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ThePhysiologistVolume 41, Number 5

Graduate Students Are the Working Poor; They Can Get Federal Assistance David S. North Office of Insular Affairs, US Department of Interior

I recently received a cheerful voice-mail message from a Chinese man who had just completed his graduate studies. He gave his name, told me of his new doctorate, and said: "Thank you, Mr. North, for suggesting I file for the EIC. I just received a check for the maximum benefit, \$3,556."

The EIC is the earned-income credit, a longstanding federal program for the working poor. I had suggested that Dr. X apply for the credit when I interviewed him at an Ivy League institution six months earlier, in the course of a research project.

Why was I, an immigration-policy researcher, giving financial advice to a graduate student? Why didn't his university advise him?

Giving this financial advice was an unanticipated consequence of my study for the Alfred P. Sloan Foundation about who finances the graduate education of non-citizens in science and engineering programs. To answer that question, I conducted structured, detailed interviews with students in 15 graduate schools around the nation. Each of the 87 respondents was paid \$40 for the interview, and all were very open about the extent and sources of their financing, 85 to 90 per cent of which came from U.S. sources.

I quickly learned what all academics know that graduate students are a very hard-working group, with pinched finances. I also stumbled on a technique to increase graduate students' incomes without creating a new federal program and without increasing the students' modest

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share of the research money coming to the universities.

The technique? Universities should regard the graduate students as what they really are—the working poor—and help them obtain the benefits available to such people. Several programs exist that could help many graduate students native-born and naturalized citizens, as well as some foreign students studying in the United States.

The best program for married students is the earned-income credit, which is operated like an income-tax-refund program by the Internal Revenue Service. The EIC has a complex formula that encourages work and rewards people for being married, and (even more) for having one or two children. The program helps those with earned incomes under a certain figure (\$29,290 in 1997), and it is most generous to those with incomes around \$15,000. It is almost tailor-made for a graduate student with a dependent spouse and child, like Dr. X. Foreign students can make use of the program after they have been in the United States for five years, or sooner if they are married to a permanent resident or citizen.

Also useful to graduate students, under the right set of circumstances, are food stamps, public housing, Medicaid, welfare, and the US Agricultural Department's Special Supplemental Food Program for Women, Infants, and Children. Citizens and permanent residents have more access to these programs, generally, than

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Federal Assistance for Graduate Students

do students on temporary visas.

Any of the programs can bring as much as several thousand dollars a year in cash or (more likely) goods and services to a struggling graduate-student couple, particularly if they have a child. The Agriculture Department's program, which is known as WIC, provides food for pregnant women and for nursing mothers and their babies. It has an upper-income limit of \$24,661 for families of three, and is available without regard to immigration status-again, a perfect fit for the typical graduate-student family. Like most government programs, WIC has varying benefit levels, but it can bring in an average of about \$100 a month.

Graduate students' incomes are so low, at least on the campuses I visited, that most of the students easily qualify for the working-poor programs. Yet most university administrators and many graduate students seem oblivious to the opportunities.

It is interesting to compare two populations being supported by Uncle Sam: Buck privates in the Army and graduate students working as research assistants on federal grants. While the compensation packages for both groups are complex, unmarried first-year privates receive an average of \$17,000 a year, and married ones about \$1,000 more.

In comparison, the median stipend for the 41 unmarried graduate students whom I interviewed (in 1996-1997) was \$14,000. Universities do not grant larger stipends for students with families; in fact, the median stipend for the 46 married students I interviewed was actually smaller—only about \$12,000.

Most graduate students have to live on their stipends; a few have help from their families or from a working spouse. Many, particularly US citizens, go into debt.

How does all this play out with real people? Let's look at a couple of other students in my study, Mr. Y and Ms. Z. Mr. Y was a PhD candidate in mathematics, and his only income was a stipend of \$11,400 a year for him, his wife (whose visa limitations prohibited her from working), and their child. Out of this amount, Mr. Y sent \$100 a month to his widowed mother in Vietnam.

The Y's had not been in the United States long enough to qualify for the earned-income credit.

But Mr. Y had an opportunity to improve his finances of which he was unaware. His father had died in what the Hanoi government calls a "re-education camp." Mr. Y did not want to return to Vietnam, and he could apply for political asylum. Based on some work I had done earlier on this topic, I assured him that the Immigration and Naturalization Service usually grants asylum to applicants from Vietnam with stories like his. That would lead quickly to a green card, or permanent-resident status, giving the family access to the EIC and food stamps, and allowing his wife to work.

Ms. Z was faring somewhat better in the social-services system, but still was not using all of the resources available to her. A native of Turkey seeking a PhD in engineering, she was married to a Turkish man who was studying full time for the US physician's examination, which doctors educated abroad must pass in order to practice medicine in the United States. They had two children, one born overseas and one a US citizen.

The Z family had been in the United States for nine years. They had not received any counseling from their institution, but on their own had discovered government programs available to the working poor. They lived in public housing and, when I talked to them, had just retired several thousand dollars in credit-card debt after the receipt of their third EIC check. Their only income was her \$7,800-a-year stipend and the annual EIC check of about \$3,000, but they did not want to apply for Medicaid or for food stamps for the child who was a US citizen, because those services are "welfare." The Z's thus were using only two of the four working-poor programs available to them.

While both Mr. Y and Ms. Z are foreign-born, the lessons from their financial lives apply to native-born graduate students as well. Yet during my study, I found no evidence that the universities I visited counsel any of their students about how to use the assistance programs—although, of course, some other institutions may do so.

As a policy matter, I believe that universities should pay their graduate assistants at least as much as privates in the military earn—a step that federal agencies could encourage by slight increases in their formulas for calculating research grants.

Failing that, graduate schools should accept the fact that their PhD candidates are members of the working poor and help those students figure out how to use federal assistance programs. Perhaps graduate students in social work could be hired part-time to help the PhD candidates apply for those programs. Why should the working poor among our graduate students continue to lose out on benefits that they are legally eligible to receive?

David S. North is the public affairs officer for the Office of Insular Affairs at the United States Department of Interior. He is the author of Soothing the Establishment: The Impact of Foreign-Born Scientists and Engineers on America (University Press of America, 1995). His article originally appeared in the March 13, 1998 Chronical of Higher Education, and is reprinted with the author's permission. Personal copies of the book may be purchased by sending \$7.00 to 3113 N. Kensington Street, Arlington, VA 22207.

APS News

Council Meets in Bethesda

The APS summer Council meeting was held in Bethesda, Maryland, at the APS Headquarters on July 16-18, 1998. The summer meeting is highlighted by the Council meeting with a majority of the committee chairs, receiving reports on the committees' accomplishments during the past year, and listening to their plans for the coming year. These committee reports were published in the August issue of The Physiologist. Council also met with Mordecai P. Blaustein, President of the Association of Chairmen of Departments of Physiology (ACDP), to discuss possible agenda items for the upcoming joint meeting of APS Council and ACDP in December 1998.

In addition, this year Council had the unique opportunity to hear from Claude Lenfant, Director of the National Heart, Lung and Blood Institute of NIH, who discussed the funding outlook and new initiatives within the Institute in the area of physiological genomics.

Among the farreaching issues acted on by Council was a decision to change the APS Bylaws to allow current corresponding members (members from outside of The

Americas) to have all the rights and privileges of regular members, including the right to vote in elections and serve on committees. This proposed change will be voted on by the general membership at the Business Meeting

> held during the E x p e r i m e n t a l Biology 1999 meeting.

> Council also approved a request for financial support from the IUPS to help reimburse the invited speakers for the 1997 IUPS Congress held in St. Petersburg. While Russia had been

expected to have the funds promised as speaker reimbursements, it became apparent after the Congress that the entirety of the amount needed would not be forthcoming. Therefore the President of the IUPS requested each society in each country to donate a specific amount based on the proportion of their members to aid the IUPS in honoring its commitment to invited speakers.

There was much excitement among Council over the changes in programming for the Experimental Biology meeting. The newly formed Joint Program Committee will replace both the Program Committee and Program Advisory Committee. With the election of Ethan Nadel to Council, Judith Neubauer was appointed chair of the



APS Council.



APS Committee Chairs.



orrespon-Members Allen Cowley, Jr. (Past President), L. Gabriel Navar (President), members Claude Lenfant (Director, NHLBI), and Walter Boron, (Presidentfrom elect).

APS Council meets with Claude Lenfant.

APS News

Joint Program Committee and will be overseeing the enactment of the Council recommendations on programming from last fall's retreat.

A strategic planning meeting has been scheduled for fall 1999. The last retreat in 1992 resulted in the development of the APS Strategic Plan, which called for the institution of Marketing and Education Offices within APS, greater financial self sufficiency for the individual society journals, an enlarged Public Affairs Office, and the establishment of specialized APS Conferences. The 1999 retreat will look critically at the current Strategic Plan to determine which areas need greater emphasis or perhaps redirection. The Long-Range Planning Committee has been charged with developing the agenda for the retreat with assistance from the Section Advisory Committee and Council.

The Society's primary research journals are all online. *Physiological Reviews* is scheduled to go up this fall and *News in Physiological Sciences* in 1999. Online access control to the *American Journal of Physiology* begins in October 1998, making the offer of online access for members to all the Society's journals for only \$49.50 a very attractive offer. A new member benefit was approved during the Council meeting. Free access to AAAS's ScienceNOW and Science's Next Wave will become available to all Society members later this fall. ScienceNOW is a daily science news service, whereas Science's Next Wave is a mentoring site for young and senior scientists. Information on how to access these two sites will be sent to the membership.

Additional details of the Council's actions during the July meeting will be communicated to the membership at the next business meeting and in *The Physiologist.*

Navar Thanks APS Staff

APS President L. Gabriel Navar hosted a staff appreciation reception for the 70 employees at the Headquarters Office in Bethesda, Maryland. Together with Council and committee chairs, Navar thanked the staff for all their efforts over the past year. He noted that because of the commitment and the excellence of the staff, APS continues to provide it members with the quality programs and journals they have come to expect.

A major portion of the staff apprecia-

tion reception is the recognition of years of service to the Society. This year, Navar presented a 25-year certificate to Brenda Rauner (Publications Manager and Executive Editor), a 20year certificate to Laurie Chambers (Production Manager), a 15-year certificate to Ruth Freehling (Copy Editor), 10-year certificates to Joanne Acevedo (Subscriptions Assistant) and Maria Kuhrmann (Copy Editor), and a 5-year Marsha certificate to Matyas (Education Officer). Navar expressed

Council's appreciation for their years of service.

In addition, Navar conveyed the gratitude of the Society's leadership for the efforts of all the staff in implementing the actions of the Council and committee chairs, and remarked that, with the staff's help, APS would continue to serve the needs of the physiology community in exciting and profitable ways for many years to come.



Joanne Acevedo, Martin Frank, Brenda Rauner, L. Gabriel Navar, and Laurie Chambers.



Maria Kuhrmann, L. Gabriel Navar, and Marsha Lakes Matyas.

Section News

Introducing...David H. Wasserman, Chair, Endocrinology and Metabolism Section

Effective April 1998, David H. Wasserman succeeded Marian Walters as the chair of the Endocrinology and Metabolism Section of the APS. Wasserman has served as the Endocrinology and Metabolism Section Program Advisory Committee Representative and Secretary/Treasurer in past years. He also serves on the edi-

torial boards of the American Journal of Physiology: Endocrinology and Metabolism and the Journal of Applied Physiology. Wasserman has also served on the organizing committee for APS Conferences held in 1991, 1996, and now for the year 2000. Wasserman received the 1997 Bowditch Lecture Award of the APS.

Wasserman is a Professor of Molecular Physiology and Biophysics in the Vanderbilt University School of Medicine. He did his undergraduate training at UCLA and received his PhD in 1985 from the University of Toronto, where he was a student of Mladen Vranic. His dissertation research investigated the hormonal regulation of hepatic glucose production during

exercise, using a chronically catheterized dog model. A key finding of this work was that glucagon is the primary controller of the increase in hepatic glucose production that occurs with exercise in both healthy and diabetic states. Upon completion of his doctoral degree, Wasserman began postdoctoral training at Vanderbilt University School of Medicine under the guidance of Alan Cherrington. During this period he further defined the regulation of glucose metabolism during exercise using novel arteriovenous and isotopic methods in the dog to assess glucose fluxes and tissue-specific glucose metabolism in vivo. In 1987, Wasserman joined the faculty at Vanderbilt.

Along with his APS activities,

Wasserman is also on the editorial board of *Metabolism* and is on grant review boards of the NIH and the Juvenile Diabetes Foundation International. He serves as Chair of the Vanderbilt University Animal Care and Use Committee and is involved with numerous activities related to that position.



The aim of research in the Wasserman laboratory is to explore the regulation of glucose metabolism using in vivo model systems. Results of his work have comprehensively defined how hormones, nerves, and metabolic substrates interact to control glucose metabolism during exercise and other physiological stresses. Over the last several years his laboratory has used molecular biological techniques, isotopic methods, and transgenic mouse models to elucidate sites (delivery to muscle membrane, transport across muscle membrane, phosphorylation within muscle) at which muscle glucose uptake is regulated in normal physiology and impaired in insulin resistant states. Particular emphasis has been placed on the control of exercise- and insulin-stimulated muscle glucose uptake. Most recently, studies in the Wasserman laboratory show that glucose sensing by carotid bodies or receptors near by is an important component of the control system governing blood glucose.

In addition to the area of carbohy-

drate metabolism, work from the Wasserman laboratory has been important in determining the role of the intestine as a source of amino acids when the body is physically active and the importance of the liver in removal and metabolism of nitrogenous compounds. Work in this area is focusing on the hormonal control of splanchnic amino acid metabolism.

Wasserman has a number of goals for the Endocrinology and Metabolism Section. The primary one is to increase the Section's participation in the Experimental Biology Meeting by developing a program based on hot current topics in the field of endocrinology and/or metabolism. He feels that this objective will be facilitated by

the recent decision of the APS to decentralize programming, giving the sections the autonomy to devise a program that will serve as a "meeting within a meeting." Charles H. Lang of Pennsylvania State University is the Chair of the Section Program Committee and will play an active role in the programming of this meeting. Wasserman believes that with the expanded role of the Section in programming added opportunities for involvement of Section members will arise. He feels that the Section leadership, including two newly electing councillors, must make these opportunities visible to the members. Owen McGuinness of Vanderbilt University School of Medicine has taken on the

Section News

position of Secretary/Treasurer for the Section and will be important in assuring that sectional opportunities and activities are communicated to members. The critical element for the success of this meeting will then ultimately depend on enthusiastic participation from the membership as a whole.

Wasserman feels that the APS has provided the sections with the vehicles needed to make them the leading resource in their respective areas, the Experimental Biology Meeting, the American Journal of Physiology: Endocrinology and Metabolism, and the opportunity to sponsor conferences highlighting cutting edge research topics. He believes that the development of transgenic animals and gene transfer techniques has created a renaissance in physiology, for which the people who originally created these models are largely unprepared. As the leading society in the world for promoting the physiological sciences, the APS and its sections must take the lead in providing forums to educate and make scientists aware of how best to utilize transgenic models to understand physiological systems. Wasserman sees the first step in doing this as making people who may consider themselves "cell biologists" aware that they are doing physiology and that APS services can facilitate their research program. So while in the past the emphasis has been in exposing physiologists to molecular biological techniques, he recognizes an important need to bring the tools of the physiologist to molecular biologists. To do this, Section activities need to be promoted to a broad range of scientists.

Renal Section Awards Presented

This year at Experimental Biology '98 the Renal Section of the American Physiological Society took the opportunity to recognize the outstanding achievements of some of our graduate



Mark Knepper, Janos Peti-Peterdi, Dietmar Kultz, Cathy Sandman (Hoechst Marion Roussel Representative), Martin Mense, Theodore R. Muth (Procter & Gamble Awardee), and Michael Butterworth.

students, postdoctoral fellows, young investigators, and renown members.

The graduate student and postdoctoral awards, sponsored by Hoechst Marion Roussel, are given to the graduate students and postdoctoral fellows presenting their work as first authors at the EB meeting. The awards are judged in part on the submitted abstract and in part based on the subsequent presentation. This year's winners in the student category for the 1998 awards were Michael Butterworth, working with W. Els at the University of Cape Town, South Africa, and Martin Mense, working with L. Dunbar and M. Caplan at Yale University School of Medicine. The winners in the postdoctoral category were Dietmar Kultz, working

with S. Madhany and M. Burg at the National Heart, Lung and Blood Institute (NHLBI), and Janos Peti-Peterdi, working with P. Bell at the University of Alabama.

time at EB '98, a Young Investigator Award for Excellence in Research. The Renal award, sponsored by



Jeff Sands, Dawn McGuire (Neurex representative), and Arlyn Garcia-Perez (Young Investigator Awardee).

Neurex, was presented to Arlyn Garcia-Perez, of the NHLBI, for her work on the regulation of gene expression by hyperosmotic stress.



The Renal Section Bryan Cox (Abbott Representative), Bodil presented, for the first Schmidt-Nielsen, Peter Cala, Mark Knepper.

> In addition, each year the Robert W. Berliner Award is given to an outstanding senior researcher and educator in renal physiology. This year the Berliner Award, sponsored by Abbott Laboratories, was presented to Bodil Schmidt-Nielsen in honor of her outstanding research career and her dedication to the discipline of renal physiology.

The Renal Section gratefully acknowledges the support of Hoechst Marion Roussel for underwriting the graduate and postdoctoral awards, Neurex for underwriting the Young Investigator Award, and Abbott Laboratories for sponsoring the Berliner Award. 🔹

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Sample: Cheung, Stephen S., and Tom M. McLellan. Heat acclimation, aerobic fitness, and hydration effects on tolerance during uncompensable heat stress. J. Appl. Physiol. 84(5): 1731-1739, 1998.

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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



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 19, 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 19, 11:15 AM

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







DISTINGUISHED LECTURESHIP OF THE GASTROINTESTINAL SECTION

HORACE W. DAVENPORT

Irwin Arias Tufts University

The Bile Canaliculus: Biology and Pathobiology

SUNDAY, APRIL 19, 8:30 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 19, 2:30 PM

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, 11:15 AM





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, 11:15 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



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, 11:15 AM

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

Experimental Biology '99 Deadlines

November 16, 1998 February 19, 1999 February 22, 1999 March 17, 1999 Abstract Deadline Advance Registration Deadline Late-Breaking Abstract Deadline Hotel Reservation Deadline

Section-Sponsored Featured Topics

The Bile Canaliculus: Physiology and Pathobiology I. Arias Insulin and Growth Factor Receptor Signaling J. Avruch Regulation of the Epithelial Na Channel M.S. Awayda 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-toVessel 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

EB '99 Symposia Preview

Asymmetry of Receptor Signaling in Epithelial Cells

Renal, Cell & Molecular Physiology, Gastrointestinal, and Respiration Sections and Epithelial Transport Group

K. Amsler and P. Wilson

Kurt Amsler, Richard Boucher, Mark Donowitz, Raymond Harris, and Patricia Wilson

In this symposium we will introduce the concept that signaling from membrane receptors in polarized epithelia can be influenced by receptor location. Work presented in this symposium will address: *1*) the localized nature of receptor signaling phenomena, *2*) asymmetric responses initiated upon activation of receptors localized to the apical and basolateral membranes, and *3*) changes in receptor localization that occur during renal development and disease. Work on several epithelial systems will be presented, including renal, intestinal, and airway epithelia, demonstrating the potential broad applicability of this concept.

Advances in the Characterization of Na⁺-H⁺ Exchanger (NHE) Isoforms

Epithelial Transport Group, and Cell & Molecular Physiology, Gastrointestinal, Renal, and Respiration Sections **P. Aronson and M. Donowitz**

Mark Donowitz, Diane Barber, George Lamprecht, Daniel Biemesderfer, and Patrick Schultheis

Na⁺-H⁺ exchangers are widely expressed in many cell types and participate in a number of important physiological functions including the regulation of cell pH, the regulation of cell volume, and transepithelial acid-base and NaCl transport. The identification of Na⁺-H⁺ exchanger (NHE) isoforms by molecular cloning techniques opened a new era in the study of this major class of transporter proteins. The use of genetic and immunocytochemical techniques has provided new insight into the function and regulation of NHE isoforms not only at the molecular and cellular level but also at the integrative level of whole organ physiology. This symposium will summarize recent advances in the characterization of NHE isoforms that have resulted from these technical developments.

The symposium will begin with a short overview of the NHE isoforms by Donowitz. Barber will then discuss the mutual interactions between the ubiquitously expressed housekeeping NHE isoform (NHE1) and the cytoskeleton, an issue of general relevance to cell physiology. Lamprecht will

discuss the critical role of adapter proteins in mediating the regulation of an epithelial NHE isoform (NHE3) by protein kinases. Biemesderfer will discuss evidence that the renal brush border NHE exchanger isoform (NHE3) is regulated by membrane trafficking as part of the kidney's response to metabolic acidosis. Finally, Schultheis will discuss the expected and unexpected phenotypes resulting from targeted disruption of NHE isoform genes.

The specific topics to be discussed in the symposium should be of special interest to cell, epithelial, gastrointestinal, and renal physiologists. In addition, the symposium should be of general relevance to physiologists interested in the application of molecular tools to the study of problems in integrative physiology.

Angiotensin in Normal and Abnormal Growth of Cardiovascular Tissue

Cardiovascular, Comparative, and Respiration Sections and the American Society for Pharmacology and Experimental Therapeutics

K. Berecek and R. Levy

Karl T. Weber, Msatsugu Horiuchi, Gary Gibbons, Robert M.K.W. Lee, and C. Roger White

Among the most important functions of the angiotensin II (ANG II) recently recognized is the ability to be a regulator of normal and abnormal cardiovascular cell proliferation and growth. ANG II participates not only in the development of the heart and blood vessels but is also involved in long-term regulation of the structure of these organs through direct and indirect growth factor properties. Many of the growth effects of ANG II are independent of changes in systemic blood pressure and other hemodynamic and reflex effects. The growth promoting effects of ANG II have been reported for cardiomyocytes, vascular smooth muscle cells, and cardiac and vascular fibroblasts. How the angiotensin receptor is coupled with cellular growth has not been established with certainty. The purpose of this symposium is to provide the current status of knowledge on the effect of ANG II on growth of these cell types. Weber will present a talk on the effect of ANG II on the growth of fibroblasts and connective tissue homeostasis. Horiuchi will present information concerning the effect the overexpression of angiotensin AT1 and AT2 receptor transgenes on growth of cardiac tissue. Gibbons will present information on the interaction between growth factors and ANG II in remodeling of vascular smooth muscle. Lee will give new information on the effect of blocking the reninangiotensin system on cardiovascular remodeling. White will

present information on the interaction between nitric oxide and superoxide and ANG II in the growth of cardiovascular tissue. This symposium will be co-sponsored by ASPET and will complement a symposium chaired by Levy on ANG II and cardiovascular remodeling in disease states.

Refresher Course for Teaching Cardiovascular Physiology

Education Committee and Cardiovascular and Teaching of Physiology Sections

F.L. Belloni

R. John Solaro, Harvey V. Sparks, and John E. Hall

The purpose of this refresher course is to review concepts and teaching strategies related to cardiovascular physiology. Cardiovascular physiology is a major component of mammalian physiology courses in undergraduate colleges, in graduate programs, and in the professional school curricula for medicine, dentistry, and allied health professions. In many cases, these course sections are assigned to teachers whose own professional expertise is in another area of physiology or in a subspecialty within cardiovascular physiology. A major goal of the refresher course is to provide these teachers with a succinct summary of current concepts in cardiovascular physiology, including recently developed concepts, that are appropriate for introductory physiology courses in undergraduate, graduate, and professional curricula. A second major goal is to provide these instructors with guidelines and suggestions about teaching strategies and instructional resources related to cardiovascular physiology.

The didactic component of the session will consist of three lectures by noted experts in cardiovascular physiology, who are also excellent teachers. Each lecture will deal with a subfield of the overall topic—cardiac muscle (Solaro), vascular physiology (Sparks), and integration and regulation (Hall) and will be followed by a question and discussion period. There will also be a general discussion and question session at the conclusion of the lecture component. In addition to the lecture component, there will also be poster presentations (from abstracts submitted to the Refresher Course topic category), demonstrations (e.g., computer simulations, audiovisual teaching material), and exhibits (e.g., textbooks, course syllabi, problem-based learning cases).

Postmenopausal Physiology

Environmental & Exercise Physiology and Endocrinology & Metabolism Sections

J. Cannon

Phyllis M. Wise, W. Larry Kenney, Joseph G. Cannon, Pamela Parker Jones, and Wendy M. Kohrt

Menopause has important consequences for women's health, including increased susceptibility to vascular diseases, thermoregulatory abnormalities (hot flashes), and increased bone resorption leading to osteoporosis. Menopause has often been ascribed to depletion of a nonrenewable population of follicles, leading to diminished production of estradiol. As a result, much of the research and therapy directed at menopause has centered on the issue of ovarian estradiol withdrawal. Although important, focusing on this one aspect of menopause results in both conceptual and clinical problems. For example, it is unclear why the rate of follicle loss increases in middle-aged women and if the signal(s) for this accelerated loss originates within the ovarian tissue itself. As another example, vascular and skeletal deterioration have been ascribed to cytokine-mediated inflammatory processes that are no longer held in check by the anti-inflammatory actions of estradiol, yet pro-inflammatory factors driving such conditions have not been identified. Finally, estrogen replacement therapy ameliorates many postmenopausal conditions but is also associated with its own set of discomforts as well as increased rates of cancer. This symposium will address questions less tightly bound to the ovary/estradiol paradigm. Do menopausal triggers originate in the central nervous system? Are gonadotropins important inducers of inflammatory cytokines? Are these cytokines involved in the altered thermoregulation after menopause? Does exercise training provide cardiovascular or osteogenic benefits to postmenopausal women? This symposium is designed to be more inclusive of younger investigators, with invited speakers ranging from postdoctoral fellows to a department chair. It is anticipated that such a spectrum will provide fresh new insights seasoned with experienced, authoritative perspectives.

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

MyoBio/Muscle Group, and Cardiovascular and Environmental & Exercise Physiology Sections

R.C. Carlsen and S.D. Gray

Torben Clausen, Sarah D. Gray, Joel G. Pickar, Timothy I. Musch, and Richard C. Carlsen

Skeletal muscle plays an important role in maintaining whole body electrolyte and energy homeostasis. It is not surprising, then, that disorders of the cardiovascular system may give rise to changes in skeletal muscle structure and function. This symposium will focus on the relationship between two cardiovascular disorders and observed changes in skeletal muscle blood flow, energy metabolism, and electrolyte bal-

ance. Clausen will describe the relationship between cardiac insufficiency, a decrease in the concentration of Na⁺,K⁺pumps in skeletal muscle and alterations in muscle contractile function. Graty and Pickar will discuss changes in blood flow, resistance to fatigue, and electrolyte balance in skeletal muscles in spontaneously hypertensive rats. Finally, Musch will consider changes in skeletal muscle function in the heart failure model used in his laboratory. The physiology of skeletal muscle has received little attention in investigations of cardiovascular disease, yet muscle may play a major role in modulating the course of the disease and the therapeutic interventions designed to treat the disease. We hope this symposium will stimulate interest from investigators in cardiovascular physiology, exercise physiology, and muscle physiology and will offer insight into mechanisms associated with muscle fatigue and electrolyte homeostasis.

Neuroendocrine Determinants of Obesity and Satiety

Endocrinology & Metabolism, Central Nervous System, Gastrointestinal, and Water & Electrolyte Homeostasis Sections and the American Federation for Medical Research

J.F. Caro

Jose F. Caro, Jeffrey S. Flier, Masashi Yanagisawa, and Bradford B. Lowell

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

Gastrointestinal and Endocrinology & Metabolism Sections C. Cheeseman

Chris McIntosh, Patricia Brubaker, Donald Munroe, Daniel Drucker, and Chris Cheeseman

Intestinal endocrine L-cells produce two peptides related to pancreatic glucagon, glucagon-like peptide 1 (GLP-1) and glucagon-like peptide 2 (GLP-2). All three peptides are produced from the same large pro-peptide coded for by a single gene. The differential cleavage of the pro-peptide is achieved by two different peptidases, and it is their tissue-specific expression that determines the peptide to be subsequently released. GLP-1 is know to have an insulinotropic action on pancreatic B-cells and its receptor has been cloned. In contrast, in the absence of a receptor for GLP-2 nothing was known about its possible physiological actions, although it is released from L-cells in the small intestinal epithelium into the circulation. Recently, Drucker and Brubaker have shown that GLP-2 specifically promotes growth and expression of hexose transporter proteins in the gastrointestinal tract when plasma levels are elevated for several days *in vivo*. They have also shown that circulating levels of this peptide are elevated in experimental diabetes, and thus it may play a role in the intestinal hypertrophy and increase hexose absorptive capacity known to occur in this disease. Munroe has now cloned the receptor, which should rapidly advance our understanding of the actions of this peptide.

As well as the chronic effects of GLP-2, Cheeseman has shown that there are specific acute effects on the small intestine that promote hexose absorption. Additional sodiumdependent hexose transporter, SGLT-1, is inserted into the enterocyle brush-border membrane when plasma levels of GLP-2 are elevated *in vivo*. At the same time the transporter activity of the facilitated transporter GLUT2 in the basolateral membrane is also increased so that the net effect is to upregulate glucose absorption.

This symposium will look at the physiological roles of GLP-2 in controlling the small intestine in health and disease.

Endothelin and the Central and Peripheral Nervous System

Neural Control & Autonomic Regulation, Central Nervous System, Gastrointestinal, Respiration, and Water & Electrolyte Homeostasis Sections

D.H. Damon and C. Hinojosa-Laborde

Michael Gershon, Tomoyuki Kuwaki, Carmen Hinojosa-Laborde, and Deborah H. Damon

Endothelin is a peptide that was originally identified as a vascular endothelial-derived vasoconstrictor. It is now recognized that this peptide is produced by and modulates the function of many organ systems including the central and peripheral nervous system. Although it is known that endothelin is expressed by and acts on neuronal and non-neuronal cells in the nervous system, the physiological significance of these observations has not been clearly established. The goal of this symposium is to begin to understand the physiological importance of endothelin in the nervous system. Multiple aspects of endothelin and central and peripheral neuronal function will be discussed. Specifically, speakers will consider the role of endothelin in the development of the enteric nervous system, in central control of respiration and cardiovascular function, and in adrenal and in postganglionic sympathetic neuronal function.

Time Domains of Hypoxic Ventilatory Response: Adaptive Mechanisms in Short- and Long-Term Responses

Respiration and Central Nervous System Sections and Hypoxia Interest Group

T.E. Dick and G.S. Mitchell

Thomas E. Dick, Irene C. Solomon, Kendall F. Morris, Gordon S. Mitchell, and Michael L. Smith

Hypoxia elicits an immediate response from the cardiorespiratory system mediated by the central nervous system. The carotid body senses hypoxemia and its fibers project to the medulla. Activation of these fibers increases blood pressure and ventilation. Recent studies have shown that the ventilatory response to hypoxia has multiple time domains. This symposium will define the various time domains of the hypoxic response, will present data from diverse laboratories regarding the neural substrates and mechanisms involved in these different time domains, and will integrate these mechanisms in the understanding of the hypoxic response of humans. The various time domains are 1) short-term potentiation of ventilation reflects a progressive increase in the amplitude of phrenic activity, 2) short-term depression of ventilation reflects a progressive decrease in the frequency of phrenic bursts, 3) long-term effects have been observed primarily in amplitude of phrenic nerve activity following repetitive hypoxic exposures, and 4) neonatal exposures to hyperoxia lead to long-term changes in the structure of the chemoafferents. Finally, chronic repetitive brief exposures occur in sleep apneics and sensitize them to hypoxia. Dick will introduce these definitions of the time domains in the response to hypoxia and will describe the role of the ventrolateral pons in short-term alterations in breathing frequency that follow brief exposures to hypoxia. Solomon will characterize the role of structures in the rostral ventrolateral medulla that mediate the short-term increases in sympathetic and phrenic nerve activities and an increase in the respiratory-modulation of sympathetic nerve activity. Morris will review the role of the raphe nuclei in mediating long-term facilitation of phrenic nerve activity that develops following repeated hypoxic exposures, specifically examining the reconfiguration of the neural circuit generating the respiratory pattern during long-term faciliation. Mitchell will describe long-term alterations in response to hypoxia due to plasticity of the developing nervous system. Finally, Smith will integrate this information to interpret his findings that the ventilatory response as well as the sympathetic nerve activity of sleep apneic patients have increased sensitivity to hypoxia. In summary, this symposium will present novel findings clarifying the complexity of the response to hypoxia. Specifically, it will define the different time domains in which the response occurs, identify neural

mechanism involved in these responses and specify adaptive changes.

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

Cardiovascular, Central Nervous System, and Respiration Sections

F. Faraci and D.W. Busija

David Busija, Zvonimir Katusic, Sarah England, Costantino Iadecola, and Frank Faraci

This symposium will focus on relatively new approaches to study vascular function under physiological and pathophysiological conditions. There will be an emphasis on studies of the cerebral circulation. The speakers will outline experimental methodologies that are largely molecular in nature and generally represent the state-of-the-art for studies of vascular function and more traditional methods used to study blood vessels. Some of the specific approaches that will be addressed include the use of gene-targeted mice and viralmediated gene transfer as well as the molecular biology of potassium channels. Although the focus of the symposia will be on the cerebral circulation, many of the approaches that will be described are relevant for other vascular beds as well.

HIV Vaccine Development: Opportunities and Challenges

American Federation for Medical Research

M.B. Feinberg

Bruce Walker, Beatrice Hahn, Joseph Sodroski, Ron Desrosiers, William Paul, and Susan Buchbinder

The development of a safe and effective HIV vaccine remains the best hope for containing the continuing spread of the AIDS epidemic; yet, fundamental biological and practical challenges have long frustrated realization of this goal. HIV establishes a chronic infection that destroys essential immune effector functions and cannot be cleared by natural immune responses. As such, HIV infection is fundamentally different from any infectious disease that can currently be prevented by vaccination. However, recent insights into central virologic and immunologic aspects of HIV disease have enabled new, more rigorous approaches for the study and development of novel HIV vaccine strategies. This symposium is intended to summarize critical recent research findings from basic and applied HIV vaccine research efforts. In addition, the major obstacles to HIV vaccine development and testing will be

presented so as to familiarize the audience with current prospects for and future directions of HIV vaccine development efforts.

Experimental Physiology in the Polar Regions: The Historical Development

History of Physiology Group and Comparative Physiology, Environmental & Exercise Physiology, and Respiration Sections

G.E. Folk, Jr. and Robert Elsner

Gerald L. Kooyman, Michael A. Castellini, Robert Elsner, Brian M. Barnes, and Warren Zapol

The American Physiological Society has not given attention to the effects of hostile physical environments, except those of high altitude as championed by John B. West. The polar regions produce the most extreme environments, with winds of 200 mph and temperatures as low as minus 125 degrees Fahrenheit. Thus physiological measurements made on humans and lower animals must be designed differently from those made in the university research laboratory, because of the cold and the need for studies under the icebound Polar waters. What special homeostatic mechanisms and adaptations are to be found in humans living in Siberia and sub-human animals diving for food to 5100 feet at the edge of the polar ice? The history of polar physiology began with simple measurements of anatomy, oxygen consumption, and tissue temperatures. In this symposium we will trace the history of the change from these simple measurements to the sophisticated technology of today. In the Arctic, in 1920 August Krogh studied metabolism of Greenlandic Inuit, and in 1946 Irving and Scholander introduced the concept of counter-current heat conservation in the limbs of sea mammals. In Antarctica, Edward Wilson in 1911 obtained embryos for analysis of the most primitive penguins, the Emperor, on the "worst journey in the world." In 1959 Eklund first transmitted physiological measurements from penguins by radio capsules. Diving physiology was studied directly on seals doing involuntary shallow dives. In contrast today diving is studied during voluntary deep dives with indirect measurements by satellite. Transmitted before and during deep dives are spleen size, Hb concentration, hematocrit, arterial blood analysis, and blood volume. In this symposium examples of these modern measurements will be provided. Kooyman will discuss birds that tolerate while breeding the most extreme environment of any breeding species, Castellini will discuss the history of learning physiology from the exploitation of whales, Elsner will describe the importance of experiments in 1950 by Scholander and his influence on physical science of today and Barnes will discuss the intriguing subject of how some small mammals combat cold outside their burrows of minus 55 degrees Fahrenheit by super-cooling their blood. Zapol will discuss compression hyperoxia, hypercapnia, and intriogen narcosis during diving of seals.

Peripheral and Central Mechanisms of Visceral and Somatic Pain

Central Nervous System and Neural Control & Autonomic Regulation Sections

R.D. Foreman

Robert D. Foreman, Susan M. Carlton, Patrick M. Dougherty, and Daniel R. Kenshalo

Pain is a multifaceted experience that involves sensory localization, motivational-affective behaviors and autonomic responses. The purpose of this symposium is to discuss the peripheral and central processing of noxious information from the skin, muscle, and visceral organs during acute and persistent pain experiences. Cutaneous nociceptors have NMDA, AMPA, and kainate receptors that are activated following intraplantar injection of glutamate. Carlton will discuss results of electrophysiological and anatomical studies to address how the peripheral glutamaterigic system contributes to acute and persistent pain. Changes resulting from nociceptive injury in the peripheral nervous system modulate response characteristics of spinal neurons. Foreman will discuss how nociceptive somatic and visceral afferent information is processed in different spinal segments. The spinal cord process integrates and transmits noxious information to the thalamus and other supraspinal structures. Dougherty will discuss long-term alterations in primate thalamus after the spinal cord is injured. These findings have important implications for the potential long-term thalamic reorganization that may occur with persistent pain. Thalamic information, especially the lateral thalamus, transmits noxious information to somatosensory cortex (SI) and to other areas of the cortex. Kenshalo will show that mechanical stimulation of the skin with brush, pressure, and noxious pinch dramatically increases response characteristics of the nociceptive-sensitive neurons of SI after an intradermal injection of capsaicin. In addition the cutaneous receptive fields of these cells are expanded. Thus, receptive field properties of nociceptive SI neurons can be altered with noxious stimulation. In summary, this symposium will give new insights and offer challenges about neural processing underlying changes that occur during acute and persistent pain.

Redox Regulation of Gene Expression in Hypoxia

Respiration and Cardiovascular Sections, Hypoxia Interest Group, and the American Federation for Medical Research

M.N. Gillespie and B.A. Freeman

Bruce A. Freeman, Gregg L. Semenza, Paul. T. Schumaker, Pascal J. Goldschmidt, Mark N. Gillespie, and Henry J. Foreman

Two rapidly emerging research areas bear on the mechanisms underlying hypoxic regulation of gene expression. The first pertains to whether hypoxia evokes changes in cellular redox state, and there is evidence both for and against this possibility. The second area relates to the growing recognition that reactive oxygen species function as second messengers in signal transduction, acting to govern gene expression among other cellular activities. This symposium will encourage debate and discussion at the hypothesis that gene expression in lung cells, responsible for the adaptive response of the pulmonary circulation to chronic hypoxia, is mediated by changes in pulmonary vascular cell redox state

Mechanisms of Ischemia Reperfusion: Application of Gene-Targeted Animal Models

Cardiovascular, Gastrointestinal, and Respiration Sections

D.N. Granger and D.J. Lefer

D. Neil Granger, Mark Entman, Dipak Das, David Lefer, Paul Kubes, and Wolfgang Dillman

The overall objectives of this symposium are to: 1) summarize some of the latest work on mechanisms of ischemia/reperfusion (I/R) injury, 2) illustrate how gene-targeted animals are being used to address fundamental mechanistic issues related to cardiovascular disease, 3) describe the variety of quantitative cardiovascular measurements (from myocardial infarct size to leukocyte-endothelial cell adhesion in single vessels) that can be obtained from mutant mice, and 4) address the limitations (e.g., compensatory responses to gene deletion) that are often inherent in the use of gene-targeted animal models. All of the speakers are active investigators in the area of I/R injury and have published work related to the use of gene-targeted mice in this field. The session should attract scientists with an interest in the fields of myocardial ischemia, inflammation, immunology, oxygen radical biology, and vascular biology/pathology.

Molecular Physiology of Urea Transporters

Renal and Cell & Molecular Physiology Sections and Epithelial Transport Group

R. Gunn and J. Sands

Robert B. Gunn, Serena M. Bagnasco, Matthias A. Hediger, James B. Wade, Germain Rousselet, and Jeff M. Sands

During the past decade, tremendous progress has been made on the molecular physiology of urea transport proteins. This progress was made possible by: 1) the physiological and biophysical characterization of the vasopressin-regulated urea transporter in the kidney collecting duct, 2) the expression cloning of its cDNA using *Xenopus* oocytes, and 3) the preparation of polyclonal antibodies recognizing this protein. The purpose of this symposium is to bring together scientists working on cloning urea transporters with those using these new molecular probes to work on key integrative issues in urea transport. The symposium will begin with two presentations of recent progress in cloning new urea transporters. Bagnasco will discuss the mRNA isoforms and genomic organization of the vasopressin-regulated urea transporter. Hediger will discuss a new broad selectivity neutral solute solvent channel. The second portion of the symposium will include recent progress involving functional and integrative issues in urea transport. Wage will discuss immunochemical mapping of urea transporters in the kidney using new antibodies to these proteins. Rousselet will discuss cell responses to hyperosmolality: from apoptosis to urea transporter induction. The final presentation will discuss integrative aspects of urea transport in rats. Sands will present studies of the regulation of rat urea transporters in vivo. Thus, this symposium is designed to present the latest research on urea transporters from the gene to the rat.

The Road to Apoptosis: Indictment, Judgement, Execution, and Reprieve

American Federation for Medical Research

S. Gupta, and V. Dixit

Sudhir Gupta, Suzanne Cory, Vishva Dixit, Michael J. Lenardo, John C. Reed, and Nancy A. Thronberry

There is only one way to conceive but several ways to die. The proces of physiological cell death or apoptosis can be triggered by diverse signals; however, a relatively limited number of intracellular processes appear to be involved in the

regulation or execution of apoptotic program, which ensures that a cell will die and its corpse will be rapidly cleared without an inflammatory response. There has been rapid progress in understanding various processes that regulate apoptosis that has led to understanding the pathogenesis of certain diseases in experimental animals and humans. This symposium will examine various facets of apoptosis ranging from the initial signals to the cell executioners. The signals and receptors that trigger apoptosis, the Bc1-2 family of proteins that plays an important role in controlling the pathways of apoptosis, and downstream pathways including caspases and the role of mitochondria will be discussed.

Biomaterial Design

Biomedical Engineering Society

D.A. Hammer

Kurt Drickamer, Patrick Stayton, William DeGrado, David Tirrell, Donald Ingber, and David Needham

This symposium will focus on the molecular design of biomaterials that elicit molecular and cellular functional responses. Our understanding of the physical chemistry of biological molecules and the structural basis of bio-recognition-key to control of specific biological functions-allows us to now design molecules and biomaterials with tailored physical properties and controllable features of self-assembly, and which elicit a tailored cellular response. Such materials are essential for the emerging technologies of gene therapy, drug delivery, and tissue engineering. The design and synthesis involve either synthetic chemistry or recombinant molecular biology. Drickamer will discuss recombinant design of carbohydrate-binding lectins, starting with a structural knowledge of carbohydrate recognition. Stayton will discuss both synthetic and recombinant techniques for engineering molecular recognition using proteins and polymers. DeGrado will discuss de novo protein design of channels and membrane fusion machines from a structural knowledge of how these proteins work. Tirrell's talk will address the production of self-assembled protein structure and materials that support cell adhesion using recombinant synthesis. Ingber will focus on the activity of cells on well-defined, micropatterned surfaces created with lithographic techniques, which elicit novel cell responses such as angiogenesis and cell proliferation. Needham will discuss the sedign of complex, vesicle-based carrier for drug delivery of chemotherapeutic agents.

Physiological Basis of Congestive Heart Failure

MyoBio/Muscle Group and Cardiovascular Section **S.R. Houser**

Pierro Ansversa, William Barry, Don Bers, Steven R. Houser, and Douglas Mann

Congestive heart failure is the leading cause of death in the US. This symposium will discuss the changes in the physiological phenotype of the failing cardiac myocyte. These changes are thought to contribute to, cause, or exacerbate heart failure. This symposium will focus on functional derangements in common forms of heart failure rather than in rare genetic forms. The first talk will focus on the factors responsible for the characteristics in chamber and myocyte size and shape. The second talk will focus on the basis of systolic and diastolic pump malfunction in heart failure. The third talk will focus on the cellular basis of contractile abnormalities in heart failure. The fourth talk will focus on the cellular and molecular basis of action potential abnormalities in heart failure. The fifth talk will focus on cytokines as negative inotropic agents in heart failure.

Phosphodiesterases in Renal Physiology and Pathophysiology

Renal and Water & Electrolyte Homeostasis Sections and the American Federation for Medical Research

M. Humphreys and T. Dousa

Joseph Beavo, Miles Houslay, Thomas Dousa, Mike Humphreys, and Armin Kurtz

Phosphodiesterases (PDEs) are a large family of enzymes that participate in cell signaling by catabolizing intracellular cyclic nucleotide second messengers. Because of their role in regulating cyclic nucleotides levels, they have been targets of pharmacologic intervention in diseases such as asthma and congestive heart failure. The role of PDEs in renal physiology and pathophysiology is less well appreciated. This symposium presents current information on the PDE family with particular emphasis on renal PDEs by experts in the field. Beavo will provide an overview of the classification, characteristics, and distribution of the PDE family. Houslay will discuss the role of PDE isoforms in regulating intracellular cAMP and signaling via the adenylate cyclasse-protein kinase A pathway. Dousa will present data on the roles of

PDE3 and PDE4 in mesangial cell growth and proliferation through the regulation of intracellular cAMP. Humphreys will describe the evidence implicating heightened activity of PDEs as the mediator of resistance to the renal actions of atrial naturetic peptide in edema-forming conditions. Kurta will summarize the data showing a role of PDEs in the regulation of renin secretion. In aggregate, these talks will provide the audience with background understanding of the PDE family and specific examples of the function of various family members in regulation of kidney function in health and disease.

Antioxidants and Oxidative Stress in Health and Disease

Society for Experimental Biology and Medicine **Robert Knopp and T.M. Bray**

Balz Frei, Tammy M. Bray, Robert Knopp, Carl Hubel, Robert A. Floyd, and Ann Aust

"Oxidative stress" is a term used to imply a disturbance in the balance of prooxidant-antioxidant in a biological system. Much experimental evidence has demonstrated that tissuespecific oxidative stress forms the basis of a diverse number of pathophysiological phenomena leading to diseases such as cardiovascular disease, diabetes, cancer, and neurodegenerative disorders. The mechanisms by which free radicals cause disease go beyond the simple chemical oxidation reactions of macromolecules. They are also linked to the gene expression of oxidative stress response element and other specific cellular functions. The function of antioxidant nutrients also reaches molecular and genetic levels. Research involving the interaction of antioxidants, oxidative stress, and disease processes is truly an interdisciplinary field that interfaces nutrition and contemporary biology. This interdisciplinary symposium provides an excellent platform for biologists to focus on the molecular and cellular mechanisms by which oxidative stress causes tissue specific damage and on the scientific evidence of the efficacy of antioxidants in prevention of diseases.

Translational Research in Psychiatry: From Molecular Medicine to Clinical Practice

American Federation for Medical Research

J. Licinio

Joseph T. Coyle, Wade Berrettini, Julio Licinio, Esther M. Sternberg, Philip W. Gold, and David Pickar

This symposium will cover the broad applicability of vari-

ous areas of neuroscience research to psychiatric disorders. Recent progress in basic neuroscience, molecular genetics, pharmacology, neurophysiology, imaging, and clinical investigation has contributed to a new generation of studies aimed to identify the fundamental biology underlying psychiatric disorders. Translational research that brings to the bedside the latest developments in neuroscience is limited by the lack of adequate animal models for the major psychiatric disorders, such as schizophrenia and depression. Nevertheless, the biological components that contribute to specific elements of those disorders can be assessed in the laboratory and in the clinic. The knowledge to be gained should contribute to enhance our understanding of brain circuitries and of specific candidate systems that underlie the complexity of psychiatric disorders. We will comment on the progress and limitations of dissecting molecular elements that underlie complex disorders that have not only biological, but also psychosocial, components, such as psychiatric disorders.

Comparative Mechanisms to Survive Brain Anoxia: Mitochondria to Organism

Hypoxia Interest Group and Central Nervous System, Comparative Physiology, Environmental & Exercise Physiology, and Respiration Sections

P. Lutz

Steve Hand, Rona Giffard, Peter Lutz, Goran Nilsson, and Philip Bickler

The last decade has seen explosive developments in our understanding of how animals respond to limiting availability of oxygen, and particular attention has been focused on the most vulnerable organ the brain. While most research, being health oriented, is involved with hypoxia-sensitive systems, some particularly interesting information is coming from studies of the molecular and metabolic defense mechanisms utilized by species that are naturally tolerant to anoxia.

The aim of this symposium is not only to present and integrate current views in the field but also to provide a forum for communication between two large but semi-independent groups of researchers on brain hypoxia, the mammalian/clinical and the comparative.

Some of the most promising advances in this field include identifying universal oxygen sensing and signal transduction pathways. Hand will provide evidence for the involvement of a mitochondrial molecular oxygen in an inhibitory signal for protein synthesis. Giffard will present new findings concerning protective gene activation in hypoxic tolerant cell. Lutz will compare the anoxia survival mechanisms of the turtle to switch down brain metabolic processed to "idle" and the

extraordinary strategy adopted by the frog for slow apoptosis. Nilsson will contrast these strategies with those of the anoxic tolerant carp, which manages to survive anoxia while maintaining locomotory control and sensory function. Finally, Bickler will discuss and compare the physiological mechanisms that give the mammalian neonate greatly enhanced oxygen tolerance compared to the adult. He will deal particularly with the role of the adenosine-mediated NMDA receptor complex. Overall, this series of presentations is expected to stimulate intellectual exchange and new perspectives on brain hypoxia defense mechanisms.

Regulation of Cellular Processes by Infectious Microbes

American Federation for Medical Research

C.E. McCall

Craig Gerard, Linda Bockenstedt, Keith Joiner, and Charles E. McCall

The interaction of microbes with host cells dictates the type and degree of infectious diseases. Gene products of microbes have evolved to interact specifically with host cells in a fashion designed to favor microbial infection over host defense. Specific gene products of microbes or constituents of their anatomy that act on host cell elements are now being identified and the mechanism by which they alter host cells characterized. Examples of microbial products include bacterial endotoxin, bacterial super antigens, and specific gene products. Mechanisms include alterations in apoptosis, intracellular metabolism, anatomy, cell growth and differentiation, and induction and repression of genes. This session will present data on the pathobiologic reactions between microbes and host cells that may define the outcome of any given infectious disease.

Teaching Critical Thinking Skills in Physiology: An Interactive Workshop

Teaching of Physiology Section

S. Mierson and A.P. McNeal

Sheella Mierson, Charles Levinson, Laura Malloy, and Ann McNeal

"How can I get my students to think?" is a question asked by many faculty. Research shows that lectures organized to convey large amounts of information are not necessarily the best way to teach critical thinking skills. This workshop will demonstrate recent teaching methods designed to foster such skills, which include *1*) organizing information, not just ingesting it; 2) identifying what you do not know and asking questions to address specific areas of need; 3) being able to ask "What is the evidence?"; 4) critically examining evidence; 5) generating ideas and hypotheses about physiological questions; 6) applying previously learned concepts to new situations; and 7) designing experiments to test hypotheses. Each presenter will briefly describe a method and lead an activity giving participants a chance to experience the method as the students would in a classroom.

First, Mierson will demonstrate small-group problembased learning, a teaching method that helps students think critically and develop habits of life-long learning. The students work cooperatively in groups to seek solutions to complex, real-world problems by asking and answering their own and their peers' questions. Second, Malloy will introduce some methods for close reading of published research papers to teach basic physiological concepts and analytical skills for evaluation of data and experimental design. Third, Levinson will demonstrate a model for teaching physiology to a large (200) class of first-year medical students based on the concept that group or team learning facilitates learning by the individual. With a minimal number of lectures, students work in small groups and apply what they have learned to new situations. Fourth, McNeal will give several examples of "framework" experiments in which the techniques and overall design are given, within which students can design their own experiments quite freely. Participants will then work on a structured exercise for revising their own experimental labs.

Transplantation Into the Next Century: Immunology, Genetic Engineering, Vascular Biology, Integrative Physiology, and Xenotransplantation

Cardiovascular and Respiration Sections and American Federation for Medical Research

V. Miller and S. Saddi

Suzanne T. Ildstad, Timothy Billiar, Kim M. Swenson, Sohyela Saadi, John Logan, Jeffrey Platt, and Louisa Chapman

This session will focus on the challenges and solutions for improving long-term survival of solid organ transplants in humans. Two major challenges facing solid organ transplantation are accelerated artherosclerotic-like processes of the blood vessels in the transplanted organ and the limited availability of donor organs. The emerging fields of genetic engineering and xenotransplantation (animal organs into humans) provide exciting, new opportunities for collaborations among basic scientists in physiology, immunology, and genetics to address these challenges. Speakers for this symposium represent individuals active in programs of transplantation and

genetic engineering. Topics include reviews of clinical challenges of solid organ transplantation, immunology of transplantation, and results of state-of-the-art genetic engineering as applied to transplantation. This is "physiological genomics" which may ultimately result in improved patient care.

Angiotensin Receptors and Signaling: Evolution and Perspectives

Comparative Physiology Section

H. Nishimura

Hiroko Nishimura, Yoshio Takei, Kenneth R. Olson, Kathryn Sandberg, Herve Kempf, Pierre Corvol, and Iekuni Ichikawa

The renin-angiotensin (ANG) system and ANG receptors appear to have evolved during the early stages of vertebrate evolution, and the principal structure of the ANG molecule has been well preserved throughout the phylogenetical scale. In mammals, the presence of heterogeneity among ANG receptors has been elucidated by the use of selective nonpeptide receptor antagonists and subsequent cloning of ANG receptor genes. In primitive vertebrates, ANG receptors appear to be rather nonselective to ANG antagonists, whereas ANG receptors in amphibians (60-65%) and birds (75%) show homology to the AT1 receptor subtype and mediate activation of the phosphatidylinositol hydrolysis/cytosolic Ca²⁺ signaling pathway. In addition, an unidentified ANG receptor subtype(s) appears to exist in nonmammalian tissues, and phenotypic changes in the receptor/signaling mechanism occur during development/maturation. Furthermore, the definition of receptor subtypes using pharmacological tools is not applicable in nonmammalian ANG receptors.

The questions to be discussed are: 1) When did the evolution of ligand recognition in ANG receptors occur? Did the evolution of specific ligands require the evolution of specific receptors? 2) Which molecular features preserved among various vertebrate receptors are due to conservation of function, and which divergent features reflect structural adaptation to new function? 3) What are the phenotypic modulations of ANG receptor properties and signaling during development/maturation processes? Recent advancements in these subjects will be presented in multidisciplinary aspects relating molecular/cellular information to intact tissue and organ levels using various vertebrate animal models. The symposium will begin with an introduction and overview of the topic followed by five speakers who have expertise in fields representing various classes of vertebrates. The symposium will appeal to graduate students, postdoctoral fellows, and established investigators in various comparative and general physiology disciplines.

Families of Sodium-Coupled Transporters

Cell & Molecular Physiology, Gastrointestinal, and Renal Sections and Epithelial Transport Group

A. Pajor

Ernest M. Wright, Heini Murer, James D. Young, Bruno Hagenbuch, and Ana Pajor

Recent advances in molecular cloning and sequencing of cDNAs have identified at least eight different gene families of sodium-coupled organic solute transporters in eukaryotes. Many of the sodium-coupled transporters are expressed in epithelia. Within each family of transporters, there are similarities in protein structure and transport mechanism. This symposium will present the molecular advances in five of the major families of sodium-coupled transporters. Each of the speakers will present a general overview of the family as well as more detailed discussion of their own research on members of that family.

Genetic Mechanisms Determining the Role of the Kidney in the Pathogenesis of Hypertension

Water & Electrolyte Homeostasis, Cardiovascular, Renal, Respiration Sections, Epithelial Transport Group, and the American Federation for Medical Research

R.J. Roman and Joey P. Granger

Richard Lifton, John Rapp, Curt Sigmund, Ted Kurtz, and Howard Jacob

Rapid advances in molecular genetics have led to the search for genes determining the development of hypertension and hypertension-associated renal disease in human and genetic animal models. These efforts have already lead to the identification of several mutations in renal epithelial transport genes that alter arterial pressure in humans and the discovery of a large number of chromosomal regions in animal models that contribute to the development of hypertension. Moreover, in the last two years investigators have transferred the regions of the genome of interest onto fixed generic backgrounds to create new monogenic animal models of hypertension and have begun to explore the mechanisms involved. Others have developed renal specific promoters to overexpress or knockout genes of interest for hypothesis testing. This symposium will focus on the most recent evidence regarding the mechanisms by which various genes alter renal function and/or the renal handling of salt and water and blood pressure in humans and these new animal models. Lifton will

first discuss his work describing the mechanisms by which inherited mutations in renal sodium transporters lead to abnormalities in blood pressure control in humans. Rapp will describe his pioneering work on the development of congenic strains of Dahl S rats harboring chromosomal regions that lower blood pressure. Sigmond will discuss his recent discovery of a conditional, renal specific promoter that now allows investigators for the first time to create transgenic mice that can be induced to overexpress genes of interest in the kidney for hypothesis testing. Kurtz will discuss his work on renal transplantation studies between congenic strains of normotensive and hypertensive rats that indicate there are independent genes that determine the susceptibility of animals to develop hypertensive renal injury. Jacob will discuss his recent work to identify the genes and mechanisms underlying the development of hypertension and glomerular disease in congenic strains of Fawn Hooded rats.

Physiologists and Outreach Activities Directed to Lower Primary Grades

Education Committee and Teaching of Physiology Section J. Schadt, and B.E. Goodman

Barry T. Peterson, Debby Crawford, Lynne Whitt, and Jeffrey L. Osborn

For many of us, our lifelong interest in love of science began in the lower primary grades. In the interest of continuing this capture of young minds, the purpose of this workshop is to encourage and facilitate APS member outreach activities directed at lower primary grades (i.e., K-5). The workshop will consist of: 1) four short talks and 2) active participation in several hands-on, inquiry-based activities appropriate for grades K-5. Presenters for the short talks include Barry Peterson (recipient of the 1997 AAAS Award for Public Understanding of Science); Debby Crawford, MSEd (Coodinator of Science Education Partnership, a joint effort by the University of Texas Health Sciences Center at Tyler and the Tyler, Texas Public Schools); Lynne Whitt (Executive Vice President of the National Center for Health Education); and Jeff Osborn (Director of the University of Wisconsin-Milwaukee/Medical College of Wisconsin [UWM/MCW] Center for Science Excellence). Peterson will open the session and discuss the importance of outreach, from a physiologist's perspective, and how to get started. Crawford will give a similar perspective to Peterson's but from the standpoint of the public school teacher. Whitt will discuss the role of outreach activities from the standpoint of her organization. Osborn will discuss the outreach program at UWM/MCW as an example of an outreach effort coordinated at several levels. Examples of hands-on inquiry-based activities for grades K-5 will be presented by Barbara Goodman (Chair of the APS Education Committee), Marsha Lakes Matyas (APS Education Officer), Andrea Gwosdow (Harvard Medical School), Doug Curran-Everett (University of Colorado Health Sciences Center), George Ordway (University of Texas Southwestern Medical Center, Dallas), Jill Crowder (MCW/APS Summer Teacher Fellow), Whitt, Peterson, Crawford, and Osborn. All the activities will be appropriate for grades K-5, inexpensive to set up, and easy to do. Sheets of instructions and lists of materials required for each activity will be provided.

Role of Plasmalemmal Caveolae in Signal Transduction

Cell & Molecular Physiology, Endocrinology & Metabolism, and Respiration Sections and Hypoxia Group

P.W. Shaul

Linda J. Pike, Toyoshi Fujimoto, Philip W. Shaul, Cynthia C. Mastick, and Richard G.W. Anderson

Caveolae are small, plasma membrane invaginations that are present in numerous cell types, including adipocytes, smooth muscle, and endothelial and epithelial cells. They were originally studied in relation to their key involvement in the intracellular transport of macromolecules. More recently, however, evidence has been accumulating that they play a critical role in the compartmentalization of downstream effectors. This symposium will update the audience on the role of caveolae in signal transduction, providing important new information of broad physiological significance. The aspects of cell signaling to be discussed include the role of caveolae in inositide-mediated signal transduction, intracellular calcium homeostasis, endothelial cell nitric oxide production, insulin action, and activation of the ras-raf pathway. As such the symposium will have wide-ranging appeal to researchers investigating signal transduction in a variety of disciplines.

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

Environmental & Exercise Physiology, Cardiovascular, and Central Nervous System Sections

Moderator: C.M. Tipton Point: Jere M. Mitchell and Ronald G. Victor Counterpoint: Loring B. Rowell

Point:

In resting skeletal muscle, sympathetic activation produces vasoconstriction, which is thought to optimize blood flow to

metabolically active muscles. However, the functional consequence of sympathetic activation in contracting skeletal muscle has been the subject of considerable debate. Previous studies in intact animals and humans have suggested that sympathetic vasoconstriction in contracting muscle is largely negated by metabolic vasodilation. This concept, initially termed "functional sympatholysis," recently has been extended by reductionist microcirculatory preparations demonstrating that certain local metabolic consequences of contraction interfere with specific signal transduction pathways mediating alpha-adrenergic vasoconstriction. Furthermore, the alpha-adrenergic receptors, which are most susceptible to such metabolic inhibition, are those located on the distal nutrient arterioles, which are most accessible to the metabolic products of contraction, whereas adrenergic receptors located on more proximal resistance arteries are not so accessible to these metabolic products. Using both near infrared spectroscopy and Doppler velocimetry, our recent studies extend this concept by providing multiple new lines of evidence for functional sympatholysis in both rat hindlimb and human forearm muscle. Contraction-induced metabolic modulation of sympathetic vasoconstriction in mainly nutrient arterioles is a major protective mechanism that negates an otherwise deleterious effect of reflex sympathetic activation on skeletal muscle oxygenation.

Counterpoint:

The increase in sympathetic vasoconstriction outflow to skeletal muscle, both active and inactive, during dynamic exercise is well established. The muscles vasoconstrict! In active muscles, this vasoconstriction depends on the intensity of sympathetic vasoconstriction and not on muscle metabolic rate, especially in those muscles whose composition is predominately one of red, oxidative fibers (muscle with white, glycolytic fibers may be an exception). The concept calle 'sympatholysis' (a metabolic inhibition of vasoconstriction) originated from the observed diminishing effects of sympathetic stimulatin of the change (delta) in vascular resistance as muscle blood flow and metabolism both rose. When replotting these effects as delta conductance (unaffected by flow), the results reveal the misleading effect of large changes in baseline flow. The functional necessity of vasoconstriction in active muscles highlights the severe functional consequences that could attend 'sympatholysis' were it a physiological phenomenon, rather than a mathematical one.

Mechanotransduction

Biomedical Engineering Society G.A. Truskey

Peter F. Davies, Brian Helmke, Bauer Sumpio, Christopher Chen, and Fred Sachs

Mechanotransduction represents the process by which a physical force is translated into a biochemical or biological response. Cells and tissues respond to physical forces such as pressure, fluid shear stresses, and mechanical strain. In the cardiovascular system, physical forces play a significant role in normal function and in disease states such as atherosclerosis, restenosis, and heart failure. Shortly after application of a physical force second messengers are generated. Longer term, physical forces affect protein synthesis, cell replication, mechanical properties of cells, and cell shape. Two major unanswered questions in the field are the actual mechanism by which the physical forces are translated into a biochemical signal and whether the cells respond directly to the force and/or gradients in the force. Possible mechanisms for mechanotransduction, alone or in combination, include stretch-activated ion channels, focal adhesions complexes, and the cytoskeleton. Force gradients may produce a differential response by the cell leading to directional changes observed following application of fluid shear stress and mechanical stretch. This symposium will provide a summary of evidence to support these various mechanisms and the presentation of new results from major researches and promising young investigators in the field.

President-Elect's Symposium: Microcirculatory Studies of Inflammation and Immune Function

Microcirculatory Society **R.F. Tuma**

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

Respiration and Cardiovascular Sections and Hypoxia Interest Group

E.K. Weir

Ivan F. McMurtry, Joseph R. Hume, Henry M. Thomas III, Stephen L. Archer, Stella Kourembanas, and Jimmie T. Sylvester

Considerable work has been done recently on the mechanisms by which hypoxia is sensed and transduced into vasoconstriction in the pulmonary vasculature. However, there is no unanimity as to how this is achieved. This symposium will encourage debate and discussion to help participants reach consensus or define the questions requiring further work.

Beyond Chemotherapy: The Scientific Hormonal Control Bases for New Cancer Treatments

American Federation for Medical Research P.H. Wiernik

Janice P. Dutcher, Robert E. Gallagher, Howard Kaufman, Louis M. Weiner, and Peter H. Wiernik

A review of emerging treatment concepts for neoplastic diseases will be presented, including cytokine treatment of certain solid tumors such as renal cell carcinoma and malignant melanoma; growth factor stimulation of bone marrow recovery after cytotoxic chemotherapy; induction of maturation and differentiation for certain leukemias with retinoids, arsenic trioxide, and other agents; vaccine treatment of common cancers such as colon cancer; and monoclonal antibody treatment of leukemias and lymphomas. The scientific basis for these new therapeutic modalities as well as current results will be stressed. A summary of current results of cancer treatment with standard therapy for a variety of neoplasms will be presented, and a summary of prospects for greater success in the near future will close the session.

of Protein Metabolism in Muscle

Endocrinology & Metabolism and Environmental & Exercise Physiology Sections and the American Federation for Medical Research

R.R. Wolfe

Scot R. Kimball, Michael Rennie, Robert R. Wolfe, Elisabeth Svanberg, and William E. Mitch

The focus of this symposium will be the nutritional and hormonal control of muscle metabolism. Talks will cover physiological control mechanisms, as well as regulation at molecular level. Particular attention will be given to the influence of amino acid intake and the mechanism of action of insulin and insulin-like growth factor 1 on protein anabolism. Also, the mediators of protein breakdown in catabolic states will be covered.

APS Minority Travel Fellowship Award applications are now available for Experimental Biology '99 Washington, DC ****** April 17-21, 1999

Abstract Deadline: November 16, 1998 Application Deadline: November 23, 1998

The APS Minority Travel Fellowship Award program is designed to encourage highly gualified underrepresented minority students (African-American, Native American, Hispanic, or Pacific Islander) to pursue professional careers in physiological/biomedical sciences.

Travel fellowships are now being offered for minority undergraduate, predoctoral and postdoctoral students to attend Experimental Biology '99. Faculty members at Minority Access to Research Career (MARC) and Minority Biomedical Research Support (MBRS)-eligible institutions are also eligible to apply.

The program is supported by grants from the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) and the National Institute of General Medical Sciences (NIGMS) of the National Institutes of Health.

For an application, check the EB '99 Call for Papers, or contact the APS Education Office: (301) 530-7132 or educatio@aps.faseb.org.

OR see the program description and application on our website: http://www.faseb.org/aps/educatn/descrip.htm

75 Groups Urge Animal Facility Cost Changes

A coalition of 75 organizations representing a wide range of interests in the research community has asked NIH and HHS to support a change the current government policy on how the costs of animal research are recovered.

The current policy, based upon an interpretation of cost accounting regulations such as OMB Circular A-21, would require that all associated costs be recovered from researchers who use the facilities through direct charges. In reality, this policy is not uniformly in place. Every research institution negotiates its indirect cost rate for a multiyear period. Some government cost negotiators have been insistent about this policy for some time, while others have been willing to consider portions of an animal facility as research space. However, there is considerable concern among researchers, research institutions, specialists in laboratory animal medicine and care, and patient advocates, that the long-term trend toward direct charging will have a negative impact on animal research. That is because it is difficult for animal research facilities to recover their costs through direct charges without raising per diem rates to unacceptable levels.

This spring the National Research Council's Institute For Laboratory Animal Research (ILAR) published a study recommending that the Facility and Administrative (F&A) costs associated with animal research facilities ought to be treated like the F&A costs of other research labs. That is, these costs should be included in institutional indirect costs. APS and the American Association of Immunologists played a key role in developing a letter in favor of this position and bringing together a broad coalition of groups to co-sign it.

"Animal research facilities provide laboratory space for researchers who use animal models," the letter said. "With respect to cost accounting, they should be treated like laboratories and not like specialized service facilities."

The letter explained that the current policy of requiring that costs be recovered through direct charges represents a significant accounting burden for the facility and actually creates a financial incentive for researchers to house their animals outside central animal facilities. "Keeping animals in satellite locations that are not within the control of the institutional animal resources program undermines efficient delivery of quality animal care and could undermine the reliability of research results," the letter stated.

The organizations that signed the letter fell into several categories, including scientific societies; educational and research institutions and the associations that represent their interests; veterinary and lab animal care organizations; and patient advocacy groups. The scientific societies included the APS, FASEB, and many FASEB member societies. Research institutions and associations included the Association of American Medical Colleges, Association of American Universities. Council on Government Relations. Columbia University, Emory School of Medicine, Beth Israel Deaconess Medical Center, Mount Sinai School of Medicine. Stanford School of Medicine, Tufts-New England Medical Center, and the University of Michigan. Veterinary and lab animal care organizations included the Association for Assessment and Accreditation of Laboratory Animal Care International, American Association for Laboratory Animal Science, American College of Laboratory Animal Medicine, and American Assocaition of Veterinary Medical Colleges, as well as many individual schools of veterinary medicine. Patient advocacy groups included the Alliance for Eye and Vision Research, Alzheimer's Association. American Heart Association, Juvenile Diabetes Foundation, incurably ill for Animal Research, and National Organization for Rare Diseases.

The letter is posted on the APS Public Affairs Home Page at www.faseb.org/aps/pahome.htm. *

OPRR Workshops on the Humane Care and Use of Laboratory Animals Pain and Distress Management November 4-5, 1998, Washington, DC

> Contact: Ms. Marilyn Principe Center for Alternatives to Animal Testing Johns Hopkins University Baltimore, MD Tel: 410-223-1617

NIH Funding Increase Hopeful, But Uncertain

With only one of the 13 necessary spending bills in place as the end of the fiscal year approached, Congress in late September sought to prevent another massive government shutdown. A shortterm continuing resolution was approved September 17 that funded government programs at FY 1998 levels until October 9, which was the target date for Congressional adjournment. This step was taken to extend the deadline beyond the September 30 end of the fiscal year, allowing more time to work out the details on the remaining 12 appropriations bills. These included the Labor-HHS legislation that funds NIH.

The controversy over the Independent Counsel's report and President Clinton's legal and political troubles added yet another layer of complexity to the fundamental problem: How to find funds for priority programs without taking the politically risky step of violating the previous budget agreement.

NIH was one of the many agencies whose funding was caught up in the uncertainty. Although both the House and Senate Appropriations Committees proposed unprecedented increases for NIH, larger political battles halted action before the legislation could be brought to floor on either side. This added an element of uncertainty to the agency's prospects as Congress maneuvered for adjournment.

The House Appropriations Committee in mid-July approved a bill to provide NIH with an historically large 9.1 percent increase for FY 1999. The House panel also provided generous increases for other Public Health Service agencies. In order to fund those increases without breaking the agreedupon budget caps, the House Appropriations Committee cut education, child care, and job training programs that were among President Clinton's top domestic priorities. The bill drafted by the House committee pleased conservative Republicans but angered House Democrats, leaving moderate Republicans as the uncertain swing block in the middle.

In an effort to maintain legislative momentum, the House leadership asked Republicans to support the bill as drafted but made it known that some program cuts would be restored. However, the bill also contained conservativebacked legislative provisions regarding family planning that produced strong objections from moderates and liberals. These controversies made it impossible for the leadership to bring the measure to the House floor before the August recess without risking an embarrassing defeat.

After the August recess, the action shifted to the Senate. The Labor-HHS-Education Appropriations Subcommittee got down to business September 1. Subcommittee Chairman Arlen Specter (R-PA) followed through on earlier promises to provide \$2 billion increase for NIH. This increase represented a breathtaking 14.7 percent more than the agency's FY 1998 funding level. Specter was able to do this because the Senate used more generous budget assumptions than the House. The Senate bill also "forward funded" certain other programs so that expenditures will actually take place in FY 2000.

On September 3 the full Senate Appropriations Committee ratified its subcommittee's plan. The Senate bill avoided much of the controversy that dogged the House bill by providing funding for low income energy assistance and summer jobs programs. In addition, the Senate bill provided smaller increases than the House bill for other public health programs. However, the Senate bill also lacked the momentum to go to the floor, in this case because there was fear that it might be heaped with controversial amendments on issues ranging from education block grants to campaign finance reform.

In mid- to late-September, most legislative action was temporarily sidelined as Congress grappled with the Independent Council's report recommending that President Clinton be impeached. The unresolved obstacle in the path of the FY 1999 appropriations bills was how to provide enough money so that both the White House and Congress could claim victory in funding their priority programs without seeming to violate the previous budget agreement. The budget agreement called for strict spending limits in FY 1999 to reduce the deficit. However, it was difficult to enforce fiscal austerity when the Treasury had already reported a budget surplus for FY 1998. A highlevel agreement would be needed to determine how much additional funding would be made available, and on what terms. It was widely expected that another \$10 billion in discretionary funding would be needed to satisfy the key players' priorities, but the questions remained, when would an agreement be reached, and on what terms?

As the end of September approached, it seemed unlikely that there would be time to complete action on most of the remaining 12 appropriations bills so discussions were underway to resolve the remaining funding and policy disagreements so whatever bills are left could be rolled into a massive continuing resolution. The research community was hopeful that the end result would provide NIH with something approaching the \$2 billion increase recommended by the Senate.

NIH Funding of Physiology Increases, But Position Relative to Other Departments Declines

NIH extramural funding for medical school departments of physiology doubled between 1984 and 1997, but the amount of funding it received relative to other departments has declined. This trend is seen in data prepared by the Association of American Medical Colleges (AAMC) that tracked the growth of NIH extramural funding to all medical school departments from 1984-1997 (Fig. 1)¹.

Departments of physiology went from being the third of the ten departments ranked to being seventh out of the ten in 1997. The ten departments included in the report were Anatomy, Biochemistry, Medicine, Microbiology, Pediatrics, Pathology, Pharmacology, Physiology, Psychiatry, and Surgery.

Throughout the period, departments of medicine received the most NIH extramural funding, while other disciplines fluctuated in their rankings. Departments of medicine averaged about four times the funds received by the next largest departmental recipient.

With the exception of two years in the middle of the period, NIH extramural funding for departments of physiology increased steadily. During the first five years, from 1984-1988, physiology was third in terms of extramural funding, after departments of medicine and biochemistry.

Starting in 1989, departments of psychiatry replaced departments of biochemistry as the second largest recipients of extramural grant funding. This corresponds to the period when funding increases to what was then known as the Alcohol, Drug Abuse and Mental Health Administration (ADAMHA) research institutes outpaced those awarded to other NIH institutes. Funding to departments of pediatrics also increased significantly around the same time.



Figure 1. Growth of NIH extramural funding (in millions of dollars) to medical school departments 1984-1997 (Source: AAMC).

¹Funding for departments of medicine is not represented on the graph. Departments of medicine received the most funding throughout the period.

Lab Animal Use Continues to Decline

The numbers of research animals used in the U.S. continued to decline in FY 1997, according to the figures released in the USDA's latest Animal Welfare Report. The Congressionallymandated report contains information supplied from all research facilities that use animal species regulated under the Animal Welfare Act. Rats and mice, the species most commonly used in research, are not included in the report because they are not currently regulated by USDA. Birds are also excluded for the same reason.

Although there have been some fluctuations over the years, the general usage trend has been downward since these statistics were first collected in FY 1973. For example, comparing total numbers of animals in certain species used in FY 1997 and in FY 1973:

- The number of dogs used in FY 1997 is 61 percent fewer than in FY 1973
- The number of cats also declined 61 percent

- The number of hamsters has declined 52 percent
- The number of guinea pigs declined 33 percent
- The number of rabbits has declined 31 percent

The report is available on the USDA Animal Care Home Page at www.aphis.usda.gov/ac. Look under Enforcement Reports and select either the Acrobat or text version of the "AC Enforcement Rpt '97."

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 Hellerstein 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 Hellerstein, APS Office of Public Affairs, 9650 Rockville Pike, Bethesda, MD 20814-3991. Tel: 301-530-7105; fax: 301-571-8305; e-mail: ahellers@aps.faseb.org.

Outreach Teams Receive Training

The three Local Outreach Teams (LOTs) named for 1998-99 met for training at Airlie Center in Warrenton, VA, June 25-28. The teams, named by the APS Council, are The University of Arkansas for Medical Sciences, led by Michael L. Jennings; the University of North Carolina at Chapel Hill, led by Margaret L. Meeker; and, Texas Tech University Health Sciences Center in Lubbock, led by Lorenz O. Lutherer.

Training for the Trainers

The training the LOT teams received will enable APS physiologists and local teachers to deliver to teachers in their communities the hands-on, inquirybased, APS physiology activities from the workshop units, "Neural Networks" and "Physiology of Fitness." Activities in these two units concentrate on autonomic neural functions, and cardiovascular and respiratory functions during exercise, respectively. The "Neural Network" activities are designed for middle school students while "Physiology of Fitness" was designed for high school teachers to use with their students.

Both physiologists and teachers on the new LOT teams attended the Airlie training institute. Those attending were Michael E. Soulsby and James N. Pasley from the University of Arkansas for Medical Sciences, with Mark Adame, a teacher from Mills Magnet HS, all from Little Rock; Meeker and Jan McCormick of the University of North Carolina, Chapel Hill, and JoAnne Robb, a teacher from North Chatham School also in Chapel Hill; and from Lubbock, TX, Lutherer, Mary Hobbes from Region 17 Educational Service Center, and Pam Thomas, a teacher from Lubbock HS.

Past LOTs Provide Training

Training of the LOTs was led by members of past LOTs, including Houston LOT members, Norman Weisbrodt from the University of Texas



1998-99 LOTs and Workshop Instructors.



M. Soulsby presents results as L. Lutherer looks on.



J. McCormick and M. Sullivan watch as M. Soulsby and M. Adame run an experiment at the Outreach Institute.



M. Meeker, H. Hobbs, and M. Adame develop a concept map.

Medical Center in Houston, and Lisa Bidelspach, a 1995 Frontiers in Physiology Summer Research Teacher, and Margaret Sullivan, Columbia, MO, LOT member from the Dalton Cardiovascular Center at the University of Missouri in Columbia who acted as facilitators.

In addition to reviewing physiology content, LOT members learned how to model inquiry and problem-solving pedagogy, which is promoted by the *National Science Education Standards*.

Outreach Workshops

Within a month of attending the Outreach Institute the Lubbock team held their first workshop for 15 participants. The Texas Tech University team covers a wide geographic area in northwestern Texas and is planning additional workshops throughout the fall. The Chapel Hill team has planned its workshop using the Neural Network activities for December 11. A date has not yet been set by The University of Arkansas team workshop.

Each LOT team presents at least one workshop – either "Neural Networks" or the "Physiology of Fitness" – plus at least one follow-up workshop for their local teachers. The follow-up workshop may include how teachers implemented the workshop activities; using the Internet as a science education resource; information on networking between teachers and researchers; or, any other physiology topic of interest to the teachers.

The three new LOTs join 19 others that have disseminated the APS-developed training activities in 18 localities within a dozen states during the past three years. Through this program more than 400 teachers nationwide have participated in these workshops, which are valuable in providing middle and high school teachers with hands-on activities, materials for delivering these activities to their classes, and networking opportunities between teachers and physiologists.

For more information about developing a Local Outreach Team in your community, look for information on the APS Web site: http://www.faseb.org/ aps/educatn/lot.htm or contact the APS Education Office at 301-530-7132 or email: educatio@aps.faseb.org. Applications for 1999-2000 LOTs are now available.

Summer Research Teachers at Retreat

Thirty-two 1998 Summer Research Teachers participating in the APS Frontiers in Physiology, Explorations in Biomedicine, and the Physiology Insights programs met at the Airlie Center in Warrenton, VA, July 14-19, to participate in the annual Summer Retreat. This week-long retreat focuses on instructional techniques and is designed to help teachers develop a hands-on, inquiry-based laboratory activity to use with their students.

The Retreat activities complement the summer research work teachers contribute to in the laboratories of APS members. While the laboratory research includes a strong science content focus, the retreat activities target teaching methods promoted by the National Science Education Standards.

In addition to developing a laboratory activity, teachers participated in numerous hands-on laboratory activities, shared their research work with their colleagues, and reflected on their current teaching techniques and strategies for change.

Networking with All SRTs

Bringing the SRTs from all three APS

programs together at one meeting enabled them to network with colleagues who teach at schools with diverse populations and varied The 18 Frontiers in resources. Physiology teachers teach at middle and high schools across the US. The nine Explorations in Biomedicine teachers who attended the retreat are from Montana and teach primarily Native American students at middle schools, high schools, and tribal colleges. Because of the limited number of APS members in Montana, teachers in this program work in the research laborato-



ries of APS members located across the US. Three other teachers, who participated in the Physiology Insights program, also attended the retreat. Insights participants teach physiology at 2- and 4-year colleges, but their background is not usually in physiology.

Teacher-Advisers

Joining the '98 SRTs at the Retreat were several APS Education Committee and Teaching Section members, who advised teachers on physiology content and laboratory activity format. Education Committee members attending the retreat were Barbara Goodman of the University of South Dakota Medical School in Vermillion, and Education Committee chair; George Blevins of the University of Arkansas for Medical Sciences; and Mary Anne Rokitka from the State University of New York at Buffalo, who is also a Teaching Section member. Other Teaching Section members attending were Dee Silverthorn of the University of Texas at Austin, Roy Russ from Mercer University School of Medicine in Macon, GA, and Wayne Carley from the National Association of Biology Teachers.

In addition to APS members assisting at the workshop, there were also several past SRTs who worked with the teachers as they developed their laboratory activities. The past SRTs also assisted in presenting some of the hands-on activities to the teachers. Past SRTs attending were: '94, Charles Geach; '95, Lisa Bidelspach, Evelyn Bradshaw, John Nishan; '96, Richard Carruba; and, '97, Nancy Kellogg, Anthony Kilyanek, Charity Young.

Applications for the 1999 summer research programs are now available at the APS Web site: http://www.faseb.org /educatn/k-12.htm. For additional information about the summer research programs, email the APS Education Office at educatio@aps.faseb.org, or call (301) 530-7132.

Attention APS Researchers!

Host a science teacher to work in your lab in the summer of 1999!

The APS Summer Research Programs for Teachers allow science educators nationwide at middle schools, high schools, Native American reservation schools, tribal colleges, and community colleges, to learn about science "in action."

Become a part of our effort to increase teachers' and students' knowledge about what scientists do, how the research process works, and the intrinsic satisfaction and sense of excitement that comes from conducting scientific research.





Frontiers Summer Research Teachers are middle and high school science teachers from across the country who work in the labs of APS researchers in their communities.



Physiology Insights Summer Research Teachers are faculty members at 2- and 4-year colleges who work in the labs of APS researchers in their communities.

For more information, contact the APS Education Office: (301) 530-7132 or educatio@aps.faseb.org.

OR see program descriptions and applications on our website: http://www.faseb.org/aps/educatn/k-12prog.htm http://www.faseb.org/aps/educatn/undergrd.htm

Sustaining Associates

Know Your Sustaining Associate Members

Abbott Laboratories

Abbott Laboratories started in 1988 and has evolved into one of the world's leading healthcare companies with a major presence in diagnostic, pharmaceutical, nutritional, hospital, and agriculture markets. Abbott is committed to technological leadership. In 1995, Abbott spent more than \$1 billion on research and development activities in an effort to maintain its leadership position. In addition to internal discovery, leadingedge medical technologies are being pursued through global pursuit of appropriate acquisitions, licenses, and collaborations. A few of Abbott's products are Similac, Ensure, Biaxin, Norvir, Erythromycin, Hytrin, Depakote, Abbokinase, Survanta, ADD-Vantage, Ultane, Calcijex, AxSYM, IMx, and PRISM. Abbott Laboratories is an equal opportunity employer that recognizes its business performance is strongly linked to its ability to successfully attract, retain, and develop a diverse employee population.

ADInstruments

ADInstruments manufactures a range of computer based data recorders for the life and physical sciences. The Maclab and Powerlab systems, comprising both hardware and software, record and display experimental data in real time, and features a fast data manipulation, on-line computations, convenient file storage and high resolution data presentation. A range of signal conditioners and transducers extends the use of Powerlab into many specialist fields.

Alliance Pharmaceutical Corporation

Alliance Pharmaceutical Corporation is a research and development company focused on transforming innovative scientific discoveries into therapeutic and diagnostic agents.

Oxygent is in clinical development in conjunction with Johnson & Johnson as an oxygen carrier ("blood substitute") to reduce the need for donor blood transfusions during surgery. LiquiVent is an intrapulmonary agent for treatment of acute respiratory failure. LiquiVent has Subpart E ("fast track") FDA status and is in clinical trials with neonates, children, and adults. Imagent US is in preclinical development for enhancement of ultrasound images of blood flow abnormalities related to myocardial infarctions, blood clots, or solid tumors.

American Medical Association

The American Medical Association promotes the art and science of medicine and the betterment of public health. The AMA accomplishes this mission by advancing standards of medical education, promoting support for biomedical research, representing the medical profession, providing information about medical matters, and upholding professional conduct and performance.

Amgen, Inc.

Amgen, Inc., the largest independent biotechnology company

in the world, is a global company that discovers, develops, manufactures, and markets human therapeutics based on advanced cellular and molecular biology. Amgen's four areas of research are hematopoiesis, neurobiology, inflammation/ autoimmunity, and soft tissue repair and regeneration.

Amgen has developed several biopharmaceutical products using recombinant DNA technology. Amgen currently markets two products: EPOGEN[®] (Epoetin alfa), used to treat anemia associated with chronic renal failure failure for dialysis patients, and NEUPOGEN[®] (Filgrastim), used to decrease the incidence of infection associated with some forms of chemotherapy.

Astra AB

Astra AB is an international pharmeceutical company based in Sweden. Astra has been the fastest-growing pharmaceutical company in the world market in the last five years. Marketing is conducted through subsidiaries in about 40 countries. Astra's research is primarily focused on respiratory, cardiovascular and gastrointestinal diseases and pain relief. Exploratory research is performed in several other areas, e.g. diseases of the central nervous system. Astra's commitment to innovation is the cornerstone for growth of the company and has led to real breakthroughs in patient care, especially in the fields of acid-related diseases of the gastrointestinal tract, asthma and local anesthesia.

Axon Instruments, Inc.

Axon Instruments, Inc. designs and manufactures instruments and software for electrophysiology. Axon Instruments produces full-featured amplifiers for single-channel and whole-cell patch clamp and for single- and two-electrode current/voltage clamp applications. These hardware products are supported with PC and Macintosh software and acquisition hardware for the acquisition and analysis of biophysical data. The latest products are the CyberAmp series of general-purpose analog signal conditioners. They provide up to eight channels of computer-controlled adjustment of gain, offset, and low-pass Bessel filtering. Virtually any type of transducer can be adapted for the CyberAmp. The computer can instantly determine the scaling and units of each transducer. Support for the CyberAmps is provided by software from Axon Instruments and others. The CyberAmp used in conjunction with Axotape software and TL-1-125 acquisition hardware makes a complete computer-based chart recorder system.

Berlex Biosciences

Berlex Biosciences is a US subsidiary of the multinational pharmaceutical and chemical firm Schering AG West Germany (not connected with Schering-Plough Corp. or Schering Corp. of New Jersey). It conducts research and markets prescription drug products primarily for cardiovascular, diagnostic imaging, metabolic, endocrine, and central nervous system uses.

Sustaining Associates

Genentech, Inc.

Genentech, Inc., founded in 1976, is a leading biotechnology company focusing on the development, manufacture, and marketing of pharmaceuticals produced by recombinant DNA technology. Four approved therapies derived from biotechnology were pioneered by Genentech: human insulin, alpha-interferon, human growth hormone, and recombinant tissue plasminogen activator.

Grass Foundation

The Grass Foundation underwrites the annual Walter B. Cannon Lectureship given at the APS spring meeting. The naming of this lectureship serves two functions: to commemorate the enormous contribution of Cannon to the growth of knowledge of physiology and to pay a tribute to Cannon on behalf of many of the founding trustees of the Grass Foundation who were members of his research group at Harvard Medical School early in their careers.

This lectureship is in accordance with the Grass Foundation's charter mandate to support research and education in neurophysiology. Other programs include funding for other annual and visiting lectureships, summer fellowship support for young students, and occasional relevant course support.

Harvard Apparatus

Harvard Apparatus, since its inception in 1904 at the Harvard Medical School, continues to design, develop, and supply the unique apparatus that has shaped the development of teaching and research in physiology and allied science, including syringe peristaltic and respiration pumps, recording systems, and research accessories.

Jandel Scientific

Jandel Scientific designs and sells IBM-compatible software for scientific research. Products include Sigma-Plot for publication-quality scientific graphs (with automatic error bars, regression lines, and many other scientific graphing options); Sigma-scan for *x-y* digitizing, morphometric measurement, and analysis; and PC3D for generating three-dimensional reconstructions of objects from serial sections. JAVA, the latest product, is a video analysis system capable of image processing, densitometry, automatic object counting and edge tracking, and morphometric measurement. JAVA works with a video digitizing board and input from a video camera, VCR, or other video source.

Janssen Research Foundation

Janssen Pharmaceutica was founded in Belgium in 1953 by Paul Janssen. It is now an international company built on the foundation of research and a bedrock of innovation. The company remains under the direction of Janssen and has an unparalleled record in the successful development and marketing of new pharmaceutical products. According to the Japan Drug Research studies, Janssen was responsible for more significant new drug discoveries during the period 1970-1983 than any pharmaceutical company in the world. The company currently has approximately 6,000 employees world-wide. It is a world leader in medication used in the treatment of allergies, mental disorders, digestive and intestinal problems, cardiovascular conditions, and worm and fungal infections. Janssen's compounds have also enabled major advances in anesthesia and immunology. In addition, Janssen has also discovered many chemical compounds to identify and characterize receptors in the brain and the periphery that have played a prominent role in advancing our knowledge about neurotransmitters.

Eli Lilly and Company

The Lilly Research Laboratories is dedicated to the advancement of basic scientific information upon which further targeted medical breakthroughs may be identified. Scientists in the Lilly Research Laboratories are committed to excellence in research as evidenced by a steadily increasing investment in research and development over the years. Scientific research is being supported by the construction of new research facilities and with the use of a Cray II supercomputer. Scientists are focusing on basic research and targeted medical therapy for cardiovascular disease, central nervous system dysfunction, cancer, diabetes, and pulmonary disorders.

Merck & Co., Inc.

Merck & Co., Inc. is a worldwide, research-intensive company that discovers, develops, produces, and markets a broad range of human and animal health products and services. Merck's product portfolio includes the cardiovascular drugs MEVACOR and ZOCOR, the gastrointestinal drug PEPCID, and for symptomatic benign prostate enlargement PROSCAR. Merck has recently introduced the antihypertensive drugs COZAAR and HYZAAR, the anti-glaucoma drug TRUSOPT, the HIV protease inhibitor CRIXIVAN for AIDS, the vaccines VARIVAX (protection against chickenpox and VAQTA (protection against hepatitis A), the osteoporosis drug FOS-AMAX, and the over-the counter antacid PEPCID AC.

Pharmacia and Upjohn, Inc.

Human health care is at the heart of Pharmacia and Upjohn's endeavors. Pharmacia and Upjohn, Inc., a multinational corporation and one of the largest research-based pharmaceutical manufacturers in the world, has research, production, and warehousing facilities in more than 45 countries, and its products are sold in more than 150 countries.

Some of Pharmacia and Upjohn's most promising research has been in the fields of oncology, peptide hormones, cataract surgery, nutrition, and allergy diagnostics.

Procter & Gamble Co.

Procter & Gamble is a multinational consumer products and health care company committed to world-class research and product development. It has major technical centers in Cincinnati, Ohio; Norwich, New York; Hunt Valley, Maryland; Mexico City, Mexico; Caracas, Venezuela; Brussels, Belgium; Egham and Newcastle, UK; and Kobe, Japan.

Sustaining Associates

The worldwide PhD population of Procter & Gamble is 1,200, divided about equally between life scientists and chemists. Total employees number 100,000.

Sales in the health care/pharmaceuticals, beauty care, cosmetics and fragrances, food and beverage, laundry and cleaning, and paper products make Procter & Gamble one of the largest companies in the US. Fortune magazine consistently recognizes Procter & Gamble as one of the "Most Admired Corporations."

Quaker Oats Company

The Quaker Oats Company is a leading consumer products company marketing both human and pet food products around the world. The development of new food and beverage products and the refinement of existing Quaker products occurs in the laboratories of Quaker's Research and Development facility in Barrington, Illinois. Quaker food scientists, nutritionists, biochemists, and physiologists devote their energies to making certain that Quaker products meet the high standards consumers expect of The Quaker Oats Company.

Rhone-Poulenc Rorer

An international company dedicated to health, RPR is the first pharmaceutical company in France, the third in Europe, with a turnover in 1994 of US\$4.5 billion: a research-driven company with 14 percent re-invested in Research and Development and 3,000 employees in R&D. With research centers located in France, the US, and the UK Research and Development is focused on seven main therapeutic areas: Oncology; Cardiovascular diseases; Infectious diseases/AIDS; Rheumatology/Bone metabolism; Central nervous system disorders; Respiratory diseases/Allergies; and Plasma proteins. To invest in new technologies and gene and cell therapies is RPR's commitment to the future.

Schering-Plough

Born out of a 1971 consolidation of two companies (Plough, Inc. and the Schering Corporation), Schering-PloughResearch Institute is dedicated to the discovery, development, and marketing of novel therapeutic entities. The company focused its research in the fields of anti-inflammatory, antiallergic, cardiovascular, and anti-infective disorders. The company has also attained a leading position in immunology and recombinant DNA technology.

G.D. Searle & Co.

The physiologic and scientific directions of Searle are primarily in areas related to arthritis and inflammation, cardiovascular disease, and oncology with an emphasis on adjunctive therapy and opportunistic infections. In these three major therapeutic areas, the emphasis is on defining new molecular targets that are likely to elicit a dramatic shift in therapeutic efficacy with a true ultimate enhancement of therapeutic benefit.

Research employs high throughput robotic screening to define chemical or protein leads, medicinal chemistry and protein biochemistry, including protein mutagenesis, to maximize the properties of the chemical or protein lead, and extensive animal testing to determine proof of concept. Molecular and cell biology are utilized extensively to support screening efforts and to define the molecular targets underlying a particular disease, including the use of differential display PCR. The approach is to integrate expertise across scientific disciplines to rapidly determine proof of concept underlying a disease target.

SmithKline Beecham

SmithKline Beecham is one of the world's leading health care companies. Its principal activities are the discovery, development, and marketing of both human and animal pharmaceuticals, over-the-counter (OTC) medicines, health-related consumer brands, and clinical laboratory testing services.

APS Sustaining Associate Members

The Society gratefully acknowledges the contributions received from Sustaining Members in support of the Society's goals and objectives.

Abbott Laboratories ADInstruments Alliance Pharmaceutical Corporation American Medical Association Astra Arcus USA, Inc. Axon Instruments, Inc. Berlex Biosciences Genentech, Inc. Gould, Inc. Grass Foundation Harvard Apparatus Jandel Scientific Janssen Research Foundation Kabi Pharmacia Eli Lilly and Company The Mack Printing Group Merck & Company, Inc. Nycomed, Inc. Pfizer, Inc. Pharmacia and Upjohn, Inc. Procter & Gamble Company Quaker Oats Company Rhone-Poulenc Rorer Sandoz Pharmaceuticals Corporation

W. B. Saunders CompanySchering-Plough Research InstituteG. D. Searle and CompanySmithKline Beecham PharmaceuticalsWyeth-Ayerst Laboratories

Publications

The "Top Thirty" AJP Cites

In preparing for our Centennial celebrations for the APS Publication program and specifically for the *American Journal of Physiology*, the Institute for Scientific Information (ISI) was asked to provide the most frequently cited articles for the *AJP* from the time that ISI had begun to collect such statistics. They provided a list of the 300 articles in *AJP* that had been cited 100 times or more during the period 19451995. The "top ten" were printed on the back page of the program for "A Living History: a Dramatization of the *American Journal of Physiology*, 1898-1998" that was presented at EB 98. There was such interest in these citations that the top 30 articles are provided below for your information. Please note that the three articles published prior to 1945 would have been cited many more times than listed here.

Cites	Article
2.615	Ablauist, R.P. A study of the adrenotropic receptors. Am. J. Physiol. 153: 586-600, 1948
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897	Berne, R.M. Cardiac nucleotides in hypoxia: possible role in regulation of coronary blood flow. <i>Am. J. Physiol.</i> 204: 317-322, 1963
896	Burg, M.B., J. Grantham, M. Abramow, and J. Orloff. Preparation and study of fragments of single rabbit nephrons <i>Am. J. Physiol.</i> 210:1293-1298, 1966
886	Hostetter, T.H., J.L. Olson, H.G. Rennke, M.A. Venkatachalam, and B.M. Brenner. Hyperfiltration in remnant nephrons: a potentially adverse response to renal ablation. <i>Am. J. Physiol.</i> 241 (<i>Renal Fluid Electrolyte Physiol.</i> 10): F85-F95, 1981
865	Tennant, R., and C.J. Wiggers. The effect of coronary occlusion on myocardial contraction. <i>Am. J. Physiol.</i> 112: 351-361, 1935
823	Benos, D. Amiloride: a molecular probe of sodium transport in tissues and cells. <i>Am. J. Physiol.</i> 242 (<i>Cell Physiol.</i> 11): C131-C145, 1982
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Positions Available

Postdoctoral position: In integrative respiratory physiology available January 1, 1999. NIH-funded position to study carotid body influences on ventilatory and cardiovascular control. PhD, MD, DVM, or equivalent and training in respiratory physiology is required. Fluency in written and spoken English is required. Position will remain open until filled. Contact Curtis A. Smith, PhD, The John Rankin Laboratory of Pulmonary Medicine, University of Wisconsin School of Medicine, 504 N. Walnut St., Madison, WI 53705-2368. Email: casmith4@facstaff.wisc.edu. To find out more about our Department and UW Madison, visit our web site at: http://www.biostat.wisc.edu/prevmed.

Assistant Research Scientist: The University of Iowa College of Medicine, Department of Internal Medicine, Rheumatology Division is seeking an Assistant Research Scientist to perform basic research in autoimmune diseases, immunotolerance, and transplantation of considerable scope and complexity. A person in this classification has the academic knowledge of a discipline that is generally associated with a PhD or an equivalent. Previous experience with immunologic tolerance, transplantation, and systems that examine mechanisms of induction and maintenance of immune specific tolerance, particularly in the solid organ or bone marrow transplant models, is desired. Please send resume and cover letter indicating #39211 to: Carol Wehby, Human Resources, Internal Medicine, E400 GH, 200 Hawkins Drive, Iowa City, Iowa 52242-1081. Women and minorities are strongly encouraged to apply. [EOE/AA]

Assistant Professor: Vertebrate Comparative Physiologist. Creighton University invites applications for a tenure- track, nine-month appointment at the rank of Assistant Professor to begin in August 1999. Candidates should have completed a PhD with a specialization in vertebrate physiology. Postdoctoral experience is preferred and teaching experience is highly desirable. The teaching load is four courses per year. Primary responsibility is a comparative vertebrate physiology course with laboratory. Ability to teach environmental physiology and/or cellular physiology is preferred. The successful candidate should possess a strong desire to teach in a liberal arts college and to participate in our interdisciplinary environmental science degree program. Mentoring of undergraduate research students is required. The individual must establish an effective and sustainable physiology research program that leads to peer-reviewed publications required for tenure and advancement. To apply, 1) a curriculum vitae; 2) statements on teaching, philosophy, research interests, background training and special skills, and long-term goals; 3) documentation (if available) of teaching effectiveness; 4) undergraduate and graduate transcripts; and 5) names and addresses of three references must be received by November 6, 1998. Please direct inquiries and application materials to: Jane C. Roberts, PhD, Chair of Search Committee, Department of Biology, Creighton University, Omaha, NE 68178-0103. Creighton is a Jesuit, Catholic institution that seeks qualified applicants from all backgrounds who believe they can contribute to the university's outstanding educational traditions. We encourage applications from women and minorities. [EOE/AA]

Assistant Professor: In sensory and motor systems physiology with expertise in the neurosciences. Applications are invited for a tenure-track position in the Department of Kinesiology and Applied Physiology at the University of Colorado at Boulder. A description of the department and the university is available at our website http://www.colorado.edu/kines. Applicants must have completed postdoctoral training and be able to provide evidence of an ability to obtain extramural grant support. Teaching experience is desirable. Send a current curriculum vita, three reference letters, and three recent publications to the Search Committee, Department of Kinesiology and Applied Physiology, University of Colorado, Boulder, CO 80309-0354. Additional information can be obtained by phone (303-492-3122), fax (303-492-4009), or e-mail melanie.evans@colorado.edu. Review of the applications will begin on January 15, 1999 for a start date of August 15, 1999. The University of Colorado at Boulder is committed to diversity and equality in education and employment.

Two postdoctoral cardiovascular research positions: Two postdoctoral positions are available in the Department of Physiology, University of Tennessee, Memphis. One position, under the supervision of Dr. Aviv Hassid (email: ahassid@physio1.utmem.edu) will examine the role of nitric oxide and tyrosine phosphatases in vascular remodeling and vascular injury in intact animals. Preference will be given to candidates who have a recent PhD and experience in the techniques of animal surgery and vascular pathophysiology. The second position, under the supervision of Dr. David Mendelowitz (email: dmendel@physio1.utmem.edu) will focus on the neurophysiology of presynaptic and postsynaptic receptors and the synaptic pathways that mediate central cardiorespiratory control. Preference will be given to candidates who have a recent PhD and electrophysiological experience. Send curriculum vitae and the names of three references to the appropriate email address or fax to 901-448-7126. The University of Tennessee is an EEO/AA/Title VI/Title IX/Section 504/ADA/ADEA employer.

Positions Available

Assistant Research Scientist: The University of Iowa College of Medicine, Department of Internal Medicine, Cardiovascular Diseases Division is seeking an Assistant Research Scientist to perform basic or applied research in an area of considerable scope and complexity in which existing theory or methods may be limited or lacking with responsibility for identifying and selecting the problems to be studied, the approach to them, and the results obtained. A person in this classification has the academic knowledge of a discipline that is generally associated with a doctoral degree or an equivalent. In addition, the person will have demonstrated the ability to plan and execute a research study through some progressively responsible independent research work. Previous experience in mammalian cell culture, gene cloning, gene expression, general molecular biology, genetics, cell biology, and protein biochemistry is required. Experience in cardiovascular molecular biology, genetics, and pharmacology is desired. Prior ability to provide instruction to trainees and research investigators is desirable. Please send resume and cover letter indicating #39216 to: Carol Wehby, Human Resources, Internal Medicine, E400 GH, 200 Hawkins Drive, Iowa City, Iowa 52242-1081. Women and minorities are strongly encouraged to apply. [EOE/AA]

Postdoctoral Position: NIH-funded postdoctoral position is available to study structure-functional relationship of inositol (1,4,5)- trisphosphate receptor (InsP3R). InsP3R is an intracellular Ca2+ release channel activated in response to generation of a second messenger InsP3. In our studies of InsP3R we combine molecular and biochemical approaches with electrophysiological recordings of InsP3R in planar lipid bilayers. Our group has recently setup functional recordings of recombinant InsP3R in planar lipid bilayers (J Gen Physiol. 1998, 111:847-856) and now we are taking advantage of this system in order to delineate structural determinants responsible for major functional properties of the InsP3R. Consult http://www.swmed.edu/home pages/physiology/bezprozvanny.html for the brief description of our research program. Previous experience in electrophysiological methods is a plus, but not absolutely required. Excellent multidisciplinary training opportunity in a small lab setting, with the full advantage of rich intellectual environment of UT Southwestern. Please send CV and names/contact information of 2 references to: Dr. Ilya Bezprozvanny, Dept. of Physiology, The UT Southwestern Medical Center at Dallas, 5323 Harry Hines Blvd., Dallas, TX 75235. FAX: 214-648-2974, email bezprozv@utsw.swmed.edu. Deadline is December 1, 1998.

Assistant Research Scientist: The University of Iowa College of Medicine, Department of Internal Medicine, Division of Rheumatology, is seeking an Assistant Research Scientist to perform basic research in signal transduction in the immune system of considerable scope and complexity. This position requires the academic knowledge of a discipline that is generally associated with a doctoral degree, considerable postdoctoral training, and a demonstrated ability to plan and execute a research study through progressively responsible independent research work. Potential candidates should have considerable experience (3-5 years) with signal transduction assays including biochemical analyses and manipulation of cells by gene transfection; with molecular biology techniques including subcloning cDNAs, Northern and Southern blots, and electrophoretic mobility shift assays; in generating mice made deficient in specific genes using techniques of homologous recombination as well as in generating transgenic mice; and knowledge and experience in screening genetically manipulated mice and the use of flow cytometry to study cell surface and intracellular proteins. Considerable knowledge (3-5 years) of basic immunology is also required. Please send a resume and cover letter indicating interest in Assistant Research Scientist position 39192 to: Carol Wehby, Human Resources, Internal Medicine, E400 GH, 200 Hawkins Drive, Iowa City, IA 52242-1081. Women and minorities are strongly encouraged to apply. [EOE/AA]

Assistant Professor in Exercise Physiology/Biochemistry: Applications are invited for a tenure-track appointment at the Assistant Professor level in exercise physiology/biochemistry at York University, Faculty of Pure and Applied Science, Kinesiology and Health Science. A research emphasis in the area of gene expression would be an asset. Duties include the supervision and teaching of graduate students and undergraduate teaching. 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 would be an asset. Applicants should send a curriculum vitae; a cover letter stating future research goals; relevant reprints; and the names, addresses, and telephone numbers of at least three individuals who may act as references by 31st December 1998 to: Dr. David Hood, Kinesiology and Health Science, York University, Toronto, Ontario M3J 1P3, Canada. Duties commence July 1, 1999. The position is subject to budgetary approval. The complete job posting and further information can be obtained at our Web site http://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.

Positions Available

Brain slice electrophysiologist: Postdoctoral position(s) available immediately to study the neurobiology of brainstem sensory integration at the nucleus tractus solitarius (NTS). Projects include electrophysiological studies of glutamatergic and peptidergic synaptic transmission in NTS slices, anesthetic actions on NTS synaptic integration, and the role of myelinated and unmyelinated baroreceptor inputs to baroreflex performance. Techniques include patch clamp in visualized NTS slices, fluorescent anatomical tracing, and in-vivo reflex studies. Electrophysiological experience helpful, but not required. Send CV, references, and letter of interest to: Michael C. Andresen, PhD, Department of Physiology and Pharmacology, L334, 3181 S.W. Sam Jackson Park Road, Oregon Health Sciences University, Portland, OR 97201-3098. Tel: 503-494-5831; fax: 503-494-4352; email: andresen@ohsu.edu; Internet: http://www.ohsu.edu/som-Physiology/faculty/andresen/andresen.html. Oregon Health Sciences University is an EEO/AA/Title VI/Title IX/Section 504/ADA/ADEA employer.

Two Tenure Track positions: The University of Tennessee, Memphis, Department of Physiology is actively recruiting for two tenure track faculty positions. Academic rank is dependent upon experience and qualifications. Candidates should have a PhD or MD degree, a good track record in publications, and postdoctoral research experience with a background in cellular and/or molecular biology. The abilities to establish an independent research program in the areas of cardiovascular, gastrointestinal, developmental, endocrine, or epithelial physiology and to engage in teaching activities of the department are expected. Applicants should send a curriculum vitae, copies of three representative publications, and the names of three references to Dr. Leonard R. Johnson, Chair, Department of Physiology, UT Memphis, 894 Union Avenue, Memphis, TN 38163. The University of Tennessee is an EEO/AA/Title VI/Title IX/Section 504/ADA/ADEA employer. Minorities and females are encouraged to apply.



Chair, Physiology & Biophysics: Georgetown University Medical Center is seeking a nationally known academic physiologist to chair the Department of Physiology and Biophysics. The department maintains active research programs in broad areas of physiology (cardiovascular, endocrine, neuroscience and renal) utilizing cellular,

molecular, and integrative approaches. In addition, the department has a strong, nationally ranked graduate program leading to both the MS and PhD degrees. The ideal candidate will have a PhD, MD, MD/PhD, or similar terminal degree and should possess an outstanding record of research and scholarly achievements and demonstrate leadership ability to manage and mentor a diverse group of scientists and to oversee the fiscal affairs of a department. The candidate should also be knowledgeable about the current trends in the education of medical and graduate students. Georgetown University encourages applications from qualified women and minorities. Review of applications will commence on October 30th and will continue until the position is filled. Candidates should send a letter of interest stating their qualifications for this position and a copy of their curriculum vitae to: Raymond L. Woosley, MD, PhD, Chair, Physiology and Biophysics Search Committee, Georgetown University School of Medicine, 3900 Reservoir Road, NW, Washington, DC 20007. [AA/EOE]

Call for Nominations for the Editorship of Physiological Reviews

Nominations are invited for the editorship of *Physiological Reviews* to succeed Walter F. Boron, who will complete his term as Editor on December 31, 1999. The Publications Committee plans to interview candidates in the Spring of 1999.

Applications should be received before January 15, 1999.

Nominations, accompanied by a curriculum vitae, should be sent to the chair of the Publications Committee, Leonard R. Johnson, Publications Department, American Physiological Society, 9650 Rockville Pike, Bethesda, MD 20814-3991.

APS Offers Teacher's Chat Room to Promote Communication Between Educators

APS is now managing a Teacher's Chat Room named #APSteachers on the SuperChat, www.superchat.org, IRC network. SuperChat is a quiet, professionally run network that does not allow pornography, obscenity, or hacking. The APS Chat Room is geared toward educators and gives them the opportunity to exchange ideas and information over the Information Superhighway.

So what the heck is an IRC?

IRC stands for Internet Relay Chat. The IRC network is a virtual meeting place where people from all over the world can meet and talk (well, type). On IRC you meet others on "channels" (rooms, virtual places, usually with a certain topic of conversation) to talk in groups. There is no restriction to the number of people that can participate in a given discussion or the number of channels that can be formed on IRC. One server can be connected to several other servers and up to hundreds of clients.

Depending upon your computer and your link to the Internet, you may be able to talk on SuperChat by going directly to the SuperChat web site, www.superchat.org, then look for "Click here to just connect." Please note: chatting through the web site requires your web browser (e.g., Netscape Navigator) to be "Javaenabled" and some Internet providers have a "firewall" that will not allow you to chat through a web site. Go ahead and give it a try...the worst that can happen is you will not make the connection to IRC.

You will get a box that asks for your "nickname" and your email. Give yourself a nickname that is not your real name; do not worry about being too clever with it...you can change it later. Then click on "Connect." When you have connected to IRC, some text will scroll by. Type "/join #apsteachers" in the box at the bottom of the window and hit "Enter." Welcome to the APS Teachers Chat Room!

If you try chatting through the SuperChat website and find it slow or difficult to connect, then try using an IRC client (recommended method). You have to download and install a separate shareware program, but the speed and features of an IRC client program make chatting much easier and more enjoyable. The most popular of the IRC Clients is shareware called mIRC. You can download it for free from http://www.mirc.co.uk/get. If you are using Windows95 you should download a 32bit version. If you are using Win3.x (that is, Windows 3.0, etc.) you should download a 16bit version. If you use a MacIntosh and want to use an IRC client, you can go to http://tucows.tier-ranet.com/mac/roommac.html and download one of the Macintosh clients available.

The APS Teacher Chat Room will hold discussions on physiology topics, teaching strategies, and the use of animals in research and teaching. In the APS Chat Room, only a few rules apply. No flames (personal insults) or swearing even if you vehemently disagree with what someone is saying, and most importantly, have fun! For more information, see www.faseb.org/aps/ educatn/chatinfo.htm.

If you have a suggestion for a topic that you would like to see addressed in this column, contact plombard@aps. faseb.org. Until next time, Happy Surfing!

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The Physiologist, APS 9650 Rockville Pike Bethesda, MD 20814-3991 Phone: 301-530-7165

Lydic named first Julien F. Biebuyck Professor of Anesthesiology

Ralph Lydic, APS member and current APS Public Affairs Committee member, has the honor of being named the first Julien F. Biebuyck Professor of Anesthesiology.

In 1979, Lydic earned a PhD in physiology in the laboratory of John Orem at Texas Tech University.

Postdoctoral years were spent in the laboratory of neurophysiology at Harvard Medical School where Lydic worked with Allan Hobson. While at Harvard, he was promoted to assistant professor of physiology in the Department of Psychiatry. In 1986, Lydic moved his laboratory to The Pennsylvania State University's College of Medicine. In July 1989, he was appointed director of the Division of Anesthesia and Neuroscience Research. Since July 1991, Lydic has served as professor in the Department of Anesthesia and in the Department of Cellular and Molecular Physiology.

Awards and honors resulting from Lydic's research include an Upjohn



Physiology Study Section of the NIH. Lydic's research aims to understand the cellular and molecular mechanisms that cause respiratory depression during the loss of waking consciousness. These basic studies are funded by the Heart, Lung, and Blood Institute of the NIH because of their potential clinical relevance for disorders such as sudden infant death syndrome, adult sleep apnea, and anesthesia-induced respiratory depression. Currently, Lydic holds two NIH awards supporting his research.

Washington State University Names George Hedge to Research Position

Ralph Lydic

Pharmaceutical Scholarship (Harvard

Program Scholarships (Woods Hole

Neurobiology

School),

Medical

George A. Hedge, associate dean for research and graduate studies at the West Virginia University School of Medicine, has been named vice provost for research at Washington State University.

The appointment was announced by WSU Provost Gretchen Bataille.

Hedge assumes the responsibilities for research Sept. 15, replacing Robert Smith, who resigned last year to take a similar post at the University of Connecticut.

A member of the physiology faculty at WVU School of Medicine since 1977, Hedge has served as associate dean since 1990. He was chair of the physiology department from 1977-90 and held the Edward J. Van Liere Professorship from 1985-94.

A 1961 graduate in biology education at the University of Missouri, Hedge

also earned a pharmacology degree at Missouri and a doctorate in physiology from Stanford University.

Beginning his professional career as a research fellow at the University of Utrecht, The Netherlands, Hedge also was on the physiology department faculty at the University of Arizona College of Medicine for nine years.

He serves as chair of the Board of Directors of the West Virginia Association for Biomedical Research, has been chair of the national Council of Academic Societies and is the representative of the US Endocrine Society to the council. Among his many publications is a 1987 textbook "Clinical Endocrine Physiology."

Provost Bataille said WSU is fortunate to attract a person with Hedge's experience. "As a researcher, administrator and faculty member, he has participated in university-wide research initiatives. His experience in a medical school brings strengths to support WSU's growing interest in biomedical research, veterinary medicine, nursing and pharmacy, in addition to the basic sciences," she said. "His experience with campus-wide initiatives has provided him with knowledge about the humanities, arts and social sciences."

Hedge said he is delighted to have the opportunity to join the WSU researchcommunity. "This institution has an outstanding reputation nationally, and it is clear that both the faculty and the administration are committed to further growth of this essential element of our academic mission. I look forward to both the challenges and the opportunities inherent in facilitating this growth."

Ronald F. Abercrombie has left the Department of Physiology, Emory University, School of Medicine, Atlanta, GA, and has joined the Department of Physiology and Biophysics, University of Washington, Seattle, WA.

Leonard P. Adam has accepted a position with Bristol-Myers Squibb, Cardiovascular Drug Discovery, Princeton, NJ, and has moved from Boston Biomedical Research Institute, Boston, MA.

Accepting a position with the West Roxbury Veterans Administation Medical Center, West Roxbury, MA, **Hamid I. Akbarali** has left the Division of Gastroenterology, Beth Israel Deaconess Medical Center, Boston, MA.

Joining the Department of Ophthalmology, Case Western Reserve University, Cleveland, OH, **Francisco H. Andrade** has moved from Baylor College of Medicine, Department of Medicine, Pulmonary Division, Houston, TX.

Having accepted a position with the Department of Physiology, Medical College of Wisconsin, Milwaukee, WI, **David Patrick Basile** has left the Department of Internal Medicine, Renal Division, Washington University School of Medicine, St. Louis, MO.

As a Clinical Research Specialist, **Donald Bebout** has joined Nellcor Puritan Bennett, Inc., Department of Clinical Studies, Pleasanton, CA. Prior to his new position, Bebout was associated with the Ohio State University College of Medicine, School of Allied Medical Professions, Respiratory Therapy Division, Columbus, OH.

William J. Becker has accepted an assignment as Research Scientist, Department of Diving and

Environmental Physiology, Naval Medical Research Institute, Bethesda, MD. Prior to his new post, Becker was a Graduate Assistant at the Noll Physiological Research Laboratory, Pennsylvania State University, University Park, PA.

Zibin Chen has joined the Glaxo Wellcome Inc., Division of Pharmacology, Research Triangle Park, NC. Chen was formerly with the Department of Physiology, University of North Carolina, Chapel Hill, NC.

Recently, **Deepak Kumar Chugh** affiliated with the Department of Medicine, Harbor Hospital Center, Baltimore, MD. Prior to his new commitment, Chugh was with the Department of Physiology, University of Pennsylvania School of Medicine, Philadelphia, PA.

Daniel J. Conklin is currently with the Department of Biology, University of Wisconsin, Eau Claire, WI. Prior to moving to Wisconsin, Conklin was with the Department of Pathology, University of Texas Medical Branch, Galveston, TX.

Previously affiliated with the Department of Molecular Hypertension, Baker Medical Research Institute, Prahran, Australia, **Catherine L. Coulter** has recently joined the Department of Physiology, University of Adelaide, Adelaide, Australia.

Having accepted a position with the Department of Neonatology, Division of Pediatrics, Cleveland Clinic Foundation, Cleveland, OH, **Richard M. Cowett** recently left the Women & Infants Hospital of Rhode Island, Department of Pediatrics, Brown University School of Medicine, Providence, RI.

Undertaking an assignment with the Department of Physical Therapy, Louisiana State University Medical Center, New Orleans, LA, **Jane M. Eason** is no longer affiliated with the Department of Anatomy and Cell Biology, Emory College of Medicine, Atlanta, GA.

Pauline L. Entin is currently affiliated with the Department of Medicine, University of California, San Diego, La Jolla, CA. Previously, Entin was a Graduate Student at Cornell University, Ithaca, NY.

Jinping Fan has accepted a position with the Cardiovascular Institute, Loyola University Medical Center, Maywood, IL. Prior to relocating, Fan was associated with the Department of Physiology, University of South Carolina School of Medicine, Columbia, SC.

Accepting the position of Vice President of Biological Research and Development, Trega Biosciences Inc., San Diego, CA., **Stephen F. Flaim** is no longer affiliated with Alliance Pharmaceutical Corporation, Biological Sciences, San Diego CA.

Peter A. Friedman has joined the Department of Pharmacology, University of Pittsburgh School of Medicine, Pittsburgh, PA. Prior to his new position, Friedman was with the Department of Pharmacology & Toxicology, Dartmouth Medical School, Hanover, NH.

Joining the Department of Psychiatry, Wayne State University, Detroit, MI, **Philip B. Furspan** has left the Department of Physiology, University of Michigan, Ann Arbor, MI.

Formerly, **Thomas M. Glenn** was President of Panda Pharmaceuticals, Houston, TX. Recently, Glenn assumed the Presidency of the University of South Alabama College of Medicine, Mobile, AL.

James B. Grotberg has joined the

Department of Biomedical Engineering, University of Michigan, Ann Arbor, MI. Before his new affiliation, Grotberg was with the Biomedical Engineering Department, Northwestern University, Evanston, IL.

Formerly with the VA Medical Center, Division of Cardiovascular Diseases, Iowa City, IA, **David D. Gutterman** has affiliated with the Cardiovascular Research Center, Medical College of Wisconsin, Milwaukee, WI.

Accepting a position with the Pennsylvania State University Bioengineering Program, University Park, PA, **Norman R. Harris** has moved from the Department of Physiology, Louisiana State University Medical Center, Shreveport, LA.

Currently, the Vice Provost for Research, Washington State University, Pullman, WA, **George A. Hedge** has moved from Morgantown, WV, where he was the Associate Dean, Research and Graduate Studies, West Virginia University School of Medicine.

Having left the Department of Molecular Cell Physiology, the University of Cincinnati, Cincinnati, OH, **Tracey L. Keith** has joined the Department of OB/GYN and Reproductive Science, University of Pittsburgh, Magee Womens Research Institute, Pittsburgh, PA.

Timothy James Kieffer formerly associated with the Laboratory of Molecular Endocrinology, Massachusetts General Hospital, Boston, MA, is currently affiliated with the Department of Medicine and Physiology, Division of Endocrinology & Metabolism, University of Alberta, Edmonton, Alberta, Canada.

Having joined the Department of Physiology, University of Mississippi Medical Center, Jackson, MS, **Christoph P.R. Klett** has left the Department of Pharmacology, University of California, San Diego, La Jolla, CA.

Howard G. Knuttgen has accepted a position with Spaulding Rehabilitation Hospital, Department of Physical Medical Rehabilitation, Boston, MA. Prior to his new position, Knuttgen was the Director of the Pennsylvania State University Center for Sports Medicine, University Park, PA.

John H. Linehan has joined The Whitaker Foundation, Rosslyn, VA, as Vice President. Prior to his new commitment, Linehan was Professor and Chairman of the Department of Biomedical Engineering, Marquette University, Milwaukee, WI.

Edward Lowenstein, formerly Anesthetist-in-Chief, Beth Israel Hospital, Boston, MA, has joined the Department of Anesthesia and Critical Care, Massachusetts General Hospital, Boston, MA.

Formerly the Director of Sinai Hospital of Detroit, Center for Lipid Metabolism, Detroit, MI, **James J. Maciejko** recently accepted the position of Director of Botsford General Hospital, Center for Lipid Metabolim and Atherosclerosis, Farmington Hills, MI.

Recently, **James P. Maloney** moved from the Department of Pulmonary Science, Pathology and Pediatrics, Health Sciences Center, University of Colorado, Denver, CO. Maloney has joined the Department of Pulmonary Critical Care, Medical College of Wisconsin, Milwaukee, WI.

Christopher C. Michel is now affiliated with the Division of Biomedical Science, Cell and Integrative Biology, Imperial College School of Medicine, South Kensington, UK. Prior to his new affiliation, Michel was with the Department of Physiology and Biophysics, St. Mary's Hospital Medical School, London, UK.

Accepting a position with Cornell University, Department of Veterinary Physiology, Laboratory Pregnancy and Newborn Research, Ithaca, NY, **Mark J.M. Nijland** has left the Harbor-UCLA Medical Center, Torrance, CA.

Having left the Department of Medicine, Division of Nephrology, Hennepin County Medical Center, Minneapolis, MN, **Hiroaki Oda** has become a member of the Clinical Staff of the Department of Medicine, Kure National Hospital, Kure, Hiroshima, Japan.

Allen C. Parcell, formerly affiliated with the Human Performance Laboratory, Ball State University, Muncie, IN, has recently joined the Department of Physical Education, Brigham Young University. Provo, UT.

After leaving the Dalton Cardiovascular Research Center, University of Missouri, Columbia, MO, **Janet L. Parker** has joined the Department of Medical Physiology, College of Medicine, Texas A&M University Health Science Center, College Station, TX.

Moving from the Department of Exercise Science, University of Georgia, Athens, GA, **Chester A. Ray** has joined the Division of Cardiology, Milton S. Hershey Medical Center, Hershey, PA.

Lorrie D. Rea has joined the Department of Biology, University of Central Florida, Orlando, FL as an Assistant Professor. Prior to moving to Orlando, Rea was with the National Marine Mammal Laboratory of the National Marine Fishery Service, National Oceanic Atmospheric Administration, Seattle, WA.

David A. Roth is currently the Research Director of Collateral Therapeutics, San Diego, CA. Prior to his new position, Roth was the Assistant Professor, Department of Kinesiology, University of Colorado, Boulder, CO.

Accepting a position with the Department of Veterinary Medical Biosciences, University of Missouri, Columbia, MO, **James W.E. Rush** has left the Department of Physiology, SUNY Health Science Center, Syracuse, NY.

Kenzo Sato has accepted a position with the Human Gene Therapy Research Institute, Des Moines, IA. Prior to his new position, Sato was with the Department of Dermatology, University of Iowa Hospitals, Iowa City, IA.

Having joined the National Institute of Health and Digestive and Kidney Diseases, NIH, Bethesda, MD, **Jurgen Schnermann** is no longer with the Department of Physiology, the University of Michigan Medical School, Ann Arbor, MI.

Dan David Sheriff has accepted a position with the Department of Exercise Science, University of Iowa, Iowa City, IA. Previously, Sheriff was assigned to the Air Force Research Lab, Brooks Air Force Base, San Antonio, TX.

Peggy McGinnis Simon is presently the Senior Associate Consultant, Dartmouth-Hitchcock Medical Center, Section of Pulmonary & Critical Care Medicine, Lebanon, NH. Simon was previously a Senior Associate Consultant with the Mayo Clinic, Rochester, MN.

Accepting a position as Associate Professor, Texas A&M College of Veterinary Medicine, Texas Veterinary Medical Center, College Station, TX, John N. Stallone has left the Physiology Department, College of Medicine, Northeastern Ohio University, Rootstown, OH.

Annmarie Surprenant has moved from Glaxo Institute for Molecular Biology, Geneva, Switzerland, to the Institute Molecular Physiology, Department of Biomedical Science, University of Sheffield, Sheffield, UK.

Robert J. Talmadge is presently Assistant Professor, Department of Human Nutrition Foods & Exercise, Virginia Polytechnic Institute & State University, Blacksburg, VA. Prior to his new assignment, Talmadge was an Assistant Researcher, Department of Physiological Science, University of California-Los Angeles.

Joining the University of Pennsylvania School of Nursing, Science and Role Development Division, Philadelphia, PA, **Nancy C. Tkacs** has left the Department of Psychiatry, New Jersey Medical School, Newark, NJ.

Accepting a new position with the University Occupation and

Environmental Health, School of Medicine, Second Department Internal Medicine, Kitakyushu, Japan, **Masato Tsutsui** has left the Department of Cardiology, Moji Rousai Hospital, Kitakyushu, Japan.

Carlos G. Vanoye-Trevino has left the Department of Physiology & Biophysics, the University of Texas Medical Branch, Galveston, TX. Vanoye-Trevino has now joined the Department of Medicine, Division of Nephrology, Vanderbilt University Medical Center, Nashville, TN.

Accepting a position with Parke Davis Laboratory for Molecular Genetics, Alameda, CA, **David B. West** has left the Pennington Biomedical Research Center, Louisiana State University, Baton Rouge, LA.

hia, Affiliating with Covance as the the Executive Director of Medical Safety, rsey CAPS Division of Medical Safety & Therapeutics, Princeton, NJ, Jeffrey T. Whitmer has left the position of the Director of Metabolic Studies, Bristoland Myers Squibb, Princeton, NJ.

Schultz appointed to Editor of University of Texas-Houston Electronic Press

Stanley G. Schultz, APS Past-President and current editor of *News in Physiological Sciences*, was recently given additional duties at the University of Texas, Houston, where he was appointed Editor of the University of Texas-Houston Electronic Press. The Electronic Press will function in a fashion analogous to a university press, except it will be disseminating scholarly work electronically. Schultz's experience with the founding of *APStracts*, the Society's first online journal of abstracts from accepted manuscripts (first hosted on a University of Texas gopher server and then by the World Wide Web) will serve him well in his new position.

Deceased Members		
Eugene Aserinsky	Eugene Grim	
San Diego, CA	St. Paul, MN	
Joseph C. Gabel	Lazaro J. Mandel	
Los Angeles, CA	Durham, NC	
David E. Goldman	Charles G. Wilber	
Falmouth, MA	Fort Collins, CO	

News from Senior Physiologists

Letters to Michael Bárány

Allen Rovick writes: "Thanks for your birthday greetings and your invitation to share my life with the members of APS. Like many people I have had a 'career change', in my case from bench scientist to teacher/education researcher. The transition began more than 15 years ago when I became interested in computerbased teaching. I started to write teaching programs which I hoped would stimulate, challenge, and help to provide effective learning platforms for students. I think that I have been reasonably successful in this. The next step was to join with a colleague at Rush, Joel Michael, and Martha Evens, a computer scientist at IIT, to design and produce an intelligent computer tutor with a natural language front end. The Office of Naval Research has been supporting this activity for the past ten years. It has been a most stimulating and educating effort. Like all computer programs the elements in it must be stated explicitly, a requirement that quickly demonstrated how little we knew about how our students learn and how we as educators teach. We have extensively studied these activities during the past decade, and it has been quite informative and rewarding.

"I have also become interested in instructional activities that actively engage students, believing that these are more effective learning modalities than is the overused lecture. This has led to my involvement in workshops at APS, IUPS, and HAPS meetings and with ECFMG. Joel Michael and I have written a book on the use of problem solving in the teaching of physiology. It is due out next month. The establishment of the Teaching Section of APS has provided a forum for exchanging ideas with like-minded teachers of physiology. It has also led to my becoming a member of PERC (The Physiology Educational Research Consortium), a group of physiology teacher/educational researchers who are attempting to



improve the way in which our discipline is learned at all educational levels. Our last year's activity was supported by a pilot grant from NSF.

"I hope to continue these activities for a few more years. Thanks again for your interest."

Joseph Engelberg writes: "Thank you for inviting me to contribute a few words to *The Physiologist*.

"I retired four years ago (at age 66) to make a faculty line available to a younger scientist and, thereby, help launch a family and a career. The university has since been very good to me, allowing me to retain my office and support staff. In my younger days, I thought being a postdoc as the best of all worlds—the opportunity for scholarly work without distraction. Now I am essentially a postdoc again (but without the title); it is a great blessing.

"I won't bore you with reciting what I am doing presently since it is what academics in my position would tend to be doing. Allow me, however, to tell you of a project which may be of interest to some of your readers.

"Some years ago I founded the Office of Integrative Studies at the University of Kentucky. About four years ago this Office, in turn, founded the "Lexington Academy of Senior Professionals," an organization which it continues to provide logistical and moral support.

"To facilitate parking, members meet in the library of the local Jewish Temple, not at the University. The group meets weekly from 2 to 5 PM. most weeks of the year. There are now close to 40 members, with weekly attendance at 18 to 25 members. The yearly dues are \$20 per person to defray the costs of xeroxing and refreshments.

"The Academy sponsors no lectures

or other passive forms of group participation. Instead, a text is read aloud a few lines at a time and serves as a catalyst for discussion. Texts are drawn from the works of some of the best thinkers of the past 3000 years. Montaigne, economic theory, Plato, the Afro-American migration from South to Northern cities, Dante, medieval history, and James Joyce are some of the subjects of previous meetings. Generally, three consecutive sessions are devoted to each subject.

"The entire life experience of each member is the only preparation required of our members for each session. Members have quickly bonded; many friendships have formed. Starting the group was not difficult. We brought together a few people at a convenient site, then immediately began meeting on a weekly basis. As regards starting such an organization, three things are important: a steady rhythm of weekly meetings; maintaining high standards for the texts; not allowing members to lecture. This being done, a membership of high quality develops spontaneously by self-selection."

Letters to Kenneth Zierler

Robert M. Berne writes: "In the past, I have avoided replies to 'what are you doing now' because I felt that no one was really interested. However, since I have been on the Senior Physiologist Committee and am now chairman of the committee, my views have changed. Also, I feel duty-bound to contribute and now appreciate that members of the APS are really interested in what the 'old folks' are up to.

"I relinquished the Chair in physiology in 1988 and became emeritus in 1994. Since then, I have worked about half time, updating our physiology texts, reviewing papers, and attending meetings. I spend the rest of the time pursuing my hobbies (tennis, fishing, classical guitar) and traveling solely for pleasure. Beth and I spend the summers

News from Senior Physiologists

in Woods Hole where we are visited by our four children (plus spouses) and our seven grandchildren."

Harry Goldsmith writes: "I was very surprised but truly honored to receive your letter: surprised as I am not really a bona fide Physiologist with my background in chemistry and my past research in biorheology, but honored to be asked to contribute to the news from senior physiologists. I am blest with good health, and the arrival to contribute of the 70th birthday did not bring any changes in my academic or research activities in the Montreal General Hospital and McGill. I still work full days, teach sections on the mechanics of blood flow in three courses in Physiology and one in Colloid Chemistry at McGill and also coordiadvanced nate я course in Cardiovascular Physiology. I was fortunate to obtain research grants which may enable me to pursue my work on shear-induced blood cell interactions into the 21st century. I still enjoy attending and presenting at the annual meetings of the Microcirculatory Society of Experimental Biology and hope to travel to the 11th Congress of the International Society of Biorheology in 1999. Since 1995, I have been Editor-in-Chief of the journal Biorheology. The main change in lifestyle actually occurred in 1995 when I retired from being Director of the Division of Experimental Medicine, the graduate arm of the Department of Medicine at McGill, with well over 100 PhD students enrolled.

"It would be remiss of me if I did not use this occasion to point out how fortunate I have been all these years to have found a niche in research in biorheology and biophysics at McGill, to have been accepted in a department of medicine, and to have been able to work in the environment of a hospital research institute. For this, I owe a debt of gratitude to the late Stanley Mason, Sir Arnold Burgen, Douglas Cameron, Francis Chinard, and above all to the late Carl Goresky, who is greatly missed.

"Life is not all work, and my wife and I travel to see family, children, and grandchildren and were recently at a reunion in Germany to attend the opening of an exhibition to commemorate a bicycle factory originally founded by my great uncle and grandfather in 1882.

"Thank you for having written to me and for the opportunity to write this column."

Francis P. Chinard writes: "Thank you for your letter requesting information regarding my present activities, scientific and otherwise. Here is probably more than you ever wanted to know.

"The New Jersey Medical School gave me a retirement dinner last October (1997) so I suppose that is more or less the date of my retirement. However, from other standpoints it may have started nearly 10 years ago when I became a 'Distinguished Professor' or perhaps two years ago when I was made 'Emeritus'."

"There has been a substantial reduction in my laboratory activities as I am now without any full-time assistants, but I still manage to do some experiments. One set is on the effects of free radicals and of organic mercury compounds on the microcirculation and on the permeability of the endothelium of rat lungs, hearts, and kidneys. There is an intense vasoconstriction, calcium dependent, reversed by sulfhydryl compounds. Curiously, these experiments echo in part an early research effort I was engaged in when I was a medical student at Hopkins on the inhibition of the enzyme urease by organic mercurials, also reversible by sulfhydryl compounds. Another set of experiments is related to osmotic pressure and the concept of the colligative properties of solutions. In a sense, it is a contrast between the strict approach of Willard Gibbs and the interpretations imposed on the experiments of Ernest Starling.

In brief, I have suggested that the endothelium, at least in the lungs, is similar to a desalting membrane. An early sign of endothelial injury in the lungs could well be an increased permeability to sodium and chloride. The increased permeability to proteins, so much studied in the adult respiratory distress syndrome, could well be a late, perhaps too late, phenomenon.

"On the clinical side, I serve as an occasional consultant or referring physician and try to act as a buffer in the many problems patients encounter in the managed care game. I can conclude only that the market place and the forprofit organizations are have a detrimental effect on the quality of medical care.

"I am also participating in a clinical study of the possibility of helping patients with emphysema by reducing lung volume by non-invasive, i.e., nonsurgical means. The hostility exhibited by some surgeons to this suggests that we may be on the right track. Also, with a microbiologist colleague, I am gathering data on risk factors on pneumococcal infections in Newark, New Jersey. There is a high correlations with HIV infection.

"As to teaching, I plan to continue for at least another year an elective on the history of medicine in which I trace the evolution of our institutions and practices. Another elective is on current issues in medicine, in which there is active participation by students in discussions of subjects ranging from the Hippocratic Oaths (old and new versions), through euthanasia and medical ethics, to the duration of medical education and training. I always include a well-received diatribe on academic bulimia, garaging, and regurgitation on the examinations.

"I also participate in the activities of several historically oriented groups. A recent effort was a brief presentation at the Charaka Club in New York City of 'Renal reminiscences of a former renologist'. That was preceded by two chap-

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ters in a book *A History of Breathing Physiology* edited by Don Proctor, relating to respirology in the 18th century and to the contributions of Lavoisier and Priestley. There have also been seven mini-biographies of scientists for a junior encyclopedia.

"Just to make sure that I keep out of trouble, I am participating in the development of a Master of Public Health program involving our Department of Preventive Medicine under Donald Louria, the New Jersey Institute of Technology, and Rutgers in Newark. This serves to strengthen my hopes that eventually, through research and preventive activities, clinical medicine as we know it can safely self-destruct but by apoptosis rather than necrosis.

"What I will not do may explain some of the above. I will not serve on committees. I will not attend meetings on matters I am not interested in, and I am no longer president of a not-for-profit medical practice corporation.

"As to words of wisdom to younger colleagues, I could say: 'Cheer up. It will get worse before it gets better', and as I do for medical students, I would add 'Make it get better. It's up to you'."

"Thank you for this opportunity. I remain, despite occasional vacillations, a Voltairian optimist."

Sami Said writes: "It was a pleasure to get your letter, and I must first apologize for the lateness of my reply. I probably would have written back earlier, if you hadn't told me that the letter might be published in *The Physiologist*!

"My 70th birthday snuck up on me a few weeks ago. Happily, I am still active at work, and enjoying. Since arriving here in 1991, I have held a professorship in the Departments of Medicine and Physiology, as well as membership in the Faculty of the Graduate Program in Pharmacology. I have also been a Medical Investigator and a Physician at the affiliated VA Medical C enter in nearby Northport. Following the untimely death of my friend and long-time colleague Ed Bergofsky, in 1993, I served as Acting Chief of the Pulmonary and Critical Care Division at the University, until last year. I continue to hold the same position at Northport where, earlier this year, I was also named Associate Chief of Staff, R&D.

"My associates and I have been examining the mechanisms and modulation of two conditions of importance in pulmonary medicine: acute lung injury, and bronchial asthma and airway inflammation. Vasoactive intestinal peptide (VIP), as an anti-inflammatory agent, is a major focus in both projects. VIP, as you may remember, is the neuropeptide that I discovered and, with Viktor Mutt in Stockholm, isolated from small intestine 28 years ago. My research is supported by two NIH grants and by the VA. Recently, I have extended my studies to neuronal cell injury and death in an attempt to shed more light on the mechanisms of neuronal loss in Alzheimer's disease and stroke. Not surprisingly, acute lung injury and brain cell death turn out to have several causative mechanisms in common, including reactive oxygen species, glutamate toxicity, and apoptosis.

"I still attend the FASEB (now Experimental Biology) meetings faithfully, as well as the American Thoracic Society, both of which have become thoroughly international, rather than just American. I now also participate in meetings of the Society for Neuroscience, which continues to grow in size.

"This Senior Physiologist intends to continue to work, so long as he remains healthy and productive—and is permitted to work. There is still much to be done!"

Bill Blake writes: "We are both in reasonably good health, still able to travel, etc. We spent January, February, and March in the Southern California desert where El Nino made the floral display incredible, 'best in 100 years'.

"I'm also somewhat disorganized, no

secretary for 19 years and don't type. Since you forgot to include what aged Physiologists are interested in, I'm at a loss and have done nothing physiological (except exist) since retiring in 1979. I've given up gardening (we sold our house on the bay and moved into an apartment in town) but still paint and exhibit (group shows) occasionally, and, as noted, we travel, usually Europe, once a year or more."

Christopher Longcope writes: "Many thanks for your letter of March 6, 1998.

"I can't believe I'll be 70 this year, and most of the time I don't feel that way. I am now retired and working part time at the Medical School keeping my labs going and doing some teaching as well. I try to teach Physical Diagnosis the way you taught it to me. It's fun but I am not sure how successful I am. The course is much shorter than it should be, six sessions to learn how to take a history and physical. It is not enough time, and they really should have much more.

"I am not sure whether I'll get to my 45th reunion this June, but if I do I shall look forward to seeing everyone."

Victor J. Wilson writes: "I apologize for not answering earlier your letter of March 10th, in which you noted my approaching 70th birthday. I do eventually plan to write you the kind of letter the Society suggests, but would like to wait until I pass this milestone and officially retire next summer.

"You are quite right that letters such as those that appear in *The Physiologist*, and similar occasions, bring back memories and can bring old friends and acquaintances out of the woodwork. This year is the 50th anniversary of my college graduation, and the appearance of Gene Renkin's name as one member of your committee in a recent issue of *The Physiologist* resulted in a pleasant exchange of letters. We graduated at the same time, and had not been in touch since."

Letters to Robert Berne

Wendell N. Stainsby writes: "I am fully retired now. I am clearly not part of the modern scene, so I come in for e-mail and some minor reviewing. I live on 6 acres outside of town and like to dig in the dirt, the other hobby, you know, camping. The lost VW (a '95 Eurovan Camper) was a bummer and got traded for the largest Chevy van, with a diesel, and a Roadtrek camper built in. The rest of the time we mosey around camping, usually in the National Forests.

"Our health as we approach 70 is fine. Hope it stays that way for a while."

Rafael Rubio writes: "Since I left "Old Virginia" two years ago and came to San Luis Potosi in the "old Mexico" I joined the faculty of the school of medicine of the Universidad de San Luis Potosi. I have spent most of my time setting up my laboratory, recruiting personnel, and initiating experimental work. Finally things are moving along and we have attained momentum. I continue working in the lab on projects funded by the Mexican Federal Government, Grants are modest but sufficient to do some work and we are making progress. I have in the lab a postdoctoral fellow, a graduate student, a American medical student (AHA fellow), and a technician, and in the summer three more people will come aboard. So you see I am very busy doing what I have always done and like to do most, science. Indeed this is fun and I cannot think of anything more rewarding and enjoyable than to explore the unknown guided by your imagination and the ship steered in the right direction by experiment. This would be my 'words of wisdom' to the younger colleagues. Do it.

"My incorporation into Mexican academic society has had its frustrations and rewards. In this society you can do very simple things which are very important to improve science development and your experience of years and years is valued and is looked at as guidance. This compensates for the frustrating and negative things. Overall it is a new opportunity to contribute to growth, far from the more competitive and restraining atmosphere at home. We all seniors should try it. It is very refreshing. As for the country as you well know is very different and diverse culturally and geographically and much is to be seen and discovered even for some of us that were born here, but spent half of our life elsewhere."

Letter to Arthur Vander

Piero P. Foa writes: "Reading the latest 'News from Senior Physiologists' in the current issue of *The Physiologist* reminds me that I too received letters of congratulations and good wishes for my 70th, 75th, and 80th birthdays. Thus, I look forward to receiving one in 2001, unless the APS computers will show that on that date. I will be -10, rather than +90 years old. No matter, at my age, celebrations are held no longer every decennium or every lustrum, but every year. For this reason, I celebrated my 86th birthday skiing at the top of Snowmass, CO and, until recently, went horse-back riding with my very patient daughter. I have since succumbed to the discomfort of osteo-arthritis and the entreaties of my friends and my doctors and hung-up my skis and my boots. I rationalize that this give me more time for "physiologic" activities, such as the one described in the enclosed story (see announcement below). Other enjoyable efforts include attending the weekly sessions of the Physiology Journal Club, and giving yearly clinical correlations in Endocrinology (Growth, Cushing and Diabetes) to the freshmen. Most rewarding is to help orchestrate a series of sessions on integrated physiology, entitled Energy Exchanges in the Human Body, a topic that includes a broad overview of the efficiency and temperature regulation. Not very original, to be sure, but a lot fun for the faculty who have a chance to change their story every year and most importantly, new to each class of students who, constantly bombarded by chromatography gels, are reminded that there is more to the forest than trees and underbrush."

Videotape Copies of Pavlov's "Function of the Brain" available

At the 14th International Congress of Physiology, held in Rome in 1932, Ivan P. Pavlov projected a film entitled "The Function of the Brain." After the Congress, Pavlov donated the film to Professor Carlo Foa, then Chairman of the Department of Physiology at the University of Milano. He used the film for many years and after his retirement, sent it to his son, Piero Foa, in Detroit where, in collaboration with Ernest E. Gaynes and Robin A. Barraco, he supervised the translation of the captions into English and had the film transferred to 16-mm safety reels. The original 35-mm nitrate film was destroyed in compliance with fire and safety regulations. The film, black and white and silent, may appear elementary and sometimes naive to a modern viewer; nevertheless, it is of great historic interest because of its authenticity and because it depicts Pavlov's basic experiments on conditioned reflexes and some of his observations on the development of behavior in animals and man.

The film has now been transferred again, this time on two VCR cassettes, a complete 90-minute version and a 45-minute version, perhaps more suitable for classroom presentation. Both are in the custody of John A. Popplestone, PhD, Director of the Archives of the History of American Psychology, The University of Akron, Akron, OH 44325-4302, to whom one may write for additional information.

Oxidative Stress and Signal Transduction

H. J. Forman and E. Cadenas (Editors) New York: Chapman & Hall, 1997, 475 pp., illus., index, \$84.95 ISBN: 0-412-07681-0

Oxidative Stress and Signal Transduction, edited by Henry Forman and Enrique Cadenas (of the University of Southern California) is a timely state-of-the-art reference for investigators in the field of signal transduction and oxidants. Oxidative stress from exogenous or endogenous generation of free radicals can lead to cellular injury and death. However, oxidant species are now recognized to also alter cell function by acting as signal molecules or by affecting activation of second messengers in signal transduction. The role of oxidants in signaling is important to normal cell functioning but also likely plays a role in pathogenesis of disease in which oxidative stress is increased, e.g., chronic inflammatory disorders. Thus, the investigation of oxidants in cell signaling has increased over the past few years. This is the first reference text to review oxidative stress in the context of signal transduction. The book is divided into three parts, with an introduction by the editors. The editors outline the questions that are addressed in each section and inconsistencies among the sections. The text

effectively covers topics such as oxidants as signaling molecules, nonenzymatic oxidation products as second messengers, oxidant effects on physiological signaling, genes responsive to oxidant stress, regulation of oxidant responsive genes and transcription factors, and cellular consequences of oxidative signaling. Topics are organized in the text at three levels: (part 1) the immediate cellular responses to oxidative stress and the production of second messengers, (part 2) the connection of oxidation-induced changes in second messengers and transcription factors with activation of gene expression, and (part 3) gene expression in response to oxidative stress.

Part 1 of the book, "Immediate cellular response to oxidative stress and the production of second messengers," is the most extensive, and composed of nine chapters including oxidant regulation of nitric oxide-cyclic GMP signaling, oxidant-mediated phospholipase activation, protein kinase and tyrosine phosphorylation in oxidative stress, and reactive oxygen intermediates including peroxynitrite as signaling molecules. The biochemistry of NO synthesis is also very clearly reviewed in this section.

Part 2 consists of four chapters that explore how oxidative-induced changes in second messengers and transcription factors are connected to activation of gene expression. Transcription factors and DNA responsive elements discussed include nuclear factor kB (NFkB), activator protein 1 (AP 1), signal transducers and activators of transcription (STATs), and the antioxidant response element. In addition, the role of oxyradicals as signaling molecules for regulation of cell proliferation is reviewed.

Part 3 is composed of five chapters that cover the modulation of gene expression in response to oxidative stress. In addition to cytokine genes such as tumor necrosis factor, interleukin 8, monocyte chemotactic protein 1, and macrophage inflammatory protein, the oxidant regulation of other genes including heme-oxygenase-1, glutathione peroxidases, and DT-Diaphorase is reviewed. Modulation of gene regulation by environmental agents that lead to increased oxidant generation in vivo including asbestos and silica are also discussed.

This book is expertly edited, and the chapters are well-organized and written by prominent investigators in the fields. Information is up-to-date, with several chapters including unpublished data. The figures are clear with legends that provide good summary information. This text is a good reference source for scientists in the field of oxidants, antioxidants and cellular signaling.

Serpil C. Erzurum The Cleveland Clinic Foundation

Development of Cardiovascular Systems: Molecules to Organisms

Warren W. Burggren and Bradley B. Keller (Editors) Cambridge, UK: Cambridge University Press, 1997, 360 pp. illus., index, \$74.95 ISBN: 0-521-56072-1

Development of Cardiovascular Systems is a composite volume with a coherent theme—cardiovascular development. The uniqueness of cardiovascular development is that the circulation is the first functional system of the developing embryo. As the editors of this volume point out in the Introduction, the development of other embryonic systems is contingent upon the delivery of oxygen and metabolic substrates by the circulation.

The book is divided into three parts. The first part deals with the mechanisms—molecular, cellular and integrative—of cardiovascular development. This section has chapters on the role of genetic manipulations (gene targeting is a powerful tool in the study of cardiovascular development), membrane structure, the heart's contractile system, angiogenesis, the extracellular matrix, endothelial cell development, the coupling of structure and function, and hormonal regulatory systems. The second part of the book is comparative in nature, comprehensively covering specific variations in patterns of development in invertebrates, fish, amphibians, reptiles, birds, and mammals, with an

additional chapter on insights gained from the study of the evolution of the heart and circulation, and a special chapter on vertebrate cardiac morphogenesis. This part is the most structured of the three parts. The third part encompasses aberrations of development in disease or as a result of environmental (oxygen, temperature, pH) influences, as well as a chapter on gas-exchange models. It is, perhaps, the least cohesive of the three parts; on the other hand, it has the most practical application, dealing with interventions for congenital cardiovascular malformations. The book ends with a brief exposition of the editors' perceptions of future directions in developmental cardiovascular sciences.

Birds' eggs, specifically the eggs of the domestic fowl, have been used extensively in research on cardiovascular development, because of their ready availability and the ease with which they may be studied. Many chapters in this book, not dealing with birds *per se*, cite work on chick embryos. For example, the discovery of the cardiac neural crest in chick embryos (Chapter 19) has led to the classification of a series of neural crest—associated human cardiac defects. As a result of studies such as these, much is known about cardiovascular development in birds. Tazawa and Hou (Chapter 15), have ably summarized what is known about avian cardiovascular development, with an emphasis on function and from an underlying interest in birds rather than the use of birds' eggs for utilitarian reasons.

Similar considerations to those just cited, apply to the chapter (13) on amphibian cardiovascular development. The authors (Burggren and Fritsche) point out that, in vertebrates, the basic features of cardiovascular development are similar in the early stages of embryonic growth, and may, therefore, be studied with great facility in amphibian eggs. Fish embryos also offer many advantages as experimental animals and the Zebra Fish *Danio*, in particular, has been used as a model for the study of development of vertebrate organ systems (Chapters 1, 12).

The volume has been carefully edited and it has a good index—important for a work likely to attract readers from many different subject areas. There is also a shorter systematic index. The bibliography is up-to-date: the most recent reference is 1997, the publication date of the book. It represents a significant (17%) part of the book. *Development of Cardiovascular Systems* is not a large book (360 pp) and the potential reader will not be deterred from either dipping into it, or acquiring it, by its sheer size. In fact, it is an attractive book, printed on good quality paper and the illustrations are clear.

Who will read it? The book is likely to attract a reading audience drawn quarters-biomedical from many research, comparative physiology, pathology and others. The subtitle of the book "Molecules to Organisms" ensures that developmental biologists of different complexions will discover it. All will find parts of the volume germane to their particular interests. At the same time, the juxtaposition of chapters dealing with information that each reader would not ordinarily be exposed to, increases the likelihood that readers will expand their horizons of developmental biology. That is certain to be one of the cardinal benefits of the book. \diamondsuit

> G. Causey Whittow University of Hawaii

The Physiology and Pathophysiology of Exercise Tolerance

J. M. Steinacker and S. A. Ward (Editors) New York: Plenum, 1997, 333 pp., illus., index, \$95.00 ISBN: 0-306-45492-0

This book summarizes the proceedings of the international symposium on "The Physiology and Pathophysiology of Exercise Tolerance" organized on September 21, 1994 at the University of Ulm in Ulm, Germany. The book is divided into five sections, and each section contains two to five reviews and three to seven research reports on the topic of the section. The first section deals with the physiological basis of muscular fatigue. Maassen reviews the different mechanisms of fatigue in small muscle groups and Dirk Pette discusses the factors contributing to enhanced fatigue-resistance in low-frequency stimulated muscle. The highlight of the first section is the chapter "Energy Metabolism and Muscle Fatigue During Exercise" by Kent Sahlin from Stockholm, Sweden. Sahlin summarizes nicely the different metabolic aspects related to aerobic and anaerobic energy production in muscle.

The second section "Systemic Limitations to Maximum Exercise in Healthy Subjects" is the largest of the book and covers different physiological aspects related to the limits of exercise performance. Brian J. Whipp provides insight into the domains of aerobic function and their limiting parameters during various exercise intensities. Craig Harms and Jerome Dempsey give a review on the role of ventilation as a limiting factor in human performance. Regulation of blood flow during exercise in man is discussed by Niels Secher and Bengt Saltin from the Copenhagen Muscle Research Center. Ron Maughan continues the series of excellent reviews by summarizing the current knowledge on thermoregulation and fluid balance as possible limiting factors in long-term exercise. Finally, Weicker and Strobel review the endocrine regulation of metabolism during exercise.

The third section "Pathophysiology of Exercise Intolerance" begins with a review on the major abnormalities dur-

ing exercise in patients with pulmonary diseases by C.G. Gallagher and D.D. Marciniuk, followed by brief summaries on exercise physiology and the immune system by Bente Pedersen and Tomas Rohde, and on exercise tolerance and impairment of sympathetic nervous system activity by Manfred Lehmann and Uwe Gastmann. Finally, Liu and co-workers review noninvasive methods to investigate blood supply to the lower extremities during exercise in patients with peripheral arterial occlusive disease.

The fourth section covers topics related to sports-specific limitations to exercise in health and disease. R. Hughson and co-workers summarize their findings on physiological limitations to endurance exercise in the first chapter. In the second chapter of the section, Jürgen Steinacker gives a nice review on cardiopulmonary and metabolic responses to upper body exercise.

The final section of the book entitled "Enhancing Exercise Tolerance in Health and Disease" begins with a chapter on the possible influences of amino acids on exercise performance in athletes by E. Newsholme and L. Castell. Richard Casaburi reviews the current knowledge on the possibilities to enhance exercise tolerance in patients with lung disease, and the effects of drugs on exercise tolerance in patients with cardiovascular diseases are nicely summarized by Martin Stauch.

The authors of the reviews are internationally recognized top scientists in their areas of research and it is a pleasure to read their text. However, the quality of the research reports varies considerably and few of them really convince the reader. I think that the people who participated in the symposium will really enjoy the book and, based on the author list and topics covered, the symposium must have been an excellent one. However, this book leaves the nonparticipant with mixed emotions because several of the authors of the review chapters have published more extensive ones before (for example, proceedings of the Physical Activity, Fitness and Health concensus conference, published in 1994) and one can not avoid the feeling that the authors have struggled with page limitations. In several cases the authors refer to more detailed discussions published elsewhere and that is quite frustrating for the reader. It may have been a better solution to exclude some of the research reports and give more space for the reviews, but since the purpose of the book is to summarize the content of the symposium it is understandable that the editors have selected the current format.

In summary, the book contains several interesting reviews on different areas of exercise physiology and pathophysiology but after considering all of the facts, I think the price of \$95 is more than its real value. However, when the next international symposium on "The Physiology and Pathophysiology of Exercise Tolerance" is organized and if the program is as good as in the first one, I will seriously consider participating and perhaps I will also purchase the book.

> Tuomo Rankinen Laval University

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 p 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 p. 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 *p* continuously with satisfying resolution in variety of settings and the measurements can be repeated in vivo. Its disadvantages include inability in revealing p 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 noninvasive, quantitative measurement of spatial p 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 hypoxicischemic 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 hypoxiaischemia. Therapy against hypoxicischemic 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 p 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 p are known to activate glycolytic rate or excite the carotid body chemoreceptors. It is interesting that 2 minutes after removing extracellular C2+ the net maximum increase in carotid nerve discharge (ND) in response to hypoxia remains the same (400 vs. 400 impulses/s) and sensitivity is actually increased. It is not clear whether the apparently slower ND response at the time results from the slower disappearance rate. This is followed by a slow decline in hypoxic responses, without changes in consumption, suggesting an involvement of intracellular C2+ 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 amelioration 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 cvtochrome 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 p 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 transportrelated 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

Books Received

Acute Respiratory Distress Syndrome: Cellular and Molecular Mechanisms and Clinical Management. Sadis Matalon and Jacob Iasha Sznajder (Editors). NATO ASI Series A: Life Sciences, Vol. 297. New York: Plenum, 1998, 432 pp., illus., index, \$129.50. ISBN: 0-306-45830-6.

Brain, Mind, and Behavior: A New Perspective on Human Nature. David L. Robinson. Westport, CT: Greenwood Publishing Group, Inc., 1996, 192 pp., illus., index, \$55.00. ISBN: 0-275-95468-4.

The Camel's Nose: Memoirs of a Curious Scientist. Knut Schmidt-Nielsen Washington, DC: Island, 1998, 352 pp., illus, index, \$24.95. ISBN: 1-55963-512-6. *Cell Physiology: Source Book.* Second Edition. Nicholas Sperelakis. San Diego, CA: Academic, 1998, 1095 pp., illus., index, \$59.95. ISBN: 0-12-656973-8,

Complexity in Structure and Function of the Lung. Michael P. Hlastala and H. Thomas Robertson (Editors). Lung Biology in Health and Disease Series/121. New York: Dekker, 1998, 672 pp., illus., index, \$195.00. ISBN: 0-8247-9879-1.

High Life: A History of High-Altitude Physiology and Medicine. John B. West. New York: Oxford University Press, 1998, 493 pp., illus., index, \$79.50. ISBN: 0-19-512194-5. Immune Crossover: The Two Faces of Immunity. Enrique Rewald. New York: Parthenon, 1998, 126 pp., illus., index, \$25,00. ISBN 1-85070-018-4.

Methods in Enzymology, Vol. 293. Ion Channels, Part B. P. Michael Conn (Editor). San Diego, CA: Academic, 1998, 805 pp., illus., index, \$110.00. ISBN: 0-12-182194-3.

Methods in Neuroendocrinology. Louis D. Van de Kar (Editor). Boca Raton, FL: CRC, 1998, 236 pp., illus., index, \$89.95. ISBN: 0-8493-3363-6.

The Physiological Basis of Primary Care. Patrick Eggena Carmel, NY: Novateur Medmedia, 1998, 745 pp., illus., index, \$59.95. ISBN: 0-9663441-0-3.

Have you received your EB'99 Call for Papers?

The EB '99 Call for Papers was mailed in September. If you would like one, but have not received it, let us know!

> Contact the APS Membership Office Phone: 301-530-7172 Fax: 301-571-8313

Don't forget: EB'99 Abstracts are DUE NOVEMBER 16th!

Announcements

National Science Foundation Graduate Research Fellowships Three-year graduate fellowships in science, mathematics, and engineering

Eligibility Requirements:

Applicants must be US citizens or nationals, or permanent resident aliens of the US.

Those eligible to apply in fall 1998 are college seniors, first-year graduate students, and others who have completed a limited amount of graduate study in science, mathematics, or engineering.

Women in Engineering and Computer and Information Science: Additional Awards will be offered to encourage women to undertake graduate study in engineering and computer and information science.

Stipend and Allowances: \$15,000 stipend, for twelve-month tenure, and tuition waiver at US institutions (or up to \$10,500 per tenure year at foreign institutions). A \$1,000 International Research Travel Allowance is also available under conditions specified in the Program Announcement.

For more information: Contact the the NSF web site at http://www.ehr.nsf.gov/ehr/dge/grfp.htm or Write to: NSF Graduate Research Fellowship Program

Oak Ridge Associated Universities (ORAU), PO Box 3010, Oak Ridge, TN 37831-3010, or Phone: 703-306-1142; Email: felapp@nsf.gov

Deadline for applying is November 5, 1998.

Nominations Are Invited for the Seventh Annual Arthur C. Guyton Physiology Teacher of the Year Award

The APS Teaching of Physiology Section is again sponsoring the "Arthur C. Guyton Physiology Teacher of the Year" award. This award is supported by the W.B. Saunders Company. Nominees must be full-time faculty members of accredited colleges or universities and members of APS. They must be involved in classroom teaching and not exclusively the teaching of graduate students in a research laboratory.

Each proposed person must be nominated by an APS member. The nominator is responsible for providing the following application materials and forwarding three copies to the Chairperson of the Award Selection Committee, **postmarked no later than November 30, 1998:**

- 1. A letter of nomination from the nominator.
- 2. Letters of support from three other colleagues familiar with the nominee's teaching career, including one being the nominee's chairperson if possible.
- 3. Letters of support from up to 10 current and/or former students.
- 4. Scores on standard student evaluations of teaching effectiveness.
- 5. Competitive teaching honors received, such as the Golden Apple.
- 6. Evidence of education-related activities outside the classroom, such as developing laboratory exercises or teaching software, authoring textbooks or educational research articles, education-related presentations at professional meetings, educational committees within the institution, education consultation with other organizations, public appearances, etc.
- 7. A copy of the nominee's curriculum vitae.
- 8. Any additional documentation that the nominee wishes to include, such as number of graduate students trained, number of undergraduate students pursuing careers in physiology, teaching innovations introduced, etc.

The person selected will receive the award at the banquet of the Teaching of Physiology Section during the next APS annual meeting during EB '99 in Washington, DC, in April 1999. The Arthur C. Guyton Physiology Teacher of the Year will receive a framed, inscribed certificate, an honorarium of \$1,000, and expenses of up to \$750 to attend the meeting. The awardee is requested to write an essay on his/her philosophy of education for publication in *The Physiologist* and is expected to deliver this essay as an address at the annual Section dinner.

Send nominations to: Joel A Michael, Department of Molecular Biophysics, Rush Medical College, 1750 W. Harrison Street, Chicago, IL 60612 (Tel: 312-942-6426; fax: 312-942-8711; email: jmichael@rush.edu).

Announcements

"The Balanced Evaluation of Animal Research: Fulfilling the Obligations of Science and Society"

The Kennedy Institute of Ethics at Georgetown University and the College of Health Professions in cooperation with the College of Veterinary Medicine at the University of Florida announce the conference entitled "The Balanced Evaluation of Animal Research: Fulfilling the Obligations of Science and Society" will be held at The University of Florida, Gainesville, Florida, on February 6-8, 1999.

The program will consider issues of decisionmaking in a variety of animal-use contexts with a particular focus on the Institutional Animal Care and Use Committee (IACUC). The conference is intended for biological, biomedical, behavorial, and social scientists, clinicians, students, scholars of the humanities and philosophy, and members of the concerned public. The seminar is particularly important to those individuals concerned with the education of researchers and those involved in making decisions that directly impact the welfare of animals (e.g. researchers, veterinarians, members of animal care committees).

For additional information, please see the conference web site at www.hp.ufl.edu. If you do not have access to the web or have additional questions, feel free to contact either or all of the following:

Robbie Eller, Office of the Dean, College of Health Professions, PO Box 100185, University of Florida, Gainesville, FL 32610-0185. Phone: 352-392-4215; Fax: 352-392-6529; Email: rellet@hp.ufl.edu.

Wellcome Visiting Professorships in the Basic Medical Sciences for 1999-2000

The Federation of American Societies for Experimental Biology invites nominations from US medical schools, universities and other nonprofit scientific research institutions for Wellcome Visiting Professorships in the Basic Medical Sciences.

Sponsored by The Burroughs Wellcome Fund

For application procedures and information, contact Rose P. Grimm, Executive Officer, Federation of American Societies for Experimental Biology, 9650 Rockville Pike, Bethesda, MD 20814-3998.

Phone: 301-530-7090 Fax: 301-530-7049 Email: rgrimm@execofc.faseb.org

Application deadline: March 1, 1999

Howard Hughes Medical Institute 1999 Predoctoral Fellowships

Eighty Fellowships will be awarded by the Howard Hughes Medical Institute for full-time study toward a PhD or ScD degree in the biological sciences listed below. Awards are for three years, with extension possible for two additional years of full support. Fellowship awards are ope to both US citizens and foreign citizens, and provide an annual stipend of \$16,000 and a \$15,000 annual cost-of-education allowance, effective June 1999.

Eligible fields of study include:

biochemistry bioinformatics biophysics biostatistics cell biology developmental biology epidemiology genetics immunology mathematical and computational biology molecular biology neuroscience pharmacology physiology structural biology virology

For copies of the Program Announcement for application, contact:

Hughes Fellowship Program, The Fellowship Office, National Research Council, 2101 Constitution Avenue, Washington, DC 20418. Phone: 202-334-2872; Fax: 202-334-3419; Email: infofell@nas.edu; Internet: fellowships. nas.edu.

Application deadline: November 10, 1998

Scientific Meetings and Congresses

1998

October 15-18

8th Congress of the European Shock Society, La Hulpe, Belgium. *Information*: Ana Maria de Campos, Department of Intensive Care, Erasme University Hospital, Route de Lennik 808, B-1070

Brussels, Belgium. Tel: +32-2-555-3215 or 3631; fax: +32-2-555-4555; e-mail: sympicu@resulb.ulb.ac.be.

October 16-19

Regulation of Bone Formation; Polypeptide Growth Factors; Transcription Events (parallel ASBMB/ASBMR Fall Symposia), Taos, New Mexico. *Information:* ASMBS 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/fall98.

October 18-23

Principles and Practice of Tracer Methodology in Metabolism, Galveston, Texas. *Information:* Robert R. Wolfe, PhD, Course Director, UTMB/Shriners Burns Institute, Metabolism Department, 815 Market Street, Galveston, TX 77550. Tel: 409-770-6623; fax: 409-770-6825; e-mail: rwolfe@sbi.utmb.edu.

October 23-26

Phosphoryl Transfer: A Molecular Basis for Signaling (ASBMB Fall Symposium), Lake Tahoe, California. *Information:* ASMBS 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/fall98.

October 26-29

2nd International Conference on Transgenic Animals, Beijing, China. *Information*: Registration and Visa: Zhang Zhong-Lian, email: cicast@public.bta.net.cn; Abstract and scientific program: Dr. Carl A. Pinkert, e-mail: pinkert@uab.edu; Internet: http://www.ciccst.org.cn/icta, http://www.public.iastate.edu/~pig map/community/meetings.html, http://www.freeyellow.com/ members2/2 ndicta.

October 28-31

14th Annual Meeting of the American Society for Gravitational and Space Biology, Houston, Texas. *Information:* P. Russell, ASGSB, PO Box 12247, Rosslyn, VA 22219. Fax: 703-671-1706; email: ASGSB@usra.edu; Internet: http://www.indstate.edu/asgsb.

October 30-November 2

Membrane Biogenesis (ASBMB Fall Symposium), Lake Tahoe, California. *Information:* ASMBS 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/fall98.

November 7-12

Twenty-eighth Annual Meeting of the Society for Neuroscience, Los Angeles, California. *Information*: Jamie L. Swank, Program Director, Society for Neuroscience, 11 Dupont Circle, NW, Suite 500, Washington, DC 20036. Tel: 202-462-6688; Internet: http://www.sfn.org.ond Street SW, Suite 103, Rochester, MN 55902. Tel: 507-288-0100; fax: 507-288-1225; e-mail: aaem@aol.com.

December 2-16

American Society for Cell Biology Thirty-Eighth Annual Meeting, San Francisco, CA. *Information:* American Society for Cell Biology, 9650 Rockville Pike, Bethesda, MD 20814- 3992. Tel: 301-530-7153; fax: 301-530-7139; e-mail: ascbinfo@ascb.org; Internet: http://www.ascb.org/ascb.



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.



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