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The Physiologist

Volume 41, Number 6

December 1998



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Trends in Early Research Careers of Life Scientists

Executive Summary

The 50 years since the end of World War II have seen unprecedented growth in the life sciences. In 1997 US government investments in health research exceeded \$14 billion, private foundations contributed more than \$1.2 billion, and industry's investment in health research and development exceeded \$17 billion. Government and private support of agriculture and environmental research approached \$5 billion. Clearly, the life-science enterprise is large and vigorous.

The large investment in the life sciences has produced many important results. Discoveries in agricultural science have improved our understanding of soils and their chemistry and have led to the development of new strains of crop plants that are resistant to diseases and yield more food per cultivated acre. Environmental sciences and forestry have evolved new methods for managing sustainable resources that will help our expanding population to pass on more of its natural wealth to future generations. Medical science has provided fundamental understanding of the molecular basis of numerous diseases which has led to the elimination of some and the containment of many. Advances in molecular biology not only have spawned the economically important biotechnology industry but have contributed fundamental knowledge about the structure of genes and the behavior of biological macromolecules. These advances have yielded new insights into the relationships among organisms and into the continuum of structure and function that connects living and nonliving things. The long-range implications of all the rapidly evolving knowledge are hard to predict, but many additional benefits are now on the horizon.

The continued success of the life-science research enterprise depends on the uninterrupted entry into the field of well-trained, skilled, and motivated young people. For this critical flow to be guaranteed, young aspirants must see that there are exciting challenges in life-science research and they need to believe that they have a reasonable likelihood of becoming practicing independent scientists after their long years of training to prepare for their careers. Yet recent trends in employment opportunities suggest that the attractiveness to young people of careers in life-science research is declining.

In the last few years, reports from the National Research Council have detailed a changing world for young scientists. A 1994 study sought to determine whether young investigators in the biologic and biomedical sciences might be at a disadvantage compared with older, established scientists in the competition for research support. The study found no evidence of discrimination by age in National Institutes of Health (NIH) awards; but it did reveal that NIH research-grant applications from investigators below the age of 37 had plummeted between 1983 and 1993. The reasons for the decline were not immediately obvious, but concern over the seeming contraction of young research talent led to the appointment of the present committee. A 1995 study examined graduate education in all fields of science and engineering and the changing employment opportunities for PhD graduates. That committee found that more than half of new graduates with PhDs in all disciplines now find employment in nonacademic settings, and it recommended that graduate programs

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Published bimonthly
and distributed by
The American
Physiological Society

9650 Rockville Pike
Bethesda, Maryland 20814-3991
ISSN 0031-9376

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Nonmembers in the USA: individuals
\$38.00; institutions \$56.00.
Nonmembers elsewhere: individuals
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copies and back issues when available,
\$10.00 each; single copies and back
issues of Abstracts issues when avail-
able, \$20.00. Subscribers to *The
Physiologist* also receive abstracts of
the Conferences of the American
Physiological Society.

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Deadline for submission of material
for publication: Jan. 1, February issue;
March 1, April issue; May 1, June
issue; July 1, August issue; Sept. 1,
October issue; Nov. 1, December
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APS Members Share Nobel Prize

Two APS members, along with a third researcher, were recently awarded the Nobel Prize in physiology or medicine for the finding that nitric oxide serves as a messenger molecule in the body. Nitric oxide, which is also an air pollutant in auto exhaust, was also recently found to regulate blood pressure and blood flow throughout the body. That discovery was a key factor in the development of Viagra, an anti-impotence drug.

Ferid Murad, and Louis J. Ignarro, both APS members, along with Robert F. Furchgott, each played different roles in the collective finding that nitric oxide relaxes the smooth muscle of blood vessels, causing an effect that also helps control blood pressure.

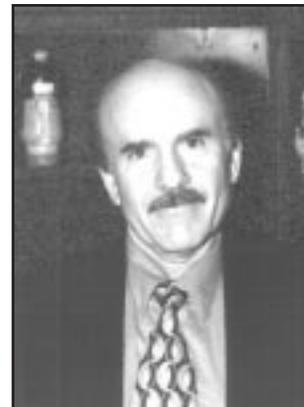
The prize is a culmination of decades of research by the three individuals. In 1977, Murad, who was working at the University of Virginia at the time, but is currently at the University of Texas Medical School in Houston, discovered that nitroglycerin and other vessel-dilating compounds release nitric oxide. Three years later Furchgott, currently a pharmacologist at the State University of New York, concluded that blood vessels dilate because cells produce a signal molecule in their inner lining which makes their

smooth muscle cells relax. In 1986, Ignarro, working on his own and with Furchgott, at the University of California Los Angeles School of Medicine, proved that this signal mol-

Medical Institute, and a mentoree of Ignarro. Septic shock, the drop in blood pressure caused by white cells putting out too much nitric oxide in response to infections, could also be alleviated as a



Ferid Murad



Louis J. Ignarro

ecule, an "endothelium-derived relaxing factor," was nitric oxide.

In addition to treatments for blood pressure and impotence, there have already been advancements in other studies related to the effects of nitric oxide. The gas has turned out to be one of the body's main weapons against atherosclerosis, according to Jonathan Stamler, a researcher at Duke University Medical Center and the Howard Hughes

result of the discovery. Cancerous white cells use nitric oxide to defend against tumors, and scientists are studying whether they can use nitric oxide to halt tumor growth. In addition to remedies for adult high blood pressure, the discovery has already lead to a treatment for dangerously high blood pressure in the lungs of infants whereby the babies simply breathe the gas.

APS offers its congratulations to these members. ❖

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diversify to reflect the changing employment opportunities afforded PhD scientists.

This report extends the analyses of the previous reports by examining the changes that have occurred over the last 30 years in graduate and postgraduate training of life scientists and the nature of their employment on completion of training. It suggests reasons for the decrease in the number of young scientists applying for NIH grants and the growing “crisis in expectation” that grips young life scientists who face difficulty in achieving their career objectives.

Charge

This committee was charged to:

Construct a comprehensive data profile of the career paths for recent PhD recipients in the life sciences.

Use the profile for assessing the implications of recent career trends for individuals and for the research enterprise.

Make recommendations, as appropriate, about options for science policy.

The charge called on the committee to consider all the life sciences and the health of the enterprise in addition to the well-being of the individuals involved.

The committee approached its first task by analyzing data contained in the large databases maintained by the National Research Council Office of Scientific and Engineering Personnel, which provides the most comprehensive and accurate record available of the educational course and employment status of scientists educated to the PhD level in the United States. These records are collected when degrees are awarded and updated biennially through surveys of a sample of doctorate holders. The committee’s analysis included the 1970-1995 surveys, and thus enabled documentation of trends in important career stages.

Findings

The training and career prospects of

a graduate student or postdoctoral fellow in the life sciences in 1998 are very different from what they were in the 1960s or 1970s. Today’s life scientist will start graduate school when slightly older and take more than 2 years longer to obtain the PhD degree. Today’s life-science PhD recipient will be an average of 32 years old. Furthermore, the new PhD today is twice as likely as in earlier years to take a postdoctoral fellowship and thus join an ever-growing pool of postdoctoral fellows—now estimated to number about 20,000—who engage in research while obtaining further training and waiting to obtain permanent positions. It is not unusual for a trainee to spend 5 years—some more than 5 years—as a postdoctoral fellow. As a consequence of that long preparation, the average life scientist is likely to be 35-40 years old before obtaining his or her first permanent job. The median age of a tenured or tenure track faculty member is now about 8 years more than that of the faculty member of the 1970s.

Those facts suggest one source of the seeming contraction of “young investigator” applicants for NIH research grants. “Young” investigators have grown older, and fewer are in faculty positions before the age of 37. More of them are postdoctoral fellows, who, by most institutional regulations, may not submit applications for individual research grants.

There have been major changes in career opportunities for PhDs over the last 3 decades. Historically, the three major employment sectors for life scientists have been academe, industry, and government; academe has been the largest. The opportunity to secure an academic appointment has steadily narrowed since the 1960s. Of life scientists who received the PhD in 1963 and 1964, 61% had achieved tenured appointments at universities or 4-year colleges 10 years later. For the cohort who graduated in 1971-1972, that percentage had dropped to 54%; and for the 1985-1986 cohort, to 38%. The probability of industrial employment

rose from 12% to 24% for the cohorts described above, and the probability of working in a federal or other government laboratory dropped from 14% to 11%. Overall, the fraction of PhDs with “permanent”¹ positions in the traditional employment sectors for PhD scientists—academe, industry, and government—9-10 years after receipt of the PhD declined from 87% to 73% from 1975 to 1995. For the cohort 5-6 years after receipt of the PhD, the fraction has declined from 89% to 61% from 1975 to 1995.

During most of the time that those changes in permanent research-career outcomes were taking place, the number of life-science PhDs awarded annually by American universities was growing steadily, but slowly, from about 2,700 in 1965 to about 5,000 in the middle 1980s. Then, in 1987, the number began to rise rather steeply to 7,696 in 1996. PhDs awarded to foreign nationals made up the majority of the increase after 1987. There has been a steady increase in the number of women receiving PhDs since 1965. Differences exist between biomedical and nonbiomedical fields; almost all the growth in numbers among life-science PhDs has been in the biomedical fields.

The 42% increase in PhD production between 1987 and 1996 was not accompanied by a parallel increase in employment opportunities, and recent graduates have increasingly found themselves in a “holding pattern” reflected in the increase in the fraction of young life scientists who after extensive postdoctoral apprenticeships still

¹The committee defines the goal of graduate education and postdoctoral training in the life sciences as the preparation of young scientists for careers as independent researchers in academe, industry, government, or a private research environment. We call positions in those careers “permanent”, although it is understood that no employment is guaranteed, to distinguish them from the “impermanent” positions, such as postdoctoral and research associate-positions held by persons whose career objective is to obtain permanent positions.

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have not obtained permanent full-time positions in the life sciences. In 1995, as many as 38% of the life-science PhDs—5-6 years after receipt of their doctorates—still held postdoctoral positions or other nonfaculty jobs in universities, were employed part-time, worked outside the sciences, or were among the steady 1-2% unemployed. The comparable fraction in 1973 was only 11%. What may be most alarming about the 1995 figure is that it reflects the situations of those earning PhDs in 1989 and 1990, at the beginning of the sharp rise in the rate of PhD production.

The frustration of young scientists caught in the holding pattern is understandable. These people, most of whom are 35-40 years old, typically receive low salaries and have little job security or status within the university. Moreover, they are competing with a rapidly growing pool of highly talented young scientists—including many highly qualified foreign postdoctoral fellows—for a limited number of jobs in which they can independently use their research training. This situation—and its implications for both individual scientists and the research enterprise—is a matter of concern to the committee.

The committee viewed it as unlikely that conditions will change enough in the near future to provide employment for the large number of life-science PhDs now waiting in the holding pattern. Federal funding for life-science research is expected to grow but the growth is unlikely to compensate for the imbalance in production of PhDs as federal funding was growing substantially through the 1980s and 1990s while the employment situation for the increasing number of young life graduates worsened. We believe that the growth in funding does not ensure that trends in obtaining permanent jobs will improve. The cost of doing research at private universities has been borne traditionally by federal and private grant-giving agencies, and it is highly unlikely that tuition, already high, can be

increased to the extent that it could provide needed research support. Schools of medicine, where large numbers of PhDs are educated and work, are faced with the need to adjust to the era of “managed care” with a marked reduction in income from clinical-practice plans that previously contributed substantially to the support of research and training. Finally, industry—and perhaps specifically the biotechnology sector—which employed large numbers of new life-science PhDs in the 1980s, has slowed its hiring in the 1990s.

In response to the increasing difficulty of finding employment in traditional sectors, trainees and their mentors have looked to alternative careers, such as law, science writing, science policy, and secondary-school teaching. Our analysis suggests that opportunities in these fields might not be as numerous or as attractive as advocates of alternative careers imply.

Implications

Whether the career trends described above are a source of concern depends on the viewpoint of the stakeholder observing them. To the graduate student and postdoctoral trainee who have invested many years of preparation with the expectation of having a research career, the situation is discouraging indeed. To the established investigator and the overseers of life-science research, the availability of large numbers of bright young scientists willing to work very hard for relatively little financial compensation is an asset that contributes to a remarkably successful enterprise. Since World War II, the structure of life-science research has been built around these young scientists, who are the primary producers of research. The public, whose taxes support the enterprise, has benefitted from the abundance of young trainees.

The imbalance between the number of life-science PhDs being produced and the availability of positions that permit them to become independent

investigators concerns the committee. The long times spent in training, the delay in achieving independence, and especially the difficulty in finding positions where young scientists can independently use their training have led to a “crisis in expectation”. The feelings of disappointment, frustration, and even despair are palpable in the laboratories of academic centers. Many graduate students entered life-science training with the expectation that they would become like their mentors: they would be able to establish laboratories in which they would pursue research based on their own scientific ideas. The reality that now faces many of them seems very different. The future health of the life sciences depends on our continuing to attract the most talented students. That will require that students be realistically informed at the beginning of their training of their chances of achieving their career goals and that faculty recognize that current employment opportunities are different. The challenges for the life-science community are to acknowledge that it is the structure of the profession that has led to declining prospects for its young and to develop accommodations to maximize the quantity and quality of the scientific productivity of the future.

Conclusions and Recommendations

The committee’s analysis of the patterns of employment of recent recipients of life-science PhDs suggests that the current level of PhD production now exceeds the current availability of jobs in academe, government, and industry where they can independently use their training. While only a small minority of recent PhDs have left the field entirely, a large fraction of the “excess” supply is currently found in two kinds of appointments, “postdoctoral” and “other academic”, where they may be called “fellows”, “research assistants”, “adjunct instructors” or some other title that conveys a clear message of impermanence in academe—outside the tenure track of

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regular faculty. The professional structure of the life sciences research enterprise, in which the important work of conducting experiments rests almost entirely on the shoulders of graduate students and postdoctoral fellows, was based on the premise that there would be continuous expansion of available independent research positions in order to provide employment commensurate with their training for the ever-growing number of trainees. By the 1980s, however, there were signs of trouble ahead as the postdoctoral pool began to swell in size. The dramatic jump in number of graduates from PhD programs that began in 1987, driven by the influx of foreign-born PhD candidates together with the increase in foreign-trained PhDs who have sought postdoctoral training in the US, has greatly exacerbated what was already the growing imbalance between the rate of training versus the rate of growth in research-career opportunities.

Although the current abundance of PhDs is an advantage to established investigators, those responsible for graduate education in the life sciences should realize that further growth in the rate of PhD training could adversely affect the future of the research enterprise. Intense competition for jobs has created a “crisis of expectation” among young scientists; further increase in the competition could discourage the best from entering the field.

Recommendation 1: Restraint of the Rate of Growth of the Number of Graduate Students in the Life Sciences

The committee recommends that the life-science community constrain the rate of growth in the number of graduate students, that is, that there be no further expansion in the size of existing graduate-education programs in the life sciences and no development of new programs, except under rare and special circumstances, such as a program to

serve an emerging field or to encourage the education of members of under-represented minority groups.

The current rate of increase in awards of life science PhDs—5.1% from 1995 to 1996—if allowed to continue, would result in a doubling of the number of such PhDs in just 14 years. Our analysis suggests that would be deleterious to individuals and the research enterprise. The committee recognizes that the number of PhDs awarded each year might already be too high. Although a return to pre-1988 levels of training might be beneficial, we believe that a concentrated effort to reduce the size of graduate-student populations rapidly would be disruptive to the highly successful research enterprise. While our data show a current abundance, some unanticipated discovery in the life sciences or unexpected change in funding trends might lead to an increase in demand for life scientists. The committee believes that the current system is well prepared to meet such a need.

We caution that it will be necessary to distinguish among fields when making decisions about optimal numbers of graduate students. As shown in chapter 2, almost all the increase in life-science PhD production has been in biomedical fields. Actions taken in one field of the life sciences might be unnecessary in others. It is worth noting, however, that the data suggest that biomedical and nonbiomedical life-science fields are experiencing similar changes in employment trends, for example, smaller fractions of PhDs finding permanent employment in academe.

The committee examined several approaches to stabilizing the total number of PhDs produced by life-science departments beyond the first and obvious approach of individual action on the part of graduate programs to constrain growth in the number of graduate students enrolled. Some might argue that this solution is expecting unreasonably altruistic behavior on the part of established investigators and training-pro-

gram directors and that graduate programs will continue to accept large numbers of students simply to meet their faculties’ need for instructors and laboratory workers. The committee urges life-science faculties to seek alternatives to these workforce needs by increasing the number of permanent laboratory workers. As the increases over the last decade have been fueled almost entirely by the increased availability of federal and institutional support for research assistants, consideration might be given to restricting the numbers of graduate students supported through the research-grant mechanism.

The committee believes the most prudent way to reasonably reduce the rate of increase in the number of PhDs awarded annually and perhaps to achieve a gradual reduction in the numbers being trained is to help students to make informed decisions about their career choices.

To be effective, such decisions must be based on relevant and up-to-date information about both the quality of the training available in particular graduate programs and in the job opportunities of a given field. Equally importantly, this information must be used by individual graduate programs and mentors in determining the numbers of trainees they accept and in assessing the effectiveness of their programs. It is our expectation that such information will have the salutary effect of letting market forces control the rate of entry into the profession *before* young people have invested ten and more years in training.

Recommendation 2: Dissemination of Accurate Information on the Career Prospects of Young Life Scientists

The committee recommends that accurate and up-to-date information on career prospects in the life sciences and career outcome information about individual training programs be made widely available to students and faculty. Every life sci-

ence department receiving federal funding for research or training should be required to provide to its prospective graduate students specific information regarding all predoctoral students enrolled in the graduate program during the preceding 10 years.

With the most accurate information available, students will be able to make informed decisions about their careers.

Recommendation 3: Improvement of the Educational Experience of Graduate Students

There is no clear evidence that career outcomes of persons supported by training grants are superior to those of persons supported by research grants. However, the committee, which included members with direct experience with training grants, concluded that training grants are pedagogically superior to research grants and result in a superior educational climate in which students have greater autonomy. First, training grants are pedagogically superior because they provide a mechanism for stringent peer review of the training process itself, something that is not considered in the review of a research project. Second, they improve the educational climate because they minimize the potential conflicts of interest that can arise between trainers and trainees. Although the student-mentor relationship is ordinarily healthy and productive for both partners, it can be distorted by the conditions of the mentor's employment of the student and limit the ability of students to take advantage of opportunities to broaden their education. Third, training grants provide the federal government with information that it needs to evaluate the level of its investment in graduate life-science education with the aim of developing a funding framework for graduate education that contributes to the long-term stability and well-being of the research enterprise.

The committee encourages all federal agencies that support life-science education and research to invest in training grants and individual graduate fellowships as preferable to research grants to support PhD education. Agencies that lack such programs should look for ways to start them, and agencies that already have them should seek ways to sustain and in some instances expand them.

This recommendation should not be pursued at the expense of scientific and geographic diversity. Rather, we encourage the establishment of small, focused training-grant programs for universities that have groups of highly productive faculty in important specialized fields, but might not have the number of faculty needed for more traditional, broad-based training grants.

It is true that the current regulations governing NIH training grants bring universities some financial disadvantages because of restricted overhead recovery. Furthermore, NIH training grants cannot support foreigners on student visas, and so this recommendation places at disadvantage programs that depend on foreign students for research or teaching. These disadvantages are outweighed, in the committee's view, by the salutary effect that the training-grant peer-review process brings to the members of a department faculty, leading them to examine and reflect on how, as an entity, they are providing for the education and training of their graduate students.

Our endorsement of training grants and fellowships is not intended to result in the training of more PhDs. Rather we advocate a shift from support by research grants to training grants. We anticipate improvements in the quality and oversight of graduate education in the life sciences. The federal government is already heavily invested in life-science education; greater reliance on support of graduate students on training

grants ensures that taxpayers are receiving the best return on their investment.

The committee is also concerned that the length of time spent in training has become too long at a median of 8 years elapsed time from first enrollment to PhD for all life sciences (though field differences exist). We believe that the time should be about 5-6 years. However, an immediate effort to shorten the time to degree would increase the number of PhDs produced. Efforts to shorten the time to degree should be undertaken when the effort to restrain growth in the number of PhDs has shown positive effects.

Recommendation 4: Enhancement of Opportunities for Independence of Postdoctoral Fellows

While the length of graduate training has been increasing, so too have the extent and duration of postdoctoral training. Prolonged tenure as a postdoctoral fellow provides a person with valuable research experience, but it carries some real costs. In most cases, fellows are not independent of their mentors so they can not pursue their own research. We recognize the many good reasons for prolonged tenure as a postdoctoral fellow but we believe that tenures longer than 5 years are not in the best interest of either the individual fellow or the scientific enterprise.

Because of its concern for optimizing the creativity of young scientists and broadening the variety of scientific problems under study in the life sciences the committee recommends that public and private funding agencies establish "career-transition" grants for senior postdoctoral fellows. The intent is to identify the highest-quality scientists while they are still postdoctoral fellows and give them financial independence to begin new scientific projects of their own design in anticipation of their obtaining fully independent positions.

The committee recommends a

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goal of 200 federal and private grants awarded annually, representing about 1% of the postdoctoral pool. That number of people supported would be quite small but the program might provide an important opportunity for the most promising postdoctoral fellows and serve as both example and incentive to many more. We make this recommendation with the knowledge that it is possible that the money for a new federal grant program probably would come from existing federal funds. In our view, the benefits of increased intellectual independence and improved motivation of talented midcareer postdoctoral fellows justify such a reallocation of funds. Private funders might establish new programs or enlarge existing programs that support career-transition grants.

Recommendation 5: Alternative Paths to Careers in the Life Sciences

As traditional research positions in academe, industry, and government have become more difficult to obtain, positions in “alternative careers”—such as law, finance, journalism, teaching, and public policy—have been suggested as opportunities for PhDs in the life sciences.

The idea of highly trained scientists investing their talents in nontraditional careers seems at first glance attractive. Scientists have analytical skills and a work ethic to bring to any position, and the placement of highly trained scientists in diverse jobs in the workforce would lead to an increase in general science literacy. As the committee’s review of alternative opportunities concludes, however, most of the possibilities are less available or less attractive than they might at first glance appear. Many “alternative” careers are also heavily populated, and competition for good positions is stiff. Others require special preparation or certification, or offer unattractive compensation, and none makes full use of the PhD’s hard won

life-science research skills. The committee believes that the idea of alternative careers should not be oversold to PhD candidates.

The interest in alternative careers for PhD scientists has inevitably raised the question of whether preparation for the degree should be changed from its current narrow focus on training for the conduct of scientific research to embrace a broader variety of educational goals that would connect to alternative career paths. The committee has discussed that question extensively.

The committee recommends that the PhD degree remain a research-intensive degree, with the current primary purpose of training future independent scientists.

At the same time, the committee recognizes that not all students who begin graduate school intending to pursue a research career maintain that desire as they progress through training. Graduate programs should expand their efforts to help students learn about the diversity of career opportunities open to them, and university departments should examine possible alternatives to the research PhD.

One alternative to broadening the PhD program is to strengthen the master’s degree, which may be a more appropriate end point for students who determine early enough in their training that PhD training is not necessary for the career goals they have selected. There has been a decline in the number of master’s-degree programs in the life sciences and with it a growing perception that the master’s degree has become a consolation prize for those who do not complete a PhD program.

This devaluation of the master’s degree effectively limits the number of choices for college graduates who are interested in a career in the life sciences, although not necessarily careers in directing laboratories conducting fundamental research. For example, the college graduate who is interested in teaching in secondary school or two-

year colleges, would benefit from formal and focused master’s-degree programs that do not require long periods of research-intensive graduate and postdoctoral training. Master’s-degree programs would not only be more appropriate but also be preferable to the PhD for this type of employment and these students.

We recommend that universities identify specific areas of the biological and biomedical sciences for which master’s level training is more appropriate, more efficient and less costly than PhD training. We recommend that focused master’s programs be established in those areas.

A vigorous master’s-degree program that produces highly skilled laboratory technicians for industry, government, and academe could potentially contribute to righting the imbalance between PhD training and the labor market. When the committee recommended constraint in further growth in training in recommendation 1, it was fully aware that graduate students are needed in the labor-intensive life-science research enterprise and to teach undergraduates. One way to resolve this dilemma is to effect a modest shift toward a more permanent laboratory workforce by replacing some fraction of the existing training positions with permanent employees such as MSc-level technicians and PhD-level research associates.

The Impact of Foreign Nationals

This report has documented that the majority of the recent increase in the number of PhD trainees and postdoctoral fellows are foreign nationals, not US citizens. The number of foreign nationals reflects the international nature of modern science and the central place that the US plays in this international arena. Furthermore, foreign nationals have traditionally contributed to the excellence of US science, as suggested by the fact that of the 732 members of the National Academy of Sciences who

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are life scientists, 21.2% are foreign born and 12.4% obtained their PhD training abroad. Foreign nationals' important contributions to US scientific leadership is reflected in their representation as department chairs (25%) and their inclusion as "outstanding authors" in life sciences (26.4%). Foreign students and fellows are welcome participants in the research enterprise, provided they are of high quality and competitive with American applicants.

We believe it would be unwise to place arbitrary limitations on the number of visas issued for foreign students. But we do not believe that US institutions should continue to enroll unlimited numbers of foreign nationals. As decisions are made on ways to constrain further growth, the measures adopted should apply equally to all students regardless of nationality.

If, as we hope, implementation of our recommendations results in constraining further growth in PhDs awarded in the life sciences, we urge our colleagues on graduate admissions committees to resist the temptation to respond by simply increasing the number of foreign applicants admitted.

Responsibility for Effecting Change

This report has documented several dramatic changes in career trends in the life sciences over the last several decades. The rapid growth in the academic scientific establishment in the 1960s and the early 1970s set in place a training infrastructure that was built on the premise that there would be continued growth. When the inevitable slowdown in resources to support that growth occurred, it was not accompa-

nied by a commensurate adjustment in the rate of training. The impact of the imbalance between the number of aspirants and the research opportunities is now being felt by a generation of scientists trained in the last 10 years who are finding it increasingly difficult to find permanent positions in which their hard-accumulated skills in research can be used. Unless steps are taken to put the system more in balance, the difference between students' expectations and the reality of the employment market will only widen and the workforce will become more disaffected. Such an occurrence would damage the life-science research enterprise and all the participants in it.

The training of life scientists is a highly decentralized activity. Notwithstanding the heavy dependence on federal funds, the most important decisions affecting the rate of production of life scientists are made locally by the universities and their faculties. The numbers and qualifications of students admitted to graduate study, the allocation of institutional funds for their tuition and stipends (which account for half or more of the total expenditures for graduate-student support), the requirements for the degree—all are local decisions. As a consequence, a large portion of the responsibility for implementing our recommendations falls on the shoulders of established investigators, their departments and universities, professional scientific organizations, and students themselves. Students must take the responsibility of making informed decisions about graduate study, but they must be provided accurate career information on which to base their decisions.

Individual faculty members must be willing to set aside their short-term self-interest in maintaining the high level of staffing of their laboratories for the sake of the long-term stability and well-being of the scientific workforce. Directors of graduate programs must be willing to examine the future workforce needs of the scientific fields in which they train, not just the current needs of their individual departments for research and teaching assistants.

The recommendations in this report are offered as first steps to improve the overall quality of training and career prospects of future life scientists. We hope that the information in this report will be used to begin discussions within the life-science community on the best ways to prepare future scientists for exciting careers in the profession and to protect the vitality of the life-science research enterprise. ❖

Members of the Committee included: Shirley Tilghman (Chair), Helen S. Astin, William Brinkley, Mary Dell Chilton, Michael P. Cummings, Ronald G. Ehrenberg, Mary Frank Fox, Kevin Glenn, Pamela J. Green, Sherrie Hans, Arthur Kelman, Jules PaPidus, Bruce Levin, J. Richard McIntosh, Henry Riecken, Paula E. Stephan.

Additional copies of this report are available from:
National Academy Press
2101 Constitution Avenue, NW
Box 285
Washington, DC 20055
800-624-6242
202-334-3313
<http://www.nap.edu>

A Matter of Opinion

Long Term Solution to a Short Term Problem

The report entitled "Trends in Early Research Careers of Life Scientists" (TERC) of the National Academy of Sciences addresses an acute and painful issue, namely the excess number of

PhD postdoctoral fellows who are unable to land tenure-earning faculty positions within a reasonable time frame. While most of the recommendations of the study are worthwhile, it is

my opinion that the main recommendation, a freeze on the number of trainees, is not justified. The majority of the recommendations, including better career guidance for the graduate students and

A Matter of Opinion

postdoctoral fellows, shortening of the time to degree, a return to more federal training grants, and institutional monitoring of international trainees, are long overdue.

Very few universities have any structured programs or mechanisms to regularly advise their trainees about permanent employment opportunities in the changing job markets. The trainees are too often “on their own” to find their next position. Successful guidance programs for graduate students and postdoctoral fellows must be developed and copied. These programs must be a joint effort of the mentors, training programs, and university administration.

The time to the PhD degree has gradually increased to a length that is discouraging to many students. The open-ended nature of research and training should not result in a semi-permanent life style of servitude. While we are training “problem solvers,” most graduate students will enjoy a postdoctoral experience that will continue their development as independent scientists. Most PhD graduates are no more prepared to act as independent investigators than recent graduates of our medical schools are prepared to be independent physicians before a period of residency. Mentors, graduate committees, and programs must set realistic goals that can be achieved in a 48- to 60-month period. Continuous graduate training that stretches into six and seven years (or longer) needs serious evaluation and modification. Postdoctoral training that exceeds five years without full employment benefits also requires re-evaluation.

The NIH training grant is viewed by many as the “gold standard” for the education of graduate students and postdoctoral fellows. However, limited training grant opportunities over the past two decades have concentrated these grants into fewer universities and have shifted the majority of federal support of biomedical trainees to the R-01. This in itself is not always bad but there

are often fewer requirements or oversight of trainees supported by the R-01. Even worse, federal policies often force trainees supported by the R-01 to be treated as employees. Hopefully the Presidential Review Directive will address and remedy these policies.

The increasing number of international trainees reflects the global nature of science. Unfortunately many of these international trainees are used as relatively cheap labor in the absence of qualified domestic employees. The institution’s policy on education and training should not be used to solve labor shortages. America was built by immigration and bright international trainees in the sciences must continue to study here but they must not be abused.

Fortunately it is generally possible to modify the training policies and behaviors of universities and principle investigators. Positive financial incentives (rather than punitive financial disincentives) must be provided by the NIH to carefully and systematically improve biomedical training.

While it is indeed frustrating and unfortunate that some well-trained scientists in the life sciences cannot land permanent faculty appointments at the prestigious universities, there are still many job openings which need PhD-level training. These opportunities may be in less prestigious institutions or in less attractive locations but they are real. Industry (which is unfortunately still perceived by some faculty mentors as less than desirable for their academic children) continues to employ a high percentage of biomedical scientists who are team oriented.

I fear that the negative tone of the TERC report may discourage some of the bright domestic undergraduates from entering into biomedical sciences training, precisely at a time when we need them to train for exciting careers in biomedical research.

Three reasons convince me of a bright future:

1) The NIH and NSF budgets are

increasing rapidly; these funding increases will require more scientists in government, industry, and yes, even academia. These new academic opportunities will not necessarily be as tenure-earning faculty, however. These new positions must be permanent positions with full benefits including health and life insurance and retirement plans. The opportunity to apply for grants and serve as a PI must be available to these scientists.

2) The rapid progress in sequencing of the human genome (as well as the other animal and plant genomes) will quickly lead to research opportunities in protein research and then to physiological research (“functional genomics”). There will soon be infinitely more problems to solve.

3) The largest group of biomedical scientists that the world has ever seen is the baby-boomers. These 42- to 52-year-old biomedical scientists have moved into the tenured faculty positions and will soon move into the ranks of administration. Within 10 years or less the baby boomers will realize the benefits of early retirement, leaving the biomedical professions with a “workforce vacuum.” While its true that some will work beyond 70 years of age, most of this Viet Nam era generation will opt for a generous retirement provided by the bullish stock market. If doctoral training trends continue, it will take 5 years to train the new PhD and another 3-4 years of postdoctoral experience to independence. There’s your 10 years when demand will soar.

Thus the main TERC recommendation seems to be a long-term solution to a short-term problem. If today’s postdoctoral fellows are having employment difficulties, then we need solutions for today, not a solution that slows the growth of the workforce pipeline, the effects of which are 10 years away.

*Gilbert R. Hageman, PhD
University of Alabama at Birmingham*

Bylaw Changes Proposed by Council

The following proposals to amend the Society Bylaws were approved by Council at its summer meeting in Bethesda. These proposed amendments will be presented to the membership for vote at the Spring Business Meeting, Tuesday, April 20, 1999, in Washington, DC.

Membership

At the summer Council meeting, Council unanimously approved the recommendation of the Membership Committee to discontinue the membership category of Corresponding Members and allow foreign members to have the rights and privileges of Regular Members. It also approved the recommendation to accept foreign students as student members. The amended wording of Articles III (Membership), Article IV (Officers), and VI (Dues) are presented below.

ARTICLE III. *Membership*

SECTION 1. The Society shall consist of regular, ~~corresponding~~, honorary, affiliate, emeritus, student, and sustaining associate members.

SECTION 2. *Regular Members.* Any person who has conducted and published meritorious original research in physiology, and who is presently engaged in physiological work, and ~~who is a resident of The Americas~~ shall be eligible for proposal for regular membership in the Society.

~~SECTION 3. *Corresponding Members.* Any person who has conducted and published meritorious research in physiology, who is presently engaged in physiological work and who resides outside of The Americas shall be eligible for proposal for corresponding membership in the Society.~~

SECTION 4 to be renumbered SECTION 3.

SECTION 5 to be renumbered SECTION 4.

SECTION ~~65~~. *Emeritus Members.* A regular ~~or corresponding~~ member may apply to Council for transfer to emeritus membership if that person (1) has reached the age of 65 and is retired from regular employment or (2) has been forced to retire from regular employment because of illness or disability. An emeritus member may be restored to regular membership status on request to Council.

SECTION ~~76~~. *Student Members.* Any student who is actively engaged in physiological work ~~at an institution in The Americas~~ as attested to by two regular members of the Society shall be eligible for proposal for student membership. No individual may remain in this category for more than five years, without reapplying.

SECTION 8 to be renumbered SECTION 7.

SECTION ~~98~~. *Nominations for Membership.* Two regular members of the Society must nominate a person for regular, ~~corresponding~~, or affiliate membership on APS membership application forms, ~~provided by the Executive Director. In the nomination of corresponding members, a corresponding or honorary member of the Society may substitute for one of the regular members.~~

a. The Membership Committee shall assess the qualifications of potential regular and corresponding members and recommend nominations to Council.

SECTION ~~109~~. *Election of Members.* Election of regular, ~~corresponding~~, and

honorary members shall be by vote of secret ballot by members of Council. A two-thirds majority of the members present and voting shall be necessary for election.

SECTION ~~110~~. *Voting.* Only regular members shall be voting members. ~~Corresponding~~, Honorary, affiliate, and emeritus members shall have the privilege of attending Business Meetings of the Society but shall have no vote.

SECTION 12 to be renumbered SECTION 11.

ARTICLE VI. *Dues*

SECTION 1. *Annual Dues.* The annual dues for regular members, ~~corresponding members~~, affiliate members, and student members shall be determined by the Council and shall be paid in advance of July 1. Honorary members and emeritus members shall pay no membership dues.

SECTION 2. *Nonpayment of Dues.* A regular member, ~~corresponding member~~, affiliate member, or student member whose dues are two years in arrears shall cease to be a member of the Society, unless, after payment of dues in arrears and application to the Council, he/she shall be reinstated at the next meeting by vote of the Council. It shall be the duty of the President-Elect to notify the delinquent of his/her right to request reinstatement.

SECTION 3. *Retirement.* A regular member ~~or corresponding member~~, who has been granted emeritus membership status is relieved from the payment of dues but retains the other privileges of his/her former membership status, except voting privileges.

Joint Program Committee

In addition, Council also unanimously approved the newly restructured Joint Program Committee's suggested changes to the Bylaws. The amended versions of Articles V (Standing Committees) and X (Society Sections and Affiliations) are presented below.

ARTICLE V. *Standing Committees*

SECTION 5. *Joint Program Committee.* A Joint Program Committee composed of six regular members of the Society appointed by Council and elected representatives of the sections and groups shall be responsible for scientific programs of the Society. ~~with the assistance of the Program Advisory Committee.~~ The term of each member shall be for three years; a member may not serve more than two consecutive terms. The Council shall designate the Chairperson of the Committee, who shall be an ex officio member of the Council, without vote. The President-Elect and Executive Director shall be ex officio members, without vote.

ARTICLE X. *Society Sections and Affiliations*

SECTION 1. *Society Sections.* Upon acceptance of a Statement of Organization and Procedures and approval by Council, an appropriate group of regular members of the Society may form a section which encompasses an area of physiology. Such sections shall: a. participate in the governance of the Society by electing a representative to the Section Advisory Committee; b. advise the Society on matters of interest to the specialty group represented in the section; c. assist the Society in organization of scientific meetings by electing a member to the Joint Program Committee; d. nominate individuals for membership on Society committees; e. be open to all members of the Society expressing an interest in

section membership.

The Executive Director shall provide assistance to sections in the carrying out of section business.

Nothing in a section's Statement of Organization and Procedures may be construed as contradictory to the Constitution and Bylaws or Operational Guide of the Society.

Other Amendments

In addition, Article IV (Officers) requires changes to bring it up-to-date with current procedures.

ARTICLE IV. *Officers*

SECTION 2. *President.* A person shall serve only one term as president, except that if the President-Elect becomes President after September 30 ~~he/she~~ shall continue as President for the year beginning ~~at the next July 1~~ end of the Spring Council meeting. The President shall chair all sessions of the Council and Business Meetings of the Society and shall be an ex officio member of all committees without vote.

The other changes listed below are to bring the Bylaws into conformity. with gender nonspecificity.

ARTICLE V. *Standing Committees*

SECTION 1. *Publications Committee.* A Publications Committee composed of five regular members of the Society appointed by Council shall be responsible for the management of all of the publications of the Society. The term of each member of the Publications Committee shall be three years; a member may not serve more than two consecutive terms. The Council shall designate the ~~Chairman~~ Chairperson of the Committee who shall be an ex officio member of the Council, without vote. On the advice of the Publications Committee and consent of Council, the Executive Director shall be empowered

to appoint and compensate the Publications Manager who shall assist in carrying out the functions of the Publications Committee under the supervision of the Executive Director. The President, Executive Director and the Publications Manager shall be ex officio members of the Publications Committee without vote. The Committee shall have the power to appoint editorial boards for the Society's publications. The Committee shall present an annual report on publications and policies to the Council for approval and present an annual budget coordinated through the Executive Director, to the Finance Committee for its approval and recommendation to Council.

SECTION 2. *Finance Committee.* A Finance Committee, composed of four regular members of the Society appointed by Council, shall receive the total coordinated budget proposals annually from the Executive Director and shall determine the annual budgets, reserve funds and investments of the Society, subject to approval by the Council. The term of each member of the Finance Committee shall be three years; a member may not serve more than two consecutive terms. The Council shall designate the ~~Chairman~~ Chairperson of the Committee who shall be an ex officio member of the Council, without vote. On advice of the Finance Committee and consent of Council, the Executive Director shall be empowered to appoint and compensate a Business Manager who shall assist in carrying out the functions of the Finance Committee under the supervision of the Executive Director. The Past President shall serve as a voting member of the Finance Committee. The President-Elect, President, Executive Director, the ~~Chairman~~ Chairperson of the Publications Committee, and the Business Manager shall be ex officio members of the Finance Committee, without vote.

SECTION 3. *Membership Committee.* A Membership Committee, composed of six or more regular members of the Society appointed by the Council, shall receive and review processed applications for membership and make recommendations for nomination to the Council. The term of each member of the Membership Committee shall be three years; a member shall not be eligible for immediate reappointment. The ~~Chairman~~Chairperson of the Committee shall be designated by the Council.

SECTION 4. *Education Committee.* An Education Committee, composed of five or more regular members of the Society and representatives of such other societies as may be designated by the Council, appointed by the Council, shall conduct such educational, teaching and recruitment programs as may be required or deemed advisable. The term of each member of the Education Committee shall be three years. The ~~Chairman~~Chairperson of the Committee shall be designated by the Council. The Executive Director may act as executive

officer of the educational programs with approval of the Council. The Committee shall present an annual report to the Council and an annual budget through the Executive Director to the Finance Committee for its approval.

SECTION 8. *Term of Office of ~~Chairman~~Chairperson.* The ~~Chairman~~Chairperson of a standing committee may serve one full term in that capacity in addition to any consecutive term as a committee member limited by other provisions of these Bylaws.

ARTICLE VII. *Financial*

SECTION 3. Publications Contingency and Reserve Fund. The Publications Contingency and Reserve Fund shall consist of the long-term capital investments of publication earnings. The Executive Director, with advice from the Finance Committee, shall have discretionary and signatory powers, except for withdrawals. Authority for any withdrawal from this fund shall require the following five signatures: 1) the

~~Chairman~~Chairperson of the Publications Committee (alternate, the senior member of the Committee); 2) the President of the Society (alternate, the President-Elect); 3) the Executive Director (alternate, the Publications Manager); 4) and 5) any two members of Council. The Finance Committee shall not recommend to Council the expenditure of any of this capital fund for non-publication purposes without the consent of the Publications Committee. The Finance Committee shall be responsible for the separate investment of the reserve fund for publications; any capital gains from such investment shall accrue to the fund (capital losses will, however, reduce its value). Any dividends, interest or income, other than capital gains, from this invested fund may be used for emergency support of any of the activities of the Society, including publications, as determined annually by the Council, but the primary goal shall be to increase the investment capital. ❖

Second Federation of European Physiological Societies (FEPS)

June 30 -July 4, 1999

Prague, Czech Republic

The Final Announcement and Call for Abstracts has now been printed for the 2nd FEPS Congress.

The scientific program has been finalized and includes 7 plenary lectures, 21 symposia and 3 workshops, along with 7 poster sessions and 7 oral communication sessions. The Congress abstracts will be published in *Physiological Research*, and, in addition, the abstracts will be published in electronic form on the *Physiological Research* website.

Copies of the Final Announcement can be obtained by contacting the Congress Secretariat at:

Second FEPS Congress Secretariat
Czech Medical Association J.E. Purkyn
Sokolsk< 31
120 26 Prague 2, Czech Republic
TEL: +420 2 297-271 or FAX: +420 2 294 610
Email: SENDEROVA@CLS.CZ

Current information about the Congress, as well as the registration and abstract forms, is also available on the Congress web site: <http://uemweb.biomed.cas.ca/FEPS99.htm>

Congress Deadlines

Abstract Submission and Early Registration	February 1, 1999
Accommodation Reservation	April 30, 1999
Cancellation of Registration	June 1, 1999

Plenary Lectures

J. Bure	G.E. Bisgard
P. Jonas	M.M. Merzenich
E. Neher	Y. Touitou
E.R. Weibel	

Round Table

Physiome - the Future of Physiology
Chair: R.S. Reneman

1999 Officers and Standing Committees

APS Council

Officers

L. Gabriel Navar, President (1999)
Walter F. Boron, President-Elect (1999)
Allen W. Cowley, Jr., Past President (1999)

Councillors

Dale J. Benos (2000)
Ethan R. Nadel (2001)
Celia D. Sladek (1999)
Richard J. Traystman (2000)
John A. Williams (1999)
Phyllis M. Wise (2001)

ex officio members

Barbara E. Goodman, Education (2000)
Edward H. Blaine, Finance (1999)
Judith A. Neubauer, Program (2001)
Dale J. Benos, Publications (2001)
John E. Hall, Section Advisory (1999)

Society Standing Committees

Animal Care and Experimentation

Maintains and updates the APS "Guiding Principles in the Care and Use of Animals," provides consultation regarding animal experimental procedures and care, and keeps abreast of legislation and new developments in animal models for student teaching and alternatives for animal usage.

C. Terrance Hawk, Chair (2000)
Susan E. Jacobs-Kaufman (2000)
Lorenz O. Lutherer (1999)
Steven W. Mifflin (2001)
John N. Stallone (1999)
Linda A. Toth (2001)
Jennifer Laiprasert, student member (1999)
Terry J. Opgenorth, *ex officio* (2001)
Joseph R. Haywood, *ex officio* (2000)

Awards

Oversees the award programs of the Society to ensure uniformity and conformity with the goals of APS,

investigates new means of funding for the APS awards program, and selects The Research Career Enhancement Awardees and Postdoctoral Fellowship Awardees.

Ethan R. Nadel, Chair (2001)
Thomas H. Adair (1999)
William L. Joyner (2000)
Sadis Matalon (2001)
Roger G. O'Neil (1999)
Thomas V. Peterson (2000)
Patricia Preisig (2001)
John B. Stokes (1999)
Pamela J. Gunter-Smith, *ex officio* (2001)
Kim E. Barrett, *ex officio* (1999)

Career Opportunities in Physiology

Provides Council with information regarding availability and needs for appropriately trained physiological personnel and recommends measures to assure appropriate balance in the supply and demand for physiologists.

Edward J. Zambraski, Chair (2000)
Francis L. Belloni (2001)
David P. Brooks (2000)
Nicholas S. Gantenberg (1999)
Thomas C. Herzig (2001)
Raul Martinez-Zaguilan (2000)
Jo Rae Wright (1999)

Committee on Committees

Serves as an advisory committee to Council to make recommendations for nominees to the standing committees and reviews charges of the various committees regarding overlapping responsibilities.

Celia D. Sladek, Chair (1999)
Phyllis M. Wise, Incoming Chair (2001)
William J. Arendshorst (1999)
James B. Bassingthwaite (2000)
Beverly P. Bishop (1999)
Eldon J. Braun (2000)
Steven C. George (2001)

M. Harold Laughlin (2000)
Thomas E. Lohmeier (2001)
Marshall H. Montrose (2001)
Mrinalini C. Rao (2000)
Mary F. Ruh (1999)
Dee U. Silverthorn (2001)
William T. Talman (1999)

Ray G. Daggs Award

Annually selects a member of the Society to receive this award in recognition of distinguished service to APS and to the science of physiology.

Ronald H. Freeman, Chair (1999)
Beverly P. Bishop (2000)
James E. Faber (2001)

Education

Provides leadership and guidance in the area of physiology education of undergraduate, graduate, and professional students; recommends objectives for the graduate programs in physiology; and organizes workshops on the application of new techniques in physiological problems.

Barbara E. Goodman, Chair (2000)
George T. Blevins (2000)
William M. Chilian (1999)
Linda S. Costanzo (1999)
John R. Dietz (1999)
Cheryl M. Heesch (2001)
Andrew J. Lechner (2000)
James C. Schadt (1999)
Steven S. Segal (2000)
Richard C. Vari (2001)
Mary Anne Rokitka, *ex officio* (1999)
Penny Hansen, *ex officio* (2001)
Edward J. Zambraski, *ex officio* (2000)

Finance

Reviews the proposed annual budget and fiscal plan for all Society activities and recommends a final budget and implementation plan to Council. Supervises the investment of the

Society's financial resources subject to approval of Council.

Edward H. Blaine, Chair (1999)
 Steven L. Britton (2001)
 William H. Dantzler (2001)
 David R. Harder (2000)
 Allen W. Cowley, Jr. (1999)
 L. Gabriel Navar, *ex officio* (1999)
 Walter F. Boron, *ex officio* (1999)
 Dale J. Benos, *ex officio* (2001)

Honorary Membership

Recommends to Council distinguished scientists who have contributed to the advancement of physiology as candidates for honorary membership.

Vernon S. Bishop, Chair (1999)
 Leonard S. Jefferson (2001)
 Franklyn G. Knox (2000)

International Physiology

Facilitates interchange between APS, other physiological societies, and their individual members; handles all matters pertaining to international physiological affairs, with an emphasis on developing countries; and maintains a clearinghouse for linkages with developing countries.

Hector Rasgado-Flores, Chair (2001)
 Walter N. Duran (1999)
 Bernice Grafstein (2000)
 John E. Greenleaf (1999)
 Carmen Hinojosa-Laborde (2001)
 J. Carlos Romero (1999)
 Aviad Haramati, *ex officio* (2000)
 Shu Chien, *ex officio* (2000)

Joint Program

Develops the scientific programs for the Society and assists Council in shaping policy for scientific programs and in the organization of fall conferences.

Judith A. Neubauer, Chair (2001)
 Michael Andresen (2000)
 Michael Caplan (2001)
 Catherine Chew (2000)

William W. Chin (2000)
 Steven R. Gullans (2000)
 Joseph M. Metzger (2000)
 Scott K. Powers (2001)
 Richard Roman (1999)
 Curt D. Sigmund (2000)
 Walter F. Boron, *ex officio* (1999)

Cardiovascular

R. John Solaro (2001) and
 H. Glenn Bohlen (2000)

Cell and Molecular Physiology

Simon A. Lewis (1999)

Central Nervous System

Susan M. Barman (1999)

Comparative Physiology

Stephen C. Wood (2001)

Endocrinology and Metabolism

Charles H. Lang (2001)

Environmental and Exercise Physiology

Ronald L. Terjung (1999)

Gastrointestinal

Helen Raybould (1999)

Neural Control and Autonomic

Regulation

Frank J. Gordon (1999)

Renal

Jeffrey L. Garvin (2000) and
 Jurgen B. Schnermann (1999)

Respiration

Ivan F. McMurtry (1999)

Teaching of Physiology

Ann P. McNeal (2000)

Water and Electrolyte Homeostasis

Joseph R. Haywood (1999)

Epithelial Transport Group

John Cuppoletti (1999)

History of Physiology Group

Henry Brown. (1999)

Hypoxia Group

Nanduri R. Prabhakar (1999)

Myobio Group

Thomas M. Nosek (1999)

Members in Industry Group

Terry J. Opgenorth (2001)

Education Committee

Barbara E. Goodman (2000) and
 Penny Hansen (2001)

Liaison With Industry

Fosters interactions and improved relations between the Society and industry and cooperates with the Career Opportunities in Physiology Committee

to encourage high school and college students to choose a career in physiology.

Terry J. Opgenorth, Chair (2001)
 Salah D. Kivlighn (2000)
 Robert Murray (2000)
 David M. Pollock (1999)
 Francis G. Spinale (1999)
 Louis Van de Kar (2000)
 Edward J. Zambraski, *ex officio* (2000)
 Barbara E. Goodman, *ex officio* (2000)
 Judith A. Neubauer, *ex officio* (2001)

Long-Range Planning

Advises and reports annually to Council and interacts with the Section Advisory Committee; prepares systematic, periodic analyses and realistic assessments of past and present Societal performance and accomplishments; conducts review of the Society's relationships with other organizations; and devises specific goals and objectives pertinent to the future scientific mission of APS and American physiology. Reviews the progress of the Strategic Plan annually, conducts studies as assigned by Council, and prepares proposals.

Brian R. Duling, Chair (1999)
 William H. Beierwaltes (2001)
 Helen J. Cooke (1999)
 Gregory D. Fink (2001)
 Robert D. Foreman (1999)
 Richard Hawkins (2000)
 Barbara A. Horwitz (2000)
 Richard J. Traystman, Council member (2000)

Membership

Considers all matters pertaining to membership, reviews and evaluates applications received from candidates for membership, and recommends to Council the nominees for election to regular and corresponding membership.

Sue Amy Shapses, Chair (1999)
 Pamela K. Carmines (1999)
 Meredith Hay (2000)
 Raouf A. Khalil (2001)
 Ali A. Khraibi (1999)

Martha E. O'Donnell (2001)
Jeanne L. Seagard (1999)

Perkins Memorial Fellowship

Selects recipients for visiting scientist family support awards and supervises administration of the Perkins Funds.

Aviad Haramati, Chair (2000)
Klaus W. Beyenbach (2001)
Matthew J. Kluger (2000)
Arthur D. Loewy (2000)
Molly P. Hauck, *ex officio* (indefinite)

Porter Physiology Development

Selects recipients for visiting scientists and professorships and teaching and training fellowships, aimed at improving physiological departments of medical schools with predominately minority enrollments. Counsels underdeveloped physiology departments, assists in the selection of NIDDK minority fellowship awards, and supervises the administration of the Porter Fund.

Pamela J. Gunter-Smith, CoChair (2001)
H. Maurice Goodman, CoChair (2001)
Martha L. Blair (1999)
Parimal Chowdhury (2001)
J. Andrew Daubenspeck (2000)
Jeffrey L. Garvin (2000)
Irving G. Joshua (1999)
Evangeline D. Motley (2001)
Marian R. Walters (2000)

Public Affairs

Advise Council on all matters pertaining to public affairs that affect physiologists and implements public affairs activities in response to Council guidance.

Joseph R. Haywood, Chair (2000)
Philip S. Clifford (2000)
David J. Dzielak (2000)
Andrea R. Gwosdow (2001)
Ralph Lydic (1999)
Timothy I. Musch (2001)
David W. Ploth (1999)

C. Terrance Hawk, *ex officio* (2000)
Terry J. Opgenorth, *ex officio* (2001)

Publications

Manages all Society publications, including the appointment of editors and editorial boards, and supervises the Book Advisory Committees (handbooks, technical series, and history) to ensure timely publication.

Dale J. Benos, Chair (2001)
David H. Alpers (2001)
R. Davis Manning, Jr. (2000)
James A. Schafer (2001)
Stephen H. Wright (1999)
L. Gabriel Navar, *ex officio* (1999)

Section Advisory

Recommends to Council ways to strengthen the Sections' roles in programs, public affairs, and governance of the Society; serves as a Nominating Committee to nominate Society officers; and nominates members as candidates for service on Society committees.

John E. Hall, Chair (1999)

Cardiovascular

Kathleen H. Berecek (2001)

Cell and Molecular Physiology

Robert B. Gunn (2001)

Central Nervous System

Bruce G. Lindsey (1999)

Comparative Physiology

David H. Evans (2000)

Endocrinology and Metabolism

David H. Wasserman (2001)

Environmental and Exercise Physiology

Charles M. Tipton (2000)

Gastrointestinal Physiology

Hannah V. Carey (2000)

Neural Control and Autonomic Regulation

Eileen M. Hasser (1999)

Renal Physiology

Mark A. Knepper (1999)

Respiration

Thomas R. Martin (1999)

Teaching of Physiology

Robert G. Carroll (1999)

Water and Electrolyte Homeostasis

Ronald H. Freeman (2000)

Senior Physiologists

Maintains liaison with senior and emeritus members and assists in the selection of recipients of the G. Edgar Folk, Jr. grants.

Eugene M. Renkin, Chair (2001)
Michael Bárány (2000)
Arthur E. Baue (2001)
Stephen M. Cain (1999)
Lerner B. Hinshaw (2001)
Arthur J. Vander (1999)
Kenneth L. Zierler (2000)

Women in Physiology

Deals with all issues pertaining to education, employment, and professional opportunities for women in physiology. Develops programs to provide incentives enabling graduate students to present their research work at APS meetings, coordinates activities with other committees on women in the FASEB organization, administers the Caroline tum Suden Professional Opportunities Awards, and provides mentoring opportunities for members.

Kim E. Barrett, Chair (1999)
Susan M. Barman (1999)
Ann Bonham (1999)
Lisa M. Harrison-Bernard (2001)
Ulla C. Kopp (1999)
Carole M. Liedtke (2001)
Alice R. Villalobos (1999)
Erin L. Seifert, student member (1999)

Society Representatives to Other Organizations

Association for Assessment and Accreditation of Laboratory Animal Care, International
C. Terrance Hawk (2000)

American Association for the Advancement of Science

Lynne E. Olson (2001)
Frank L. Powell (2001)

APS News

Council of Academic Societies of the Association of American Medical Colleges

Vernon S. Bishop (2001)
William H. Dantzler (2000)

Federation of American Societies for Experimental Biology Board

James A. Schafer (1999)
L. Gabriel Navar (2001)

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College of New Jersey
Joseph Bonanno
Private Practice

Pamela Gooch
Sacred Heart Academy
Jane M. Hemminger
Iowa Lutheran Hospital

Bob Madson
Dull Knife Memorial College

Accepted Student Applicants

John McLaws Adams II
Univ. of Texas Health Science Center
Roberto M. Aguilar
University of Texas
Antchineche Tsegaw Ayele
Ball State University
Laurel A. Bachle
Creighton University
Yun Bai
Univ. of Texas Health Science Center
Philip Edward Baker
Michigan State University
Stacy Dean Beske
Colorado State University
Kathleen T. Swan Beutler
George Washington University
Clinton A. Brawner
Oakland University
Eric Stephen Bushrow
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University of Michigan
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Allison Marie Davis
University of Wisconsin-Milwaukee
Leyla Descheny
Arizona State University
Roy Precido Diaz
University of Washington
Li Fang
University of Texas Medical Branch
Tamara Felder
University of Michigan
Patrick Thomas Fueger
Univeristy of Wisconsin-Milwaukee
Samantha Noelle Gamache
Tulane University Medical School
Kathleen A. Goei
Univ. of Texas Health Science Center
S. Gonzalez-Irizarry
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J. Lauren-Sakara Hall
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Jing Hu
University of Louisville
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University of Michigan
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University of Georgia
Patricia Kelly
Ball State University
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University of Pittsburgh
Jeffrey M. Kramer
University of Illinois
Ping Lai
University of South Florida
Susan Marie Leaman
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Lian Liu
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University of Utah

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Paula Andrea Navarro
California State University
Theresa Lynne O'Donoghuy
University of New Mexico
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Northern Arizona University
Gina B. Perez Baron
San Francisco State University
Olga N.U. Russi-Roman
California Technology
James Andrew Roussie
University of Rochester
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New Mexico State University
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Scott M. Stoeger
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University of Northern Colorado
Beth Marla Tannenbaum
McGill University
Deming Wang
Boston University
Yuan Wang
University of Missouri
Li Yang
University of Southern California
Dailin Ye
University of Hawaii

Section-Sponsored Featured Topics

The Bile Canalculus: Physiology and Pathobiology

I. Arias

Insulin and Growth Factor Receptor Signaling

J. Avruch

Regulation of the Epithelial Na Channel

M.S. Awaysda and Bonnie Blazer-Yost

Physiological and Molecular Responses of Peripheral Chemoreceptors to Chronic Stimuli

G.E. Bisgard

Cytokines and Body Temperature in Health and Disease

C. Blatteis

Cardiovascular Adaptations and Responses to Ischemia

J. Canty

Membrane Trafficking and the Regulation of Ion Transport Proteins

M. Caplan and J. Lippincott-Schwartz

Genetic Models and Novel Tools: Application of Physiological Genomics to the Study of Neural Control of Cardiovascular Function

R. Davisson

Chloride Channels: Mechanisms and Physiological Functions

D. Dawson

Glucose Uptake by Contracting Muscle

G.L. Dohm

Use of Transgenic and Knockout Models for the Study of GI Function

M. Donowitz

Vessel-to-Vessel Signaling in Resistance Vessels

B.R. Duling

Mechanisms and Regulation of Epithelial Calcium Transport: Genetics Illuminating Physiology

P. Friedman

Regulatory Peptides, Guanylin, Uroguanylin and Lymphoguanylin and Their Congate Receptors

L.R. Forte

Role of Membrane Traffic in Epithelial Transport Regulation

R. Frizzell

Teaching and Educational Innovation

J. Griswold

The Gravity of Circulation

A. Hargens

Alterations in Redox State and Cell Signaling

D.G. Harrison

Biodiversity Prospecting: The Use of Biological Adaptations in Industrial Applications

M. Heath

Gene Transfer to Blood Vessels

D.D. Heistad

Cardiac Electromechanics: The Development and Validation of Whole Heart Models

P. Hunter

Remote Monitoring of Physiological Functions

D. Jones and P. Butler

Neurohumoral Mechanisms in the Regulation of Blood Volume and Arterial Pressure

T. Lohmeier and J.T. Cunningham

Mechanisms of Lung Alveolar Epithelial Injury

T.R. Martin

Raphe: Pain and Autonomic Integration

P. Mason

Molecular and Cellular Control of Insulin Secretion

F.M. Matschinsky

Vagal Mechanisms in Neural Control

D. Mendelowitz and A. Travagli

Blood Volume Regulation

E.R. Nadel

Muscle Fatigue

T.M. Nosek

Mitochondrial Maturation and Biogenesis in Striated Muscle

M.A. Portman

Second Messengers in Hypoxia

N.R. Prabhakar

The Medullary Raphe: Such an Obvious Role in Respiratory Control, But What Exactly is It?

G. Richerson

Control of Renal Function by Cytochrome P450 Eicosanoids

R.J. Roman and J. Imig

Mechanisms of Lung Vascular Development

J.M. Shannon

Understanding How Cells Sense Volume: New Sites and Insights

K. Strange

Vascular Actions of Nitric Oxide Including Leukocyte-Endothelium Interactions, Vascular Permeability, and Angiogenesis

P. Vanhoutte

The Neuroimmune Axis in Gut Inflammation: Clues to Therapy

J. Wallace

Nongenomic Effects of the Gonadal Steroids on Vascular Function

R.E. White and J. Stallone

Endothelial Factors in Cardiorenal Regulation

C. Wilcox

Signal Transduction in Somatosensory Pathways

W.D. Willis, Jr.

Regulation of Sympathetic Function by Nitric Oxide

J. Zanzinger

Neural Circuitry of Body Fluid and Cardiovascular Homeostasis

Chair to be decided

Experimental Biology '99

April 17-21, 1999 • Washington, DC

Saturday, April 17, Morning Session

Refresher Course for Teaching Cardiovascular Physiology
F.L. Belloni

Secretion: Mechanisms and Regulation of Exocytosis
(*Journal of Physiology*)
B.H. Hirst

Saturday, April 17, Afternoon Session

Experimental Physiology in the Polar Regions: The Historical Development
G.E. Folk, Jr. and R. Elsner

Genetic Mechanisms Determining the Role of the Kidney in the Pathogenesis of Hypertension
R.J. Roman and J. P. Granger

Physiologists and Outreach Activities Directed to Lower Primary Grades
J. Schadt and B.E. Goodman

President-Elect's Symposium: Microcirculatory Studies of Inflammation and Immune Function
(Microcirculatory Society)
R.F. Tuma

Secretion: Mechanisms and Regulation of Exocytosis
(*Journal of Physiology*)
B.H. Hirst

Sunday, April 18, Morning Session

Asymmetry of Receptor Signaling in Epithelial Cells
K. Amsler and P. Wilson

Endothelin and the Central and Peripheral Nervous System
D.H. Damon and C. Hinojosa-Laborde

Time Domains of Hypoxic Ventilatory Response: Adaptive Mechanisms in Short- and Long-Term Responses
T.E. Dick and G.S. Mitchell

Antioxidants and Oxidative Stress in Health and Disease
(Society for Experimental Biology and Medicine)
R. Knopp and T.M. Bray

Teaching Critical Thinking Skills in Physiology: An Interactive Workshop
S. Mierson and A.P. McNeal

Sunday, April 18, Afternoon Session

Advances in the Characterization of Na⁺-H⁺ Exchanger (NHE) Isoforms
P. Aronson and M. Donowitz

Peripheral and Central Mechanisms of Visceral and Somatic Pain
R.D. Foreman

Translational Research in Psychiatry: From Molecular Medicine to Clinical Practice
(American Federation for Medical Research)
J. Licinio

Comparative Mechanisms to Survive Brain Anoxia: Mitochondria to Organism
P. Lutz

Role of Plasmalemmal Caveolae in Signal Transduction
P.W. Shaul

Monday, April 19, Morning Session

Molecular Physiology of Urea Transporters
R. Gunn and J. Sands

The Road to Apoptosis: Indictment, Judgement, Execution, and Reprieve
(American Federation for Medical Research)
S. Gupta and V. Dixit

Biomaterial Design
(Biomedical Engineering Society)
D.A. Hammer

Hormonal Control of Protein Metabolism in Muscle
R.R. Wolfe

Monday, April 19, Afternoon Session

Regulation of Cellular Processes by Infectious Microbes
(American Federation for Medical Research)
C.E. McCall

Angiotensin Receptors and Signaling: Evolution and Perspectives
H. Nishimura

Families of Sodium-Coupled Transporters
A. Pajor

Mechanotransduction
(Biomedical Engineering Society)
G.A. Truskey

Tuesday, April 20, Morning Session

Angiotensin in Normal and Abnormal Growth of Cardiovascular Tissue
K. Berecek and R. Levy

Neuroendocrine Determinants of Obesity and Satiety
J.F. Caro

Redox Regulation of Gene Expression in Hypoxia
M.N. Gillespie and B.A. Freeman

Mechanisms of Ischemia Reperfusion: Application of Gene-Targeted Animal Models
D.N. Granger and D.J. Lefer

Point/Counterpoint: Is Active Muscle Mass an Important Target for Vasoconstriction During Exercise?

Moderator: C.M. Tipton

Point: **J. M. Mitchell and R. G. Victor**

Counterpoint: **L. B. Rowell**

Beyond Chemotherapy: The Scientific Bases for New Cancer Treatments

(American Federation for Medical Research)

P.H. Wiernik

Tuesday, April 20, Afternoon Session

Effect of Cardiovascular Disease on the Structure and Function of Skeletal Muscle

R.C. Carlsen and S.D. Gray

Phosphodiesterases in Renal Physiology and Pathophysiology

M. Humphreys and T. Dousa

Transplantation Into the Next Century: Genetic Engineering and Xenotransplantation

V. Miller and S. Saggi

Wednesday, April 21, Morning Session

Postmenopausal Physiology

J. Cannon

Glucagon-Like Peptide (GLP) 2: Intestinal Growth Factor and Regulatory Peptide

C. Cheeseman

Molecular Approaches to Study Cerebral Circulation: New Insight Into Physiology and Pathophysiology

F. Faraci and D.W. Busija

HIV Vaccine Development: Opportunities and Challenges
(American Federation for Medical Research)

M.B. Feinberg

Physiological Basis of Congestive Heart Failure

S.R. Houser

Mechanisms Involved in Hypoxic Pulmonary Vasoconstriction: Can Everyone be Right?

E.K. Weir

Physiology InFocus Genomics and Molecular Medicine

Organizers: L. Gabriel Navar and Victor Dzau

Sponsored by the Burroughs Wellcome Fund and the Merck Genome Research Institute

Monday, April 19 Morning Session

Physiological Genomics: Launching a New Journal

Victor Dzau

Brigham & Women's Hospital, Harvard Medical School

Speakers:

Victor Dzau, Brigham & Women's Hospital, Harvard Medical School; **David Housman**, Massachusetts Institute of Technology; **Richard Mulligan**, Harvard University; **Robert Rosenberg**, Harvard University; **Allen Cowley**, Medical College of Wisconsin

Monday, April 19 Afternoon Session

*Tissue-Specific Gene Targeting
as a Window into Physiological Function*

L. Gabriel Navar and Curt D. Sigmund

Speakers:

Brian Sauer, National Institute of Diabetes, Digestive and Kidney Disorders; **Susumu Tonegawa**, Howard Hughes Medical Institute; **Curt D. Sigmund**, University of Iowa;

Eric N. Olson, University of Texas-Southwestern Medical Center, Dallas.

Tuesday, April 20 Morning Session

From Genome to Function

Steve Gullans

Harvard University

Speakers:

J. Craig Venter, Institute for Genomic Research; **Roger Brent**, The Molecular Sciences Institute, Berkeley; **N. Leigh Anderson**, Washington Analysis of Protein Expression; **Steve Gullans**, Harvard University

Tuesday, April 20 Afternoon Session

Secrets of the Sarcomere Revealed by Transgenesis and Gene Transfer

Joseph M. Metzger and R. John Solaro

Speakers:

R. John Solaro, University of Illinois; **Joseph M. Metzger**, University of Michigan; **Leslie Leinwand**, University of Colorado; **Jeffrey Robbins**, Children's Hospital of Cincinnati; **Margaret Westfall**, University of Michigan.

Experimental Biology '99

April 17-21, 1999 • Washington, DC



HENRY PICKERING BOWDITCH
AWARD LECTURE

Howard J. Jacob
Medical College of Wisconsin

*End Stage Renal Disease:
Of Rat and Man*

MONDAY, APRIL 19, 5:15 PM



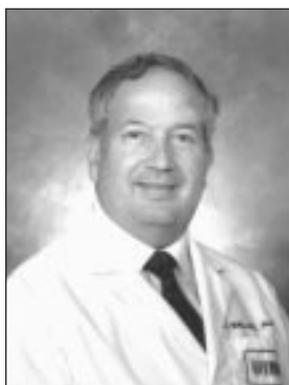
PHYSIOLOGY IN PERSPECTIVE:
THE WALTER B. CANNON
AWARD LECTURE
(SUPPORTED BY THE GRASS
FOUNDATION)

Aubrey E. Taylor
University of South Alabama

*Starling's Hypothesis of
Transcapillary Fluid
Exchange: Then,
Now, and the Future*

SATURDAY, APRIL 17, 5:15 PM

Distinguished Lectureships



JOSEPH ERLANGER
DISTINGUISHED LECTURESHIP
OF THE CENTRAL NERVOUS
SYSTEM SECTION

William D. Willis, Jr.
University of Texas Medical
Branch, Galveston

*The Role of Signal Transduction
Pathways in Central
Sensitization of Spinothalamic
Tract Neurons*

SUNDAY, APRIL 18, 8:30 AM



HORACE W. DAVENPORT
DISTINGUISHED LECTURESHIP
OF THE GASTROINTESTINAL
SECTION

Irwin Arias
Tufts University

*The Bile Canaliculus:
Biology and Pathobiology*

SUNDAY, APRIL 18, 8:30 AM

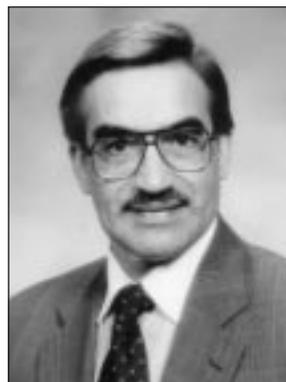


ROBERT M. BERNE
DISTINGUISHED LECTURESHIP
OF THE CARDIOVASCULAR
SECTION

Brian R. Duling
University of Virginia

*Vessel-to-Vessel Signaling in
Resistance Vessels: Who's
Talking, Who's Listening?*

SUNDAY, APRIL 18, 11:45 AM

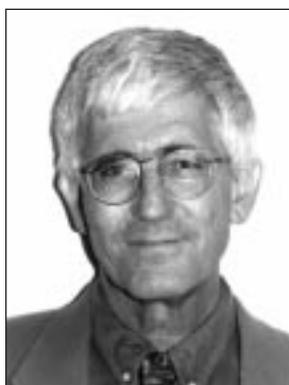


CARL LUDWIG
DISTINGUISHED LECTURESHIP OF
THE NEURAL CONTROL AND
AUTONOMIC REGULATION
SECTION

Robert D. Foreman
University of Oklahoma
Health Science Center

*Central and Autonomic Neural
Mechanisms of Angina
Pectoris*

SUNDAY, APRIL 18, 2:30 PM

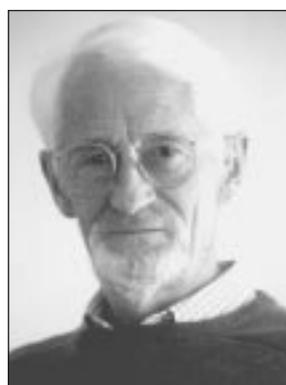


AUGUST KROGH
DISTINGUISHED LECTURESHIP
OF THE COMPARATIVE
PHYSIOLOGY SECTION

Donald C. Jackson
Brown University

*Living Without Oxygen:
Lessons From the Freshwater
Turtle*

MONDAY, APRIL 19, 8:30 AM



HUGH DAVSON
DISTINGUISHED LECTURESHIP
OF THE CELL AND MOLECULAR
PHYSIOLOGY SECTION

Jens Christian Skou
University of Aarhus,
Denmark

*The Identification of the
Sodium-Potassium Pump*

MONDAY, APRIL 19, 11:45 AM

Experimental Biology '99

April 17-21, 1999 • Washington, DC

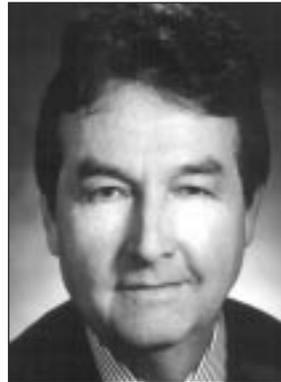


SOLOMON A. BERSON
DISTINGUISHED LECTURESHIP
OF THE ENDOCRINOLOGY AND
METABOLISM SECTION

Leonard S. Jefferson
Hershey Medical Center,
Pennsylvania State University

*Protein Metabolism and its
Regulation by Hormones and
Nutrients*

MONDAY APRIL 19, 2:30 PM



ERNEST H. STARLING
DISTINGUISHED LECTURESHIP
OF THE WATER AND
ELECTROLYTE HOMEOSTASIS
SECTION

Alan Kim Johnson
University of Iowa

*Parallel and Complementary
Neural Mechanisms in the
Maintenance of Body Fluid
and Cardiovascular
Homeostasis*

TUESDAY, APRIL 20, 8:30 AM



EDWARD F. ADOLPH
DISTINGUISHED LECTURESHIP
OF THE ENVIRONMENTAL
AND EXERCISE PHYSIOLOGY
SECTION

Ethan R. Nadel
John B. Pierce Foundation

*Blood Volume Regulation:
Hierarchical Solutions to
Environmental Challenges*

TUESDAY, APRIL 20, 11:45 AM

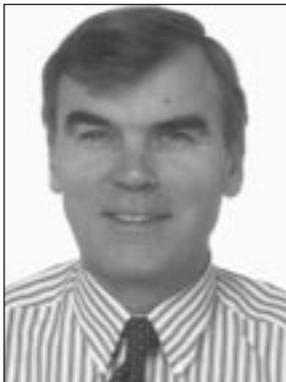


CARL W. GOTTSCHALK
DISTINGUISHED LECTURESHIP
OF THE RENAL SECTION

Dennis Brown
Massachusetts General
Hospital

*Modulation of Membrane
Structure and Function in
Transporting Epithelia: When
Cell Biology Meets Physiology*

TUESDAY, APRIL 20, 11:45 AM



JULIUS H. COMROE, JR.
DISTINGUISHED LECTURESHIP
OF THE RESPIRATION SECTION

Richard C. Boucher
University of North Carolina
at Chapel Hill

*Mysteries of Thin Film:
Airway Surface Liquid*

TUESDAY, APRIL 20, 2:30 PM

Walter C. Randall Lecture in Biomedical Ethics

Frank E. Young
Former Commissioner of
FDA; Assistant Surgeon
General

*Biomedical Ethics in the
21st Century: Human
Cloning and Embryo
Manipulation*

MONDAY, APRIL 20, 12:45 PM



(SPONSORED BY THE AMERICAN
FEDERATION FOR AGING
RESEARCH)

Edward J. Masoro
University of Texas Health
Science Center, San Antonio

*Dietary Restriction in the
Rodent Model: Insights
on the Biology of Aging*

SUNDAY, APRIL 18, 12:45 PM



1998 APS Conference Report

Endothelial Regulation of Vascular Tone: Molecular to Integrative Physiology

The Savannah River and Augusta Riverwalk served as the backdrop for the Society's 1998 conference on "Endothelial Regulation of Vascular Tone: Molecular to Integrative Physiology" organized by David M. Pollock with the assistance of John D. Catravas, Harris J. Granger, L. Gabriel Navar, and Jennifer S. Pollock. The conference featured an in-depth exchange of ideas concerning the interaction among major endothelial factors in the control of the vascular tone. Diverging areas of endothelial cell biology were brought together to develop a more cohesive picture of vascular endothelial function with an emphasis on specific mediators and related subjects such as shear stress and vascular remodeling. Molecular and whole animal physiologists demonstrated how their methodologies integrate into a central hypothesis and also defined the similar aspects and unique mechanisms that exist among the different vascular beds.

There was an internationally recognized and interdisciplinary group of investigators present and interaction was enhanced by the presence of young scientists, students, and investigators



Opening reception.



Friday evening banquet.



Opening reception.



Dancing to "All That Jazz."

new to this burgeoning field of endothelial regulation. The conference attracted 241 registrants, (Table 1) 34% of which represented young scientists including 21% student and 13% postdoctoral registrants. 18% were members—including one Emeritus member—and 25% were not members of APS. 21% of the registrants represented invited speakers and session moderators.

The outstanding program consisted of 8 symposia, 3 plenary lectures, and a

total of 112 poster presentations. The social program included the Wednesday evening opening reception and Friday evening banquet and awards presentation. Banquet attendees enjoyed the music of local jazz band "All That Jazz."

In the nonscientific realm, first-time visitors to Augusta were surprised to discover a diverse and culturally rich Old South community with much to offer, especially all the interesting and

Table 1. Registration Statistics

	No.	%
APS Member	43	18
Non-member	60	25
Postdoctoral	30	12
Student	51	21
Retired	1	1
Invited Speaker	50	21
Guest	6	2
Total	241	100



Ferid Murad prepares to instruct Pam Carmines, David Pollock, and Martin Frank how to win the big prize.



The winning team.

1998 APS Conference Report

unique restaurants. The Augusta "Arts in the Heart" festival coincided with the conference and provided many of the attendees a chance to relax and enjoy the local art and antique collections as well as concerts and shows. For some, of course, a visit to Augusta would not be complete without a round of golf. Sixteen hackers ventured out to the River Golf Club on a beautiful morning prior to the start of the meeting. A good time was had by all as participants divided into teams to play a "scramble" tournament. The team of Steve Garner, Bill Rivell, Clay Ghann, and Jeff Falcone scored a six-under-par to take first prize.

The awards presentation recognized the four recipients of the Graduate Student Award. The awardees presented with a cash prize and certificate were Nathalie Berthiaume, University of Sherbrooke, for "In Vitro and In Vivo Pharmacology of Endothelins in Wild

Type, ETA and ETB Heterozygous (+/-) Knockout Mice"; So Yeon Chin, Tulane University, for "Calcium-Dependent Nitric Oxide Synthase Activity is Elevated in the Renal Cortex in Angiotensin-II Induced Hypertension"; Lynelle Johnson, University of Missouri, for "Exercise Training Produces Enhanced Acetylcholine-Induced Vasorelaxation in Porcine Pulmonary Arteries"; and Ron Johnson, Michigan State University, for "Mechanisms of Endothelin-Induced Venoconstriction in Isolated Guinea Pig Mesentery."

Sonia Houston, University of Missouri, was the recipient of the NIDDK Fellowship Award provided to encourage participation of under-represented minority students. Supported by the National Institutes of Diabetes and

Table 2. Distribution by Department of Submitted Abstracts

Department	Abstracts	
	No.	%
Physiology or Physiol/Biophysics	26	23
Pharmacology and Toxicology	16	14
Biology or Biological Sciences	14	13
Surgery	10	9
Biochemistry	6	5
Medicine or Internal Medicine	4	4

Digestive and Kidney Diseases the fellowship provides reimbursement of all expenses associated with travel to and participation in the conference. The recipient is matched with an APS member attending the conference who will offer guidance and make introductions to other scientists. Terry Opgenorth of Abbott Laboratories and Martin Frank, Executive Director of APS, served as mentors.

A total of 112 abstracts were submitted to the conference for poster presentation. Table 1 provides a distribution of abstracts based on submitting department. 29% were by female first authors; 20% were submitted by authors at institutions outside The Americas. A total of 241 registrants attended the conference. Table 2 provides the breakdown of registration by type: 29% of the registrants were female, 12% were from outside The Americas, and 5% were from industry.

The Society and Organizing Committee gratefully acknowledge financial support provided through generous educational grants from Abbott Laboratories, Astra Hässle, Astra Merck, Bayer Corporation, BIOMOL Research Laboratories, Inc., Hoffmann-LaRoche, Medical College of Georgia School of Medicine, Medical College of Georgia Research Institute, Merck Research Laboratories, The Microcirculatory Institute of Texas A&M University, Parke-Davis Pharmaceutical Research, and Texas Bio-technology Corporation. ♦



David Pollack, Wendell Hoffman, Ron Johnson, Nathalie Berthiaume, Lynelle Johnson, President L. Gabriel Navar.



Poster session.



Poster session.

Conferences

1999 APS Conference Biology of K⁺ Channels: From Molecules to Disease September 22-26, 1999 • Snowmass, CO Snowmass Village

ORGANIZERS:

Steve Hebert, Vanderbilt University
Gerhard Giebisch, Yale University

STEERING COMMITTEE:

Richard Aldrich, Stanford University
David Clapham, Children's Hospital/Harvard Med. School
Lily Jan, University of California, San Francisco
Olaf Pongs, Institut für Neuronale Signalverarbeitung
Francis Ashcroft, Oxford University
Fred Sigworth, Yale University
Lawrence Palmer, Cornell University

This meeting on the broad topic of K⁺ channels will promote dissemination of current and evolving information/trends as well as foster potential interactions among attendees. Focus will be on gating/regulatory and structural/genetic elements of K⁺ channels. The involvement of K⁺ channels in several inherited diseases will be stressed.

WEDNESDAY, September 22, 1999

Structure of the Potassium Channel Pore

Roderick MacKinnon, Rockefeller Institute

THURSDAY, September 23, 1999

High Conductance Ca-Activated Potassium Channels: Structure, Function and Pharmacology

G. J. Kaczorowski, Merck Research Laboratories

Session 1: K Channel Gating

Clay Armstrong, Univ. of Pennsylvania, and Fred Sigworth, Yale Univ.

Speakers: **Francisco Bezanilla**, UCLA; **Richard Aldrich**, Stanford Univ.; **Colin Nichols**, Washington Univ.; **David Clapham**, Children's Hospital and Harvard Medical School.

Session 2: The Channel Pore

Henry Sackin, Chicago Medical School, and G. Yellen, Massachusetts General Hospital

Speakers: **Benoit Roux**, Univ. of Montreal; **Hans Oberleitner**, Institut für Physiologie, Münster, Germany; **Arthur Brown**, Rammelkamp Research Center, Case Western Reserve Univ.; **G. Yellen**, Massachusetts General Hospital, Boston; **Robert Guy**, NIH.

ATP-Sensitive K Channels: Structure, Pharmacology and Function

Frances Ashcroft, Oxford Univ.

FRIDAY, September 24, 1999

The Inward Rectifier K Channel Family

Lily Jan, UCSF

Session 3: K Channel-Associated Protein

Rainer Greger, Univ. of Freiburg, Germany, and L. Bryan, Baylor Univ.

Speakers: **Jochen Roper**, Newham General Hospital, London; **David Brecht**, UCSF; **Joseph Bryan**, Baylor Univ.; **Solomon Snyder**, Johns Hopkins Univ..

Session 4: Assembly of K Channels

Ramon Latorre, CECS, Santiago, Chile, and Y. N. Jan, UCSF

Speakers: **J. S. Trimmer**, SUNY at Stony Brook; **D. Papazian**, UCLA; **Senyon Choe**, Salk Institute

Session 5: Channel Regulation

Wen-Hui Wang, Yale Univ., and J. P. Ruppersberg, Institute of Physiology, Tübingen, Germany

Speakers: **Larry Palmer**, Cornell; **Steve Hebert**, Vanderbilt Univ.; **Donald Hilgemann**, Univ. of Texas Southwestern.

SATURDAY, September 25, 1999

Knockout/Transgenic Models of Potassium Channel Function

Olaf Pongs, Center for Molecular Neurobiology, Hamburg

Session 6: K Channels and Inherited Diseases

David Clapham, Children's Hospital and Harvard Univ., and M. Bienkowski, Pharmacia and Upjohn

Speakers: **Lydia Bryan**, Baylor Univ.; **G. E. Breitwieser**, Johns Hopkins Univ.; **M. C. Sanquinetti**, Univ. of Utah; **R. Lifton**, Yale Univ.

Session 7: Other K Channels

W. Stuhmer, Max-Planck Institute, and G. Desir, Yale Univ.

Speakers: **H. Sentenac**, Laboratoire de Biochimie et Physiologie Moléculaire des Plantes, Montpellier; **L Salkoff**, Washington Univ.; **M. Lazdunski**, Institut de Pharmacologie Moléculaire et Cellulaire, Valbonne; **J. P. Adelman**, Vollum Institute, Portland, OR; **Steve Goldstein**, Yale Univ.; **N. B. Standen**, Univ. of Leicester, UK.

DEADLINES

Abstract Deadline - June 1, 1999

Advance Registration Deadline - August 2, 1999

Conferences

1999 APS Conference

Determinants of Vigilance: Interaction Between the Sleep and Circadian Systems

October 19-22, 1999 • Ft. Lauderdale, FL

Radisson Bahia Mar Beach Resort

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Allan Pack, University of Pennsylvania

STEERING COMMITTEE:

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Leszek Kubin, University of Pennsylvania

Adrian Morrison, University of Pennsylvania

Amita Sehgal, University of Pennsylvania

Robert Moore, University of Pittsburgh

Fred Turek, Northwestern University

Jerry Siegel, University of California, Los Angeles

This meeting will explore the quantitative nature of the interaction of circadian biology and basic mechanisms of sleep and new potential areas of scientific opportunity. We will examine the neuroanatomical evidence of direct connections between neurons involved in the circadian clock and those involved in the sleep/wake cycle. There will be presentations about how the circadian system affects neuroendocrine function and how such neurohormones might affect sleep. We will address whether the interaction between the circadian and sleep system could occur at the level of regulation of gene transcription.

TUESDAY, October 19, 1999

Evidence for Interaction Between Sleep and Circadian Systems

Robert Moore, Univ. of Pittsburgh

Speakers: **Charles Czeisler**, Harvard Univ.; **Irene Tobler**, Univ. of Zurich; **Dale Edgar**, Stanford Univ.; **H. Craig Heller**, Stanford Univ..

Molecular Basis of the Circadian Clock

Fred Turek, Northwestern Univ.

Speakers: **Amita Sehgal**, Univ. of Pennsylvania; **Joe Takahashi**, Northwestern Univ.; **Steven Reppert**, Massachusetts General Hospital; **Martha Gillette**, Univ. of Illinois, Urbana.

WEDNESDAY, October 20, 1999

Mechanisms Controlling Sleep: Networks and Systems

Adrian Morrison, Univ. of Pennsylvania

Speakers: Robert McCarley, Harvard Univ.; Ronald Szymusiak, UCLA; Jerry Siegel, UCLA

Sleep Promoting Systems

Alexander Borbely, Univ. of Zurich

Speakers: **Osamu Hayaishi**, Osaka Bioscience Institute; **Robert Greene**, Harvard Univ.; **James Krueger**, Univ. of Tennessee, Memphis

Neuroanatomical Basis of Interaction

Gene Block, Univ. of Virginia, Charlottesville

Speakers: **Robert Moore**, Univ. of Pittsburgh; **Clifford Saper**, Harvard Univ.; **Gary Aston-Jones**, Univ. of Pennsylvania

Could Interaction be Neurohormonal or Neurochemical?

Irene Tobler, Univ. of Zurich

Speakers: **Alexander Boberly**, Univ. of Zurich; **Eve van Cauter**, Univ. of Chicago; **Rae Silver**, Columbia Univ.

THURSDAY, October 21, 1999

Possible Mechanisms of Interaction

Steven Reppert, Massachusetts General Hospital/Harvard Univ.

Speaker: **Allan Pack**, Univ. of Pennsylvania

Consequences of the Interaction Between Circadian and Sleep Systems: Behavior and Vigilance

Michael Menaker, Univ. of Virginia, Charlottesville

Speakers: **David Dinges**, Univ. of Pennsylvania; **Gregory Belenky**, Walter Reed Army Institute of Research; **Mary Carskadon**, Brown Univ.

Consequences of the Interaction Between Circadian and Sleep Systems: Other Systems

Charles Czeisler, Harvard Univ.

Speakers: **Virend Sommers**, Univ. of Iowa; **Janet Mullington**, Harvard Univ.

Panel Discussion: Where Do We Go From Here?

Allan Pack, Univ. of Pennsylvania

Gary Aston-Jones, Univ. of Pennsylvania; **Gene Block**, Univ. of Virginia, Charlottesville; **Michael Menaker**, Univ. of Virginia, Charlottesville; **Jerry Siegel**, UCLA; **Fred Turek**, Northwestern Univ.

DEADLINES

Abstracts Deadline - July 16, 1999

Advance Registration Deadline - August 30, 1999

Congress Votes Historic 15% Increase for NIH

Funding legislation was the last item of “must pass” business before the 105th Congress adjourned. The agreement was reached in mid-October, but it took another week for the massive legislation to be compiled, reviewed, and approved.

The House passed a multi-agency “continuing resolution” on October 20 by a vote of 333-95. The Senate passed the bill October 21 by a vote of 65-29. Despite the wide margins of approval, many Members of Congress deplored the fact that a \$520 billion piece of legislation had to be approved under pressure at the last minute.

The legislation provided NIH with an increase of \$2 billion or nearly 15% in FY 1999, the largest in its history. This extraordinary increase came about through the persistent efforts of NIH’s champions, Rep. John Porter (R-IL) and Sen. Arlen Specter (R-PA), who chair the respective House and Senate Appropriations Subcommittees with jurisdiction over NIH funding.

In early November, NIH Director Harold Varmus announced that the agency plans to award 9,958 new research project grants in FY 1999. This figure represents approximately 2,300 more than the 7,625 new grants

awarded in 1998.

In other legislative actions, Congress also approved nearly a 9% increase for Research and Related Activities (R&RA) at the National Science Foundation. This was part of a bill that also provides funding for VA medical research and NASA life sciences research. This legislation was passed as a separate bill and also signed by President Clinton on October 21. Details of that bill include:

NSF: Funding for NSF’s R&RA will increase by \$224 million to \$2.8 billion in FY 1999. The NSF overall got a 7% increase or a total FY 1999 budget of \$3.7 billion.

VA: Medical and Prosthetic Research at the VA will increase by \$44 million or 16% to an FY 1999 total of \$316 million. The conferees earmarked \$6 million for the VA Musculoskeletal Disease Center.

NASA: Life and Microgravity Sciences programs at NASA are slated to receive an additional \$22 million for an FY 1999 total of \$264 million, an increase of 23%. The ground-based Research and Analysis (R&A) grants program, which gave out \$54 million in grants in FY 1998 is funded from this budget line. The precise amount that

will be made available for Life Sciences R&A grants in FY 1999 has not yet been determined.

Due to delays in the timetable for the space station, the conferees specified that \$15 million of the Life and Microgravity Sciences budget should be used to add research payloads to shuttle missions. The conferees stated that “additional research missions during space station assembly are critical for providing scientists the opportunity to develop research capabilities needed for optimal utilization of the International Space Station.”

It is clear that the 105th Congress made research in general and NIH in particular a priority. The scientific community should acknowledge this if we would like to see the trend continue. Members of the APS rapid response network NetAlert were encouraged to send letters to key Members of Congress thanking them for making biomedical research a priority. At the EB ‘99 meeting in Washington, DC, in April, the APS Public Affairs and Animal Care and Experimentation Committees will sponsor a symposium called “A Call to Activism” to help scientists learn how to make their voices heard in Washington. ♦

NIH Almanac Available

The 1998 edition of the NIH Almanac is now available on the NIH home page at <http://www.nih.gov/welcome/almanac/>.

The NIH Almanac is an invaluable source of current and historical information concerning NIH. It includes a chronology of important events in the history of NIH and the individual institutes and centers; biographical sketches of current and past directors, deputy directors, and associate directors of NIH as well as the directors and deputies of the institutes and centers; summary appropriations information from 1938-1998; summary information about the NIH staff; information about the history and cost of each NIH building; and a list of NIH lecturers and Nobel Prize winners.

The NIH Almanac is produced by the Editorial Operations Branch of the NIH Office of Communications.



Watch for the New APS “Call to Activism:” Do you know the names of your Representative and Senators and how to contact them? APS is developing new material to help you communicate with Congress. Keep your eyes open for a seminar on this topic at **EB ‘99!**

NIH to Recruit Public Representatives

The NIH is expected to begin shortly to recruit members for its new Council of Public Representatives (COPR). The COPR idea was discussed September 23 at an NIH meeting on "Enhancing Public Participation in NIH Activities."

Formation of a public council was recommended this summer in an Institute of Medicine review headed by Leon Rosenberg of Princeton University. The IOM "Committee on the NIH Research Priority-Setting Process" was commissioned in February by Congress in response to concerns over how the NIH allocates research funding among diseases. The panel expressed support for NIH's priority setting process but

recommended that the agency do more to analyze the burdens of specific diseases. The panel also recommended that NIH establish a council to be composed of 18-25 representatives of disease advocacy groups, public health officials, and ethnic groups with specific health concerns.

The NIH will now try to identify public representatives with an interest in NIH's mission who can "help bring to the NIH the concerns and interests of the many external public that have a stake in the agency's activities, programs, policies, and research," according to an advance notification released by the NIH in early November. The notice was expected to be published in

the *Federal Register* shortly thereafter, with the nomination period open from approximately November 23, 1998 through January 15, 1999.

"In addition to serving as a forum, the COPR will assist the NIH in enhancing the participation of the public in myriad NIH activities that have an impact upon the public, in increasing public understanding of the NIH and its programs, and in bringing important matters of public interest forward for discussion in public settings," the notice said.

The COPR is expected to meet twice a year. For more information, contact Anne Thomas or Laura Vazquez at the NIH at 301 496-4461. ♦

Singer Appointment Draws Criticism

The appointment of Australian bioethicist and animal rights philosopher Peter Singer as a distinguished professor at Princeton University is drawing considerable criticism. In July Princeton announced that Singer had been appointed as the Ira W. DeCamp Professor of Bioethics at the University Center for Human Values.

Singer is best known in the research community as the intellectual founder of the modern animal rights movement. In his 1975 book *Animal Liberation*, Singer used his own version of utilitarianism to argue that humans do not have the ethical right to use animals. Utilitarianism says that actions should be judged based upon their consequences, that is, the pleasure or pain those actions cause. Singer extended this ethical calculation to include animals, whom Singer has defined as "persons" based upon their capacity to seek pleasure and avoid pain. This led him to the stunning conclusion that it is "speciesism" to give human beings special consideration over animals.

Singer's version of utilitarianism has also led him to advocate controversial views about human beings. Most of

the current criticism is focused on his assertion that euthanasia of sick or disabled humans can be ethically justified. One critic of his Princeton appointment is Wesley J. Smith, an attorney for the International Anti-Euthanasia Task Force and the author of *Forced Exit: The Slippery Slope From Assisted Suicide to Legalized Murder*.

In an article in the September issue of the magazine *Heterodoxy*, Smith quotes from Singer's 1979 book *Practical Ethics*, in which he rationalizes the killing of human infants: "When the death of a disabled infant will lead to the birth of another infant with better prospects of a happy life, the total amount of happiness will be greater if the disabled infant is killed. The loss of the happy life for the first infant is outweighed by the gain of a happier life for the second. Therefore, if the killing of the hemophiliac infant has no adverse effect on others, it would be right to kill him."

Singer's advocacy of such views has made him unwelcome in many German-speaking nations, where arguments in favor of euthanasia evoke chilling memories of Nazism. Singer

was shouted down a few years ago when he tried to give a lecture at the University of Zurich, and Nazi-hunter Simon Wiesenthal wrote a letter of protest last year to the organizers of a Swedish book fair who had invited Singer to speak. Singer is the son of Jewish refugees from Central Europe who lost family members in the Holocaust, and he reportedly chafes at the idea that his philosophy has been linked to the Nazis. Yet there are many who find that conclusion to be inescapable.

Columnist Don Feder criticized the Singer appointment recently in the on-line magazine *Jewish World Review*. Feder points out the essential misanthropy of Singer's views noting that Singer makes a "lethal" distinction between humans and persons. Feder further notes a symmetry between Singer's efforts to award rights to some animals while denying them to some humans: "pigs and monkeys have rights, handicapped babies do not."

Singer is scheduled to arrive at Princeton in June 1999 and to begin his teaching duties in the fall. ♦

Congress Okays Foreign Scientist Honoraria

The Omnibus Appropriations bill that provided funding for NIH and other federal agencies also included key changes in immigration law.

The “American Competitiveness and Workforce Improvement Act,” which was folded into the massive funding legislation, amended current immigration law to permit scientists from other countries to accept honoraria and payments for incidental expenses for short-term academic activities. The new law permits such expenses for “a usual academic activity or activities”

lasting up to nine days at any one institution and at a no more than five institutions or organizations in a six-month period.

Under a previous Executive Order, it was illegal to pay honoraria to visiting foreign scientists except under the auspices of an international exchange program administered by the US Information Agency.

Other changes to immigration law dealt with H-1B visas that are issued to bring skilled workers into the US each year. Although the driving force behind

these changes was the computer industry, academic scientists in some life sciences disciplines complained about a shortage of American scientists and an inability to pay prevailing industrial wages, as the law required. In response, Congress increased the total number of H1B visas, and educational and non-profit institutions were granted permission to set prevailing wages for foreign scientists based upon wages in comparable institutions rather than in industry. ❖

Greenwood Introduces Chimpanzee Care Act; NIH Offers Its Own Plan

On October 8, Rep. Jim Greenwood (R-PA) introduced the Postresearch Chimpanzee Care Act with then-House Speaker Newt Gingrich (R-GA) as cosponsor. The bill was assigned the number HR 4744 and was referred to the House Commerce Committee. However, no action was taken, so the legislation died when the 105th Congress adjourned two weeks later.

H.R. 4744 would establish a national sanctuary system for federally owned or supported chimpanzees no longer needed for research. The sanctuary system could also acquire ownership of other “postresearch” chimpanzees and provide for their long-term care by imposing fees to cover the associated costs. The sanctuary system would be operated by a nonprofit entity chosen by the Secretary of Health and Human Services, and that entity would be required to share the costs of establishing and operating the system. H.R. 4744 authorizes up to \$15 million per year to provide for postresearch care of chimpanzees. The bill would have also required that the Secretary of HHS submit a report to Congress within 120 days reporting the number of chim-

panzees used, bred, or purchased in research and the funding available for the care of chimpanzees.

In establishing standards for operating the long-term care system, the bill calls upon HHS to consider the recommendations of the National Research Council’s 1997 report, *Chimpanzees in Research – Strategies for their Ethical Care, Management, and Use*. That report recommended that NIH establish a centralized office to assume both ownership and management of a core population of about 1,000 research chimpanzees and that it provide them with lifetime support. It also recommended that other chimpanzees, which are no longer needed for research or breeding, be provided long-term care in various settings. Animals that pose no health risks to humans or other animals could be transferred to privately operated sanctuaries.

On September 17 the Advisory Council of NIH’s National Center for Research Resources approved a plan to establish a national NIH Chimpanzee Management Program (ChiMP) within the Comparative Medicine Program at NCRR. This plan was developed to

implement the recommendations of the NRC report, including determining how many chimpanzees are likely to be needed for research and breeding, and then arranging to assume ownership and care responsibilities for them. The NCRR plan recommends that the existing NCRR-funded Chimpanzee Biomedical Research Program centers be invited to compete for selection as the three sites that will provide long-term, cost-effective housing to this core population of NIH-owned chimpanzees.

The NCRR plan addresses other issues relevant to the general management of the research chimpanzee population and calls for making long-term care arrangements for “reserve” animals that are not currently needed for research.

By contrast, H.R. 4744 calls for designating chimpanzees as “surplus” and making them part of a “sanctuary” system so that they can never again be used for research. It remains to be seen whether H.R. 4744 will be reintroduced in the 106th Congress and what impact the legislation would have on NIH’s own chimpanzee management plans.

ALDF Representative Granted Legal Standing in Case Against USDA

On September 1, the US Court of Appeals for the District of Columbia issued a split decision granting legal standing to one of plaintiffs in the latest Animal Legal Defense Fund challenge to USDA's Animal Welfare Act (AWA) regulations.

The case, Animal Legal Defense Fund vs. the Secretary of Agriculture and the National Association for Biomedical Research, involved the ALDF and four individual plaintiffs. The individuals alleged that they suffered "aesthetic injury" when they had visited animal exhibitors who failed to provide appropriate environmental enrichment for nonhuman primates as mandated under the AWA. (Aesthetic injury is an established concept in laws intended to protect the environment.) In all previous cases, the courts have refused to grant legal standing to individuals and organizations who wanted to sue the USDA over its enforcement of the AWA.

In 1996, the late US District Court Judge Charles Richey issued an initial ruling on the ALDF's suit against USDA. Richey granted the plaintiffs' standing to sue the government, accepted the merits of their arguments, and ordered USDA to rewrite its standards for nonhuman primate enrichment. NABR subsequently petitioned the court to join the suit as a codefendant to represent the interests of the research community.

In 1997, a three-judge panel of the US District Court of Appeals issued a 2-1 split decision reversing Judge Richey's ruling. However, the dissenting judge on that panel argued that defendant Marc Jurnove's complaint successfully met the legal tests for standing to sue a government agency. Those tests are that the plaintiff must have suffered an injury that was caused by the agency's actions and that it is possible to redress the injury through court action; in addition, the individual

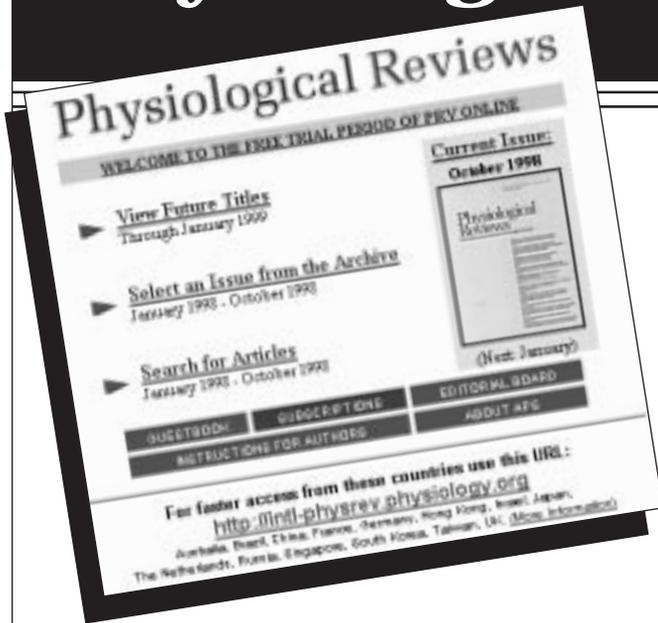
who alleges the injury must fall within the scope or "zone of interests" of the law in question. Previous cases had involved animal activist efforts to influence how the AWA was applied to research laboratories, and the courts had ruled that the plaintiffs were not entitled to standing. The significant difference was that Jurnove's complaint dealt with animals on exhibit to the public.

Because the three-judge panel issued a split decision, the ALDF appealed to the full Court of Appeals, which heard the case earlier this year. The sole question under consideration was whether Jurnove qualified for standing, and the court ruled 7-4 in favor. The case was then sent back to the District Court for consideration of its merits.

It is not yet known whether the USDA will appeal the Appeals Court decision on standing to the Supreme Court. ❖

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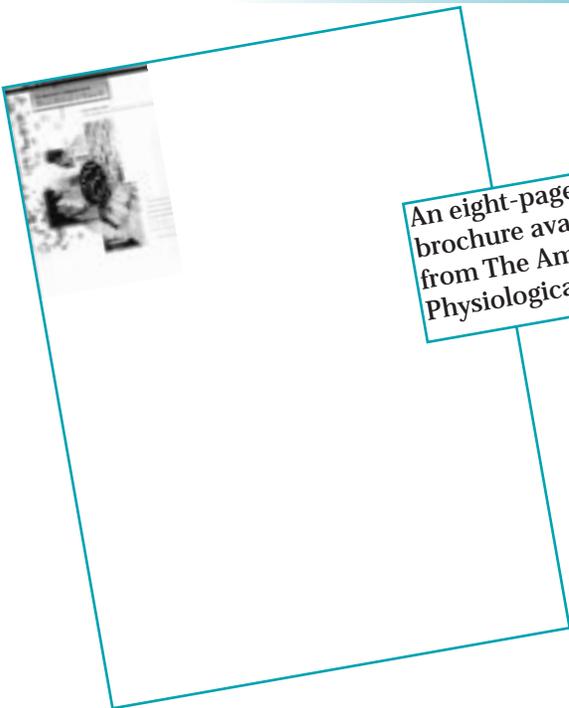
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With Answers from The American Physiological Society



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Mail or Fax to: The American Physiological Society, Public Affairs Office, 9650 Rockville Pike, Bethesda, MD 20814-3991. FAX: 301-571-8305. For information: 301-530-7105.

Public Affairs

New APS Brochures Available

The APS Public Affairs Office has just published some new educational materials concerning animals in research.

The first item is the brochure *Questions People Ask About Animals in Research. . . With Answers From The American Physiological Society*. It provides short essays answers to questions such as, Why do scientists use animals in research? Do animals have rights? Are there alternatives to the use of animals? How are research animals protected? The brochure is available for viewing and downloading in both HTML and PDF formats on the APS web site at the URL <http://www.faseb.org/aps/pubaff/animals/index.html>. Individuals and organizations are wel-

come to establish a link to the brochure or to publicize it in newsletters.

APS will provide complimentary single copies of the printed brochure. Persons wishing to request a copy may send email to araan@aps.faseb.org with their complete name and mailing address in the body of the message. Written requests may be sent to the attention of Alice Ra'anan, APS Public Affairs Officer, 9650 Rockville Pike, Bethesda, MD 20814-3991. Multiple copies of the brochure may be ordered for a nominal charge. (See previous page for details.)

The second item is a new *Guide to Internet Resources: Animals in Research and Education*, which is available on the Internet at the URL

<http://www.faseb.org/aps/classroom.htm#resource>.

This is a compilation of helpful Internet information sources for teachers, students, and members of the general public interested in how animals are used in research and education. Among the web sites listed are government agencies that oversee the use of animals in research, national organizations that address various aspects of animal usage, organizations providing guidelines for the use of animals in the classroom, state biomedical research societies, and a smattering of interesting and useful sites such as the Electronic Zoo. Copies of the *Guide to Internet Resources* are also available upon request. ❖

Mass Media Science and Engineering Fellowship Applications Being Accepted

BACKGROUND: Applications are currently being accepted for an APS sponsored American Association for the Advancement of Science (AAAS) Mass Media Science and Engineering fellow. This individual will spend a summer working in the newsroom of a newspaper, magazine, radio or television station, sharpening his or her ability to communicate complex scientific issues to nonscientists and helping to improve public understanding of science.

DUTIES: The APS-sponsored fellow will spend 10 weeks helping to cover science and technology issues. AAAS will arrange placement at a participating media outlet as part of the selection process. The fellowship will include travel to Washington for an advance orientation to journalism and an evaluation session at the conclusion of the assignment, as well as travel to the job site and a weekly stipend based upon local cost of living.

ELIGIBILITY: You must be currently enrolled as a graduate or postgraduate student of physiology or a related discipline.

APPLICATION INFORMATION: Application forms are available from Alice Ra'anan in the APS Office of Public Affairs at the address below. In addition to the completed form, applicants must submit a current résumé, at least one three- to five-page writing sample directed to the general public, transcripts of graduate and undergraduate work, and three letters of recommendation. Two recommendation letters should be from faculty members, and the third should be a personal reference. The selection process is designed to seek out qualified candidates especially from underrepresented communities, including African-Americans, Hispanics, and Native Americans, as well as scientists with disabilities.

DEADLINE & CONTACT: The application deadline is **January 15, 1999**. For more information, contact Alice Ra'anan, APS Office of Public Affairs, 9650 Rockville Pike, Bethesda, MD 20814-3991. Tel: 301-530-7105; fax: 301-571-8305; e-mail: araan@aps.faseb.org.

Teaching at an Undergraduate Campus

Mike Woller

University of Wisconsin-Whitewater

I received my BS and MS in Zoology from the University of Wisconsin-Oshkosh in 1981 and 1984, respectively. While at UWO, I conducted research with I.Y. Mahmoud and Rodney Cyrus. After one year of working as a technician in a microbiology laboratory, I returned to graduate school at the University of Wisconsin-Madison in 1985. My thesis work in Madison was conducted at the Wisconsin Regional Primate Research Center under the direction of Ei Terasawa. I received my PhD from the Endocrinology and Reproductive Physiology Training Program in 1991 and left for a postdoctoral position at the University of South Carolina School of Medicine. I was fortunate enough to work with two great mentors at USC, Charles Blake and Gary Campbell. While under their wings, I learned much more about survival in science than either of them suspect. After spending 4 years at USC, I accepted a position at the University of Wisconsin-Whitewater (UWW) in 1995. I am still here at UWW and plan to remain for a while. My training involved a number of profound experiences, but the experience I had early on with Mahmoud and Cyrus has been most influential in my choice of career paths. Throughout my graduate and postdoctoral training, I was being groomed to conduct research, with a career at either a medical school or a large PhD-granting research institution in my future. My passion, however, has always been to work at a smaller teaching campus. Be careful what you ask for.

Factors That Led Me To Teach At An Undergraduate Campus

I will present some of the factors that went into my decision to develop my physiology career at a predominantly undergraduate teaching campus. I

will present observations, both positive and negative, that may be useful to graduate students and postdoctoral fellows considering the next step in their career. I will include the experiences of friends and colleagues in the field to give a broader view of what it is like to teach and do research at a small liberal arts university. In fairness, I should include the disclaimer that I am extremely happy with the position I hold at UWW. UWW is a comprehensive 4-year campus with an enrollment of 10,500 students (primarily undergraduate) and part of the University of Wisconsin system. I am smiling virtually every day when I arrive at work and still smiling most days when I leave. Thus, I may not be as objective as I would like while describing what it is like to be a physiologist at a teaching campus, but I will try to present a balanced view.

The earliest and strongest factor in my decision to teach at a smaller campus was my undergraduate and masters thesis mentor, I.Y. (Abe) Mahmoud. Abe was a very powerful force in my intellectual and professional development. He was infinitely patient, adding direction and focus to my work without inhibiting creativity. More important to me, although it took me years to comprehend fully the significance of this, was that Abe always enjoyed the processes of science through good times and bad. Not every graduate student or postdoctoral fellow has the luxury of working with an "Abe" who illustrates to them the full array of opportunities available at an undergraduate institute.

Positive and Negative Aspects of a Career at an Undergraduate Campus

As with all value judgements, "positive" and "negative" will vary from person to person, but I will try to

include a list of items for consideration. I will break these items down into three categories that have some overlap but help me cover the important topics at least once. The categories are based on commodities important to most scientists: time, research opportunities, and money.

Time

Time constraints, while pressing on both teaching and research PhDs, are composed of different mixes of obligations. In our department, we have a teaching load of 14-15 contact hours per week; this is common for positions without a significant research component in comprehensive universities. Departments will significantly reduce teaching load (to 6-9 contact hours per week) if research productivity is expected. In addition to contact hours, we are obligated to schedule five office hours per week and to participate in service via departmental, college, university and system committees. With a conscientious approach to ancillary teaching activities (advising, additional help for students, course preparation, laboratory preparation, and evaluation), I usually invest ~50-60 hours per week. While this is certainly a feasible work load, it does not include time for either directing student research or performing one's own research.

The positive side to spending extensive time teaching is that teaching physiology to undergraduates is enjoyable and rewarding. As complex systems are explained to them, students give immediate feedback as they assimilate conceptually difficult ideas. This immediate feedback is a powerful motivating force for me, and it keeps me enthusiastic about the material. We all know feedback from research projects can be delayed months or years, and it frequently has a significant negative com-

ponent. On the other hand, delayed feedback from students who have started careers or have gone to graduate or professional schools is even more gratifying. While I enjoy research, I find the teaching much more rewarding. There are days that I wonder why they pay me for having as much fun as I do, but I will discuss the money issue later.

Research Opportunities

The research opportunities at undergraduate institutions tend to vary greatly by location and department. The national trend seems to be for expectations of some level of research from teaching faculty. For those of us trained to do research and who enjoy the process, this is a welcome change. Unfortunately, the administrators at many institutions have failed to recognize the need for two commodities to do research successfully: time and money. Several of my peers have accepted positions that required extensive research and grant writing efforts on top of a full teaching load. One needs to be careful when interviewing for these positions: be sure you know what is expected of you and that you will have the support and time to accomplish your goals. Once hired, we need to be diligent in educating our administrators as to the infrastructure and support required to conduct legitimate research in the life sciences.

How can one overcome the limitations on research experienced at comprehensive universities? I have had several experiences that have helped me be successful at this level. First, limited resources and time necessitate extensive collaboration. When I think of collaboration, I view it as less work, more productivity per unit work, and more fun doing the science. Given this, I am very fond of collaboration. Second, I have extensively engaged my undergraduate students in research projects. While this

strategy is not as efficient as the first (I find it much easier to do the work myself versus guiding undergraduates in their research), working with undergraduates is very rewarding. I hope that Abe, my mentor, enjoyed working with me as much as I have enjoyed the students who have worked with me. I have had some great students in my laboratory, and I intend to revel vicariously in their future successes. Third, since my ultimate tenure decision does not hinge upon my being able to obtain an NIH grant or publish two to three papers per year, I have the luxury (freedom) of being able to take on riskier that others cannot take a chance on.

Money

There are several angles to the money issue that one needs to consider before entering an academic position at an undergraduate institution. Salary is one of the pragmatic issues that may be important to consider. It is reasonable to expect a 15-30% lower starting salary than you would receive at a graduate school or medical school. A position in industry is likely to pay considerably higher than either type of academic position. If your salary is an important component of your self-worth, make your decision accordingly.

A second aspect of money to consider is the infrastructure and support provided for both teaching and research. To be successful in writing grants, you will need infrastructure and preliminary data. Thus, your administration needs to recognize its obligation and invest in the sciences in general, and in your department and you in particular. If not fully supported initially (a common plight), some creativity may be necessary to stock a lab with equipment and supplies. Small grants and gifts-in-kind from corporations and private foundations (thank you Merck

Pharmaceuticals and St. Lukes Hospital!) require time investments on your part but can be useful in acquiring needed materials. In return, the benefactors remove surplus equipment and typically receive a tax write-off. Collaborations at regional research institutions (thank you Wisconsin Regional Primate Research Center and University of Wisconsin-Milwaukee!) can provide you with access to equipment, expertise, and research colleagues. In return, the benefactors here receive the benefit of your hands (brain) and a chance to recruit promising undergraduates to their advanced programs or as employees.

The third facet of money to consider is the magic elixir all institutions crave: the overhead money associated with extramural grants. The big advantage a position at an undergraduate institution has over one at a research institution is that faculty at undergraduate institutions are not required to bring in overhead to keep the laboratory roof overhead, much less pay their own salaries. Given the status of funding levels at NIH and NSF over the last 10 years, this is an important consideration. For myself, this was the key money consideration in accepting my position here at UWW.

Summary

The decision to cut your career path toward an undergraduate teaching institution must result from your evaluation of all the options. Each of us has different needs. When you arrive at the final stages of your job search, collect good data, analyze it thoroughly, be honest with yourself about what your career needs are and then make a good decision. As physiologists, this is what we are trained to do. Perhaps my training is why I am so happy with my career path. Good luck. ❖

Positions Available

Postdoctoral Fellowships: Two postdoctoral fellowships in cardiovascular research are available for 1-3 years. University of Missouri has a strong program in cardiovascular sciences, spanning the Colleges of Medicine, Veterinary Medicine, and Dalton Cardiovascular Research Center. One position will focus on cellular mechanisms responsible for cardiac Ca channel dysfunction associated with endotoxemia, including second messenger regulation and potential Ca channel-cytoskeletal interactions. The second position will explore exercise-induced adaptations in porcine coronary artery function and include studies of adenosine transport/metabolism and/or K channel function. The successful applicant will possess a DVM, PhD, MD, or the equivalent. Experience in second messenger biochemistry, cytoskeletal regulation of membrane events, electrophysiology, and/or confocal microscopy is preferable. Strong interest and/or background in some aspect of cardiovascular research is essential. Send a letter of interest, a recent curriculum vitae, and the names of three references to Dr. Leona Rubin, Department of Veterinary Biomedical Sciences E102, University of Missouri, Columbia, MO 65211, e-mail: RubinL@missouri.edu. Minorities and women are encouraged to apply. [EOE]



Faculty Position in Department of Physiology: Applications are invited for a faculty position in the Department of Physiology, Faculty of Medicine, National University of Singapore. The successful applicant should possess and MD or PhD degree (or equivalent) and should have had at least two years of postdoctoral experience. He/she is expected to teach human physiology at both undergraduate and graduate levels, to conduct independent research, and to compete successfully for research funding from intramural and extramural sources. A medical background or research experience in molecular biology will be an advantage. Remuneration will be commensurate with experience. Applicants should send their curriculum vitae, a brief description of research plans, and the names and addresses of three references to: Head, Recruitment Committee, Department of Physiology, Faculty of Medicine, National University of Singapore, 10 Kent Ridge Crescent, Singapore 119260. For more details, visit the department's web site: <http://www.nus.sg/NUSinfo/Appoint/med-physio.htm>. Only short-listed candidates will be notified.

Postdoctoral Position: A postdoctoral position to study oxygen radicals and convulsions will become available on October 1, 1998. The research is funded by NIEHS to study relationships between convulsions and the concentrations of excitatory and inhibitory metabolites of the kynurenine pathway for NMDA receptors in the brains of rats exposed to hyperbaric oxygen. Associated research will assess the interactive effects (in vivo and in vitro) of oxygen, iron, and various antioxidants on flux through, and enzyme kinetics of, the kynurenine pathway using both procaryotes and eucaryotes. The work has medical applications for oxygen therapy, deep sea diving, brain degenerative diseases, and stroke. The research is a team effort involving the laboratories of Olen R. Brown and William E. Dale (University of Missouri - Columbia) and Fong Fu Hsu (Washington University, St. Louis). The successful candidate will have some combination of interests and abilities in biochemistry, analytical chemistry, enzymology, microbial physiology, and/or oxygen radicals. Expertise with HPLC and brain microdialysis techniques also would be helpful. Send a resume and the names of three scientists as references to: William E. Dale, PhD, Dalton Cardiovascular Research Center, University of Missouri, Columbia, MO 65211 (tel: 573-882-0778; fax: 573-884-4232; email: dalew@missouri.edu).

Research Biologists. Pharmacia and Upjohn is seeking candidates to fill two openings for Research Biologists in Safety Pharmacology. Both are located at Pharmacia and Upjohn's North American Research and Development Center in Kalamazoo, Michigan. The incumbent will be responsible for planning, conducting, evaluating, and reporting on safety pharmacology studies and for collection and analysis of ECGs on non-rodent toxicology studies in support of early discovery and product development. Knowledge of cardiovascular pharmacology and a BS or MS degree in a related discipline with at least 3 years of experience in conducting these studies are required. Experience in the pharmaceutical industry is highly desirable, as is experience in performing all aspects of studies utilizing computerized radiotelemetric data acquisition. These studies are conducted in compliance with GLP regulations; a working knowledge of these regulations is desirable. The ability to communicate effectively in writing and orally is required. For confidential consideration, send your resume to: Laurie A. Hanson, Pharmacia and Upjohn, 301 Henrietta Street, Kalamazoo, MI 49007. Reference Requisition number 980586. Resumes are accepted by email at: Laurie.A.Hanson@am.pnu.com. Pharmacia and Upjohn is an equal opportunity employer with a commitment to workplace diversity.

Positions Available

Postdoctoral position: available to study effect of diet on skeletal muscle insulin signaling and glucose transport. Research experience in biochemistry, cell biology, molecular biology, and/or physiology is preferred. Position is available January 1999 and is funded through NIH for up to 3 years. Minimum salary is \$30,000. Send a cover letter describing research experience, a curriculum vitae, and the names and addresses of three references to: Greg Cartee, Ph.D., Biodynamics Laboratory, University of Wisconsin-Madison, 2000 Observatory Drive, Madison, WI 53706. Fax: 608-262-1656; email: cartee@soemadison.wisc.edu. [EOE]

Postdoctoral Research Fellowships: The Reproductive Sciences Program at the University of Michigan currently has postdoctoral research fellow positions available on its NIH/NICHD-funded training grant (NRSA), "Training Program in Reproductive Endocrinology." To be considered for open postdoctoral positions, applicants must arrange a mentorship with an RSP-affiliated faculty member, must be a citizen or non-citizen national of the US, or must have been lawfully admitted for permanent residence. Individuals on temporary or student visas are not eligible. Application deadline is February 1. Visit our web site to obtain additional information and application procedure at: <http://www.umich.edu/~rspwww/>.

Tenure-Track Position in Biology: The Biology Program of Claremont McKenna, Pitzer, and Scripps Colleges of The Claremont Colleges seeks a broadly trained Organismal Biologist to fill a tenure-track position in biology. Appointment may be made at the Assistant Professor or at a more advanced level. Preference will be given to candidates with research experience and continuing interests in the physiology or anatomy of animals or plants. The position will begin September 1999. Teaching responsibilities will include participation in our Introductory Biology sequence and an upper-division undergraduate laboratory course in the area of specialization. Interest in developing courses for non-science majors is highly desirable. Supervision of undergraduates in research is expected. The successful candidates will show evidence of being able to sustain an active research program attracting and involving undergraduates at a liberal arts college. A PhD degree, prior teaching experience, and a record of scholarly publication are required. The Biology program is part of the Joint Science Department (<http://www.jsd.claremont.edu>), an interdisciplinary department that serves three selective liberal arts colleges in The Claremont Colleges consortium: Claremont McKenna, Pitzer, and Scripps Colleges. The Joint Science faculty consists of 11 biologists, 6 chemists, and 4 physicists. The department offers major programs in Biology, Chemistry, Physics, and various interdisciplinary topics. Send a CV, a statement of teaching interests and philosophy, and a statement of research interests to Dr. Newton Copp, W.M. Keck Science Center, 925 N. Mills Avenue, Claremont, CA 91711. (Email: ncopp@jsd.claremont.edu). Arrange to have three letters of recommendation sent to the same address. Review of applications will begin on November 30, 1998 and continue until the position is filled. In a continuing effort to enrich its academic environment and provide equal educational and employment opportunities, The Claremont Colleges actively encourage applications from women and members of historically under-represented social groups in higher education.

Tenure-track faculty position: Applications are invited for a tenure-track faculty position at the Assistant Professor level in the Department of Exercise Science, University of Southern California, with a possible secondary appointment in Neural Informational and Behavioral Sciences, commencing July 1, 1999. Applicants must hold an earned PhD degree relevant to the area of muscle mechanics. The research orientation may be from any number of perspectives, e.g., physiological, molecular, neuromuscular, or biomechanical. Candidates must demonstrate evidence of scholarly productivity and potential for external funding. Postdoctoral experience is highly desired. The successful candidate's responsibilities will include development of an independent research laboratory, publication in peer-reviewed journals, acquisition of external funding for research, instruction at the undergraduate and graduate level, and supervision of graduate students. Additionally, this individual will be expected to contribute to the service of the department and/or university. Successful candidates will have excellent verbal and communication skills and will be able to work effectively and cohesively with other teaching, research, and administrative personnel. Please provide a letter of interest including research goals and teaching philosophy, a current curriculum vitae, three letters of reference, examples of relevant publications (maximum 3), and a current email address to: Dr. Jill McNitt-Gray, Chair of Search Committee, Department of Exercise Science, University of Southern California, 3560 Watt Way, PED 107, Los Angeles, CA 90089-0652. Fax: 213-740-7909; email: mcnitt@usc.edu. Preliminary screening of applications will begin on December 15, 1998. Applications will continue to be accepted until the position is filled. [AA/EOE]

Positions Available

Two tenure-track positions: Exercise Physiology, Department of Kinesiology and Noll Physiological Research Center, Pennsylvania State University. Two tenure-track positions are available at the assistant professor level, beginning August 1999. Teaching interests and experience in fitness appraisal, exercise prescription, or related clinical/preventive exercise science courses are desired. An earned doctorate in an appropriate discipline, a record of scholarship, and a commitment to excellence in teaching and service are required. ACSM Certification is highly desirable. Research should complement existing faculty strengths. Send a letter of application; a curriculum vitae; three recent publications; and the name, address, and phone number of three individuals from whom you have requested letters of recommendation to: Dr. W. Larry Kenney, Chair, Search Committee, c/o Ms. Susan Eberly, Department of Kinesiology, 146 Recreation Building, Box J, Pennsylvania State University, University Park, PA 16802. Applications will be reviewed beginning immediately and continue until the position is filled. Pennsylvania State University is committed to affirmative action, equal opportunity, and the diversity of its workforce.

Assistant Professor, Animal Physiology: The Department of Biology, University of Dayton, invites applications for a tenure-track Assistant Professor position. We particularly seek candidates who use cellular, molecular, or developmental approaches in the study of tissue and organ physiology. The successful applicant will be expected to build a strong research program and successfully compete for outside funding to support his/her research. Teaching responsibilities include one formal lecture course and a laboratory course in animal physiology, advanced physiology, or introductory biology each semester. A PhD and at least two years of post-doctoral experience are required. Please send an updated resume, including a statement on research and teaching interests, along with three letters of recommendation to: Dr. Jeffrey Stavenhagen, Chair, Physiology Search Committee, Department of Biology, University of Dayton, 300 College Park, Dayton, OH 45469-2320. The deadline is December 9, 1998. Women and minorities are strongly encouraged to apply. [AA/EOE]

Assistant Professor in Neurophysiology/Neuroscience: Applications are invited for a tenure-track appointment at the Assistant Professor level in neurophysiology/neuroscience with an emphasis on some aspect of physical activity, behavior, and health. A research program utilizing molecular approaches will be a definite asset. Duties include teaching undergraduate and graduate courses and supervising graduate students. A PhD and a publication record in refereed journals are required, as well as the ability to develop a research program supported by external funding. Postdoctoral experience preferred. Applicants should send a curriculum vitae; a covering letter stating future research goals; relevant reprints; and the names, addresses, and telephone numbers of at least 3 individuals who may act as references by December 31, 1998 to: Dr. E. Cafarelli, Kinesiology and Health Science, York University, Toronto, Ontario M3J 1P3, Canada. E-mail: ecaf@yorku.ca. Duties commence July 1, 1999. The position is subject to budgetary approval. Further information can be obtained at www.yorku.ca/dept/physed. York University has a policy of employment equity, including affirmative action for women faculty. In accordance with Canadian immigration requirements, this advertisement is directed to Canadian citizens and permanent residents.

Tenure-Track Faculty Positions in Medical Sciences. Applications are invited for two tenure-track faculty positions in the Division of Basic Medical Sciences, Faculty of Medicine, Memorial University of Newfoundland, St. John's, Newfoundland, Canada. The Division consists of approximately 35 faculty members with research strengths in cancer research, cardiovascular/renal science, immunology, and neuroscience. One appointment will be in the area of cardiovascular/renal science. A second appointment is open in any of the four areas listed above. Applicants must hold an MD or PhD degree and have postdoctoral training. Successful candidates are expected to develop externally funded research programs and participate in medical undergraduate and graduate teaching. Additional information regarding the Faculty of Medicine and Memorial University of Newfoundland may be found at <http://aorta.library.mun.ca/med/> and <http://www.mun.ca>. To apply, send a curriculum vitae, description of research interests, and the names of three references to the Associate Dean, Division of Basic Medical Sciences, Faculty of Medicine, Health Sciences Centre, Memorial University of Newfoundland, St. John's, Newfoundland, Canada A1B 3V6. Application review will begin January 15, 1999. In accordance with Canadian immigration requirements, priority will be given to Canadian citizens and permanent residents of Canada. Memorial University is committed to the principles of employment equity and welcomes applications from all qualified candidates.

Positions Available

Assistant Professor: A tenure-track position for an Assistant Professor in Exercise Science is available beginning in August 1999. Teaching responsibilities include undergraduate courses in human physiology, anatomy, and exercise physiology; nutrition; research design; and other science-based theory classes in the Department of Exercise Science and the university general education program. Qualifications: PhD expected, evidence of successful undergraduate teaching experience, scholarly and professional activity, and the ability to develop student research programs and laboratory experiences. Salary is competitive. Review of applicants begins December 15, 1998. Send a letter of application, curriculum vitae, three current letters of recommendation, and official transcripts to: Russ Cagle, Chair, Department of Exercise Science, Willamette University, 900 State Street, Salem, OR 97301. Willamette University is an Equal Opportunity Employer and embraces excellence through diversity.

Postdoctoral Research Fellow: Postdoctoral research positions are available immediately in the Division of Cardiology at Pennsylvania State College of Medicine in the area of neural control of the circulation. Individuals will collaborate on NIH, NASA and AHA funded projects. Projects include vestibular regulation of sympathetic nerve activity, cardiovascular effects of bed rest, heart failure, and the role of muscle reflexes on sympathetic nerve activity. The Milton S. Hershey Medical Center has an NIH-funded clinical research center to provide additional infrastructure for outstanding clinical research. Interested applicants with training in integrative, cardiovascular, or exercise physiology are invited to contact: Chester A. Ray, PhD or Lawrence I. Sinoway, MD; Pennsylvania State College of Medicine, Division of Cardiology; 500 University Drive, Hershey, PA 17033; Tel: 717-531-6853; Fax: 717-531-1792; email: caray@psu.edu. Pennsylvania State is committed to affirmative action, equal opportunity and the diversity of its workforce.

Professor and Chair: Department of Biological Sciences, Bayer School of Natural and Environmental Sciences, Duquesne University. Duquesne University invites applications and nominations for the position of Professor and Chair of the Department of Biological Sciences. The Department currently has 14 full-time faculty members and 5 full-time staff and supports 20 graduate teaching assistants. Our faculty have research interests in the areas of cellular and molecular biology, microbiology, and cellular and systems physiology. The Department of Biological Sciences has contemporary BS and MS programs with a strong research emphasis, and a multidisciplinary PhD program is in the planning stages. Additional information regarding our programs, the School, and the University can be found at the University Web site (www.duq.edu). We are seeking an individual with imagination, energy, and leadership ability to enable us to continue building and strengthening our educational and research programs. The preferred candidate will have an earned PhD in an area of Biological Science, be an established researcher with a strong record of publication and extramural support, have a strong commitment to excellence in education, and have demonstrated leadership skills. Applicants should submit a full curriculum vitae, the names and addresses of three references, a letter of interest that includes a summary of teaching philosophy and leadership skills, and a two-page description of research interests and goals to: Steven P. Thomas, PhD, Chair, Faculty Search Committee, Department of Biological Sciences, Duquesne University, Pittsburgh, PA 15282-1502. Salary will be commensurate with qualifications and experience. Review of applicants will begin immediately, and will continue until the deadline for receipt of applications which is December 7, 1998. [AA/EOE]

Postdoctoral Fellowship: Postdoctoral Fellowship available in the Exercise Science laboratory, Department of Physiology, Science Faculty, University of Stellenbosch, South Africa. Requirements: PhD in one of the following disciplines: muscle biochemistry, metabolism or respiratory physiology. Special interest and expertise in one or more of the following research areas: lactate turnover, hypoxia, muscle adaptation (short-term and long-term), metabolism during high intensity exercise, peripheral fatigue. Research model: human subjects or rats. Job description: independent research related to one or two of the above special interest areas; collaboration with MSc students. Opportunities if desired: postgraduate teaching; work with athletes. Stellenbosch is situated in the Western Cape wine country, 50 km from Cape Town and 20 km from the ocean. University of Stellenbosch is renowned in South Africa for its high standard of undergraduate teaching and is currently actively supporting and expanding postgraduate expertise. The Physiology Department offers a postgraduate course - MPhil (Exercise Science), that includes both course work and research. Dr. Kathy Myburgh co-ordinates the course and directs the Exercise Physiology and Biochemistry laboratories. Further enquiries: khm@maties.sun.ac.za or Fax: 27-21-808-3145. Preferred starting date: by 1 April, but position will be held open for best possible candidate.

Publications

Three AJP Editors Hold Meetings

The editors of two of the journals of the *American Journal of Physiology* held mini-retreats recently. Steve Hebert, editor of *AJP: Renal Physiology* and Marty Kagnoff, editor of *AJP: Gastrointestinal and Liver Physiology* met with their associate editors in Nashville and Santa Barbara, respectively. The Publications Committee has determined that such meetings, held at appropriate intervals in an editor's term, are invaluable to the health of the Society's journals.

Hebert's meeting was attended by associate editors Christine Baylis, Peter Friedman, Steve Gullans, and Sanjay K. Nigam; publications manager Brenda Rauner; and assistant to the editor Jennifer Mahar. Mark Zeidel was unable to attend. Kagnoff's meeting was attended by all his associate editors: David Brenner, Paul Kubes, Chip Montrose, Chung Owyang, and John Walsh; APS production manager Laurie Chambers and assistant to the editor Irene Hendricks. Ann Taguchi, assistant to Walsh, also attended.

At both meetings the groups discussed the health and efficiency of their journals, particularly submission rates, the review process, schedules for invited material, color figures, covers, and rapid or expedited articles. Both editors plan on communicating to their constituency the excellent citation statistics

for their journals and the excellent time from acceptance to publication, either in an editorial or through the mail. However, although the independent study contracted for by APS with ISI shows (see www.faseb.aps.org) that these two journals are cited much more frequently than their competitors, the editors still would prefer separate impact factors for the individual *AJP* journals, rather than the sole impact factor for the consolidated *American Journal of Physiology*.

At their respective meetings, Rauner and Chambers outlined new policies and procedures to the editors including the Publications Committee's decision to limit color figures to those in which color is scientifically warranted, even if an author is willing to pay the full cost of unnecessary color. They also reported on the new tracking system to be installed at APS and the plans for the electronic submission of manuscripts and review of manuscripts through a web-based site. Hebert announced his intention to set up a home page for *AJP: Renal Physiology*, which he plans to develop into a significant resource for researchers in the field through links to other appropriate databases and by providing meeting calendars as well as information about the journal.

David Harder, whose term of office as editor of *AJP: Heart and Circulatory*

Physiology begins on January 1, 1999, held an organizational meeting at the head offices in Bethesda on October 23. He was accompanied by Karen Kangas, new office manager for the journal. Seven associate editors attended: Allen Cowley, William Chilian, Richard Roman, Julian Lombard, Richard Traytsman, Eileen Hasser, Diana Kunze, and Christopher Dawson. Three members of the journal's newly created board of medical editors also came: Ted Kotchen, Roberto Bolli, and Stephen Vatner. Those unable to attend included associate editors Andrew Green and David Guterman and medical editors Claude Lenfant, Kenneth Chien, Richard Cohen, and David Warltier. APS staff in attendance included Brenda Rauner, Laurie Chambers, and Alice O'Donnell. Candace Berryman, assistant to Traytsman, also came.

The editor outlined his plans for the journal, which are described on the next page, including the role of the board of medical editors.

Other topics for discussion included reviewing policy and procedures to ensure competent reviews and rapid turnaround, the handling of invited reviews, and the improvement of time from acceptance to publication.

Mrs. Rauner outlined journal policies and procedures for the submission and acceptance of manuscripts. ♦



AJP: Renal Physiology: Peter Friedman, Jennifer Mahar, Steve Gullans, Christine Baylis, Sanjay Nigam, Steve Hebert.



AJP: Gastrointestinal and Liver Physiology: Chung Owyang, David Brenner, Ann Taguchi, Martin Kagnoff, Paul Kubes, Irene Hendricks, Chip Montrose.

Introducing David Harder

David Harder has been appointed new editor of *AJP: Heart and Circulatory Physiology*, succeeding Harris J. Granger, whose term ends December 31, 1998. Harder is currently Professor of Physiology and Director of the Cardiovascular Research Center at the Medical College of Wisconsin in Milwaukee. He received his BS from the University of Wisconsin in 1972 and PhD in Physiology from the Medical College of Wisconsin in 1977. After postdoctoral training with Nick Sperelakis at the University of Virginia Medical School, he was appointed as Assistant Professor of Physiology at the newly formed East Tennessee State University College of Medicine in Johnson City, TN. Harder spent two years in Johnson City before moving to the University of Vermont College of Medicine as an Assistant Professor of Physiology. In 1983, he returned to the Medical College of Wisconsin as an Associate Professor of Physiology and Neurology. He was promoted to full Professor in 1987, and in 1992 was appointed as Director of the Cardiovascular Research Center.

Harder's research focuses on signal transduction in vascular smooth muscle. He has published manuscripts on control of ion channels in mesentery, coronary, renal and cerebral circulation. His recent research has focused on identification of P-450 generated fatty acid metabolites as controllers of vascular tone by regulating ion channel activity as intracellular second messengers and as endothelial-derived hyperpolarizing factors. Harder's interests primarily lie in defining the mechanisms of autoregulation of blood flow in the brain and the kidney and how increased neuronal activity results in discrete functional

hyperemia in the brain. Harder has authored over 150 manuscripts.

Harder has been an active member of APS since 1978, previously serving on the Committee for Committees, and presently serving as a member of the



Finance Committee. He has also served on the Program and Publications Committee for the Council for High Blood Pressure Research. He is a Career Scientist of the Veterans Administration and has been continually funded by the NIH since 1979. Harder holds a MERIT Award from NIH, and has served on a number of study sections. Harder serves on the editorial boards of *Circulation Research*, *Hypertension*, and *Endothelium*, and was also Associate Editor for the *Journal of Vascular Research*.

Harder's goal for *AJP: Heart and Circulatory Physiology* is to make it the premier cardiovascular journal in the world, to establish a reputation of excellence, and to convince investigators to send their best work. Toward this goal, a noted list of scientists have agreed to

accept Associate Editor responsibilities. These include, William Chilian, Allen Cowley, Jr., Christopher Dawson, Andrew Greene, David Gutterman, Eileen Hasser, Diana Kunze, Julian Lombard, Richard Roman, and Richard Traystman. A number of changes will be made to the journal, most notably the establishment of a Board of Medical Editors, including Roberto Bolli, Kenneth Chien, Richard Cohen, Theodore Kotchen, Stephen Vatner, and David Warltier. The charge of this board is to contribute editorials on the clinical impact of selected manuscripts grouped around specific mechanistic themes. The goal of these editorials is to enhance the journal's impact on the clinical arena and to serve as a tool in designing clinically relevant experimental protocols. Another change will be the elimination of headings that group manuscripts under cardiac, vascular and integrative topics. These will be replaced, in time, by specific mechanistic headings (i.e., mechanisms of cell-cell coupling, signal transduction, apoptosis, angiogenesis, etc.), which will change from volume to volume. The last major addition to the journal will be inclusion of editorials from the National Institutes of Health Heart, Lung, and Blood Institute. Claude Lenfant has agreed to write these editorials and is looking forward to establishing a new and productive partnership between the American Physiological Society and the NIH, NHLBI. Harder and the new editorial team of the *American Journal of Physiology: Heart and Circulatory Physiology* continue in the footsteps of Harris Granger and associates with commitment, energy, and enthusiasm. ♦

People & Places

Richard Hawkins Appointed as Provost

The Board of Trustees of the Finch University of Health Sciences/The Chicago Medical School is pleased to announce the appointment of Richard A. Hawkins as Provost of the University, effective immediately. Hawkins will manage all business and educational affairs of the University and will retain his duties as Chief Academic Officer.

Hawkins is known for his research on the internal working and processing of the human brain. He received his PhD in Physiology in 1969 from Harvard University followed by post-doctoral training at Oxford University, Oxford, England. Prior to joining the



University he was Professor of Anesthesiology, Physiology, and Metabolic Research at the Milton S. Hershey Medical Center, Pennsylvania State College of Medicine, Hershey, Pennsylvania.

Hawkins joined the University in 1988 as Professor and Chairman of the Department of Physiology and Biophysics and was appointed Executive Vice President of Academic Affairs and Chief Academic Officer in 1993.

Hawkins is a member of numerous professional groups including the American Physiological Society, the American Society of Neurochemistry and the American Institute of Nutrition. Since 1977, his research has been supported continuously by the National Institutes of Health. He is the author or co-author of over 100 original scientific articles published in prestigious medical journals. ❖

APS Members Elected to IOM

On October 12, the Institute of Medicine (IOM) announced the election of 55 new members, raising the total active membership to 579. In addition, six people were honored by direct election to senior membership, bringing that total to 659 members. Ten years ago, the IOM established the category of foreign associate membership, which now totals 47 with the election of five members this year.

Three APS members were elected to active membership and one member was elected as a foreign associate member. APS members elected to the Institute include:

Dennis A. Ausiello, MD, Jackson Professor of Clinical Medicine, Harvard Medical School, and physician-in-chief, medical services, and chief, renal unit, Massachusetts

General Hospital, Boston.

Victor J. Dzau, MD, physician-in-chief and chairman, Department of Medicine, Brigham and Women's Hospital, Boston.

Ferid Murad, MD, PhD, professor and chair, Department of Integrative Biology, Pharmacology, and Physiology, University of Texas Medical School, Houston.

The APS member elected to foreign associate membership was **John H. Vane**, DPhil, DSc, President, William Harvey Research Institute, St. Bartholomew's and the Royal London School of Medicine and Dentistry, Queen Mary and Westfield College, University of London. ❖

Moving?

If you have moved or changed your phone, fax, or email address, please notify the APS Membership Office at 301-530-7171 or fax to 301-571-8313.

People & Places

Gregory C. Amberg is no longer affiliated with Idaho State University, Pocatello, ID. Amberg is now with the Department of Physiology and Cell Biology, University of Nevada, Reno, NV.

Recently associating with the Vascular Biology Center, Medical College of Georgia, Augusta, GA, **Farhad Amiri** has left the Clinical Research Institute of Montreal, Montreal, Canada.

Moving to Rochester, NY, **Bradford C. Berk** became the Unit Chief of Cardiology, Department of Cardiology, University of Rochester. Berg previously was with the Department of Medicine, University of Washington, Seattle, WA.

Nicholas J. Bernier has left the Department of Biology, University of Ottawa, Ottawa, Ontario, Canada. Today, Bernier is a postdoctoral fellow with the Department of Biological Sciences, University of Alberta, Edmonton, Alberta, Canada.

Ann M. Bode is no longer with the Department of Physiology, University of North Dakota School of Medicine, Grand Forks, ND. Bode is now with the Department of Exercise and Movement Science, University of Oregon, Eugene, OR.

Formerly with Krug Life Science Inc., Department of Cardiovascular Lab, Houston, TX, **Troy Edwin Brown** is now a Lead Scientist with Wyle Laboratories, Neuroscience Labs, Houston, TX.

Warren William Burggren has accepted a new position with the Department of Biological Sciences, University of North Texas, Denton, TX. Formerly, Burggren was Professor and Chair, Department of Biological Science, University of Nevada, Las Vegas, NV.

Originally from the Department of Physiology, Northeastern Ohio University College of Medicine, Rootstown, OH, **Yifan Chen** recently has joined the Department of Anesthesiology, University of Rochester Medical Center, Rochester, NY, as a Research Associate.

Accepting an assignment as Assistant Professor, Department of Physiology & Biophysics, Indiana University School of Medicine, Indianapolis, IN, **Shaoyou Chu** has moved from the Department of Medicine, Johns Hopkins University School of Medicine, Baltimore, MD.

Joining the Department of Physiology, Wayne State University School of Medicine, Detroit, MI, **Heidi L. Collins** has moved from the Department of Physiology, Northeastern Ohio University College of Medicine, Rootstown, OH.

Having left Department of Physiology, Northeastern Ohio University, Rootstown, OH, **Stephen E. DiCarlo**, has accepted a position with the Department of Physiology, Wayne State University School of Medicine, Detroit, MI.

Sean P. Didion, a former University of Nebraska Medical Center student, Omaha, NE, has moved to the Medical Labs, University of Iowa, Iowa City, IA.

W. Richard Dukelow who was Professor and Director, Endocrine Research Labs, Michigan State University, East Lansing, MI, has accepted a new position with High Meadows Enterprises, Somers, MT.

Cheryl Miller Heesch has accepted a position with the Dalton Cardiovascular Research Center, University of Missouri, Columbus, MO. Until recently, Heesch was associated with the Department of Physiology, Ohio State University, Columbus, OH.

Muhammad Iqbal has moved from Division of Animal and Veterinary Sciences, West Virginia University, Morgantown, WV. Iqbal is currently a Graduate Research Assistant, Department of Poultry Science, University of Arkansas, Fayetteville, AR.

Having become the Director of the Center for Metabolism/Nutrition, MetroHealth Medical Center, Cleveland, OH, **Satish C. Kalhan**, has left the Division of Neonatology, Rainbow Babies & Childrens Hospital, Cleveland, OH.

Richard Kinkead, Assistant Professor, has joined the Department of Pediatrics, CHUQ, Pavillon St. Francois d'Assise, Quebec City, Canada. Prior to his new position, Kinkead was a Research Associate with the Department of Comparative Biosciences, University of Wisconsin, Madison, WI.

Having accepted a position as Associate Professor with the Department of Biomedical Science, Ohio University College of Osteopathic Medicine, Athens, OH, **Richard E. Klabunde** has moved from the Deborah Research Institute in Browns Mills, NJ where he was the Senior Cardiovascular Group Leader.

Dietmar Kultz has joined the Whitney Lab, University of Florida, St. Augustine, FL. Kultz had been working at the Laboratory of Kidney and Electrolyte Metabolism, National Heart, Lung, and Blood Institute, National Institutes of Health, Bethesda, MD.

David T. Kurjiaka is currently Assistant Professor, Department of Biological Sciences, Ohio University, Athens, OH. Prior to this position, Kurjiaka was with the Department of Physiology, University of Arizona, Tucson, AZ.

People & Places

Becoming affiliated with Meakins-Christies Labs, McGill University, Montreal, Canada, **Anne-Marie Lauzon** has moved from the Department of Molecular Physiology and Biophysics, University of Vermont, Burlington, VT.

J. Russell Linderman, a postdoctoral fellow, has moved to the Department of Physiology, Medical College of Wisconsin, Milwaukee, WI. Prior to his new assignment, Linderman was affiliated with the Department of Physiology, West Virginia University, Morgantown, WV.

Pamela A. Lucchesi has accepted a position with the Department of Physiology/Biophysics, University of Alabama-Birmingham, Birmingham, AL. Prior to her new position, Lucchesi was associated with the Department of Physiology, Loyola University Medical Center, Maywood, IL.

Affiliating with McMaster University, **Maureen Jane MacDonald** is now Sessional Lecturer, Department of Kinesiology, Hamilton, Ontario, Canada. Prior to her new assignment, MacDonald was associated with the School of Human Kinetics, University of British Columbia, Vancouver, BC, Canada.

Previously associated with the Department of Pharmacology, East Carolina University School of Medicine, Greenville, NC, **Ravi B. Marala** is now Senior Research Scientist, Central Research Division, Department of Cardiovascular & Metabolic Diseases, Groton, CT.

Donald J. Meyer, Jr. has joined Columbia Anesthesia Associates, Columbia, MO. Prior to his new assignment, Meyer was with the Department of Anesthesiology, University of Missouri, Columbia, MO.

Associate Professor **Alan D. Miller** has moved from Rockefeller University,

New York, NY. Miller is now with Cooper & Dunham, LLP, New York, NY.

Marshall H. Montrose is now associated with the Department of Physiology/Biophysics, Indiana University, Indianapolis, IN. Previously, Montrose was affiliated with the Department of Medicine, Johns Hopkins University School of Medicine, Baltimore, MD.

Lawrence J. Mulligan is currently a Scientific Editor at the GeoMedGlobal Communications, Secaucus, NJ. Prior to his new position, Mulligan was a Senior Research Associate, Department of Experimental Surgery, Deborah Research Institute, Browns Mills, NJ.

Formerly, **Daniel K. Nelson** was Director and Assistant of the GI Unit, Genesee Hospital, Rochester, NY. Recently, Nelson moved to the University of North Carolina-Chapel Hill, Chapel Hill, NC as Director of the Office of Human Research Studies, .

Douglas Scott Neufeld was affiliated with the Department of Physiology, University of Arizona College of Medicine, Tucson, AZ. Currently, Neufeld is an Assistant Professor, Department of Biology, Eastern Mennonite University, Harrisonburg, VA.

Having accepted a position with Department of Kinesiology, Hope College, Holland, MI, **L. Maureen Odland** is no longer at the Department of Human Biology and Nutritional Sciences, University of Guelph, Guelph, Ontario, Canada.

Jason Mitchell Pass has left the Department of Physiology, East Tennessee State University, Johnson City, TN. Pass is now a Graduate Research Assistant with the Department of Physiology/Biophysics, University of Louisville, Louisville, KY.

Moving to the Department of Neuroanesthesia Research, University of Illinois at Chicago, Chicago, IL, **Dale A. Pelligrino** has left the Department of Anesthesiology, Michael Reese Hospital Medical Center, Chicago, IL.

Robert C. Roach has moved from the Copenhagen Muscle Research Center, Copenhagen, Denmark, to accept a position as Visiting Research Associate Professor, Division of Physiology, New Mexico Highlands University, Las Vegas, NV.

Having moved from the University of North Texas Health Science Center, Fort Worth TX, **Gerson Rocha** is currently affiliated with the National Heart, Lung, and Blood Institute, National Institutes of Health, Bethesda, MD.

Charles Maurice Schworer has joined the Department of Physiology/Cell Biology, Albany Medical College, Albany, NY. Schworer was with the Geisinger Clinic, Weis Center for Research, Danville, PA.

Harold A. Singer, is currently Professor of Cellular and Molecular Physiology, Albany Medical College, Albany, NY. Prior to his new commitment, Singer was Professor of Cellular and Molecular Physiology, Pennsylvania State University College of Medicine, Weis Center for Research, Danville, PA,

Assistant Professor **Adrian Sculptoreanu** has moved from Lady Davis Institute Medical Research, Montreal, CA, and has joined the Department of Pharmacology, University of Pittsburgh School of Medicine, Pittsburgh, PA.

Formerly, **Ronald J. Torry** was affiliated with the Center for Reproduction and Transplant Immunology, Methodist Hospital Indiana, Indianapolis, IN. Associate Professor, in the College of Pharmacy.

People & Places

Mary Van Soeren is no longer with the University of Western Ontario, Faculty of Nursing, London, Ontario, Canada. Van Soeren has joined St. Joseph's Health Center, as a Nurse Practitioner, Intensive Care Unit, London, Ontario, Canada.

Having moved from the Cardiology & Cardiovascular Center, University of Cincinnati, Cincinnati, OH, **Richard A. Walsh** has accepted a position with the Department of Medicine, as Mabel S. Stonehill Professor of Medicine and Director University of Hospitals of Cleveland, Cleveland, OH.

David S. Weber is currently a Postdoctoral Fellow, Department of Physiology, University of Michigan,

Ann Arbor, MI. Before moving to Michigan, Weber was a graduate student with the Department of Physiology, Medical College of Wisconsin, Milwaukee, WI.

Sarah A. Wilcox-Adelman has left the Department of Physiology and Cell Biology, Albany, NY. Wilcox-Adelman has joined the Cutaneous Biology Research Center, Massachusetts General Hospital-East, Charlestown, MA.

Todd Dennis Williams has left the Hebrew Rehabilitation Center for the Aged, Boston, MA, and has affiliated with the Department Program in Neuroscience, Florida State University, Tallahassee, FL.

Recently, **Sean Michael Wilson** affiliated with the Department of Physiology and Cell Biology, University of Nevada School of Medicine, Reno, NV. Prior to his new affiliation, Wilson was with Neural Biology, Physiology and Behavior, Division of Biological Sciences, University of California at Davis, Davis, CA.

Graduate student **Zhenpeng Zhuang** was formerly associated with the Whitney Laboratory, University of Florida, St. Augustine, FL. Recently, Zhuang moved to the Department of Human Physiology, University of California-Davis, Davis, CA. ❖

Eleanor Lutia Ison-Franklin (1929-1998)

Eleanor L. Ison-Franklin, long-time cochair of the Porter Physiology Development Committee, died at her home in Washington, DC on October 1, 1998.

Born on Christmas Eve in 1929 in Dublin, Georgia, Ison-Franklin graduated valedictorian from Carver High School in 1944 and Magna Cum Laude with a Bachelor of Arts from Spelman College in 1948. She was awarded a Master of Science in 1951, followed by a Doctor of Philosophy degree in 1957 in zoology by the University of Wisconsin in Madison. Between degrees and during the time she was working on her degrees, Ison-Franklin began a life-long commitment to teaching. She worked as an Instructor at Spelman College in the Department of Biology and as a Teaching Assistant in the Department of Zoology at the University of Wisconsin, Madison. Ison-Franklin's first appointment was as an Assistant and then Associate Professor in the Department of Physiology and Pharmacology in the School of Veterinary Medicine at Tuskegee Institute. She was then hired in 1963 by the Department of Physiology and Biophysics at Howard University in Washington, DC. She steadily rose through the ranks at Howard University, being promoted to Professor in 1971. At the same time, Ison-Franklin's talent at administration was duly noted, such that in 1970 she was named Associate Dean for Administration for the College of Medicine at Howard, the first woman to hold a deanship in the 103-year history of the University. In 1972 she was made Associate Dean for Academic Affairs in the College of Medicine. In 1980 she was asked to also serve as the Director of the Edward W. Hawthorne Laboratory for Cardiovascular Research, a position which she held until 1985. In 1987, Howard University

asked her to take on the challenge of a new position, that of Dean of the School of Continuing Education. Ison-Franklin held that position while maintaining her



Eleanor Ison-Franklin

laboratory and training of graduate students in the Department of Physiology and Biophysics. She retired from these positions in July 1997. For her many accomplishments and great service to Howard University, Ison-Franklin was designated a "Magnificent Professor" in May 1998.

Ison-Franklin's research focused on three areas: cardiac performance in conscious animals, experimental hypertension, and left ventricular hypertrophy. Much of her research was done in collaboration with Edward W. Hawthorne. She was a constant attendee at the FASEB and later the Experimental Biology meetings, including the most recent Experimental Biology '98 held this past April in San Francisco, CA.

Among the numerous awards and recognition Ison-Franklin received were many from her alma mater, Spelman College, including a Centennial Citation for extraordinary contributions to the development and strengthening of the National Alumnae Association (1981) and election to that group's Alumnae Hall of Fame (1987). She was

also given citations for Outstanding and Dedicated Service (1980) and Outstanding Contributions to Graduate Education (1975/76) from Howard University. She was also twice elected Faculty Trustee representing the Graduate and Professional Schools to the Board of Trustees of Howard University (1981-84 and 1984-87). Ison-Franklin was selected as a Porter Lecturer in 1967 and retained that designation until her retirement in 1997.

Ison-Franklin was a member of many scientific organizations in addition to The American Physiological Society, which she joined in 1971. She was a charter member of the American Society of Hypertension and was active in both the American Heart Association, serving on Ad Hoc Committees and on the Basic Science Council, and in the Washington Heart Association. Ison-Franklin served on the local committee of the XXIV Congress of the International Union of Physiological Sciences held in Washington, DC in 1968. In addition, she was a member of the New York Academy of Sciences, Sigma Xi, AAAS, Sigma Delta Epsilon Women's Scientific Fraternity, and Phi Sigma Honorary Biological Society.

Perhaps what Ison-Franklin will best be remembered for will be her great love of teaching and advising students on how to live both in the laboratory and beyond. In her capacity as Cochair of the Porter Physiology Development Committee from 1984 until the time of her death, she touched the lives of over 100 minority students, helping them along in their careers and then, at the right time, letting them go on to realize their full potential. She continued to participate in the instruction of undergraduates as a Visiting Lecturer in the physiology course at Spelman College. Her commitment was to excellence in all things, with an attitude of respect toward all people. Her

Obituary

skill at critiquing a student's research while at the same time elevating the stature of that insecure student about to make his/her first scientific presentation was legendary. In her own words at the time of her acknowledgment as a "Magnificent Professor":

"It is axiomatic that the only true rewards of an academic career are the successes of one's students. Therefore, I am witness to my rewards as I look around....They sit as chairs of departments, directors of programs, chiefs of divisions, deans, vice presidents, and researchers. They are also clinical health providers, health physicians,

dentists, therapists, and technicians. I hope that in some small way, I have stimulated their development and have imparted to them a modicum of their knowledge. Of course, it is not enough that there has been the transmission of facts between me and the young men and women with whom I have been privileged to learn and think and solve problems. I hope that through all of the many engagements with my students, I have also succeeded in imparting some time-honored values, which they have been able to incorporate into their lives, their practices, and their interpersonal relationships. Among these that I hold

most high are integrity and continuous learning."

The American Physiological Society owes a huge debt of gratitude to Eleanor Ison-Franklin for many years of diligence and hard work on behalf of the Society and its minority members. Her sound advice, good judgement, and keen insight will be sorely missed.

Donations in honor of Eleanor Ison-Franklin can be made to the Porter Physiology Development Fund, 9650 Rockville Pike, Bethesda, MD 20814.

Porter Physiology Fellowship Program for Minority Graduate Students

The American Physiological Society has been continuously involved in the support of career training in physiology. The graduate fellowship program has, during the past 30 years, been funded largely through the generosity of the William Townsend Porter Foundation (formerly Harvard Apparatus Foundation). On behalf of the Society, the program is monitored by the Porter Physiology Development Committee.

The goal of the Porter Physiology Fellowship Program is to encourage diversity among students pursuing full-time studies toward the PhD or Dsc degree in the physiological sciences and to encourage their participation in the Society.

Porter Physiology Fellowships are open to underrepresented ethnic minority applicants (African Americans,

Hispanics, Native Americans, Native Alaskans, or Native Pacific Islanders) who are citizens or permanent residents of the US or its territories. The applicant must have been accepted into or currently be in a graduate program in physiology at the time of application.

Applicants for Porter Physiology Fellowships may choose institutions of higher education that offer advanced degrees in physiology, especially in North America where memberships in the American Physiological Society are most prevalent. The fellow may study or engage in research away from the fellowship institution during part of the tenure of the award, if the faculty judge such an opportunity to be advantageous for the fellow's training.

Annual stipends under the Porter Physiology Development Fellowship Program are \$15,000. There is no

dependency allowance and no tuition or fees paid from the Porter Fund. Fellowships are awarded for one year, with a commitment from the Program for a second year if trainee progress is rated to be good by the Committee. Under exceptional circumstances, a third year may be awarded.

To obtain an application, please contact: Porter Physiology Fellowships Program The American Physiological Society, Education Office 9650 Rockville Pike Bethesda, MD. 20814-3991 Tel: 301-530-7132; fax: 301-571-8305; email: educatio@aps.faseb.org Website: <http://www.faseb.org/aps/educatn/porter.htm>

The closing dates for new applications are **January 15** and June 15. Announcements of awards are made on May 20 and August 20, respectively.

Deceased Members

Herbert Chasis

New York, NY

Walter S. Druz

Kailua, HI

Albert Haas

New York, NY

A. McGehee Harvey

Baltimore, MD

Sibley W. Hoobler

Cleveland, OH

Eleanor L. Ison-Franklin

Washington, DC

Chien-Yuan Kao

Brooklyn, NY

Richard W. Lawton

Schenectady, NY

Y.C.P. Lee

Irvine, CA

Victor Lorber,

Santa Barbara, CA

Michael L. Pollock

Gainesville, FL

Giovanni Salvati

Padova, Italy

Thomas G. Smith

Bethesda, MD

Robert C. Stroud

Chevy Chase, MD

Robert E. Taylor

Falmouth, MA

Richard F. Tislow

Somerville, MA

Thomas L. Willmon

Alpine, TX

Letter to Eugene Rankin

William Hansel writes: “Thank you for your recent note and best wishes for my 80th birthday. I am continuing my research activities, but stopped teaching a year ago. After compulsory retirement at Cornell in 1990, I accepted the Gordon D. Cain Endowed Professorship at Louisiana State University and later became a member of the faculty of the Pennington Biomedical Research Center. Facilities at the Pennington Center are superb, and although my professorship is terminated, I have been able to pursue my interests in ovarian function, and recently I initiated studies on the use of conjugates of lytic peptides and luteinizing hormone (LH) or LH-releasing hormones (LHRH) to target cancer cells that express receptors for these hormones.

“Recently, I was fortunate in being awarded the first Pharmacia-Upjohn International Award for Lifetime Achievements in Research on Reproduction in Ruminants. The award was presented in August at the 5th International Symposium on Reproduction in Domestic Ruminants, at Colorado Springs, Colorado.

“I hope to continue my research activities for another year.”

Letter to Stephen Cain

Frank D. Mann writes: “I greatly appreciate your message of good wishes from the APS on my 80th birthday. The older one becomes, the more gratifying it is to be remembered.

“My entire intellectual life has been shaped by my remarkably early scientific companionship with my father, Frank Charles Mann, President of APS in 1936 and 1937. I welcome the opportunity to write about a scientific question which puzzled him for many years and now me for many more: namely, the cause of death in what he terms the “second stage” of encephalopathy following total hepatectomy in which glu-

cose, totally restorative in the “first stage,” was now no longer restorative. Having performed hundreds of total hepatectomies over the period of 1920-52, close observation of the liverless animals left him with the enduring impression that, in analogy with the dramatic restorative effect of glucose, a second substance supplied by the liver was required by the brain. He never published this hypothesis, but I have done so (*FASEB J.* Abstract 1994), not wishing it to be entirely forgotten, since it may eventually aid the understanding of other causes of encephalopathy and mortality. I remember discussing this idea with my father many times, especially while we were both attending the International Physiological Congress in Zurich in 1938. We never could come up with a plausible suggestion of the chemical identity of the hypothetical substance. Occasionally, thinking about this question over the years, about 10 years ago, I thought it might be free cholesterol. Since then, I have been collecting evidence from the literature.

“Some of the evidence I have published (*Persp. Biol. Med.* 33: 531-534, 1990; 41: 417-425, 1998), but one key number was lacking, the cholesterol content of the human brain. Since membranes, the principal site of cell cholesterol, make up so much of the mass of the brain, one would expect this content to be large. Early biochemists were well aware that brain is a good source material from which to prepare cholesterol, but I could not locate quantitative data. Published analyses of foods show brain to be in a class by itself: average values for pork brain 2,552 mg of cholesterol per 100 g tissue compared to 82 mg per 100 g of pork muscle; liver, second highest, 355 mg per 100 g; similar values for beef. From these crude data on foods, one can estimate that in the human, 50% of total body cholesterol is in the brain, 2% of body weight. One would expect the complex human brain to show even greater concentration of lipoprotein of tissue fluid and plasma.

Most of tissue cholesterol appears to be supplied by the liver, but it is possible that rule may not strictly apply to nerve membrane. In any case, the brain clearly needs a large supply of cholesterol; with its extreme concentration in the brain, there is the potential for large loss, should the brain’s cholesterol balance become negative. Total hepatectomy should be a prime cause of such negative balance, but lesser degrees of impairment of hepatic supply are clearly possible. A large loss of membrane cholesterol would be likely to have serious effects. There is morphological and functional evidence of weakening of the endothelial cells of the blood-brain barrier attributable to low cholesterol, rendering the brain more permeable to toxic substances. There is evidence of such increased permeability in hepatic failure. Possibly also pertinent are the recently reported impairment of the blood-brain barrier in Alzheimer’s disease and the well-known loss of synapses in the disease.

“My father’s hypothesis over 70 years ago, of a second life-saving function of the liver, in addition to maintaining the blood glucose, even though yet unproven, remains, I believe, an interesting example of what Stanley Schultz aptly named ‘Integrative Biology.’”

S.R. (Dick) Heisey writes: “I can only add that I’m still in the adapting phase of retirement. I’ve played more golf than I have in the past 10 or 20 years, which isn’t saying very much since I played very little during that time. I’m doing some volunteer work associated with the MSU (Michigan State University) retirees club and with Meals-on-Wheels, a program for seniors who are home-bound for various reasons. I go into my office at school periodically to work on a monograph a colleague and I are writing on acid-base physiology. In addition, I’ve been attending a seminar series in celebration of the 75th anniversary of the Department of Physiology at MSU.” ❖

Book Reviews

Oxygen Transport to Tissue XVIII

Edwin M. Nemoto and Joseph C. LaManna (Editors)

Advances in Experimental Medicine and Biology, Vol. 411

New York: Plenum, 1997, 608 pp., illus., index, \$159.50

ISBN: 0-306-45516-1

At the heart of normal and active functions of almost all life forms on this planet is cellular oxygenation, a phenomenon that depends on oxygen transport in multicellular organisms. This is why this volume, *Oxygen Transport to Tissue*, is a much-needed and valuable book. It covers the mix of projects ranging from molecular biology to clinical aspects of oxygen transport and tissue oxygenation. The volume is divided into 11 parts that contain 74 papers, written by a large number of authors, many of whom are recognized authorities. Despite its many papers and authors, the volume is tightly structured so that its succinct papers, which average about eight pages in length, yield a cohesive survey of a complex topic and represent the forefront of research on oxygen transport to tissues.

A core issue in oxygen transport is still how better to assess tissue oxygenation. The use of oxygen-sensitive electrodes, while satisfying in acute experimental conditions, requires an insertion of microelectrodes, causing mechanical injury to the tissue. Surface multi-electrode arrays cannot make accurate measurements of local O_2 deep in tissues. Several papers thus focus on development of oxygen-assessing techniques and their potential use. These include application of positron emission tomography and functional magnetic resonance imaging (MRI). Clinical application of near infrared (NIR) spectroscopy and cerebral oximetry is also discussed. NIR, while potentially valuable in noninvasive monitoring, measures cerebral blood flow and concentration changes in oxygenated and deoxygenated hemoglobin, not the interstitial O_2 . Several

papers highlight application of low-frequency electron paramagnetic resonance (EPR) instruments and stable paramagnetic particles with oxygen-sensitive EPR spectra *in vivo*, in conscious animals. EPR oximetry appears promising: it can monitor O_2 continuously with satisfying resolution in variety of settings and the measurements can be repeated *in vivo*. Its disadvantages include inability in revealing O_2 variations over regions of tissues and a necessary insertion of the oxygen-sensitive EPR probe into tissues, though in the gerbil brain and spinal cord, majority of the probe material has been found remaining extracellular. No inflammatory or foreign body tissue reaction has been observed over a relatively long (1-2 month) period. Resident phagocytic cells containing small fragments of the probe material, however, is observed, in addition to focal hemorrhage surrounding the probe material in rat brain. Therefore, detecting insufficient oxygenation and monitoring and maintaining suitable oxygenation in tissues, such as the brain, using non-invasive, quantitative measurement of spatial O_2 with the capacity for multiple measurements remains a big challenge.

Several aspects of tissue oxygen delivery are presented as relating to the brain, heart, kidneys, gut, and tumors, with respects to oxygen carriers, hypoxic adaptation through altered metabolism or angiogenesis, and roles of leukocytes and immune response to hypoxic-ischemic injury. Insufficient oxygen delivery jeopardizes cellular respiration, metabolism, and functional integrity and may underlie a variety of neurodegenerative diseases, including memory loss. The brain and spinal cord have a high metabolic rate, depend primarily on an aerobic metabolism, and thus are the most vulnerable to hypoxia-ischemia. Therapy against hypoxic-ischemic damage relies on clarifying underlying mechanisms involved in hypoxic injury. Levels of tissue oxygenation are also well known to influence tumor growth, malignant potential, and effectiveness of tumor therapies.

Angiogenesis reflects a dynamic tissue process in adapting to oxygen deficiency and may hold great potential in fighting against hypoxic-ischemic injury. Suppressing angiogenesis in tumor tissues, on the other hand, has been proposed as one strategy in cancer therapy. Hypoxic tumors are, however, more resistant to radiation-induced killing. This calls for in-depth understanding of interplays between oxygenation, tumor growth, and effectiveness of a variety of treatments, for better monitoring and manipulating O_2 to optimize therapy.

Oxygen level is sensed by many tissues, some of which are specialized. Identity of the sensors, underlying chemotransduction mechanisms, and their connections to result in a final altered oxygenation state, oxygen uptake, delivery, and consumption, are worth intensive studies. Small decreases in O_2 are known to activate glycolytic rate or excite the carotid body chemoreceptors. It is interesting that 2 minutes after removing extracellular Ca^{2+} the net maximum increase in carotid nerve discharge (ND) in response to hypoxia remains the same (400 vs. 400 impulses/s) and O_2 sensitivity is actually increased. It is not clear whether the apparently slower ND response at the time results from the slower O_2 disappearance rate. This is followed by a slow decline in hypoxic responses, without changes in O_2 consumption, suggesting an involvement of intracellular Ca^{2+} mobilization in chemotransduction. Furthermore, systemic hypoxia in anesthetized, vagotomized and mechanically ventilated rats is associated with comparable decrease in intracellular pH and ATP in RVL and NTS at the time point when respiratory depression occurred, suggesting their possible contribution in initiating hypoxic apnea.

Other issues addressed in the volume include nitric oxide and roles of free radicals in tissue injury and oxygenation. Several papers focus on protein kinase C separation and production in transgenic animals. Hemoglobinopathies and potential mechanisms or ameliora-

Book Reviews

tion in addition to the development of oxygen carriers bring to the fore the potential for molecular biology in addressing problems in tissue oxygenation. Interestingly, aging changes neither brain oxygen consumption nor the reduction-oxidation (redox) state of cytochrome a but acts intracellularly to limit the brain's capacity to increase oxidative phosphorylation under hypoxic challenge and during recovery from such challenge. Knowledge of the control mechanisms for maintaining local O₂ and conditions that lead to their failure is incomplete.

My only concern in the volume is that oxygen transport to a particular cell or tissue type is more like a dot, though

important, in a big picture. Complex and effective physiological controls have evolved to enable the brain to maintain adequate levels of oxygen in tissues. CNS not only controls the respiratory function but also can enhance or cut off blood flow to tissues. How this dynamic control is achieved and maintained is fascinating and important to oxygen transport research, since abnormality of the control results in almost all types of oxygen transport-related diseases. This is, however, barely touched in this volume.

As such, I can highly recommend this volume, which I have found interesting to read. There is no other source that provides such inclusive coverage of

oxygen delivery to tissues, as well as its physiological and clinical aspects. This volume is a uniquely valuable resource for reference in oxygen transport to tissues and will serve its intended readership well. ♦

Miao-Kun Sun
National Institute of Neurological
Disorders and Stroke

Oxygen Transport to Tissue XVIII is being reprinted from the October issue of *The Physiologist*. When the review originally appeared, there was a loss of clarifying characters due to the electronic conversion of the material. *The Physiologist* regrets these errors and apologizes for any inconvenience.

Concepts of Human Physiology

Richard L. Malvin, Michael D. Johnson, and Gary M. Malvin
Menlo Park, CA: Addison Wesley
Longman, 1997, 450 pp., illus., index,
\$49.00
ISBN: 0-673-98562-8

While the table of contents of a book provides an ordered listing of what can be found between its covers, it is the *title* that is often most inviting or even enticing. In the case of *Concepts of Human Physiology*, one might expect a disclosure of the major notions that govern or describe the well-orchestrated functioning of the human body.

The authors of *Concepts of Human Physiology* attempt to deliver what they promise. However, the concepts are concealed from the view of naïve (beginning) students. Given the authors' target audience, "the beginning student of human physiology," the text fails to identify those concepts that constitute essential learning in physiology. Naïve students are likely to "miss the point," to fail to recognize patterns, to miss interactions or interrelationships, if they are not made explicit. While it is unlikely that there is unanimity among physi-

ologists as to what constitutes the "key concepts," any book that promises "concepts" ought to deliver them unabashedly.

As for the content of the book, it manages to cover the usual body systems in 15 chapters and 450 pages. This represents a departure from the "industry standard" of 20-22 chapters and upwards of 750 pages. In fact, the very size of the book betrays the breadth of coverage and amount of detail that are contained within its covers. By the authors' own admission, "the text is designed to be completed in one term." Even though the authors do not say so explicitly, the text provides a less rigorous coverage of human physiology than provided by most other undergraduate physiology textbooks. As such, it would appear to be useful in courses for non-science majors or for students in allied health programs in which an "introduction" to human physiology suffices.

The pedagogical features include boxed "Highlights" (physiology in daily life, physiological research, medical/health issues) and "Milestones" (historical treatment of selected subjects). End of chapter questions are of two types, conceptual/factual review and application. An appendix with suggested answers to the latter type of

question would be a valuable addition to the text.

The illustration program is generally quite good. On occasion, however, illustrations take on a cartoon-like quality that distracts/confuses the reader. There is also some inconsistency in the use of lines to indicate positive and negative feedback. The colors and lines (broken vs. solid) vary from one illustration to the next. In addition, the figures that include representations of arterial and venous blood are misleading to the extent that they imply an open (!) circulatory system.

Where tables are included, they tend to provide timely summaries and/or comparisons. Students are likely to depend on these when they review material. They are also likely to use the glossary. It provides very basic definitions/descriptions of key terms.

All told, this book will serve the "beginning student." It is by no means the book of choice for pre-professional students in the health sciences, nor should it be selected for use by students whose science background invites a more thorough exposure to human physiology.

Mary Anne Rokitka
State University of New York at Buffalo

The Measurement of Sensation

Donald R. J. Laming
Oxford Psychology Series #30
(Norman J. Mackintosh, James L. McGaugh, Timothy Shallice, Daniel Schacter, Anne Treisman, and Lawrence Weiskrantz, Series Eds.)
Oxford: Oxford University Press, 1997,
xiii+262 pp., illus., author index, subject index, \$115.00
ISBN: 0-19-852342-4

Almost a century and a half ago, Fechner presented a comprehensive argument in favor of a particular psychophysical relation, namely that sensations grew in proportion to the logarithms of the stimuli that evoke them. Although it was based as much on philosophical propositions as on empirical evidence drawn from studies of sensory discriminations, his argument was quite readily accepted, in part because of the immediacy of our shared experience that sensations clearly do vary in quantity—intense lights are obviously brighter than faint lights and strong sounds are obviously louder than soft sounds.

When technical developments gave electrophysiologists the ability to pose parallel questions to neural preparations early in the twentieth century, it appeared to such pioneers as Adrian that neural responses were also fairly proportional to the logarithms of the stimuli that evoked them. From this apparent convergence between physiology and behavior came today's commonplace in both disciplines: sensory stimuli are usually chosen so that they are equally spaced on a log scale and the data resulting from such experiments are customarily plotted on semi-log coordinates.

However, a powerful personality forced a reconsideration of this settlement in the middle of the present century. Stevens argued that Fechner's complex and possibly tendentious analyses

of discrimination data should be abandoned in favor of the collection of simple and direct verbal reports of the perceived magnitudes of the sensations evoked by stimuli. He therefore asked observers to assign numbers so that they were proportional to the magnitudes of their sensations. Over a wide range of modalities and testing conditions, these so-called magnitude estimations were characteristically proportional to a power function of the stimuli. Usually, the function's exponent was fractional so that brightness or loudness could be said to grow as the cube root or square root of the intensity of the stimulus. However some stimuli, most notably electric shock, gave exponents much larger than one.

Buttressed by the sheer force of his personality, Stevens' approach precipitated a radical debate about the foundations of psychophysics. This debate survived his passing and continues to the present day. Laming's *The Measurement of Sensation* presents a quite complete and very well balanced overview of the history of this discussion. Although Laming does have his own particular view, of which more later, most of the book is a commendably fair minded and quite matter of fact presentation of the basic ideas and the critical experiments. Impressively, in a field in which mathematical formalisms have often been used as much to obscure as to reveal, Laming masterfully controls his formal propositions so that they nicely illuminate the discussion. Coupled with adroit illustrations that provide an intuitive counterpart to the more formal discussion, *The Measurement of Sensation* is very accessible.

Unlike many who have approached this issue as partisans of one formulation over another, Laming marshals the evidence to provide fundamental and critical tests of both propositions. Most of the book is devoted to these critiques. They are quite powerful. For example, if the estimation of single stimuli leads to a given psychophysical function, it

should be possible to use that function to predict what observers will do when asked to deal with the differences between stimuli. Such predictions fail, and the failures are so large that they cannot be attributed to imprecision of measurement.

Other difficulties come from the interactions among stimuli. Laming nicely presents a vast array of evidence that indicates that the sensation evoked by one stimulus is strongly influenced by the stimulus that preceded it. Even the range of stimuli used in an experiment matter. In some experiments, the strongest stimulus is only slightly stronger than the weaker but in others, the stimulus range can extend to the maximum feasible. Although the first stimulus obviously does not tell an observer anything about the range of the stimuli that will follow, succeeding stimuli fairly rapidly give observers an appreciation of the range that is actually being employed currently.

In Laming's view, these so-called context effects limit the psychophysical enterprise. He concludes (on p. 205) "that the evidence so far to hand does not support any intermediate continuum at the psychological level of description which might reasonably be labeled 'sensation'." At most, according to Laming, observers are able to sort their impressions into five or so categories. Thus, for vision, he says that lights can be sorted into very dim, dim, medium, bright, and very bright categories, yielding no more than an ordinal scale whose properties are nothing like the scales of natural science.

Laming may be right. Certainly, it is hard to be sanguine after reading his catalog of the failures and contradictions which appear to be the primary result of a century and half of diligent labor by intelligent investigators.

However there is another possibility. Almost all of this effort antecedently presupposed that a simple formalism would characterize the psychophysical function. Thus, although investigators

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accumulated a vast amount of data in support of either the logarithmic or power function formalism, as Laming pointedly notes, many of these data were only reported in highly condensed form after having been pressed onto the Procrustean bed of one or the other formalism. This automatically constricted the domain of alternatives. Therefore, if one knew nothing else about this problem area, one would surely have to consider the possibility that some alternate characterization might have been explored if a bottom up approach had been taken rather than a top down.

A major pointer to such an alternative, in my opinion, is an important experiment which is extensively discussed by Laming. This is the work of Knibestöl and Vallbo who recorded the electrical activity of mechanoreceptors in the skin of the human hand. They also obtained psychophysical judgments about the same stimuli from the same individuals. Their behavioral data indeed exhibited the same type of context effects used more broadly by Laming in his impeachment of attempts to measure sensations on anything more than a category scale.

However, as I have documented elsewhere, their electrophysiological data exhibited context effects that

exactly paralleled those in the behavioral data. Therefore, if it is fair to impeach the idea of a sensory scale (beyond a five-category ordinal scale) on the basis of Knibestöl and Vallbo's behavioral data, then by the same token one should use their physiological data to impeach the idea of a neurelectric scale. In other words, we might just as well conclude from these data that we should not measure sensory receptor polarizations in millivolts or afferent discharges in spikes per second but rather we should characterize bio-electric signals as being very weak, weak, medium, strong, or very strong. Yet, as long as two and a half centuries ago, Benjamin Franklin's electric quantitations were more complete than that; today electrophysiologists not uncommonly consider the effects of microvolt and nanoampere variations.

Instead, I believe it is instructive to consider the full complexity of the results of the last few decades of research on the properties of sensory receptors and afferents. Although such investigations still do use a logarithmic metric to display their results, these investigations have been thoroughly agnostic with respect to scale form. The result of this bottom up empiricism has been the revelation of a suite of com-

plexities that totally rule out the possibility of any simple neurelectric scale. For example, the potentials evoked in sensory receptors saturate at high stimulus levels, ruling out any log or power characterization. Further, axonal spike generators contain about a dozen ion-specific channels, each with its own voltage, time, and concentration dependencies. The result is that the neurelectric functions relating spike activity to stimulus level are mathematically discontinuous. Finally, both the sensory receptor and the spike generator adapt, giving powerful context effects.

So I welcome Laming's masterful demonstration that psychophysics has come to a dead end. Time now to retrace our steps back to the fundamentals. I believe that we are very much in the position of having discovered that weight measurements are not fundamental because they vary with context; Neil Armstrong in the context of the moon weighed less than he did in the Earth's context. Likewise, it still remains to be seen whether there is a fundamental sensory concept which parallels the fundamental physical concept of mass. ❖

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Molecular Pathogenesis of Diabetes Mellitus

R.D.G. Leslie (Editor). *Frontiers of Hormone Research*, Vol. 22

A.B. Grossman (Series Editor).

Basel: Karger, 1997, 228 pp., illus., index, \$198.25

ISBN: 0-443-07681-2

Rapid progress has been made in recent years in furthering our understanding of the immunopathogenesis of type 1 diabetes and the pathophysiology of non-insulin-dependent (type 2) diabetes mellitus. This multi-author book seeks

to provide a comprehensive account of the current state of knowledge in these areas. The book is divided into two sections, the larger is devoted to Type 1 diabetes mellitus, the remainder to Type 2 diabetes mellitus.

The first section includes an introductory chapter by Pociot and Mandrup-Poulsen that provides a good balanced overview of the interplay between genetic susceptibility and environmental factors in the pathogenesis of type 1 diabetes mellitus. Both HLA- and non-HLA-associated susceptibility genes are discussed. These areas are subsequently discussed in more

detail in chapters dealing specifically with the genetics of type 1 diabetes, the roles of HLA susceptibility, islet-related autoantigens, and T-lymphocytes in the aetiology of type 1 diabetes mellitus. An additional chapter is devoted to animal models of insulin-dependent diabetes. The second section includes an overview of type 2 diabetes, chapters on the genetics and physiology of insulin secretion in type 2 diabetes, and a chapter on the insulin signaling cascade as determined primarily from studies in cultured cells.

On the whole the chapters are well written, informative, and well refer-

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enced. The chapter dealing with the genetics of type 1 diabetes mellitus is heavy going for the nongeneticist and would have benefitted from fewer abbreviations, more detailed explanations, and some illustrations, particularly as it precedes the chapter on the HLA complex, which logically might have been better first. Overall the section on type 1 diabetes mellitus is comprehensively covered and provides a balanced view of the current state of our understanding. In the section dealing with type 2 diabetes mellitus, Hattersley provides an excellent discussion of the approaches to defining the genetics of type 2 diabetes mellitus. The chapter on insulin secretion in type 2 diabetes, including a discussion of islet amyloid, is also clear and well written. The chapter on insulin signaling is clear and provides an up-to-date account of a rapidly evolving field.

The section on type 2 diabetes mellitus, by contrast with the first part of the book, is notable for its omissions. The overview chapter is precisely that. Those familiar with the field will find the discussion of the metabolic disturbance in type 2 diabetes very superficial and poorly referenced. In parts state-

ments are made without reference to the relevant studies and discussion of differing views so that those unfamiliar with the field will not gain significant insight. The discussion of insulin resistance and hepatic insulin resistance occupies only one and a half pages, and the author cites only one study suggesting that gluconeogenesis is increased in type 2 diabetes. Likewise, the discussion of the role of TNF- α would benefit by reference to the work of others showing no increase in plasma levels and no effect of anti-TNF- α antibodies on insulin action in type 2 diabetes (e.g., Taylor et al., *Diabetes* 45: 881, 1996;). It is unfortunate that there is no follow up chapter dealing specifically with insulin resistance and the insulin resistance syndrome because the subsequent chapter on the mechanism of insulin action is written from a cell biologists view point rather than from a physiological perspective. There is no mention of the role of the hexosamine pathway and the interrelationships of glucose and lipid metabolism in insulin resistance are poorly covered. Also not covered is the area of islet β -cell gene expression and physiology as it relates to insulin secretion in animal models of

Type 2 diabetes mellitus, the effects of hyperglycemia on islet β -cell gene expression, and pathophysiological findings (other than amyloid) in islets from patients with Type 2 diabetes mellitus. Readers interested in the pathophysiology of diabetic complications must look elsewhere.

Cross-referencing between chapters is limited and this leads to some overlap, particularly in the sections on the role of the HLA complex and immunology of type 1 diabetes, the genetics of type 2 diabetes mellitus, and descriptions of MODY 1, 2 and 3, which are discussed in three separate chapters.

On balance this book will be found useful by both clinicians and basic scientists, particularly those seeking an understanding of the immunopathogenesis of type 1 diabetes mellitus. Although coverage of type 2 diabetes mellitus is rather limited, clinicians and researchers will find the chapters on insulin secretion, genetics and insulin signalling to be useful. However, the price of this small book at \$198 is high.

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Polyamine Protocols

David M.L. Morgan (Editor). *Methods in Molecular Biology*, Vol. 79. Totowa, NJ: Humana Press Inc., 1997, 186 pp., illus., index, \$59.50 ISBN: 0-89603-448-8

“Although receiving little attention in biochemical and physiological textbooks, the polyamines have a long history and have accumulated a considerable literature.” So starts the monograph entitled *Polyamine Protocols*, edited by David M.L. Morgan. The polyamines putrescine spermidine, and spermine are ubiquitously distributed organic

cations that have been identified in bacteria, plant, and animal cells where they where they play a role in cell growth, differentiation, and perhaps apoptosis. Although a number of intracellular actions have been identified, the full range of polyamine functions remains a current area of investigation. Morgan quotes Coffino when stating, “Polyamines are doing some important things, but we do not know what they are.” This 186-page collection of polyamine-related protocols is designed to make the task of identifying further polyamine actions a little easier.

The compact volume is the seventyninth in a series of similar technique-

oriented monographs that are collected under the somewhat misleading title, *Methods in Molecular Biology*. The book includes an introduction followed by five sections describing assays to measure polyamine biosynthesis, catabolism, quantitation, and transport.

The introduction is a fascinating review of what has been learned about polyamines since Van Leeuwenhoek first described a crystalline precipitate, later identified as spermine, in human semen over 300 years ago. The chapter is exceptionally informative and should be required reading for every graduate student and postdoctoral fellow interested in cellular proliferation. In mam-

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malian systems the polyamines are synthesized by a two highly inducible enzymes, ornithine decarboxylase and *S*-adenosylmethionine decarboxylase as well as two constitutively expressed enzymes, spermidine and spermine synthases. In the nucleus, polyamine synthesis includes the N^8 -acetylation of spermidine by N^8 -acetyltransferase. A full chapter is devoted to quantitating the action of each of these enzymes. The chapter on spermidine and spermine synthases includes a description of the synthesis of radiolabeled propylamine donor decarboxylated *S*-adenosylmethionine as no commercial source is available. The catabolism of the polyamines accounts for polyamine interconversion and excretion. Catabolism is covered in chapters describing S^8 -acetylspermidine deacetylase, amine oxidase, diamine oxidase and two protocols for measurement of polyamine oxidase activity. Both colorimetric and radiometric methods are presented and due to the lack of commercially available labeled substrates a the chemical synthesis and purification of tritiated N^8 -[acetyl- 3H]-acetylspermidine is described. Four methods are presented under the heading "Measurement of Polyamines." Three are HPLC based and describe the derivatization of native polyamines with benzoyl chloride, dansyl chloride, or fluorescamine. Finally, for the truly technically challenged, a perfectly adequate TLC-based method is included. Representative chromatograms are presented as well as limits of sensitivity and retention times for each polyamine

in question. In addition to synthesis, polyamines may be transported from the extracellular space through a set of partially characterized transport proteins. Simple methods for measuring polyamine uptake in cells in suspension and for adherent cells are presented. The final chapter in this section describes the measurement of polyamine efflux, another mechanism whereby cells modulate intracellular polyamine levels.

Each chapter starts with a short introduction on the biochemical action of the enzyme in question followed by a materials list and a step by step description of the method. All chapters are written by investigators active in the use of each assay and include a section entitled "Notes" in which pitfalls and lessons learned during the daily use of the protocols is presented. The presentations are extremely detailed, to the point of suggesting which pipette and which pipette tip work best in a particular step in the assay. Any graduate student should be able to take a chapter and set up an assay with little difficulty. As noted above, in some cases more than one protocol is offered allowing, for instance, a laboratory without HPLC a TLC-based method for measuring polyamine content. What is missing from the volume is information at the molecular level regarding reagents available for investigating polyamine function. Although every enzyme in the synthetic pathway has been cloned, little mention is made of this fact and except in the first chapter,

nowhere in the monograph do the authors present this information. This is especially surprising given the title of the series, *Methods in Molecular Biology*. Additionally, one of the more recently described proteins involved in polyamine metabolism is excluded from consideration. Ornithine decarboxylase antizyme regulates polyamine biosynthesis by decreasing the stability of the ODC protein and is inhibitory to polyamine transport into cells, both actions leading to attenuation of polyamine availability. The absence of information on antizyme and the availability of molecular reagents detracts from what is otherwise a thorough compilation of polyamine-related protocols.

If the reader is either an experienced investigator in this field or someone who only recently became interested in research on polyamine function, he or she should find this monograph a valuable addition to their library. Nowhere, until now, has such detailed information regarding polyamine protocols been collected into a single volume. For the novice the book should prove invaluable and even the experienced investigator should benefit from having protocols for this many assays available to his/her laboratory personnel. The important things polyamines are doing will be described in time; hopefully, this book will hasten that time even make the job a little easier. ♦

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Books Received

Analysis and Assessment of Cardiovascular Function

Gary M. Drzewiecki and John K-J. Li (Editors).

Newark, NJ: Springer, 387 pp., illus., index, \$79.95.

ISBN: 0-387-98282-5.

Bioelectricity and Biomagnetism

Ramesh M. Gulrajani

New York: Wiley, 729 pp., illus., index, \$149.00.

ISBN: 0-471-2-24852-5.

Conditioned Taste Aversion: Memory of a Special Kind

Jan Bures, Federico Bermúdez-Rattoni, and Takashi Yamamoto (Editors).

New York: Oxford University Press, 178 pp., illus., index, \$105.00.

ISBN: 0-19-852347-5.

Books Received

Endocrine Cell Culture.

Stephen Bidey (Editor).

Handbooks in Practical Animal Cell Biology.

New York: Cambridge University Press, 156 pp., illus., index, \$26.95.

ISBN: 0-521-59563-0.

The Fats of Life.

Caroline M. Pond.

New York: Cambridge University Press, 337 pp., illus., index, \$19.95.

ISBN: 0-521-63577-2.

Foundations of Neurobiology.

Fred Delcomyn.

New York: Freeman, 648 pp., illus., index, \$62.95.

ISBN: 0-71673-295-5. (CD-Rom Enclosed)

Kidney Physiology.

Jurgen B. Schnermann and Samir I. Sayegh.

Philadelphia, PA: Lippincott-Raven, 200 pp., illus., index, \$32.95.

ISBN: 0-397-51673-8.

Methods in Enzymology, Vol. 294.

Ionic Channels, Part C.

P. Michael Conn (Editor).

San Diego, CA: Academic Press, 788 pp., illus., index, \$110.00.

ISBN: 0-12-182195-1

Methods in Enzymology, Vol. 296.

Neurotransmitter Transporters.

Susan G. Amara (Editor).

San Diego, CA: Academic Press, 784 pp., illus., index, \$110.00.

ISBN:0-12-182195-1.

The Physiology of Excitable Cells (4th Edition)

David J. Aidley.

New York: Cambridge University Press, 477 pp., illus., index, \$47.95.

ISBN: 0-521-57421-8.

Skeletal Muscle Metabolism in Exercise and Diabetes.

Erik A. Richter, Bente Kiens, Henrik Galbo, and Bengt Saltin (Editors).

Advances in Experimental Medicine and Biology, Vol. 441.

New York: Plenum, 328 pp., illus., index, \$95.00.

ISBN: 0-306-45920-5.

Scientific Meetings and Conferences

1999

January 11-12

Cardiovascular Genomics, Orlando FL. *Information:* Cambridge Healthtech Institute, 1037 Chestnut Street, Newton Upper Falls, MA 02464. Tel: 617-630-1300; fax: 617-630-1325; email: chi@healthtech.com; Internet: <http://www.healthtech.com/conferences>.

February 13-17

Biophysical Society 43rd Annual Meeting, Baltimore, MD. *Information:* Biophysical Society, 9650 Rockville Pike, Ste. 0512, Bethesda, MD 20814-3998. Tel: 301-530-7114; fax: 301-530-7133; email: society@biophysics.faseb.org; Internet: <http://www.biophysics.org/biophys>.

February 20-26

Medical Imaging 1999, San Diego, CA. *Information:* International Society for Optical Engineering (SPIE), PO Box 10, Bellingham, WA 98227-0010. Tel: 360-676-3290; fax: 360-647-1445; e-mail: mi99call@spie.org; Internet: <http://www.spie.org/info/mi/>.

February 21-26

Salivary Glands and Saliva Gordon Conference, Ventura, CA. *Information:* Dr. Bruce J. Baum, organizer, MSC 1190, NIDR, NIH, Bldg. 10, Rm. 1N113, 9000 Rockville Pike, Bethesda, MD 20892-1190. Tel: 301-496-1363; fax: 301-402-1228; email: bruce_j_baum@nih.gov; Internet: <http://www.grc.uri.edu> or see the upcoming issue of Science on Gordon Conferences.

April 5-8

Physiology Teaching in the Developing World: Models for Quality Learning, Karachi, Pakistan.

Information: Dr. Arif Siddiqui, Conference Secretariat, International Workshop on Physiology Teaching, The Aga Khan University, Stadium Road, Karachi-74800, Pakistan. Tel: +92-21-493 0051, ext. 4567; fax: +92-21-493 2095 or 493 4294; e-mail: arif.siddiqui@aku.edu.

May 16-20

Biochemistry Molecular Biology '99 (sponsored by American Society for Biochemistry and Molecular Biology, Pan-American Society for Biochemistry, Canadian Society of Biochemistry and Molecular and Cellular Biology, and Division of Biological Chemistry of the American Chemical Society), San Francisco, California. *Information:* ASBMB Fall Symposium Office, 9650 Rockville Pike, Bethesda, MD 20814-3998. Tel: 301-530-7010; fax: 301-530-7014; e-mail: gswindle@osmc.faseb.org; Internet: <http://www.faseb.org/meetings/asbmb/jointmt.htm>.

May 21-23

7th International Congress on Physical Education and Sport, Komotini, Greece. *Information:* Savvas Tokmakidis, PhD, 7th International Congress on Physical Education and Sport, Department of Physical Education and Sport Science, Democritus University of Thrace, Komotini, 69100, Greece. Tel: +30-531-21764 or 21762; fax: +30-531-26908; email: stokmaki@kom.forthnet.gr; Internet: <http://platon.ee.duth.gr/~tefaa/icpes99>.

May 22-27

13th Annual Human Anatomy and Physiology Society Conference, Baltimore, MD. *Information:* HAPS/OSG, 222 S. Meramec, Suite 303, St. Louis, MO 63105.

June 12-16

12th International Congress: International Society for Aerosols in Medicine, Vienna, Austria. *Information:* Vienna Academy of Postgraduate Medical Education and Research, Alser Strasse 4, A-1090 Vienna, Austria. Tel: +43-1-405 13 83-22; fax: +43-1-405 13 83-23; e-mail: medacad@via.at.

June 27-30

Pulmonary Circulation VII, Prague, Czech Republic. *Information:* Vaclav Hampl, PhD, Department of Physiology, Charles University Second Medical School, Plzenska 130/221, 15000 Prague 5, Czech Republic. Tel: +4202-57210345; fax: +4202-57210995; Internet: <http://www.lf2.cuni.cz/departments/physiology/PCVII/index.htm>.

June 30-July 4

Second Federation of European Physiological Societies (FEPS) Congress, Prague, Czech Republic. *Information:* Prague Congress Secretariat, Czech Medical Association, J. E. Purkyne, P. B. 88, Sokolska 31, 120 26 Prague 2, Czech Republic. Tel: +420-2-296889 or 297271; fax: +420-2-24216836 or 294610; e-mail: Ion@czechmed.anet.cz; Internet: <http://uemweb.biomed.cas.cz/FEPS99.htm>.

July 7-8

International Conference on the Physiology and Psychology of Sport, Anchorage, Alaska. *Information:* Dr. Edgar F. Pierce, Jr., Department of Health and Sport Science, Robins Center, University of Richmond, Richmond, VA 23173. Tel: 804-289-8356; fax: 804-287-8820; email: epierce@richmond.edu; Internet: <http://www.urich.edu/~mcgowan/ed1.html>.

July 10-15

Neural Cardiovascular Regulation (FASEB Summer Conference), Saxtons River, VT. *Information:* Adele Hewitt, FASEB Office of Scientific Meetings and Congresses, 9650 Rockville Pike, Bethesda, MD 20814-3998. Tel: 301-530-7010; fax: 301-530-7014; e-mail: ahewitt@faseb.org; Internet: <http://hsc.virginia.edu/~pgg>.

August 3-7

6th International Congress on Amino Acids, Bonn, Germany. *Information:* Dr. O. Labudova, Rheinische Friedrich-Wilhelms-Universität, Experimentelle Radiologie und Strahlenbiologie, Sigmund-Freud-Strasse 25, D-53105 Bonn, Germany. Fax: +49-228-287-4457; email: hrink@mail.meb.uni-bonn.de

August 22-27

9th World Congress on Pain, Vienna, Austria. *Information:* International Association for the Study of Pain (IASP) Secretariat, 909 NE 43rd St., Suite 306, Seattle, WA 98105. Tel: 206-547-6409; fax: 206-547-1703; e-mail: IASP@locke.hs.washington.edu; Internet: <http://www.halecyon.com/iasp>.

August 23-28

Fifth International Congress of Comparative Physiology and Biochemistry, Calgary, Alberta, Canada. *Information:* The Secretariat, Fifth International Congress of Comparative Physiology and Biochemistry, Special Events and Conference Office, University of Calgary - Olympic Centre, 2500 University Drive NW, Calgary, Alberta, Canada T2N 1N4. Tel: 403-220-5261; fax: 403-289-9311; e-mail: iccpb@acs.ucalgary.ca; Internet: <http://acs.ucalgary.ca/~iccpb99/>.