might they be removed or overcome?

NIH could and should facilitate cross-institutional collaborations. It can be very difficult to collaborate with

research partners at other institutions, when jurisdictional responsibilities between regulatory committees in different institutions are not clear. It is redundant and wasteful for committees at two institutions to review all aspects of collaborative projects.

The complete APS response is available on at <http://www.the-aps.org/pa/resources/archives/comments/OSTPbioeconomyRFI.pdf>. ♦

Senior Physiologists' News

Letters to Margaret Anderson

Adelbert Ames III writes: "Thank you for the Senior Physiologists Committee's birthday wishes. It keeps coming as a surprise that I am already into my tenth decade."

"Having spent my professional career trying to learn how the brain works, I'm interested to find that I am learning more about it by observing it slowly being disassembled as a consequence of aging. For example, it now seems clear to me that we remember things with respect to their 'whatness' on the one hand and their 'whereness' on the other, the latter type of memory involving positioning things in three dimensional space. And 'whereness' is better remembered than 'whatness.' Thus, I often find myself in a room upstairs knowing that I'm in the right place, but I can't remember what for.

"A couple of comments from an observer whose viewpoint was founded in a prior time: I still think PHYSIOLOGY is central to our understanding of how living things work. It bridges the gap between our knowledge of the myriad of newly discovered chemical reactions and our knowledge of the changes they cause in the function (or malfunction) of the whole cell or organism.

"I'm dumfounded by the rate at which new discoveries are being made and grateful that I am not having to learn them all. It seems inevitable that, as scientists are required to master more details, the scope of their area of expertise must become narrower.

"I'm interested by how much of the work that researchers used to have to do for themselves can now be bought if their grant is big enough (e.g., chemical compounds, analytic devices, genetical-

ly modified organisms.)"

Douglas G. Stuart writes: "Many thanks for your letter of October 16 in which you send greetings on the occasion of my 80th birthday. My late reply is due to a plethora of deadlines and obligations as no doubt beset you, too. "I was once a member of the APS Senior Physiologists Committee (2001-2003), an assignment that I found to be most enjoyable and rewarding.

"In regard to my current interests, activities, and whereabouts, they have changed but little since mid-August, 1967. That was the year and month I moved with my family to Tucson to become a member of the then-new Department of Physiology at the Univ. of Arizona (UA) in the also new College of Medicine. We began with two faculty members, Paul Johnson, the department head, and myself, an associate professor. In early 1968 we were joined by William ("Bill") Dantzler, another associate professor, and then steadily more faculty with the current complement including almost 40 academicians most of whom balance research with participation in a variety of undergraduate and graduate training programs. As is commonly done in the USA today, medical students at the UA are now taught their basic science in an integrated fashion that combines the traditional disciplines and also features instruction to small groups of students and considerable emphasis on case-based learning. Graduate students, who used to take medical physiology in the former medical curriculum, now have separate systems physiology courses. Remarkably, our department currently has almost 600 upper division undergraduates who are majoring

in physiology! Their talent and dedication is a constant source of pride and inspiration for my colleagues and me just as are my department's other teaching, research, and research mentoring activities.

"In my opinion, the progressively increasing appearance of undergraduate programs in physiology at our nation's research universities is a major step forward for the discipline of physiology, the APS, and the health professions. At the UA, my department is proud to be among the USA departments that are on the forefront of this intriguing development.

"Paul Johnson was a dedicated and effective head of my department until 1987, followed by me for a short period (1988-1991) until I relinquished the position to become the college's associate dean of research (1991-1996), then Bill Dantzler (1991-2005), and now Nicholas ("Nick") Delamere (2006-). I have greatly enjoyed and profited from my association with Paul, Bill, and Nick, and many others in the physiology department, as well. Similarly, I have learned much and also enjoyed the company of UA colleagues in other disciplines as we developed interdisciplinary training programs in applied mathematics, biomedical engineering, neuroscience, and physiological sciences.

"About five years before my retirement on June 30, 2002 at the age of 71 years I told Bill Dantzler when I would retire such that he could make plans for my replacement.

"This transition was smooth and effective, and since then I have continued happily on in the department as an emeritus professor. That same year, I closed my experimental laboratory, solicited no more extramural research

funds, and focused solely on the submission for publication of completed research in parallel with focusing more and more on the writing of short reviews and historical articles on movement neuroscience, as studied from the cellular-molecular to the behavioral level of experimentation and analysis. This has been the area of my research since the late 1950s. Historical articles alone are now my mainstay, this being particularly enjoyable when I co-author articles with close friends and colleagues in several countries, which currently include Australia (my native land), Belgium, Canada, France, Great Britain, Japan, and the USA.

"My modest, albeit appropriate office is in the basement of a building on the attractive central mall of the main campus of the UA, where the undergraduate, MS, PhD, and postdoctoral trainees of four of our physiology faculty have office space and undertake their research. I have daily contact with these trainees and their faculty. All four of these talented faculty are also in the field of movement neuroscience, as studied in several species including drosophila, mice, neonatal rats, and humans. These daily social contacts and conversations about academic life in general, and the strategy of movement neuroscience research, in particular, are very invigorating for this 80-year-old!

"It is indeed a privilege to have this opportunity to work with such a fine group of bright, hard working, truly dedicated, and collegial people. My goal is to continue my current academic activities for the foreseeable future because neurophysiology has been my 'bread and butter' since 1955, when I was first exposed as an undergraduate to its challenge and possibilities.

"In my opinion, when academicians retire they should insure that they undertake activities to which they can apply passion. If along the way they were too busy to undertake pursuits that would have brought them a sense of accomplishment, then now is the time to correct this inadequacy. In my own case, however, this was not an issue. Neurophysiology, particularly as applied to study of the control of movement, was and remains the dominant theme of my endeavors.

"In order to stay physically fit and mentally effective in contributing articles on the history of movement neuroscience I now lead a quite simple life;

swimming in a UA pool at 6:00 am two to five times/week, working in my UA office for seven to eight hours, and then late in the afternoon exercising five times/week at a gym near my home, 14 miles from the UA. The gym work includes bicycle "spinning" classes, which I undertake with my wife of 54 years, Jean, and several social friends. Jean and I are also blessed by having two married daughters in Tucson with whom we have continual interactions. Contact with them, their spouses and our local grandchildren rounds out our social life, which is enhanced regularly by visiting or being visited by our two sons and their families who live in Los Angeles and New York City, respectively.

"You asked if I have 'any words of wisdom' to pass on to my younger colleagues. I do this daily! I urge them to 1) always follow their own star and accept the fact that this star may change and often more than once; 2) undertake their research with a sense of both humor and irony; and 3) be sure to always have fun while doing their research!! In my experience, people who are passionate about their work lead far more fulfilling lives than those who lack this opportunity or possibility. In an anthropological sense *Homo sapiens* is indeed *Homo faber*!

"Since my daily contact is with established and budding neurophysiologists I also urge my younger colleagues to maintain an interest and grasp of the overall neural control of movement. It is certainly true that trainees in most fields of physiology now need to apply ever-more-demanding and difficult techniques to a narrowly focused problem somewhere along the spectrum from the cellular/molecular to the behavioral level. Over the years, trainees in movement neuroscience at this and other universities have repeatedly asked me how they can delve deeply into a problem while also maintaining not only a broad view of their field as a whole, but also intellectual enquiry in general. In my opinion, interdisciplinary training programs offer the best possibility, wherein trainees have the opportunity to interact with their peers and faculty who approach the field from a variety of perspectives and levels of analysis. At the UA we have this environment in biomedical engineering, neuroscience, and physiological sciences in the form of graduate interdisciplinary programs."

Letter to William H. Dantzler

Stanley Schultz writes: "Many thanks to you, the APS, Marty Frank, and all of the society staff at 9650 Rockville Pike, many of whom I consider part of my extended family, for remembering me on my 80th birthday; indeed, during the years of my leadership of the APS (Council, 1989-91; President-elect, 1991-92; 65th President 1992-93), Harriet (my wife of 51 years) and I considered 9650 Rockville Pike my home away from home where I spent some of my happiest hours.

"I, sort of, retired about a year ago. As a member of the Emeritus (Latin for: he's out and he deserves it) Club I still participate in a Global Health Initiative that I started when I was Dean, and offer my opinion on a sundry of school matters whether solicited or not (English for: being a nuisance). Otherwise, I am spending more time with my grandchildren, in person or via Facebook; brushing up on my chess game so that I can keep up with my 13 year old and 10 year old grandsons; and studying U.S. and Russian history. I do scan the tables of content of the major physiology journals and read some of the articles of interest; but, as John Pappenheimer confessed to me a few years before he died, it's becoming more and more like reading a foreign language.

"Actually, my retirement in 2010 was my second retirement. I first retired from active laboratory research in July 2003. This was prompted in part by my trepidations at applying for yet another renewal of my NIH grant at age 72, and, in part, by a very tempting offer from the President of our Health Science Center to assume the Deanship of the Medical School; I chose the latter.

"My 44 years in research were very exciting and I derive extreme gratification from having established the scientific foundation for oral rehydration solutions (my students refer to it as Gatorade) for which I received the Prince Mahidol Award in Medicine from King Bhumibol of Thailand in 2007. I am grateful to all of my collaborators and assistants during those wonderful years.

"My three years as Dean were also challenging and rewarding. I derive great pleasure from having had the opportunity to supervise the beautiful restoration of the medical school building following the destruction wrought in 2001 by Tropical Storm Allison, and from obtaining funding for, and design-

ing, a new six story medical school expansion building with approximately 250,000 square feet of laboratory space and a 21st century Animal Care Facility. Among the most gratifying moments stemming from my life as Dean were attending the Ribbon Cutting for the Medical School Expansion (my!) Building in 2007 and administering the Hippocratic Oath to hundreds of graduating medical students at Commencement, which brought me close to tears.

"As I reflect upon my five decades in academic medicine (1959-2010) and peer, tremulously, into the future I cannot help but feel that we are leaving a period of 'feast,' and entering a period of 'famine.' When I was launching my research career I could focus almost exclusively on asking scientific questions, planning and executing experiments, interpreting results, and writing papers without the intrusion of concerns about funding, keeping a job, earning a salary, etc. It was the 'golden

age' of biomedical research. If you worked hard and were reasonably creative, a secure future was virtually assured. I was never seriously concerned about obtaining funding to continue my research or of retaining a faculty position.

"Regrettably, that 'golden age' is over, at least for the foreseeable future. Federal and local funding sources are diminishing and the assurances of the past have vaporized. Our junior colleagues face a difficult future where the need for hard work and unwavering determination is a truism. Perhaps the best advice I can give is to seek a strong research environment with supportive colleagues and inspiring mentors—senior faculty that are willing to go that extra mile, make that important phone call, write that special letter; established investigators who consider nurturing the next generation of physiologists an inextricable part of their academic responsibilities.

"I was privileged to have had a num-

ber of mentors that included: Cliff Barger (43rd Pres. of APS) who was instrumental in getting me my first postdoctoral fellowship in 1958 and who befriended and guided me until his death in 1996; Arthur Solomon, Founder and Director of the Harvard Medical School Biophysical Laboratories, who took a chance on an eager MD who had just completed a fellowship in cardiology and opened my eyes to the beauty of independent basic research; John Pappenheimer (37th Pres. of APS) whose love of physiology and teaching was a constant inspiration; and, Ernst Knobil (52nd Pres. of APS) who hired me for my first faculty position in 1967 and remained a close friend and academic model until his death in 2000. Each, in his own way, left an indelible mark on me for which I have been always grateful. I cannot wish those launching their academic careers better mentors than these." ❖

Current Calls for Papers

Physiological Genomics

Mitochondrial Metabolism

NextGen Sequencing Technology-Based Dissection of Physiological Systems

Functional Analysis of Sequence Variation

Technology Development for Physiological Genomics

Advances in Physiology Education

Teaching and Learning of Professional Ethics

American Journal of Physiology—Renal Physiology

Aldosterone and Epithelial Na⁺ Channels (Submission deadline: July 1, 2012)

Mathematical Modeling of Renal Function (Submission deadline: April 1, 2012)

Journal of Applied Physiology

Call for Commentaries on Point:Counterpoint Debates and Viewpoint Articles

American Journal of Physiology—Gastrointestinal and Liver Physiology

Physiology and GI Cancer

Intestinal Stem Cells in GI Physiology and Disease

Innovative and Emerging Technologies in GI Physiology and Disease

American Journal of Physiology-Regulatory, Integrative and Comparative Physiology

Integrative and Translational Physiology: Inflammation and Immunity in Organ System Physiology (Submission deadline: April 30, 2012)

Integrative and Translational Physiology: Integrative Aspects of Energy Homeostasis and Metabolic Diseases (Submission deadline: April 30, 2012)

For a complete list of current Calls for Papers, visit *The Physiologist* website.

Saturday, April 21, 2012

Ballroom 20A	5:30 PM-6:30 PM Physiology in Perspective—Walter B. Cannon Memorial Award Lecture Navar	
Room 24	8:00 AM-12:00 PM APS Education Comm Symp Refresher Course in Endocrinology: Diabetic Complications Williams/Ryan	
Room 25A	3:15 PM-5:30 PM WEH Section Award Session Trainee Award Finalists Session and Data Diuresis El-Marakby	
Room 25B	1:00 PM-3:00 PM APS ACE Comm Symp Public Outreach and Animal Research: A Toolkit for Investigators Yates	
Room 25C	3:00 PM-5:00 PM APS Communications Comm Symp Using Social Media to Communicate About Physiology and You Hicks	
Room 26	9:00 AM-11:30 AM Microcirculatory Society President's Symp Cation Channels in Vascular Control: ENaC, ASIC, and TrpV Proteins Boegehold	2:00 PM-5:00 PM Microcirculatory Society Symp II/ Young Investigator Novel Trends Lukaszewicz/Goodwill
Room 27	1:00 PM-3:00 PM APS Workshop Overcoming the Fear of Making Your Own Transgenic and Knockout Mice Kohan/de Caestecker	3:15 PM-6:15 PM APS Workshop Toolkit for Genomic Biomarker Discovery by Physiologists Joe/Miller

Bowditch Award Lecture

The Bowditch Lectureship is awarded to a regular member, 42 years of age or younger (at the time of the 2011 lecture), for original and outstanding accomplishments in the field of physiology. Selected by the APS President, the recipient presents a lecture at the Experimental Biology meeting, which is considered for publication in the Society journal of their choosing. The recipient receives an honorarium of \$2,500, reimbursement of expenses incurred while participating in the Experimental Biology meeting, and a plaque. The membership is invited to submit nominations for the Bowditch Lecturer. A nomination shall be accompanied by a candidate's curriculum vitae and one letter detailing the individual's status, contributions, and potential.

More information on the award and nomination procedures are available at <http://www.the-aps.org>. Nominations should be submitted online at <http://www.the-aps.org/awardapps>.

Physiology in Perspective Walter B. Cannon Memorial Lecture

The Cannon Memorial Lecture, sponsored by the Grass Foundation, honors Walter B. Cannon, President of the Society from 1913-1916, and is presented annually at the spring meeting to an outstanding physiological scientist, domestic or foreign, as selected by the President-Elect with the consent of Council. The recipient presents a lecture on "Physiology in Perspective," addressing Cannon's concepts of "The Wisdom of the Body." The lecture is considered for publication in the Society journal of their choosing. The recipient receives an honorarium of \$4,000, a plaque, and reimbursement of expenses incurred in association with delivery of the lecture. The membership is invited to submit nominations for this lecture. A nomination shall be accompanied by a candidate's curriculum vitae and one letter detailing the individual's status and contributions.

More information on the award and nomination procedures are available at <http://www.the-aps.org>. Nominations should be submitted online at <http://www.the-aps.org/awardapps>.

Sunday, April 22, 2012

	8:00-10:00 AM	10:30 AM-12:30 PM	3:30-5:30 PM
Ballroom 20A	<i>SEBM Symp: Stem Cell Biology 2012: Basic Science and Translational Advances</i> Adamo/Friedlander	10:30 AM-11:30 AM <i>CAMPS Section Davson Lecture</i> Knepper	<i>Physiology InFocus: Physiology in Medicine: Physiology of Obesity, Cardiometabolic Disease, and Therapeutic Weight Loss</i> Hall/Schreihofner
			6:00 PM -7:00 PM <i>Henry Pickering Bowditch Award</i> Liang <i>NCAR Trainee Featured Topic</i> Carter/Sabharwal
Room 22	<i>CV Section Symp: A Complex Interplay Coming Together to Build the Heart</i> Krenz/Polo-Parada	<i>CNS Section FT: Disruption to Central Sympathetic Control Mechanisms: Implications for Obesity-Related Hypertension</i> Sartor/Stocker	
Room 23	<i>PG FT: Translational Biomarkers of Hypertension: Insights from Animal Models</i> Joe	<i>PG Symp: Molecular and Cellular Therapy for Cardiovascular Disease</i> Sun	<i>Microcirculatory Society Landis Award Lecture</i> Pittman
Room 24	<i>Cross Sectional Symp: Brain Insulin: The Forgotten Metabolic Partner of Leptin?</i> Rahmouni/Brooks	<i>BMES Symp: Frontiers in Mechanobiology</i> Chien/Hsiai	3:30-4:30 PM <i>WEH Section Starling Lecture</i> Sandberg
			4:30-5:30 PM <i>WEH Section New Investigator Award Lecture</i> Sasser
Room 25A	<i>Teaching Section FT: Innovative Use of Technology for Teaching and Student Assessment in Physiology</i> Gopalan	<i>Resp Section FT: Lung Ion Channels and Fluid Homeostasis</i> Matalon/Kuebler	<i>Resp Section Symp: Stress-related Respiratory Disorders: From Clinical Manifestations to Abnormal Chemosensitivity</i> Gargaglioni/Kinkead
Room 25B	<i>WEH Section FT: Immune Cells and their Role in the Regulation of Blood Pressure and Sodium Homeostasis</i> Marvar/Mathis	<i>WEH Section FT: Hypertension: Mechanisms and Consequences</i> Moreno-Quinn/George	<i>CAMP Section Symp: The Role of Novel WNK Signaling Pathway in the Regulation of Sodium Channel and Transporters</i> Cai
Room 25C	<i>Publications Symp: Publishing 101: How to Get Your Work Published in APS Journals and Avoid Minefields Along the Way</i> Raff/Scherman	<i>NCAR Section FT: Autonomic Control of Visceral Functions</i> Travagli	<i>Teaching Section Symp: What Do Competencies Have To Do With My Teaching?</i> McCleary/Sukalski
Room 26	<i>J. Phys. / Phys Soc (UK) Symp: Red Blood Cell Mechanisms of Tissue Blood Flow Control: Physiological Insights in Health and Disease</i> González-Alonso	<i>CV Section Symp: Control of Vascular Tone by Extraluminal Nucleotides</i> Kirby/Mortensen	<i>CV Section Symp: Systems Biology of Cardiovascular Genomes and Proteomes</i> Loscalzo/Vondriska
Room 27	<i>Phys in Industry Symp: MicroRNAs in Human Disease and as Novel Therapeutics</i> Persinger/Liles	10:30 AM -11:30 AM <i>Teaching Section Bernard Lecture</i> Galey	<i>Renal Section FT: Young Investigator Award Featured Topic: Regulation of Transport Proteins in Kidney Intercalated Cells</i> Pastor-Soler/Petrovic
Room 28A	<i>CV Section Symp: Emerging Paradigms in Inflammation and Microvascular Dysfunction: Novel Insights and Future Trends</i> Chakraborty/Muthuchamy	<i>CV Section FT: Microvascular Permeability: Paracellular versus Transcellular Transport</i> Lominadze/O'Donnell	<i>CNS Section Symp: Functional Integration in the Hypothalamic Paraventricular Nucleus</i> Watts/Aguilera
Room 28B	<i>Hypoxia Group Symp: Air Pollution—Friend or Foe to the Cardiopulmonary Systems?</i> Wold	<i>Renal Section Symp: The Role of Oxygen Metabolism for the Development of Kidney Disease</i> Palm/Carmines	<i>Endo / Metab Section Symp: Endoplasmic Reticulum Stress and Vascular Physio-Pathology</i> Matrougui/Wilson

Monday, April 23, 2012

	8:00-10:00 AM	10:30 AM-12:30 PM	3:30-5:30 PM
Ballroom 20A	<i>NCAR Section Ludwig Lecture</i> Zucker	10:30-11:30 AM <i>Endo/Metab Section Berson Lecture</i> Schwartz	<i>Physiology InFocus: Physiology in Medicine: Using Physiology to Translate Cardiac Remodeling and Heart Failure</i> Lindsey/Horn
	9:00 AM-10:00 AM <i>NCAR Section Minisymposium: Angiotensin and Sympathetic Nerve Activity</i> Zucker		
Room 22	<i>Resp Section FT: Development of the Control of Breathing</i> Bailey/Bavis	<i>CNS Section FT: Chronic Intermittent Hypoxia: Respiratory, Autonomic and Cardiovascular Consequences</i> Schreihöfer/Toney	<i>Hypoxia Group FT: Compensatory Responses to Acute or Chronic Hypoxia Exposure</i> Schrage
Room 23	<i>CNS Section Symp: Towards a Biology of Body Weight Regulation: The Work of Stephen C. Woods</i> Seeley/Woods	<i>CV Section FT: Wiggers Award Featured Topic: Calcium homeostasis and endoplasmic reticulum stress in vascular function</i> Webb	3:30-4:30 PM <i>CNS Section Erlanger Lecture</i> Woods
Room 24	<i>Cross Sectional Symp: Hypoxia Inducible Factors (HIFs) in Health and Disease</i> Rees/Wilson/Watanabe	<i>NCAR Section Symp: Altered Central and Ganglionic Catecholaminergic Transmission in Cardiovascular Disease</i> Paterson/Teschemacher 2:00 PM-3:00 PM <i>EEP Section Adolph Lecture</i> Goodyear	3:30-4:30 PM <i>Renal Section Gottschalk Lecture</i> Caplan
Room 25A	<i>Endo/Metab Section FT: Novel Mechanisms for Improving Mitochondrial Efficiency</i> Crozier	<i>Resp Section Symp: Mechanobiology in the Lungs</i> Waters/Ridge	<i>NCAR Section FT: Molecular Sensors in Afferent Neurons that Contribute to Pain, Fatigue, and Activation of Autonomic Reflexes in Health and Disease</i> Benson
Room 25B	<i>WEH Section Symp: Regulation of Water and Electrolyte Balance in Diabetic Nephropathy</i> Roman/De Miguel	<i>WEH Section FT: Sodium and Water Homeostasis: Genetic and Comparative Models (cosponsored by Comp/Evolut Phys)</i> Pannabecker/Hyndman	<i>WEH Section FT: Origins of Impaired Cardiovascular-Renal Function and Body Fluid Balance</i> Nishimura
Room 25C	<i>PG Group Special Session: Trainee Highlights in Physiological Genomics</i> Zhuo/Moreno-Quinn	<i>CAMP Section FT: Ion Channels</i> Fuller/Carattino	<i>BMES Symp: Cell Motility in Health and Disease</i> Konstantopoulos/Wirz
Room 26	<i>Teaching Section Symp: Assessment of Student Learning and Scientific Teaching</i> Wenderoth	<i>Microcirculatory Society Young Investigator Symp: Oxidant Stress and Inflammation in the Microcirculation</i> Tune	<i>CAMP Section Symp: Cellular CO₂, HCO₃⁻ and pH Sensing</i> Praetorius/Brown
Room 27	<i>CAMP Section Symp: Ion Channels as Macromolecular Complexes</i> Coetzee/Delmar	<i>Comp/Evolut Phys FT: Future Directions of Mitochondrial Bioenergetics in Integrative Physiology</i> Jastroch	<i>Comp/Evolut Phys Symp: Impact of Environmental Estrogens and Androgens on Human and Animal Health and Reproductive Function</i> Stachenfeld/Rees
Room 28A	<i>CV Section FT: Communication between Cardiac Cells and the Extracellular Matrix</i> Chang/Gardner	<i>APS Careers in Physiology Comm Symp</i> Do I Need Another Degree? Imig/Coaxum	<i>CV Section FT: Emerging Paradigms in Microvascular Signaling</i> Straub/Westcott
Room 28B	<i>Renal Section FT: Novel Signaling Pathways in Renal Pathophysiology</i> Pluznick/Riquier-Brison	<i>Renal Section Symp: Pendrin: Hearing, Blood Pressure, Thyroid Function and More</i> Wall/Muallem	<i>Resp Section Symp: Novel Sites of Regulation in the Pulmonary Vasculature: Contradictions and Non-traditional Responses</i> Eldridge/Bates
Marriott, Rancho Las Palmas Room		11:30 AM-1:20 PM <i>History Group Lecture</i> Dempsey	

Tuesday, April 24, 2012

	8:00-10:00 AM	10:30 AM-12:30 PM	3:30-5:30 PM
Ballroom 20A			<i>Physiology InFocus: Physiology in Medicine: Hypertension and Chronic Kidney Diseases</i> Jose/Sullivan
			6:00 PM-7:30 PM APS Business Meeting
Room 22	<i>ETG FT: Regulation of Water and Ion Channels and Modulatory Proteins, Lipids, and Hormones</i> Worrell/Pastor-Soler	<i>ETG FT: Regulation of Transporters and Modulatory Proteins, Lipids, and Hormones</i> Welling/Levi	<i>ETG Symp: Novel Advances in Cystic Fibrosis Research and Drug Discovery</i> Stanton/Bomberger
Room 23	<i>Phys Soc (UK) Symp: Physiology of Calcium-activated Potassium Channels</i> Shipston/Ruth	<i>Endo/Metab Section Symp: Novel Roles of the Renin-Angiotensin System in Aging and Other Pathologies</i> Chappell	<i>CAMP Section Symp: Role of Ion Channels in Cell Migration</i> O'Grady/Brocheiro
Room 24	8:00-9:00 AM <i>Comparative and Evolutionary Phys Section Krogh Lecture</i> Supported by Novo Nordisk Fndn Hicks	10:30-11:30 AM <i>Respiration Section Comroe Lecture</i> Prabhakar	2:00 PM-3:00 PM <i>CV Section Berne Lecture</i> Touyz
			3:30 PM-4:30 PM <i>GI & Liver Phys Section Davenport Lecture</i> Said
Room 25A	<i>Endo/Metab Section FT: Effect of Exercise and Nutritional Perturbations on Cumulative Muscle Protein Synthesis</i> Riechman	<i>GI & Liver Phys Section FT: Intestinal Solute Transport in Inflammation</i> Eckmann	<i>Resp Section Symp: Computational Modeling in Central Respiratory Control and CO₂ Chemoreception</i> Solomon/Cordovez
Room 25B	<i>EEP Section FT: Thermal Physiology: From Acute Responses to Protective Adaptation</i> Minson	<i>EEP Section FT: The Lethality of Trauma: New Insights into the Physiology of Hemorrhage</i> Convertino	<i>EEP Section Symp: Nrf2 Modulation in Exercise, Aging and Chronic Disease</i> Miller
Room 25C	<i>CAMP Section FT: Cellular Signaling, Second Messengers, Cell-Cell Interactions</i> Bradbury/Helms	<i>CAMP Section FT: Ubiquitylation and Deubiquitylation of Ion Channels and Transporters</i> Hamilton/Balut	<i>Endo/Metab Section Symp: Kisspeptin Neurons: Central Mediator of Reproduction and Metabolism</i> Samson/Kelly
Room 26	<i>NCAR Section Symp: From Microscopes to Microneurography: Innovative Techniques for the Study of Central Neural Control</i> Young/Clark	<i>Renal Section Symp: Vasopressin Mediated Phosphorylation and Trafficking of Transporters Involved in Urine Concentration</i> Sands/Blount	<i>CV Section Symp: Physiological Remodeling of Resistance Arteries</i> Muller-Delp/Delp
Room 27	<i>CV Section FT: Transient Receptor Potential (TRP) Channels and Endothelial Calcium Regulation in Native Cells and Whole Vessels</i> Marrelli/Earley	<i>NCAR Section FT: Neurovascular Responses to Aging and Disease: Adaptations and Interventions</i> Schrage	<i>Muscle Biology Group Symp: Kruppel-like Factors (KLFs) in Muscle Biology</i> Haldar/Jain
Room 28A	<i>Resp Section FT: Cell-Cell and Cell-Matrix Adhesions in Control of Lung Fluid Balance and Innate Immunity: Talking is Critical!</i> Birukov/Mehta	<i>CV Section FT: Targeted Proteomic Analyses of Heart Failure</i> Ping/Lindsey	<i>AFMR Symp: Role of Adipose Tissue Macrophages in Mediating the Metabolic Effects of Obesity</i> Hawkins
Room 28B	<i>Renal Section FT: Mechanisms of Blood Pressure Regulation</i> Weiner/Grimm	<i>Comp/Evolut Phys FT: Understanding the Evolution of Physiology: Insights from Selection Experiments in Rodent Models</i> Garland, Jr./Meek	<i>Comp/Evolut Phys Symp: Hydrogen Sulfide: Ecology, Physiology, and Clinical Applications</i> Olson
Room 1A			2:00 PM-4:00 PM <i>APS Public Affairs Committee Tutorial: National Institutes of Health: Programs and Policies Update from Institutes</i> Chatham/Barman

Wednesday, April 25, 2012

8:00-10:00 AM

10:30 AM-12:30 PM

3:30-5:30 PM

Ballroom 20A

Physiology InFocus: Physiology in Medicine: Nobel Prize in Physiology or Medicine Lecture
Smithies

Room 22	<i>CV Section FT: Novel Regulators of Cardiac Fibroblast Function and Fate</i> Czubryt	<i>BMES Symp: Bioengineering of Regenerative Medicine</i> Bursac/Nelson	<i>CV Section FT: Leptin: Metabolic, Cardiovascular and Immune Control. Does it All Come from the Brain?</i> Belin de Chantemele/Lob
Room 23	<i>ALACF Symp: Contemporary Approaches to the Pathophysiology of the Cardiovascular System</i> Iturriaga/Machado	<i>History Group Symp: American Physiological Society: 125 Years of Progress</i> Tipton/Ryan	
Room 24	<i>Cross Sectional Symp: Recent Advances in Physiology and Disease: The Role of the Circadian Clock in Neural, Cardiovascular and Metabolic Function</i> Gumz/Rudic	<i>Mexical Phys Soc (SMCF) Symp: Central Control of Food Ingestion and Metabolism</i> Buijs	
Room 25A	<i>GI & Liver Phys Section FT: Gastrointestinal Physiology and the Microbiome</i> Worrell/Carey	<i>GI & Liver Phys Section Symp: Regulation of Intestinal Stem Cells During Development, Homeostasis, Adaptation and Pathophysiology</i> Zavros/Nanthakumar	<i>GI & Liver Phys Section Symp: Nuclear Receptors in Liver Disease</i> Wang/Chiang
Room 25B	<i>EEP Section FT: Anabolic Resistance to Exercise with Aging or Disease</i> Fluckey	<i>EEP Section Symp: Oxygen Transport and Fatigue in Humans: Unravelling the Mechanisms</i> Lopez Calbet/Dempsey	<i>EEP Section Symp: Regulation of Muscle Blood Flow by ATP during Exercise</i> Simmons/Bender
Room 25C	<i>APS Women in Phys Com Symp: Conflict Resolution: How to Keep Everyone Happy!</i> Grippe/Sutliff	<i>APS TAC Symp: E-Media Tools for the Professional Scientist</i> Bomberger/Dale-Nagle	<i>GI & Liver Phys Section FT: Host Responses to Gastrointestinal Infections</i> Eckmann
Room 26	<i>CV Section Symp: Mitochondrial Dynamics in Cardiac Physiology</i> Stanley/Rennison	<i>CV Section Symp: Insulin Resistance: A Defense Mechanism for the Stressed Heart?</i> Taegtmeyer/Hue	
Room 27	<i>AFMR Symp: Neurovascular Mechanisms and Targets in Stroke: From Cells to Humans</i> Ning/Lo	<i>Cross Sectional Symp: Essential Insights into Protein Interactions in Epithelia</i> Fenton	<i>EEP Section Symp: Reactive Oxygen Species, Exercise and Sarcopenia</i> McArdle/Brooks
Room 28A	<i>Resp Section FT: Respiratory Pattern Variability: Insights into Respiratory Control Mechanisms in Health and Disease</i> Dick	<i>Resp Section Symp: S-glutathionylation as a Mechanism of Oxidative Signaling</i> Snow/Anathy	<i>CV Section FT: Diabetic Cardiovascular Dysfunction: ROS-dependent and -Independent Causes and Complications</i> Wold/Meszaros
Room 28B	<i>Muscle Biology Group FT: Bone-Muscle Crosstalk</i> Brotto/Johnson	<i>Muscle Biology Group FT: Mechanical Muscle Damage: Is Titin the Giant, or is the Z-line Samson?</i> Myburgh	<i>Translational Physiology Group Symp: Mammalian Target of Rapamycin (mTOR) as a Central Player in Energy Balance Regulation</i> Torre-Villalvazo/Hargens



PHYSIOLOGY IN FOCUS:
PHYSIOLOGY IN MEDICINE
NOBEL PRIZE IN PHYSIOLOGY
OR MEDICINE LECTURE

Oliver Smithies

Univ. of North Carolina

*"On Being a Bench Scientist
for 50 Years"*

WEDNESDAY, APRIL 25, 3:30 PM

Ballroom 20A
San Diego Convention
Center

The Wine Wizard

Peter Wagner

Hi all: I have been running around too much to find a large number of good values this month, but I do have a few, see below. But first, I thought I would duplicate-publish my sparkling wine suggestions from a year ago verbatim – so self-plagiarism as well. As I reread the following from Dec 2010, I think the discussion still applies:

Sparklers worth having:

Low price: Freixenet is a big Cava (Spanish equivalent of champagne) producer and they make some very dependable and tasty white sparklers. I like Carta Nevada Brut and Cordon Negro Brut. Both are very widely available. The former is a touch sweet but full of tasty fruit and costs just \$6. Goes very well with cheese and crackers, smoked oysters and olives in front of the fire. The latter (wine, not the fire) is dryer and technically “superior” to the former and costs \$9 (Trader Joe San Diego prices). Both have just 11.5% alcohol so they will not dissolve your brain tissue.

Medium price: Schramsberg and Roederer Estate are two very reliable California sparkler houses that also make excellent bubbly. Schramsberg blanc de blancs is mid-\$20's; their blanc de noirs low-\$30's. Roederer Estate's non-vintage brut is about \$20. These are all classical sparklers with finesse, dryness, and light, zesty, apply/yeasty flavors and are clearly high quality.

Higher end: Veuve Clicquot is a true French champagne and is always excellent, again with light, clean, dry elements yet tasty and long-lasting. But it costs \$35-\$40. Still, that is less than many high end French bottles, and excellence is guaranteed.

And do not forget Australian sparkling Shiraz if you can find it. Not much gets to the USA, sadly, but if you can find one, give it a try. The makers usually leave a touch of residual sugar in the wine, but usually there is very good depth of flavor. Great with any red meat, obviously. No specific names to suggest because they are so rare – just ask your wine shop, and you never know. They vary in price from \$10 to \$30. I probably would not pick the cheapest.

Now that the *Journal of Applied Physiology* Editor will arraign me on ethics violations, I shall redeem myself with the following original material.

Whites

2010 Villa Maria Sauvignon Blanc, Marlborough, New Zealand \$10. Well, maybe I will still be accused of plagia-

rism, as the same words apply as in prior years and to other SB's from NZ: Tons of squeaky clean gooseberry, lime, passionfruit on the nose and palate; good crisp but not too puckering acidity, excellent body and length.

2010 Kim Crawford Sauvignon Blanc, Marlborough, New Zealand \$13. Well, maybe I will still be accused of plagiarism, as the same words apply as in prior years and to other SB's from NZ: Tons of squeaky clean gooseberry, lime, passionfruit on the nose and palate; good crisp but not too puckering acidity, excellent body and length. Get my drift?

2010 Whitehaven Sauvignon Blanc, Marlborough, New Zealand \$11. Well, maybe I will still be accused of plagiarism, as the same words apply as in prior years and to other SB's from NZ: Tons of squeaky clean gooseberry, lime, passionfruit on the nose and palate; good crisp but not too puckering acidity, excellent body and length. Enough.

Seriously, all three are excellent, continue the great NZ SB tradition, and differ only slightly in fruit, acidity etc. They are all great. Tip: do NOT imbibe them too cold (the wines should not be cold, your temperature is immaterial).

Reds

2009 Windmill Zinfandel (old vine), Lodi \$9. Lodi – lovingly still referred to by *los arrogantes* as the armpit of California – has been turning out some fine Zin for quite a while now. “Old vine” claims mean that the vines are, well, old. Folklore has it that the older the vine, the better the wine due to greater flavor concentration in fewer grapes. The truly old vines have 100 years or more. This one has a very clean nice cherry/raspberry nose. The palate is light and bright, slightly sweet, and the wine is not heavy at all. In particular, tannins are fairly soft, and there is no residual sugar to make it sweet (thank goodness).

2007 Rosenblum Zinfandel, Paso Robles \$15. This is just a very, very, approachable, tasty, balanced, well-made and drinkable wine. Not especially complex, it is the balance of fruit, tannin and acidity that come together so well. It is hard to describe in words, but when you sip it, you immediately want more. Bright cherry/raspberry fruit; not tannic, not sweet (Thank you Rosenblum) and perfect acidity.

2008 Heartland Shiraz, South Australia \$13. This is a typical middle of the road, fairly simple but deeply col-

ored and deeply flavored wine with excellent balance, medium low tannin, good acidity, and overall very pleasant. Why it is not more expensive is because it is not especially complex – good dark berry fruit, good balance, harmonious. There is interesting eucalyptus on the nose and palate, and some spice.

Allow me to list a few California Cabernets I don't usually get to taste. These are not low end, these are not high end, so I suppose these are mid-end (I know, oxymoronic, let it go). So you may not buy them, but if your boss offers them at the holiday party, you can plagiarize from the following descriptions to wow her:

a) 2007 Whitehall Lane Cabernet, Napa, \$32. A delightful little drop, charming and shy with a dainty cherry nose and palate, hints of herbal notes, with balanced acidity and tannin. Translation: good cherry fruit, medium bodied, balanced, some complexity with fruit and herbal characteristics.

b) 2009 Darioush Cabernet “Caravan” Napa, \$38. this is a big extracted and tannic wine that nonetheless is very enjoyable if you like the style because the fruit can handle the tannin. It has a bit of cinnamon, vanilla, and dill (American Oak). The fruit is very ripe, but overall the wine is complex and rich and would go very well with any red meat.

c) 2007 Stewart Cabernet, Napa, \$40. This wine is very forward – the nose is right there with lots of dark, very ripe, almost plummy fruit, a touch of tobacco and spice, and some toasty oak. Not as tannic as the Darioush above, and yet better fruit. Complex characters come together well. Needs food – duh.

d) 2008 Phelps Cabernet, Napa \$40. This is a cheapie – not Phelps Insignia at triple the price or more – and not to be confused with it either. The nose has lots of dark berry fruit, some oak char, and is a touch herbaceous at first. It is a well-structured wine driven by strong dark berry fruit, but with a little green herbal flavor, spice, and oak. Not too tannic, it seems to have some “elegance” which I define as powerful in intensity without getting there by forced over-extraction.

Finally, for my palate, stay away from the \$78 Reynolds Reserve Cabernet, Stag's Leap district. The bottle I tasted was sherried – that is oxidized – tasting old, bitter and a bit vegetal. ❖

March 4-9

Molecular Mechanisms in Lymphatic Function and Disease, Ventura, CA. *Information:* Internet: <http://www.grc.org/programs.aspx?year=2012&program=lymphatic>.

March 14-15

Perspectives in Clinical Proteomics Conference, Cambridge, United Kingdom. *Information:* Lara Hubbard, Conference & Events Organiser, Wellcome Trust Scientific Conferences, Hinxton, Cambridge, CB10 1RQ, UK. Tel.: +44 (0) 1223 495110; Fax: +44 (0) 1223 495131; Email: l.hubbard@hinxton.wellcome.ac.uk; Internet: https://registration.hinxton.wellcome.ac.uk/display_info.asp?id=236.

March 15-17

Perspectives in Clinical Proteomics Training Workshop, Cambridge, United Kingdom. *Information:* Lara Hubbard, Conference & Events Organiser, Wellcome Trust Scientific Conferences, Hinxton, Cambridge, CB10 1RQ, UK. Tel.: +44 (0) 1223 495110; Fax: +44 (0) 1223 495131; Email: l.hubbard@hinxton.wellcome.ac.uk; Internet: https://registration.hinxton.wellcome.ac.uk/display_info.asp?id=245.

March 27-29

Researchers, Teachers, Learners – We're All in it Together! Charles Darwin House, London. *Information:* Talja Dempster, Charles Darwin House, 12 Roger Street, London WC1N 2JU. Tel.: +44 (0) 2076852605; Fax: +44 (0) 2076852601; Email: T.Dempster@sebiology.org; Internet: <http://www.sebiology.org/meetings/EPASymposium/home.html>.

April 16-17

The 59th Annual Conference on the Israel Heart Society in Association with the Israel Society of Cardiothoracic Surgery, Tel Aviv, Israel. *Information:* Anat Regev, 19 Hayetzira Street, Ramat Gan, 52118. Tel.: +972-3-5767716; Fax: +972-3-5767716; Email: seretariat@israelheart.com; Internet: <http://www.israelheart.com/en/>.

April 16-25

2012 PASI Short Course: A Systems Biology Approach to Understanding Mechanisms of Organismal Evolution, Montevideo, Uruguay. *Information:* Internet: <http://www.sdbonline.org/2012Course/course.htm>.

May 13-15

The International Conference on Integrative Medicine, Jerusalem, Israel. *Information:* Ravit Levy, 19 Hayetzira street, Ramat Gan 52118, Israel. Tel.: +972-3-5767750; Fax: +972-3-5767750; Email: rlevy@paragon-conventions.com; Internet: <http://www.mediconvention.com/>.

May 17-20

The 2nd Global Congress for Consensus in Pediatrics and Child Health, Moscow, Russia. *Information:* Meital Nave Fridenzon, Paragon Conventions, 18 Avenue Louis-Casai, 1209 Geneva, Switzerland. Tel.: +41 22 5330 948; Fax: +41 22 5802 953; Email: cip@cipediatrics.org; Internet: <http://www.cipediatrics.org/>.

May 18-23

2012 American Thoracic Society International Conference, San Francisco, California. *Information:* ATS International Conference Department. Tel.: 212-315-8652; Email: conference@thoracic.org; Internet: <http://conference.thoracic.org>.

May 19-21

2012 International Conference on Systems and Informatics (ICSAI 2012), Yantai, China. *Information:* Email: ICSAI2012@ytu.edu.cn; Internet: <http://ICSAI2012.ytu.edu.cn>.

May 29-June 2

59th ACSM Annual Meeting and 3rd World Congress on Exercise in Medicine, San Francisco, CA. *Information:* <http://acsmannualmeeting.org/educational-highlights/2012-session-submission/>.

June 7-9

OSSD Sixth Annual Meeting, Joint Meeting of OSSD and IGM, Baltimore, MD. *Information:* Internet: <http://www.ossdweb.org/2012-annual-meeting>.

June 23-27

Woodstock 2012, Abbazia di Spineto, Tuscany, Italy. *Information:* Talja Dempster, Charles Darwin House, 12 Roger Street, London WC1N 2JU. Tel.: +44 (0) 2076852605; Fax: +44 (0) 2076852601; Email: T.Dempster@sebiology.org; Internet: <http://www.sebiology.org/meetings/Woodstock/home.html>.

June 26-29

4th International Congress on Cell Membranes and Oxidative Stress Focus on Calcium Signaling and TRP Channels, Isparta, Turkey. *Information:* Internet: <http://www.cmos.org.tr/2012>.

June 29-July 2

Society for Experimental Biology Salzburg 2012, Salzburg Congress Centre, Salzburg, Austria. *Information:* Talja Dempster, Charles Darwin House, 12 Roger Street, London WC1N 2JU. Tel.: +44 (0) 2076852605; Fax: +44 (0) 2076852601; Email: T.Dempster@sebiology.org; Internet: <http://www.sebiology.org/meetings/Salzburg2012/Salzburg.html>.

August 18-22

The 30th World Congress of Biomedical Laboratory Science, Berlin, Germany. *Information:* Ilana Berkowitz, Conference Secretariat, 18 Avenue Louis-Casai, 1209 Geneva, Switzerland. Tel.: +41 22 5330 948; Fax: +41 22 5802 953; Email: secretariat@ifbls-dvta2012.com; Internet: <http://www.ifbls-dvta2012.com/>.

September 1-6

AAPS 2012 Congress, Alexandria, Egypt. *Information:* African Association of Physiological Sciences, Office of the Secretariat, 82 Bulwer Road, Durban 4001, South Africa. Tel.: +27 31 2011392; Fax: +27 31 2013950; Internet: <http://www.aapsnet.org/conferences.htm>.



MEMBERSHIP APPLICATION FORM

The American Physiological Society

1. Check membership category you are applying for: ☐ Regular ☐ Affiliate ☐ Graduate Student ☐ Undergraduate Student

2. Name of Applicant: _____
Last Name or Family Name First Name Middle Name

3. Date of Birth _____ Optional: Male ☐ Female ☐
Month Day Year

4. Institution Name _____ Department _____
(Please do not abbreviate Institution Name)

5. Institution Street Address _____

6. City/State/Zip/Country _____

7. Home Address (Students Only) _____

8. Work Phone _____ Home Phone _____

9. Fax _____ E-mail _____

10. Educational Status: **IMPORTANT for STUDENTS: ** If you are enrolled as a graduate student for an advanced degree, or as an undergraduate student, please include the month and year you expect to receive your degree.**

Dates** Degree Institution Major Field Advisor

11. **WHAT IS YOUR SECTION AFFILIATION?** Please identify your primary sectional affiliation with a "1" and check (✓) up to two additional sections with which you would like to affiliate. **There can be only one "Primary" affiliation.**

<input type="checkbox"/> Cardiovascular	<input type="checkbox"/> Endocrinology & Metabolism	<input type="checkbox"/> Renal Physiology
<input type="checkbox"/> Cell & Molecular Physiology	<input type="checkbox"/> Environmental & Exercise Physiology	<input type="checkbox"/> Respiration Physiology
<input type="checkbox"/> Central Nervous System	<input type="checkbox"/> Gastrointestinal & Liver Physiology	<input type="checkbox"/> Teaching of Physiology
<input type="checkbox"/> Comparative & Evolutionary Physiology	<input type="checkbox"/> Neural Control & Autonomic Regulation	<input type="checkbox"/> Water & Electrolyte Homeostasis

12. **DO YOU WORK IN INDUSTRY?** ☐ YES ☐ NO

13. **SPONSORS** (Sponsors must be Regular APS Members. If you are unable to find sponsors, check the box below, and we will locate them for you.) *Undergraduate Students do not require sponsors but must supply proof of enrollment such as transcripts or letter from your advisor.*

CHECK THIS BOX IF APPLICABLE: ☐ Please locate sponsors on my behalf.

#1 Sponsor Name _____

#2 Sponsor Name _____

Mailing Address _____

Mailing Address _____

Phone _____

Phone _____

Fax _____

Fax _____

E-mail _____

E-mail _____

Sponsor Signature* _____

Sponsor Signature* _____

*signature indicates that sponsor attests applicant is qualified for membership.



Please turn over for more questions...and mailing instructions.

Membership Application (Continued...) Applicant Last Name (please print) _____

14. OCCUPATIONAL HISTORY [Check if student ☐

Current Position:

Dates	Title	Institution	Department	Supervisor
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Prior Positions:

Dates	Title	Institution	Department	Supervisor
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15. LIST YOUR MOST SIGNIFICANT PUBLICATIONS, WITH EMPHASIS ON THE PAST 5 YEARS (Publications should consist of manuscripts in peer-reviewed journals. List them in the same style as sample below.)

Sample: MacLeod RJ and Hamilton JR. Volume Regulation initiated by Na⁺-nutrient cotransport in isolated mammalian villus enterocytes. *Am J Physiol Gastrointest Liver Physiol* 280: G26-G33, 1991.

16. DOCTORAL DISSERTATION TITLE (if applicable):

17. POSTDOCTORAL RESEARCH TOPIC (if applicable):

18. WHICH FACTOR INFLUENCED YOU TO FILL OUT OUR MEMBERSHIP APPLICATION?

☐ Mailer ☐ Meeting (Which meeting? _____) ☐ Colleague ☐ Other _____

Mail your application to: Membership Services Department, The American Physiological Society
9650 Rockville Pike, Bethesda, Maryland 20814-3991 (U.S.A.)
(or fax to 301-634-7264) (or submit online at: www.the-aps.org/membership/application.htm)

Send no money now—you will receive a dues statement upon approval of membership.

Approval Deadlines: Membership applications are considered for approval on a monthly basis.

Questions? Call: 301-634-7171 • **Fax:** 301-634-7264 • **E-mail:** members@the-aps.org • **Web:** www.the-aps.org