

THE PHYSIOLOGIST



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EDITORIAL

You Can Make the Difference

The time has come for physiologists and other members of the biomedical community to take a stand. We can no longer allow the public's anti-science attitude to affect legislation that has an impact on efforts to reduce human suffering from disease. A time for action will come in April 1990 at the APS/FASEB meeting in Washington, DC.

Visiting your elected representative while attending the meeting can make a difference. It can make a difference because you are a constituent, a voting member of your representative's district. You are the only one who can give him/her a credible explanation of what is happening at your institution.

Last year, Vernon Bishop discovered that he could make a difference. While visiting his congressman, Rep. Albert Bustamante (D-TX), Bishop asked Bustamante to explain why he was a co-sponsor of a resolution by Rep. Robert C. Smith (R-NH) in the 100th Congress requiring the transfer of the Silver Spring monkeys from the federally sponsored Delta Regional Primate Center in Louisiana to a privately owned facility, Primarily Primates, in San Antonio. After Bishop explained the true status of the monkeys, Bustamante expressed his willingness to reconsider his sponsorship. Bustamante no longer is a co-sponsor of Smith's bill, HR 2596, in the 101st Congress.

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Laboratory Animal Issues Broadened with New Focus on Use by High Schools

For more than a century the question of the use of laboratory animals was an issue that focused primarily on research laboratories. With the advent of the animal rights movement a decade ago the question of animal use was broadened into areas concerned with the utilization of animals for food, work, clothing, and entertainment.

The newest target now for the animal activists is the use of animals in high school biology classrooms for the purposes of teaching and dissection.

A national campaign to encourage students to oppose dissection on ethical issues has been initiated by the Animal Legal Defense Fund (ALDF), a national network of 300 lawyers who argue that biology is a life science, not a death science, and that dissection teaches that animal life is expendable and unimportant.

The "Students Against Dissection" campaign was started by ALDF in October with an announcement in the nation's press of a telephone hot line for providing support and information to both students and teachers and with the showing of a daytime network television program dramatizing how a high school student's refusal to dissect a frog led to a California law giving students the right to refuse to dissect an animal.

ALDF's sponsored hot line (1-800-922-FROG) provides students with information about their legal rights, alternatives, how to consult with school officials, and referrals to local attorneys who will represent their interests. Students also receive the handbook, "Objecting To Dissection."

The goals of the hot line are to help students defend their right to an education in accordance with their ethical beliefs and to change the way biology is taught in the classroom. ALDF also is working to assemble a battery of test cases to prove that students have a First Amendment right not to dissect an animal if dissection conflicts with their ethical beliefs.

CBS network's "Schoolbreak Special" dramatized Jenifer Graham's legal fight to avoid the dissection of a frog in her high school biology class. Graham filed suit against the school district last year in the Los Angeles Federal District Court. The suit was dismissed after school officials agreed with the judge's plan to allow Graham to view photographs to identify body parts of a dissected frog that had died from natural causes.

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EDITORIAL

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Although the issue was small, the impact of the meeting was significant. Bustamante discovered an informed constituent, able to provide advice on scientific issues, and Bishop gained a new respect for his elected representative, who demonstrated his willingness to respond to constituent concerns.

Whether you are a president of a society or only a member, you are a constituent of an elected representative who wants your vote next year. You are also a source of information that can make a difference for the scientific community.

The problem is that the issues are manifold and it is difficult to know where to start. Should you talk about biomedical research funding? Misconduct in science? Animal welfare regulations? Conflicts of interest?

To be effective, you must talk about issues that are important to you and your institution. Describe the impact proposed laws will have on you, your colleagues, and your institution. Are regulations making it more or less difficult for you to pursue your line of investigation? How do federal restrictions affect graduate education?

Science is becoming more difficult as additional regulations and restrictions

are introduced by our representatives. By visiting your elected representatives, you can make a difference and APS stands ready to help. First, I urge you to review the booklet, "How to Be Heard on The Hill," distributed to the membership earlier this year. (If you have misplaced your copy, let us know. We will send you another.) Then set up an appointment with your senator or representative to discuss issues of importance to you. Bill Samuels and I would be pleased to provide information to assist you in your discussions.

One issue of importance is the animal issue. APS urges you to ask your elected representatives to support Sen. Howell Heflin's (D-AL) bill (S 727) and Rep. Charles W. Stenholm's (D-TX) bill (HR 3270), both of which would amend the Animal Welfare Act to make break-ins and vandalism of animal facilities a federal crime. For too long now, the animal activists have been able to get our legislators to support legislation designed to restrict the scientific community's access to research animals. S 727 and HR 3270 represent the scientific community's efforts to stem the tide of animal-activist legislation.

Make plans to walk the halls of Congress next spring. It could be an experience that makes the difference.

Martin Frank

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Deadline for submission of material for publication: Dec. 5, February issue; Feb. 5, April issue; April 5, June issue; June 5, August issue; Aug. 5, October issue; Oct. 5, December issue. **If you change your address or telephone number, please notify the central office as soon as possible.**

Headquarters phone: (301) 530-7164. TELEFAX: (301) 571-1844.



ANIMAL USE BY HIGH SCHOOLS

(continued from p. 261)

Graham, a vegetarian who opposes killing animals for scientific purposes, refused to dissect a frog and received a zero for the assignment, which lowered her course grade from an A to a B. She had asked to be permitted to use models of a dissected frog, but the school said models could jeopardize the school's credibility with universities.

In her suit, Graham, then 16, contended that school officials had violated her rights by ordering her to dissect a frog that had been killed for scientific purposes. Her lawyers considered appealing the dismissal of the suit, suggesting that the school would have a hard time finding a frog that had died of natural causes and that was in good enough shape to serve the purpose.

“...school said models could jeopardize... credibility with universities.”

When Graham filed the suit she became a centerpiece for the animal rights movement, appearing on talk shows and television commercials, including a commercial for Apple Computers demonstrating a computer mock up of a frog she said would serve as well as a dead frog. The computer firm said it dropped the commercial because the animal rights issue was getting more attention than the computer.

The case was the impetus for the enactment of a California law that gives students the right not to dissect an animal. Although no other state has approved such legislation, similar legislation is expected to be considered in 1990 in several state general assemblies.

William M. Samuels

Correction

This abstract, appearing in the August 1989 issue of the *Physiologist*, p. 229, contained errors in its table. The table should read as follows:

EFFECTS OF COCAINE ON BLOOD CATECHOLAMINE LEVELS IN EXERCISING RATS. R.K. Conlee, D.W. Barnett*, K.P. Kelly*, and D.H. Han*. Exer Biochem. Lab, Brigham Young Univ, Provo, UT 84602.

	Rest		Exercise	
	Saline	Cocaine	Saline	Cocaine
D	210 ± 8	889 ± 22*	303 ± 19	848 ± 40*
E	254 ± 19	499 ± 46*	627 ± 40+	1208 ± 36* +
NE	259 ± 28	500 ± 40*	335 ± 31	892 ± 64* +

Model Pound Release Law Developed by APS

The American Physiological Society has developed a model bill for use by state and local governments considering the question of releasing unclaimed pound animals to licensed dealers and research institutions.

The model bill was an initiative of the APS Committee on Governmental Relations Initiative Programs (GRIP) and was drafted by the Committee on Animal Care and Experimentation (ACE).

The bill attempts to provide safeguards to assure the public that only the unwanted animals that are to be euthanized are to be made available to dealers and research facilities.

GRIP proposed the development of a model bill in light of a national effort by animal activists to enact laws prohibiting pounds and shelters from releasing unwanted animals to dealers and research institutions. Despite an overwhelming percentage of citizens favoring the humane use of unwanted animals for research purposes, according to several national and regional polls, state and local legislators have little information concerning legislation that can meet the concerns of that large citizens group. The model bill is an attempt to bridge that gap.

APS members in areas where pound release laws are being considered for enactment or for repeal of current laws are encouraged to share the model bill with their legislators. APS members can receive a copy of the model bill by writing to the APS national office, 9650 Rockville Pike, Bethesda, MD 20814.

Kentucky Poll Shows Support for Lab Animal Research

Two of every three people in Kentucky support research using laboratory animals, according to a poll conducted by the University of Kentucky Survey Research Center.

A statewide telephone poll of 705 individuals selected at random showed that 64.2 percent favored the use of laboratory animals, “assuming the research animals were treated humanely.” Approximately 30 percent were opposed to the use of animals and about 5 percent had no opinion.

The percentages favoring animal research varied regarding the types of animals, ranging from 51.3 percent for dogs and 53.3 percent for cats up to 76.1 percent for rats and mice.

Judge Fines Animal Laboratory for Harassing APHIS Inspectors

In what may have been a first, a Maryland animal laboratory was fined \$2,500 for harassing two Animal and Plant Health Inspection Service inspectors during a US Department of Agriculture inspection in 1987.

The Department's chief administration law judge, Victor W. Palmer, also ordered Sema, Inc., a Rockville, MD, medical research laboratory, to "comply with every provision of the Animal Welfare Act" and not to interfere with federal inspectors.

Sema, which has been conducting simian AIDS and hepatitis research under a contract with the National Institutes of Health, has been a target of harassment by animal activists and in 1986 had four chimpanzees stolen in a break-in by a group called True Friends.

The inspectors claimed they were prevented by Sema employees from taking pictures of cages and were deterred in efforts to drive away from the laboratory at the end of the inspection. The inspectors reported that they had found sanitation "suggestive of violations" of the regulations, but concluded that Sema had not violated the Animal Welfare Act.

Sema officials said there was a concern that photographs taken by the inspectors could compromise an FBI investigation of the break-in.

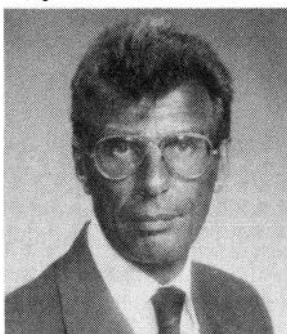
A spokesperson for PETA (People for the Ethical Treatment of Animals), which has been harassing the lab and charging it as having one of the highest animal mortality rates in the nation, said, "We're absolutely thrilled" at the judge's decision. PETA has publicized widely in this country and in Great Britain film supposedly taken by True Friends during the break-in. No one has been charged in connection with the break-in.

Symposium Honoring Robert E. Forster

The Department of Physiology, University of Pennsylvania School of Medicine, and the Respiratory Physiology Group of that department are organizing an international symposium, "pH, Carbon Dioxide, Bicarbonate and Cellular Function," to be given at the University of Pennsylvania at the time of retirement of our chairman, Professor R. E. Forster. This one-day symposium will occur on March 31, 1990, just before the FASEB meeting in Washington, DC. It will feature recent advances in knowledge of membrane and molecular mechanisms that control intracellular pH and mechanisms involved by which pH alterations change function of various cells, including respiratory neurons. Participants include Britton Chance, H. F. Lodish, C. Deutsch, A. Riggs, J. Pouyssegur, P. S. Aronson, E. D. Crandall, L. E. Limbird, D. E. Millhorn, R. Tashian, S. Dodgeson, and G. Gross. *Information:* Dr. Ronald F. Coburn, B204 Richards Bldg., Univ. of Pennsylvania School of Medicine, Philadelphia, PA 19104.

**APS/FASEB Meeting
Washington, DC
Wednesday, April 4, 1990**

**Physiology in Perspective:
Walter B. Cannon Memorial Lecture
"The Heartbeat and Its Regulation
by G Proteins"**



Arthur M. Brown
Professor and Chairman
Department of Molecular Physiology and Biophysics
Baylor College of Medicine
Houston, Texas
(Sponsored by The Grass Foundation)

Catch the Spirit

Enjoy a truly unique Washington experience, an early evening Potomac River cruise at cherry blossom time.

The American Physiological Society has chartered for its members and their guests the renowned Potomac River dinner cruise ship *Spirit of Washington*, for Sunday, April 1, 1990. The three-hour cruise gives a waterborne perspective of the city and its historical monuments and landmarks while you dine on selections of seafoods, beef, and chicken, an assortment of vegetables, salads, and desserts, and two beverages of your choice, including beer or wine.

Later you can enjoy the "Salute To Broadway" revue by the ship's singing waiters and waitresses, dance to a live band playing music from the '40s to the '80s, or just relax in the warm spring breezes on the open decks.

An evening Potomac River cruise is a truly memorable event you won't want to miss when you are in Washington for the FASEB 1990 Meeting. But space is limited to 350 persons. Don't wait to return your reservation along with \$36.00 per person. All reservations must be made before March 1, 1990.

Boarding time from Pier 4 begins at 7:00 PM. Sailing time is 7:30 **sharp!** Pier 4 is a brief taxi cab ride from the DC Convention Center.

For reservations, contact the APS *Spirit of Washington* Dinner Cruise, American Physiological Society, Attn: Cruise Desk, 9650 Rockville Pike, Bethesda, MD 20814. Phone: (301) 530-7164.

Preview

APS/FASEB 1990 Spring Meeting Symposia

Washington, DC

April 1-5, 1990

Intrinsic and Extrinsic Neural Control of the Heart

Chair: J. L. Ardell. *Participants:* W. C. Randall, M. N. Levy, D. P. Zipes, J. L. Ardell, D. C. Randall, and J. A. Armour.

This symposium will deal with neural mechanisms associated with control of cardiac function. It will focus specifically on the interactions between sympathetic and parasympathetic efferents for modulation of automatic, conductile, and contractile tissue in the heart. It will include discussions on the functional organization of both the extrapericardial autonomic inputs to the heart and the role of identified intrinsic cardiac ganglia associated with control of regional cardiac function. The presentations will discuss the effects of transient ischemia on neural control of the heart, the role of neuropeptides in sympathetic-parasympathetic interactions, the potential for neural integration and interactions within specific intrinsic cardiac ganglia, the effects of selective parasympathetic denervation on integrated control of regional cardiac function in both anesthetized and unanesthetized animals, and information on the neurophysiological characteristics of specific neurons within the intrinsic cardiac nerve plexus recorded directly on the heart.

Control of the Renal Microvasculature by Vasoactive Peptides

Chairs: P. K. Carmines and J. T. Fleming. *Participants:* L. G. Navar, G. P. Brown, R. Loutzenhiser, J. T. Fleming, P. K. Carmines, and R. Jamison.

In recent years, development of a number of innovative techniques for direct study of the renal microcirculation has provided new information regarding the specific action of vasoactive peptides within this vascular bed. These observations substantiate the concept that regulation of intrarenal and intraglomerular dynamics is accomplished by selective changes in pre- and postglomerular resistance induced by different endogenous peptides. Furthermore, differential calcium-activator mechanisms appear to mediate renal microvascular responses to peptides. The goals of the symposium are 1) to summarize current knowledge regarding the renal microvascular actions of endogenous peptides, and 2) to integrate this information with current concepts of receptor regulation and calcium activation in vascular smooth muscle cells.

Regulation of the Coronary Circulation: New Insights from Microvascular Studies

Chair: W. M. Chilian. *Participants:* S. H. Nellis, W. M. Chilian, L. Kuo, W. Halpern, K. H. Muntz, and M. L. Marcus.

Factors that govern the control of coronary blood flow have been studied extensively, but because of technical constraints most investigators have not been able to analyze these mechanisms at dis-

crete coronary vascular sites. Within the last few years, several engineering and biochemical advances have permitted study of the microcirculatory dynamics of the coronary circulation. Results elucidated by these new techniques have promulgated a new concept toward understanding the regulation of coronary blood flow; namely, there may be several independent regulatory mechanisms that dominate the control of resistance at different coronary vascular sites. The symposium will integrate knowledge at different scientific levels: biochemical identification of coronary microvascular adrenergic receptors, physical characteristics of coronary microvascular dynamics, physiological control of coronary microvascular resistance, and segmental pharmacological responses in the coronary microcirculation. Finally, clinical implications of pathophysiological disturbances in the coronary microcirculation will be discussed.

Advances in Cardiac Mechanics

Chair: J. W. Covell. *Participants:* N. B. Ingels, Jr., J. W. Covell, R. S. Reneman, A. McCulloch, and F. C.-P. Yin.

Although concepts derived from isolated muscle function and global models of ventricular function such as the end-systolic elastance approach provide useful descriptions of the function of the normal and diseased heart, neither concept provides much insight into the structure-function relationships of the myocardium. In recent years, several approaches have provided new information on the local deformation and microanatomy of the myocardium in humans and in experimental animals. These studies have demonstrated large torsional and rotational motions of the left ventricle and substantial transverse shears and shortening deformation perpendicular to the local myofibers in the inner third of the ventricular wall. These data have provided the first experimental information directly applicable to the validation of more complex finite element approaches to modeling of ventricular function. It is the objective of this symposium to summarize recent advances in both experimental and modeling approaches to cardiac mechanics.

Cardiovascular Adaptations to Obesity

Chair: D. L. Crandall. *Participants:* D. L. Crandall, G. J. Hausman, D. J. Paulson, P. Cervoni, and L. T. Clark.

Obesity is a disorder that affects a significant percentage of the human population; its existence is associated with increased morbidity and mortality. Obese individuals are more prone to a variety of diseases, including hypertension, adult-onset diabetes, and heart disease. Although the prevalence of obesity is well recognized by the scientific community, many questions concerning the etiology of obesity remain unanswered. Scientists and social scientists have approached investigations concerning this disease from a variety of aspects, ranging in topics from nutritional studies of energy regulation to its socioeconomic foundations. Importantly, however, the clinical presentation of obesity is often one of cardiovascular disease, exemplified by an associated systemic hypertension as well as cardiac muscle disorders that can directly contribute to congestive heart

failure. If, in part, the basis of physiological experimentation is to increase the understanding of a disease process as a method leading to its prevention, the use of models of obesity should occupy a position of central importance in future laboratory research endeavors. To this end, this symposium will review experimental models of obesity, address the pathophysiology of obesity in terms of cardiac and systemic vascular disorders, and approach the application of experimental obesity research toward a better understanding of the treatment of this disease in the general population.

Cellular Basis of Skeletal Muscle Fatigue

Chair: R. E. Godt. *Participants:* R. L. Terjung, J. Lannergren, J. Vergara, J. M. Metzger, G. Mainwood, and M. J. Kushmerick.

With prolonged stimulation, there is a decline in force produced by skeletal muscle (i.e., the muscle fatigues). This occurs in vitro as well as in vivo. The cellular mechanisms involved in fatigue remain unclear. In isolated muscle, force failure (and subsequent recovery) depends strongly on stimulation patterns, fiber type, and species. Over 30 years ago, Sandow proposed that fatigue was due either to a failure of excitation-contraction coupling (i.e., a decreased intracellular Ca^{2+} transient) or to a decrease in the Ca^{2+} -activated force produced by the contractile apparatus. Evidence has accumulated for both mechanisms. Experiments with intact fibers demonstrate that intracellular Ca^{2+} transients may decrease with fatigue; this decrease might account for most of the reduction in force. In skinned muscle fibers, however, both Ca^{2+} sensitivity and maximal force are decreased in solutions, mimicking the intracellular milieu of fatigued cells, with changes in pH and inorganic phosphate being most important. These data imply that both decreased Ca^{2+} and a depression of the contractile apparatus play a role in fatigue. The questions to be addressed at this symposium are 1) What are the likely loci of cellular failure in fatigue? 2) What is the cellular basis for these effects? 3) Do these differ in vivo and in vitro? 4) What are the proper in vitro conditions to study the in vivo situation? 5) Can the differences between intact muscle and skinned fiber experiments be reconciled? This discussion will acquaint those scientists interested in exercise with the cellular mechanisms that underlie muscle contraction, as well as inform those primarily studying mechanistic details with the broader picture of muscle function in exercise.

Control of Gastrointestinal Hormone Secretion: Physiologic Implications

Chairs: G. H. Greeley, Jr., and G. Gomez. *Participants:* G. M. Green, W. Y. Chey, T. M. O'Dorisio, G. Gomez, G. H. Greeley, Jr., P. Brubaker, and J. Walsh.

The objective of this symposium is to present an up-to-date overview of the mechanisms involved in the regulation of the secretion of several of the gut hormones and some physiological implications of their regulation. The regulation of the release of the classical gut hormones [i.e., cholecystokinin (CCK), secretin, and gastrin] will be discussed. In addition, aspects of the regulation and action of peptide YY (PYY) and somatostatin (SNF) will be presented; Somatotropin release-inhibiting factor (SRIF) is one of the few gut peptides for which synthetic agonists have been developed and is used to treat a variety of gut diseases. There is evidence to show that the release of CCK and secretin, and perhaps PYY, is controlled by releasing factors. The development of our understanding of gut hormone secretion is in an early stage and similar to where we were with the regulation of pituitary hormones 20 years ago. The regulation of the gut hormone secretion may prove to be as

fascinating as the regulation of pituitary function by the brain. Time is allowed after each presentation for discussion by the audience.

Coronary Collateral Growth and Function

Chair: D. M. Griggs, Jr. *Participants:* J. L. Swain, H. J. Granger, W. Schaper, J. M. Downey, D. G. Harrison, and D. M. Griggs, Jr.

During the first half of the symposium the topic of coronary collateral growth is addressed from the perspective of recent studies on the molecular and cellular biology of angiogenic growth factors. From a general review of angiogenesis, the discussion moves to the more specific subject of myocardial angiogenesis and the possible role of coronary vessel endothelial cells in the angiogenic process. A presentation on collateral growth in the ischemic myocardium rounds out this portion of the symposium.

The second half of the symposium is devoted to the topic of coronary collateral function as revealed in various animal studies, with an emphasis on studies in the intact animal. An analysis of the hemodynamic determinants of collateral blood flow is followed by a discussion of vasomotor control of collateral blood flow, taking into consideration recent information on the vasomotor properties of collateral vessels and possible humoral mechanisms by which collateral vessel tone may be modulated. The final presentation deals with the dynamic behavior of mature but noncontinuously perfused collaterals as studied in the intact, conscious animal.

Role of Calcium and Calcium-Activated Channels in Nonexcitable Cells

Chairs: W. B. Guggino and S. E. Guggino. *Participants:* W. B. Guggino, J. Lansman, E. Ehrenstein, S. E. Guggino, and P. Hess.

Stimulation of many cellular processes in nonexcitable cells occurs via an increase in intracellular Ca^{2+} -dependent processes within the cell. Much attention has been focused on measurements of intracellular Ca^{2+} . Recently, several investigators have concentrated on the properties of Ca^{2+} channels that play a role in the activation of Ca^{2+} influx from the extracellular medium. A direct consequence of the increase of intracellular Ca^{2+} in some nonexcitable cells is an activation of Ca^{2+} -activated K^+ channels.

The aim of this symposium is to present current information on the regulation of Ca^{2+} channels in nonexcitable cells, the processes that lead to activation of plasma membrane Ca^{2+} channels and to the elevation of intracellular Ca^{2+} , and, finally, the activation of Ca^{2+} -activated K^+ channels. The major focus will be on the impact of channel activation on nonexcitable cell function.

Mechanisms of Circulatory Homeostasis: A Tribute to Arthur C. Guyton

Chair: J. E. Hall. *Participants:* J. E. Hall, B. Folkow, B. M. Brenner, B. R. Duling, A. E. Taylor, A. W. Cowley, Jr., and A. C. Guyton.

Circulatory homeostasis results from the integration of multiple cardiovascular, renal, and endocrine control systems. Abnormalities of these systems can lead to disease states, such as hypertension and edema. An understanding of these diseases and their etiology requires a knowledge of the complex interrelationships between each of these control systems. A pioneer of the integrative approach to cardiovascular control mechanisms has been Arthur C. Guyton, who retired in 1989 as Chairman of Physiology and Biophysics at the University of Mississippi Medical Center. Therefore it is especial-

ly appropriate to honor Dr. Guyton with a symposium that summarizes some of the major new developments that have recently occurred in integrative cardiovascular physiology. Speakers have been chosen for the major impact that their work has had on our understanding of circulatory homeostasis. The proposed speakers are all leaders in their fields and have employed multiple approaches, ranging from studies at the single cell and microcirculatory levels to studies in intact animals and humans. More important, the proposed speakers have developed a conceptual analysis of how their research findings impact on overall circulatory homeostasis. Our goal in this symposium is to further integrate recent developments in multiple research areas including renal, endocrine, and cardiovascular physiology and to outline new directions for future research. Dr. Guyton will conclude the symposium with a summary of his views on the most important future directions in these different fields of physiology that are so intimately linked in cardiovascular control. Because this symposium is of great interest to a large segment of the APS, it is being sponsored by the Cardiovascular, Renal, and Water and Electrolyte Homeostasis Sections of the Society.

Comparative Physiology of Eicosanoids

Chairs: C. A. Herman and D. W. Stanley-Samuelson. *Participants:* D. J. Gerhart, D. Piomelli, D. W. Stanley-Samuelson, F. W. Goetz, T. Yorio, C. A. Herman, and L. J. Guillelte.

Eicosanoids, including prostaglandins, thromboxanes, leukotrienes, and other lipoxygenase products, have important regulatory functions in animals. While many symposia discuss their physiology in mammalian systems, the Comparative Physiology of Eicosanoids symposium, sponsored by the American Physiological Society, will stress an evolutionary perspective by highlighting both invertebrate and nonmammalian vertebrate animal modes. As in mammals, these compounds have diverse effects in other organisms. This symposium will include discussions of their roles in chemical defense of corals and as second messengers in the nervous system of mollusks, as well as prostaglandin involvement in H^+ transport in amphibian epithelium and leukotriene metabolism and actions in amphibians. Three presentations will discuss eicosanoids in the reproductive systems of insects, fish, and reptiles. Participants will be able to interact with both comparative and mammalian physiologists interested in obtaining a broader view of eicosanoid physiology, discussing new techniques, and sharing information on the value of research using nonmammalian model systems.

Amino Acid, Peptide, and Protein Transport in the Nephron

Chairs: F. H. Leibach and D. W. Barfuss. *Participants:* F. H. Leibach, D. W. Barfuss, E. C. Foulkes, S. Silbernagl, C. H. Park, and H. Koepsell.

The purpose of this symposium is to provide renal physiologists with new information regarding amino acid, peptide, and protein handling in the nephron. The speakers are experts in the field and will provide a broad presentation of the current status of their particular research area. The participants are studying the subject matter at different levels of experimentation, i.e., whole organ, isolated tubule, and membrane vesicle. Topics to be discussed are basolateral amino acid transport, L- and D-amino acid transport, amino acid transport in the loop of Henle, peptide transport along the nephron, protein transport in the proximal tubule, and sodium-amino acid cotransporters of the proximal tubule. Ample time for discussion will be available before, during, and after the formal presentations. Free communications related to the symposium topics are encouraged.

Cytosolic Free Magnesium: Its Regulation and Modulation of Cell Functions

Chair: E. Murphy. *Participants:* E. Murphy, R. E. London, C. Fry, S. M. Baylor, P. De Weer, M. Lieberman, M. E. Maguire, T. J. McManus, and C. Hartzell.

Until recently, little was known about the cytosolic free magnesium (Mg_i) concentration in cells, the regulation of Mg_i , or the ability of changes in Mg_i to alter cell function. This symposium will focus on measurements and regulation of Mg_i in muscle, as well as an examination of how Mg_i might alter cell function through altering other ion transporters and channels.

Recently there has been a surge of interest in cell Mg_i . This interest has been sparked by the synthesis of two separate areas of research: 1) recent data, primarily from muscle preparations, suggest that many cell functions (e.g., ion channels) can be altered by changing Mg_i in the range of 0 to 3 mM; and 2) improved methods for measuring Mg_i with good sensitivity and time resolution demonstrate that in most mammalian cells basal Mg_i is <1 mM. This timely symposium will bring together investigators from these two areas of research, allowing new and useful insights into the regulation of cell function by magnesium.

Nonmammalian Models for the Study of Renal Tubule Transport

Chairs: H. Nishimura and W. H. Dantzler. *Participants:* K. W. Beyenbach, J. L. Renfro, B. A. Stanton, W. H. Dantzler, H. Nishimura, and E. J. Braun.

The overall aim of this symposium is to introduce several unique nonmammalian models for studying renal tubule transport and their biomedical implications. Studies on nonmammalian animals often provide 1) a model in which selected aspects of epithelial transport are exaggerated and more clearly elucidated and 2) insights into evolutionary perspectives of various osmoregulatory mechanisms. The first topic will deal with the unique insect Malpighian tubule, which consists of a brush-bordered epithelium that, unlike the renal proximal tubule, secretes fluid and Na^+ , K^+ , and Cl^- under the control of natriuretic peptides. The second topic will introduce a membrane vesicle model derived from a primary culture of marine flounder proximal tubules. This model will be used to test the mechanism of renal proximal tubule anion secretion. The third topic will focus on the later distal tubule from amphibians as a model for mammalian distal convoluted tubules. It will concern thiazide-inhibitable $Na^+/H^+-Cl^-/HCO_3^-$ exchange at the apical membrane studied in isolated perfused tubules. The fourth topic will concern isolated perfused and nonperfused reptilian proximal tubules and membrane vesicles. It will emphasize how these models permit the differentiation of urate transport steps from those of other organic anions and the separation of transport steps for different organic cations. The fifth topic will concern a countercurrent multiplier model of avian Henle's loop using single-solute recycling. The interaction between nonurine-concentrating reptilian-type and urine-concentrating mammalian-type nephrons provides a unique model of water reabsorption in the collecting duct. The sixth topic will concern the transcellular movement of uric acid in avian proximal tubules. The specific question that will be addressed in this model is how epithelial cells handle a large quantity of urate without forming intracellular precipitates. The symposium will illustrate how the above-outlined models will further the understanding of both nonmammalian and mammalian tubule transport systems. Furthermore, it will provide an excellent opportunity for communication between comparative and mammalian renal and epithelial physiologists.

Diffusion in Pulmonary Gas Exchange: Models and Experimental Data

Chair: J. Piiper. *Participants:* P. W. Scherer, M. Meyer, R. B. Reeves, P. Scheid, P. D. Wagner, and J. Piiper.

Gas transfer in the lungs involves convection, diffusion, and chemical reactions in various media. Diffusion as rate-limiting process is expected to play a role at several sites: in the airways, across the air-blood barrier, in blood plasma, and in red blood cells. In this symposium, three areas in which advances have been made in recent years will be considered: 1) mixing of inspired gas with alveolar gas, 2) kinetics of O₂ uptake by red cells, and 3) diffusion limitation and pulmonary diffusing capacity. Each topic will be presented by two speakers who have been using different models or different experimental methods or who have obtained differing results. A clarification of the present status as basis for future research is expected.

Mechanism of Prolactin Action

Chairs: C. S. Nicoll and J. A. Rillema. *Participants:* P. A. Kelly, J. A. Rillema, N. D. Horseman, T. Oka, and C. S. Nicoll.

Prolactin is an adenohypophyseal hormone that has multiple functions ranging from osmoregulation in the teleosts to the regulation of lactation in mammals. Prolactin is known to regulate both differentiative as well as proliferative processes in specific tissues derived from various species. In addition, prolactin has been implicated in the induction and promotion of neoplastic processes in mammary tissues.

It is well established that the initial interaction of prolactin with its target cells is with specific receptor molecules located on the external surface of the plasma membrane; Dr. Kelly's group is determining the chemical constituents of the prolactin receptors. Subsequent to the interaction of prolactin to its receptor, several laboratories are studying the molecular events that culminate in the regulation of biological processes. Dr. Horseman's group is determining the processes involved in the prolactin regulation of gene production formation in the pigeon crop. Two laboratory groups are studying the possible role of protein kinase C in prolactin responses. Dr. Russell's group is determining the role of protein kinase C in the prolactin regulation of nuclear processes in rat liver cells, while Dr. Rillema's group is determining the role of protein kinase C in the prolactin regulation of lactational processes. Finally, Dr. Nicoll's group is studying the possible generation of intermediate peptides in the prolactin regulation of biological processes.

The Uniqueness of Physiology in the Basic Science Curriculum

Chairs: E. Rosenberg and J. Engelberg. *Participants:* H. Brown, D. Jackson, K. Cooper, E. Rosenberg, and J. Engelberg.

Basic medical physiology must teach what is understood about the function of the whole intact body. This symposium will explore how to accomplish this most effectively. It will be in two parts.

In the first part, five short talks by the panelists will present different aspects of what is essential in such a program: 1) the history of physiology instruction for physicians, 2) the relation of basic physiology to the practice of medicine, 3) the importance of comparative physiology, 4) the constraints of space and time in human physiology, and 5) the integration of basic physiology into the medical school curriculum.

The second part will consist of a discussion that should lead to a synopsis of what should be included and what should be excluded

from a basic medical physiology curriculum. Topics such as the following will be discussed: 1) What is the appropriate size of the system we study? 2) What is the appropriate time frame? 3) What is essential in the presentation of material? 4) What kind of simulation can be used? 5) What was wrong with the core curriculum of the early seventies? 6) Can the traditional organ systems approach become adequate if we add "integrative physiology"? If so, what fraction of the course must be integrative? 7) Are human and animal experiments essential in the teaching of physiology?

Endothelin

Chair: G. M. Rubanyi. *Participants:* G. M. Rubanyi, M. Yanagisawa, H. Miyazaki, L. H. Parker Botelho, T. A. Brock, P. M. Vanhoutte, V. J. Dzau, W. G. Nayler, B. M. Brenner, and J. M. Polak.

Endothelin, a 21 amino acid peptide produced by endothelial cells, was discovered in 1988 by Yanagisawa and co-workers. Endothelin is the most potent vasoconstrictor peptide known, with a wide variety of biological actions and a potential for physiological and pathological roles in the control of vascular tone and proliferation. Because of an already growing interest in endothelium-derived vasoactive factors (EDRF, EDCF) in the past years, the discovery and "availability" of endothelin stimulated an unprecedented activity in the research community. The number of abstracts and papers on the molecular biology, biochemistry, physiology, and pharmacology of endothelin is growing exponentially. The goal of the symposium (the first of its kind in the United States) is to give a comprehensive summary of this exciting and fast growing new area with lectures given by the leading experts of the field.

After a general introduction on endothelium-derived constrictor factors (G. M. Rubanyi; chairman, Cedar Knolls, NJ), M. Yanagisawa (Tsukuba, Japan) will give an overview of the molecular biology, biosynthesis, and isoforms of endothelin. H. Miyazaki, (Tsukuba, Japan) will summarize the properties of the endothelin receptor and its subtypes. L. Parker Botelho (Cedar Knolls, NJ) will discuss tissue specificity of endothelin synthesis and binding. T. A. Brock (Birmingham, AL) and V. J. Dzau (Boston, MA) will review the present knowledge on the cellular actions (contraction and proliferation) of endothelin in vascular smooth muscle. W. G. Nayler (Heidelberg, Australia) will present recent data on the cardiac action of endothelin. B. M. Brenner (Boston, MA) will talk about hemodynamic and renal actions and P. M. Vanhoutte (Houston, TX) will review the interaction between endothelin and EDRF. Finally, J. M. Polak (London, UK) will present evidence that endothelin may be a neuropeptide. It is expected that the symposium with its expert participants and broad topics will not only give an overview of the field to each interested listener, but will also result in an outline of future research directions in this exciting and important new field.

Hyperglycemia, Diabetes, and the Vascular Wall

Chairs: N. B. Ruderman, J. R. Williamson, and M. Brownlee. *Participants:* N. B. Ruderman, W. Kannel, R. Cohen, J. Colwell, A. L. McCall, J. R. Williamson, A. I. Winegrad, G. L. King, R. Engerman, M. Brownlee, H. Vlassara, J. Witzum, J. Baynes, and L. Furcht.

Micro- and macrovascular disease are the major causes of morbidity and mortality in patients with diabetes. The microvascular disease is unique to diabetes and accounts for the high incidence of blindness and renal failure in this disorder. The macrovascular disease affects arteries in the heart, brain, and periphery. It is morphologically indistinguishable from atherosclerosis in nondiabetics,

but it occurs at an earlier age. This symposium will explore the hypothesis that hyperglycemia contributes to the pathogenesis of one or both of these types of vascular diseases. Clinical and epidemiological evidence will be examined as will studies of the effects of hyperglycemia on vascular physiology, metabolism, and biochemistry. Major topics for discussion will include vascular reactivity and permeability, protein glycation, polyol and myoinositol metabolism, cellular signaling via phosphoinositide and arachidonic acid-linked messenger systems, and protein kinase C.

Singular and Interactive Effects of Blood Tonicity and Volume in Dehydration

Chairs: M. N. Sawka and C. E. Wade. *Participants:* J. A. Boulant, T. N. Thrasher, M. A. Baker, M. N. Sawka, C. E. Wade, and E. R. Nadel.

Blood tonicity and volume are important factors in the modulation of thirst, temperature regulation, and the hormonal conservation of body fluids in mammals. Osmotic and thermal regulations are two homeostatic components controlled by the rostral hypothalamus, whose neurons respond to local changes in tonicity and temperature as well as to afferent input related to blood pressure and volume. Therefore, even at the level of the single neuron, there is a basis for integration between different regulatory systems. The relative importance of tonicity and volume changes for thirst and drinking responses will be evaluated. Animal studies demonstrate that dehydration reduces the ability of the thermoregulatory system to dissipate body heat. Hypertonicity of the blood and intracranial spaces will decrease thermoregulatory evaporation in panting and sweating mammals. In humans, hypertonicity and hypovolemia both act to decrease the thermoregulatory effector responses of sweating rate and cutaneous blood flow during heat stress. In addition, the hypovolemia makes it difficult to maintain an adequate cardiac output during exercise-heat stress. The hypertonicity and hypovolemia are also the triggering mechanism for adaptive responses to conserve body fluids. Finally, the importance of electrolytes in fluids consumed during rehydration will be evaluated.

Isoforms of Thin Filament Proteins in Striated Muscle

Chairs: R. J. Solaro and P. J. Reiser. *Participants:* R. J. Solaro, P. J. Reiser, J. L. Lessard, S. E. Hitchcock-DeGregori, J. Putkey, and P. Anderson.

This symposium will provide a discussion of the diversity of thin filament proteins in cardiac and skeletal muscles. It is the first symposium addressing the issue of structure/function of the striated muscle thin filament from the level of genetic regulation of expression to the level of function of intact myofilaments and muscle. Each presentation will be focused primarily on one of the proteins of thin filament: actin, tropomyosin, and troponin-I, -T, and -C. Topics to be covered include a discussion of the extensive heterogeneity in the developmental and tissue-specific expression of thin filament isoforms, regulation of genetic expression, mutational analysis as a tool for study of structure-function relations, and the functional significance of specific isoform expression, particularly in the area of myofilament calcium regulation. The juxtaposition of presentations and people from this broad spectrum of interests in

the thin filament of striated muscle will provide a unique forum for extending our understanding of this important regulatory system.

Regulation of Muscle Carbohydrate Metabolism During Exercise

Chairs: W. C. Stanley and J. O. Holloszy. *Participants:* W. C. Stanley, K. Sahlin, R. J. Connett, J. O. Holloszy, H. Galbo, and D. E. James.

There is a controversy regarding the mechanisms that control the rates of glycogen breakdown, glucose uptake, pyruvate oxidation, and lactate formation during exercise in skeletal and cardiac muscle. It has been argued that tissue oxygenation is the primary regulator of muscle glycolysis and lactate production during exercise. Other investigators support the theory that glycolysis and lactate production are controlled by several redundant factors, such as mitochondrial oxidative capacity, substrate levels, tissue oxygenation, insulin action, and adrenergic stimulation. The purpose of this symposium is to present an integrated view of the regulation of muscle carbohydrate metabolism during exercise. The role of oxygen availability in the control of muscle glycolysis will be discussed and contrasted with a presentation on the role of metabolic pathway interaction in the regulation of muscle glycolysis. Additional participants will discuss the regulation of muscle glucose delivery, glucose transport, glycogenolysis, and myocardial carbohydrate metabolism during exercise. It is hoped that this symposium will produce fruitful discussions on the role of oxygen availability in the regulation of muscle glycolysis and foster a better understanding of the overall control of muscle carbohydrate metabolism during exercise.

Membrane Transport in Physiology: Historical Perspective

Chair: D. C. Tosteson. *Participants:* D. C. Tosteson, R. Dean, J. C. Skou, J. H. Hoffman, J. Diamond, R. D. Keynes, and R. Podolsky.

During the past four decades, there has been a tremendous growth and development in our understanding of roles of membranes in carrying out many functions of cells such as excitation and propagation of electrical impulses, excitation-contraction coupling, the regulation of solute and water content, and the movement of substances across layers of epithelial cells. We have come to realize that these and other physiological processes involve transport through pumps and channels, integral membrane proteins that penetrate the bilayers that surround cells, and intracellular organelles. Function depends on the properties of the single transport units as well as their members and distribution in various membranes. Speakers at the symposium will explore some of the origins of this view. R. Dean and J. C. Skou will discuss the concept and the properties of the sodium pump. J. F. Hoffman will describe membrane transport in red cells, a system that has permitted more quantitative characterization of transport than is usually possible in more complex cells. J. Diamond will speak to the discoveries that illuminated membrane transport in the movement of molecules across layers of epithelial cells. R. D. Keynes will address membrane transport in electrically excitable cells, and R. Podolsky will reflect on the contraction in muscle cells. All of these talks will include comments on both the people and ideas that have transformed this significant segment of physiology.

Renal and Extrarenal Glutamine Metabolism: Molecular to Organ Level Regulation

Chair: T. C. Welbourne. *Participants:* T. C. Welbourne, N. P. Curthoys, M. S. Kilberg, A. C. Schoolwerth, D. W. Good, and W. C. Souba.

Glutamine metabolism and its regulation have recently become the focus of molecular biologists, biochemists, physiologists, and clinical investigators, reflecting the application of the tools of molecular biology as well as the changes in the way traditional problems of metabolic regulation are now perceived. This symposium offers both the spirit and underlying methodology as leaders in these areas present their unique perspectives in an integrative format. Beginning with the genomic expression of renal glutaminase, Dr. Curthoys presents the application of the tools of molecular biology to the mechanism by which acidosis effects gene expression. Specifically, glutaminase cDNA will be used to determine the rate of transcription and turnover of the glutaminase mRNA as well as to isolate the glutaminase gene. Chimeric constructs of the well-defined PEPCK promoter and Neo gene will be used to identify the effectors mediating this adaptive response. Provision of glutamine within the cell depends on plasma membrane translocation, discussed by Dr. Kilberg from the perspective of membrane and molecular biology. Adaptive regulation of glutamine transport as expressed in cultured cells provides a basis for analyzing in vitro control of glutamine metabolism by membrane transport. Molecular approaches for carrying out this analysis are demonstrated in the identification, isolation, and reconstitution of amino acid transporters into proteoliposomes. Cellular glutamine metabolism regulation in response to acute changes in $[H^+]$ will be presented by Dr. Schoolwerth. The utilization of fluoroprobes to monitor cellular mitochondrial free H^+ and Ca^{2+} content are related to enzymatic activity and ammonia production. Cellular mechanisms and consequences of NH_4^+ transport are discussed from the perspective of membrane transport by Dr. Good. Emphasis will be on the control of NH_4^+ and HCO_3^- transport, end products of glutamine metabolism, and regulatory signals, including acid base alterations, adrenal steroids, and peptide hormones. Regulation of glutamine metabolism on the organ level during acidosis is discussed by Dr. Welbourne. Interorgan regulation involving release of glutamine metabolites, i.e., NH_4^+ , at upstream sites and acting at downstream sites to modulate glutamine metabolism will be presented. The role of interorgan glutamine metabolism in catabolic disease states associated with excess glucocorticoid and $[H^+]$ will be presented by Dr. Souba. His studies show that altered interorgan glutamine metabolism is characteristic of all catabolic disease states and involves accelerated release of glutamine by skeletal muscle and liver, providing glutamine for the GI tract, the kidneys, the lungs, the healing wound, the growing tumor, and lymphocytes. Provision of exogenous glutamine may be of considerable therapeutic benefit in these conditions.

DEBATE

Sheet and Post Rather Than Tubular Flow in the Pulmonary Microcirculation?

Moderator: J. Butler. *Pro:* S. S. Sobin. *Con:* W. Guntheroth.

This important physiological question is to be debated between the group, represented by Sidney Sobin, extolling the idea that the blood flow through the lungs can be analyzed as a fluid sheet between two flat parallel layers of alveolar capillary endothelium connected in places by posts, and the group, represented by Warren Guntheroth, holding the conventional view that it passes through intersecting tubules. This debate is a logical sequel to a past

discussion about distension vs. recruitment in the pulmonary circulation. John Butler, the moderator, appears first with a background of events leading to the war between these stars and lays down the laws of the engagement. Sobin starts off with the facts and figures supporting the sheet flow model. Guntheroth then counterattacks, probing Sobin's defenses with anatomic analyses and physiological fusillades. Each debater then pours scorn and molten lead on the other's arguments and is finally brought to order for a 2-min summary of his point of view. The moderator then reappears from under the table and endeavors to preserve order as the audience joins in with its arguments against the differing views. Regardless of personal danger, the moderator concludes the session with an unbiased judgment of the winners and a summary of what he thinks are the important truths to take home from the meeting.

WORKSHOP

Instructional Technologies: Design and Production of Interactive Multimedia Programs

Chair: N. C. Anderson. *Participants:* D. H. Jonassen, C. N. Locatis, N. C. Anderson, J. King, G. Ashton, and L. Spero.

A major objective of this workshop is to provide insight into both theoretical and practical aspects of interactive multimedia program design and production. Dr. Jonassen will provide an introduction to modern concepts in learning theory and how these concepts establish design constraints in instructional applications of hypertext and hypermedia technologies. Dr. Locatis will provide a critical review of interactive videodisc (IVD) design strategies with emphasis on new approaches that exploit advances in both cognition and instructional delivery hardware.

After these papers, the workshop will focus on a series of specific IVD application projects. The presentations will emphasize program design and production issues including video production, computer animation, physiological simulations, and authoring software. In addition to this workshop, arrangements have been made for study tours and hands-on experience with application programs in the Lister Hill Center for Biomedical Communication on the NIH campus (details will be provided at the workshop).

COLLOQUIUM

The Emerging Biomedical Scientist: Enthusiastic Optimism or Reason for Concern

Chair: R. D. Carlin and S. Chien. *Participants:* E. R. Kandel, F. Knox, D. DePaola, and H. V. Sparks.

There is an ongoing crisis in the biomedical sciences that may compromise future development and practical application in the treatment and understanding of the human organism under normal and pathological circumstances. While in the process of training of health care professionals, medical and dental schools are faced with the dilemma of filling classes from a significantly smaller and apparently academically weaker applicant pool. The change in number and quality of applicants is probably owing to numerous factors, such as the potential for greater financial rewards in business or computers; the achievement of financial and personal gratification in careers that do not necessitate the extremely high tuition of professional degree programs; the commitment of a minimum of 4 years and more likely 7 or 8 years to training; the exorbitant cost of malpractice insurance; service to a public that is less enamored

with the physician or health care professional; and certainly the fear of AIDS. Regardless of the reason or reasons, the career options in the biomedical sciences are no longer attracting the same number and caliber of students. There is an urgent need to bring these issues and their far reaching implications into sharper focus. Now is the time to examine the problem, and this examination should be done on a broad base, initiating a dialogue between the various sectors of the biomedical sciences, since one so profoundly influences the others. To do otherwise, or to apply "the-pendulum-will-swing-back" type of philosophy, is to ignore the problem.

BMES SYMPOSIA

Natural Interfaces Between Biomedical and Biochemical Engineering

Chairs: D. F. Bruley and R. Nerem. *Participants:* B. Chance, D. Clark, N. Nerem, R. Schoenfeld, M. Shuler, D. Bruley, D. Ryu, and R. Jain.

There are many natural interfaces between biomedical and biochemical engineering. The most apparent thread is that both disciplines formulate and solve engineering problems that involve living systems. Biomedical engineering primarily utilizes the basic medical sciences (such as physiology and anatomy, etc.) and targets the human being, whereas biochemical engineering utilizes the basic life sciences (such as biochemistry, cellular biology, molecular biology, etc.) involving microorganisms and cells to synthesize desirable bioproducts, convert macromolecules to value-added products, and/or to eliminate undesirable materials. It is the intention of this session to illustrate the interfaces between these two disciplines via pairs of biomedical and biochemical engineers addressing similar problems in their respective fields. Since the basic anatomical unit of all living systems is the cell and its survival, viability, and functioning are highly dependent on its environment (considerations of heat, mass, and momentum transport processes and biokinetics), this session will focus on cellular issues.

Mass Transport in Physiological Systems

Chairs: E. V. Cileto and J. M. Tarbell. *Participants:* E. V. Cileto, J. M. Tarbell, D. M. Shasby, S. S. Shasby, H. Jo., H. Sill, R. O. Dull, T. M. Hollis, L. McIntire, B. J. Folie, T. W. Secomb, R. Hus, M. Dewhirst, J. F. Gross, C. Colton, S. Chien, S. Weinbaum, S. J. Lin, and K. M. Jan.

The application of engineering principles to the study of physiological transport phenomena is becoming increasingly important. New insights are being provided by combining engineering analyses, mathematical modeling, and experimental procedures to study the complex processes involved in the bloodstream and tissue. A better understanding for the relationship between blood-flow dynamics and mass transport mechanisms, and especially the role endothelial cells play in controlling transport, is critically important to being able to develop a better understanding for physiological functions of mammalian systems as well as the dysfunction that occurs in disease states. This session is designed to provide insight into some of the present results being obtained from ongoing engineering studies of transvascular exchange processes.

Cellular Bioengineering

Chairs: D. A. Lauffenburger and R. Tranquillo. *Participants:* R. Tompkins, R. Tranquillo, M. Saltzman, H. Buettnier, R. Jain, and D. A. Lauffenberger.

The application of chemical engineering principles to the quantitative understanding of phenomena in the field of cell biology at a molecular level defines the newly emerging area termed cellular bioengineering. Cell biological phenomena of biomedical importance include proliferation, migration, adhesion, differentiation, secretion, and transport, all of which appear to be regulated primarily by cell receptor-mediated signals. The application of chemical kinetics, transport phenomena, and thermodynamics to these various phenomena promises to provide a more informed basis for diagnosis and treatment of cell-based pathologies.

SEBM SYMPOSIUM

Immunologic Tolerance 1990

Chair: R. A. Good. *Participants:* R. A. Good, A. P. Monaco, D. Sachs, M. Blackman, M. Bean, and B. D. Kahan.

More than 35 years have passed since Billingham, Brent, and Medewar experimentally provided the biological license to produce specific immunologic tolerance by the experimental interpretation of Ray Owens' classic experiment of nature in fraternal twin cattle. Yet, to date, transplantation surgeons have not been able to use that license because reproducible strategies for production of long-lasting immunologic tolerance in mature primates or humans have not yet been developed. Thus, even today, surgeons transplanting organs or tissues must impose varying degrees of persistent immunodeficiency on their patients to achieve successful allogeneic transplants.

Recently, a number of impressive strategies have been developed for producing long-lasting immunologic tolerance during adult life in rodents that promise at long last to be adaptable to subhuman primates and even to humans. Furthermore, impressive progress has recently been made in defining at cellular and molecular-genetic levels the nature of development in each individual of tolerance of self MHC antigens while at the same time achieving capacity to recognize and respond to nonself antigens. The challenge and the potential of being able regularly to produce long-lasting tolerance of specific nonself components at will during adult life and strategies that may be exploited to adapt acquired tolerance to humans will be a focus of this symposium.

THEME SYMPOSIA

Neural Detection of Chemical Signals and the Control of Food Intake

Chair: R. C. Ritter. *Participants:* R. C. Ritter, T. R. Scott, A. Sclafani, S. Ritter, and A. Campfield.

Neural detection of nutrients and their metabolites appears to play an important role in the control of food intake. The chemosensors involved in nutrient monitoring are located in the mouth, gastrointestinal tract, and in the brain and viscera. The ability to monitor specific nutrients and metabolites at various points between consumption and catabolism provides the potential for adjusting food intake in response to prior experience, anticipation of nutritional value, and in response to metabolic changes within specific tissues. The presentations of this symposium will focus on the most recent findings concerning pre- and postabsorptive monitoring of specific nutrients, the flexibility of nutrient monitoring systems to cope with dietary and metabolic changes, the mechanisms and pathways by which the brain is informed of changes in nutrient availability of use, and the potential role(s) of nutrient monitoring systems in the control of normal food intake.

The Recent Progress in Neuroendocrinology

Chairs: S. S. C. Yen and D. K. Sarkar. *Participants:* S. S. C. Yen, D. K. Sarkar, F. Bloom, W. Vale, S. Ojeda, D. Pfaff, and O. Civelli.

This half-day symposium will discuss recent progress in neuroendocrinology. In recent years, our understanding of the complex organization and function of the hypothalamo-pituitary system has greatly increased due to isolation and characterization of many new peptides, growth factors, oncogenes, and neurotransmitter receptors, as well as delineation of their structural and functional relationships within the hypothalamo-pituitary system. In addition, introduction of recombinant DNA technology has opened new research areas in neuroendocrinology by clarifying the structure and expression of tissue-specific hormone precursor genes in a given neuronal or pituitary cell and by elucidating the factors regulating hormone precursor gene expression. The myriad aspects of the study necessitate a central forum and focus. A major aim of the symposium is to promote interaction among investigators from different disciplines.

Central Nervous System Control of Blood Pressure and Hypertension

Chair: M. I. Phillips. *Participants:* M. I. Phillips, D. Reis, M. J. Brody, A. Lowey, G. Fink, S. M. Spyer, and P. Guyenet.

Traditionally, the organs in which to study blood pressure and hypertension have been the blood vessels, kidneys, and heart. In the last few years, however, great progress has been made in understanding how the brain controls blood pressure. Precise lesions in the brain can produce or abolish hypertension, and peptides acting in the brain can modulate the cardiovascular system. New techniques are revealing the pathways involved in these control mechanisms. This symposium will review and update recent knowledge that has accumulated from studies on the brain to look into the treatment of hypertension and cardiovascular disease. Since this is a growing field, the speakers invited represent both established authorities in the field and newer researchers, all of whom are generating new concepts and exciting results. The theme of this symposium will be taken up by each speaker, who will give an in depth account of his latest findings in this area. The total symposium should provide a solid current overview of the various areas being investigated today. The first talk will establish the brain stem mechanisms in cardiovascular control. Douglas Reis will make the presentation and review the current knowledge from his highly productive interdisciplinary laboratory. The second talk by Michael Brody will establish the central pathways involved in the regulation of blood flow from one vascular bed to another, including the heart splanchnic, mesenteric, and renovascular beds. Dr. Arthur Lowey will present a new technique for tracing pathways across synapses from the brain to the autonomic nervous system, using a pseudorabies virus. He

will present results of tracing brain pathways in the cardiovascular control circuits with this new technique. Dr. Fink will explore the question of whether the nervous system influences chronic cardiovascular responses to circulating peptides. Patrice Guyenet will describe the role of the rostral ventral medulla in sympathetic outflow and arterial pressure using electrophysiological techniques to precisely define the areas in the brain. S. M. Spyer will summarize his outstanding work on central baroreflex pathways.

Pharmacologic Treatment of Nervous System Trauma

Chairs: S. K. Salzman and A. I. Faden. *Participants:* S. K. Salzman, E. Hall, R. Simon, T. McKintosh, R. Vink, and A. I. Faden.

The leading authorities on the pharmacology and pathology of central nervous system (CNS) injury will be brought together to define recent advances and future prospects. The individuals in this group are responsible for the initial discovery of each of the pharmacological classes of agents effective against CNS injury, and for the elucidation of the pathophysiological mechanisms relevant to these treatments. The relationship between mechanisms of spinal cord injury, traumatic brain injury, and stroke/ischemia will be discussed and the potential for universal treatments considered. Emphasis will also be placed on techniques for monitoring posttraumatic function, particularly noninvasive methods such as nuclear magnetic resonance spectroscopy.

Gastrointestinal Neurons

Chair: M. D. Gershon. *Participants:* A. L. Kirchgessner, L. D. Hirning, M. Schemann, K. Tamura, T. Frieling, G. M. Mawe, and J. M. Palmer.

This will be a symposium on the cellular neurophysiology of ganglion cells located in specialized regions of the gastrointestinal tract. A major aim of the symposium is to involve outstanding young investigators who, although early in their academic careers, are conducting the leading edge research on gut neurons. The young investigators will review their work on neurons in the stomach, small and large intestine, rectum, and gallbladder. Relations of cellular neurophysiology with behavior of effector systems in specialized areas will be integrated in each of the lectures. Important new information on neural connections for communication between the duodenum, gallbladder, and pancreas will be presented. Included also will be current concepts in the rapidly developing area of neuro-immune signaling in the gut. This will be the first symposium that has taken a comparative approach to the neurophysiology of local circuits and the interactions with the immune system in specialized regions of the digestive system.

CALL FOR PAPERS

Have you received your *Call for Papers*? Deadline for receipt of abstracts is *December 4, 1989*. Contact FASEB Meeting Office, 9650 Rockville Pike, Bethesda, Maryland 20814. Phone: (301) 530-7010.

IUPS Travel Award Program

Once again, the American Physiological Society administered a travel award program for attendees to the XXXI International Congress of Physiological Sciences, Helsinki, Finland, July 9–14, 1989. Funds for the program were derived from an account established from the profits associated with the 1968 IUPS Congress in Boston. In addition, \$26,000 was received from the NIH (NIDDK, NHLBI, NIA, and NICHD) and \$20,000 from NSF. Contributions were also received from Pfizer International and Lilly Research Laboratories. APS and BMES members also contributed to the program through contributions made while paying their dues. The IUPS also contributed \$1,000 to support the travel program. Overall, APS had \$102,000 to distribute in the form of travel awards.

The US National Committee of the IUPS consists of representatives of the American Physiological Society, the Society for Neurosciences, the Society for General Physiologists, the Biomedical Engineering Society, the Microcirculatory Society, and the American Society of Zoologists, Division of Comparative Physiology and Biochemistry. The committee was charged with reviewing all submitted applications and selecting the awardees. A total of

180 applications were received and 132 awards were made. Thirty-one applications were received from female scientists with 25 receiving awards. The societal affiliations of the applicants/awardees are listed in Table 1.

The awardees were provided with \$800 partial expenses to the congress. Many of the awardees also used the Helsinki congress as an opportunity to visit research laboratories and/or satellite symposia. Of those completing the Travel Award Recipient Questionnaire, 44.2% (42 of 95) attended satellite symposia and 54.2% (52 of 96) visited research laboratories.

The median year for receipt of the doctorate degree for the awardees was 1976 (Table 2). The awardees were also asked how many IUPS congresses, including the XXXI, they had attended. Their responses are tabulated in Table 3. For the vast majority, the XXXI IUPS Congress was either the first or second congress attended. The awardees were also asked to rank the congress (with 10 being the best). More than 78.4% (76 of 97) gave the congress a ranking of seven or higher (Table 4). Overall, the attendees were enthusiastic about the scientific aspects of the XXXI International Congress of Physiological Sciences.

TABLE 1. Societal Affiliations of Applicants/Attendees

	Applicants	Awardees
American Physiological Society	104	73
Society for General Physiologists	18	16
American Society of Zoologists, DCPB	29	19
Society for Neurosciences	55	37
Biomedical Engineering Society	4	2
Microcirculatory Society	10	10
Other	54	42

TABLE 2. Awardees' Year of Doctoral Degree

Year	Number
None	4
1985–89	12
1980–84	20
1975–79	19
1970–74	16
1965–69	9
1960–64	10
1955–59	7
1950–54	5
1945–49	1
1940–44	1

TABLE 3. Number of Congresses Previously Attended*

No. Attended	No. Awardees
1	42
2	30
3	11
4	5
5	2
6	2
7	3
8	3
9	4
10	2

*Including XXXI IUPS Congress.

TABLE 4. Awardees Ranking of the XXXI Congress

Ranking (10 Best)	No. of Awardees
1	0
2	1
3	3
4	5
5	5
6	7
7	29
8	30
9	11
10	6

High School Science Teachers Research in Physiology Program

The APS has initiated a new program aimed at providing high school science teachers with experiences in research in physiology. The High School Teachers Research in Physiology Program, scheduled to start in 1990, will be carried out through the awarding of grants on a competitive basis to individual members of the APS. Grant awards will be based on the overall quality of the program planned for the high school teacher.

Information and applications can be obtained from the H.S. Science Teachers Program, APS, 9650 Rockville Pike, Bethesda, MD 20814.

**1990 APS Specialty Meeting
October 6–10
Orlando, Florida**

**In Search of Physiological Principles: the Use
of Animal Diversity and Novel Technology**

Plenary Lectures

Applying the techniques of molecular biology to physiological research

Speaker: Shu Chien

Adaptation thresholds: when do environmental changes set selection in motion?

Speaker: George Somero

The evolution of oxygen carriers

Speaker: Charlotte Mangum

Cardiovascular and respiratory function in lower vertebrates

Speaker: Graham Shelton

Special Presentations

Animal welfare legislation and the anti-experimentation movement: current developments

Speaker: Martin Frank (or alternate)

The process of publishing in scientific journals

Speaker: Charles M. Tipton

Funding grants: view from Washington, DC

Speaker: To be announced

Symposia

The role of concentric granules in nitrogen excretion and ion storage in birds, molluscs, and insects

Organizers: Timothy J. Bradley

New insights in vertebrate kidney function

Organizers: J. A. Brown, R. J. Balment, and J. C. Rankin

Comparative intestinal nutrient transport

Organizers: Randal K. Buddington

Field physiology: expanding our laboratory horizons

Organizers: Michael A. Castellini

The neural organization and modulation of homeostatic systems

Organizer: Larry I. Crawshaw

The comparative physiology of atriopeptin in fishes

Organizer: David H. Evans

NMR spectroscopy: a new technology is helping to solve old problems

Organizer: Bernard M. Hitzig

The physiology of developing marsupials

Organizer: Robert Holland

Nonmammalian models for the study of cardiovascular and renal homeostasis: integrative and cellular approach

Organizer: Hiroko Nishimura

Coping with extreme conditions: adaptations of metabolism and epithelial transport mechanisms in invertebrates

Organizer: M. J. O'Donnell

The control of breathing in fishes

Organizers: S. F. Perry and W. K. Milsom

Comparative aspects of metabolic regulations

Organizers: Erika M. Plisetskaya and Thomas P. Mommsen

Comparative aspects of functional morphology of the respiratory system

Organizers: Bradley L. Moses, Phil Kosch, and Walter Tyler

Comparative aspects of maximum exercise

Organizer: Peter D. Wagner

Intracellular and extracellular acid-base regulation in animals

Organizers: Pat Walsh and Lou Burnett

Participating Societies

American Physiological Society

Canadian Society of Zoologists

Comparative Physiology and Biochemistry Section

American Society of Zoologists

Division of Comparative Physiology and
Biochemistry

Division of Comparative Endocrinology

Society of Experimental Biology (United Kingdom)

Comparative Respiratory Society

Debate and Discussion

What is comparative physiology and where is it going?

Moderator: Bill Milsom

Participants: Dick Taylor, Dave Jones, George Somero, Steve Hand, Al Bennett, Vaughn Shoemaker, and Malcolm Gordon

Debate

How should energy metabolism scale and why?

Participants: A. A. Heusner, T. A. McMahon, and John A. Prothero

Tutorial Workshops — Teaching

Structuring a curriculum around undergraduate laboratories
Speaker: Lewis Burnett

The use of nonvertebrates to teach physiological principles
Speaker: Ingrid Deyrup-Olsen

The role of computer simulations in the student laboratory
Speaker: Harold I. Modell

Student laboratory survey and poster session
Organizers: Lewis Burnett and Donald Stevens

Tutorial Lectures Series — Scientific

NMR as applied to biological research

Speaker: Bernard M. Hitzig

The doubly labeled water method

Speaker: Kenneth Nagy

Telemetry and data storage techniques in physiological research

Speaker: Tony Woakes

Evening Programs

Sunday: a round of ethanol followed by

Daedalus and beyond: human-powered flight as a model for long-term energetics

Speaker: Ethan Nadel

Monday: cocktails, hors d'oeuvres, and conversation followed by

The desert rat: where it can lead you

Speaker: Knut Schmidt-Nielsen

Tuesday: cocktails, hors d'oeuvres, and conversation followed by

The Scholander Award Presentation and

How bird eggs breathe

Speaker: Hermann Rahn

Future Meetings

1990

FASEB Annual Meeting

April 1-5, Washington, DC

APS Fall Meeting

October 6-10, Orlando, FL

1991

FASEB Annual Meeting

April 21-26, Atlanta, GA

APS Fall Meeting

September 29-October 3, San Antonio, TX

1992

FASEB Annual Meeting

April 5-9, Anaheim, CA

APS Fall Meeting

September 13-17, Cape Cod, MA

1993

FASEB Annual Meeting

March 28-April 1, New Orleans, LA

1994

FASEB Annual Meeting

April 24-29, Anaheim, CA

1995

FASEB Annual Meeting

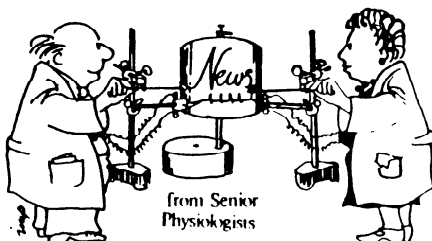
April 9-14, Atlanta, GA

News from Senior Physiologists

Letters to Roy O. Greep

A. Lawrence Bennett reports that he is still walking nine holes of golf and for real exercise he uses the ski machine. He also keeps busy with church, community programs, lapidary, silver smithing, and four-wheeling in the mountains of Colorado.

Ben B. Blivaiss retired in June 1988 as associate dean for undergraduate and continuing medical education at the University of Health Sciences/The Chicago Medical School, but he is continuing to serve on a part-time basis as a professor of physiology. He also has been active as a consultant to hospitals for the development of medical education programs. "A major benefit of the semi-retired status," he says, "has been the ability to spend the past winter season in San Diego, a most pleasant experience."



Letter to John Brobeck

Stella Y. Botelho has a most active volunteer life, including serving as a docent at the Philadelphia Zoo; working with the educational activities of a local conservation group; giving talks on travel, animal, and ecological subjects; swimming a half-mile five days a week; and serving as the chairwoman of the medical services committee for the retirement community of Blue Bell, PA. Her activities have not kept her from barging on the canals in Holland,

making two trips to mainland China, one to Australia, three to Kenya, one around Cape Horn to the Falkland Islands, and one to Nova Scotia. More recently, she traveled to Scotland and England for a month's visit with friends.

Letter to Steven M. Horvath

Charles G. Wilber has an office and laboratory on the Colorado State University campus and has undertaken the task of organizing the volumes of research results he has accumulated but not yet published. He also is devoting time to consulting in the area of forensic science. Summers are spent in Woods Hole, MA, which allows for visits with his grandchild while traveling from Fort Collins.

ANNOUNCEMENTS

International Conference on Environmental Ergonomics

The International Conference on Environmental Ergonomics will take place in Austin, TX, October 1-5, 1990. The fourth in a biennial series, topics will include work and heat stress, work in cold environments, accidental immersion in cold water, work at altered atmospheric pressure, manikin techniques for evaluating protective garments, mathematical modeling of physiological response to stress, and comfort criteria. *Contact:* Organizers E. H. Wissler, Department of Chemical Engineering, University of Texas at Austin, Austin, TX 78712 or S. A. Nunneley, USAF School of Aerospace Medicine/VNC, Brooks AFB, TX 78235.

Principles of Route-to-Route Extrapolation for Risk Assessment

The conference on Principles of Route-to-Route Extrapolation for Risk Assessment, March 19-21, 1990, will be held at

the Mariner's Inn, Hilton Head, SC. The conference will feature invited speakers and poster presentations on structure and function of barriers to uptake of toxicants, physiological parameters associated with uptake of toxicants, critical factors for modeling systemic dose of toxicants, implications for route extrapolations, and implications for risk assessment and future research needs. Registration fee is \$150 and poster abstract deadline is Dec. 15, 1989. *Contact:* Janice Braswell, Conference Coordinator, NSI-ES, Box 12313, Research Triangle Park, NC 27709. Phone: (919) 549-0611.

NIH News

Minority Biomedical Research Support Program Moves to NIGMS

The National Institute of General Medical Sciences (NIGMS) will administer the Minority Biomedical Research Support (MBRS) program. The \$39 million MBRS program, about \$10 million of which is provided by other components of the Na-

tional Institutes of Health (NIH) and the Alcohol, Drug Abuse, and Mental Health Administration, addresses the under-representation in biomedical research of scientists who are members of minority groups.

The MBRS program provides research grants to colleges, universities, and health professional schools with substantial minority enrollments, as well as to tribally controlled institutions on Indian reservations. These grants support research by faculty members, strengthen the institutions' biomedical research capabilities, and provide opportunities for students to work as part of a research team.

The transfer of MBRS will establish NIGMS as the lead institute within NIH for the administration of minority research and training grant programs. NIGMS already administers the Minority Access to Research Careers (MARC) program, which awards research training grants that help increase the number and capabilities of minority biomedical research scientists and strengthen science curricula and research opportunities at minority institutions.

Information: Doris Brady, National Institute of General Medical Sciences, Bldg. 31, Rm. 4A52, Bethesda, MD 20892. Phone: (301) 496-7301.

Leonard R. Johnson, PhD, has been appointed chairman of the Department of Physiology at the University of Tennessee. A member since 1970, Johnson has served on committees of the Society.

APS member **Robert H. Wurtz**, PhD, chief of the Laboratory of Sensorimotor Research, National Eye Institute, NIH, was voted President-Elect (1989-90) of the Society for Neuroscience.

Joseph DiSalvo, PhD, professor of physiology, has accepted a position in the Department of Physiology and Biophysics, University of Minnesota, Duluth.

APS Membership Applications

Membership applications may be obtained from APS Membership Services, 9650 Rockville Pike, Bethesda, MD 20814. Applications received between February 1 and July 1 are considered for nomination by Council at the Fall Meeting, and those received between July 1 and February 1 are considered for nomination at the Spring Meeting of the Society.

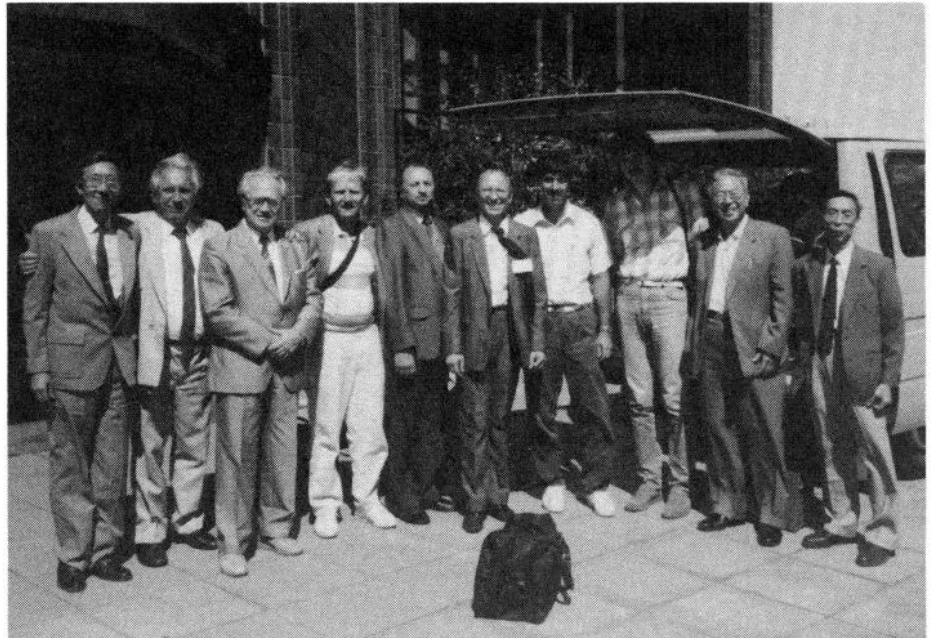
Formerly at Du Pont Critical Care, **James M. Reynolds**, PhD, has moved to the Department of Pharmacology, Drake University, Des Moines, IA.

William F. Jackson, PhD, recently moved to the Department of Biological Sciences at Western Michigan University from the Medical College of Georgia.

Anthony L. McCall, MD, PhD, has accepted a position as associate professor in the Department of Medicine, Oregon Health Science University.

Nick C. Trippodo, PhD, formerly at the Alton Oschsner Medical Foundation, has been appointed Section Head, Pharmacology Department, The Squibb Institute for Medical Research.

East Meets West in a Non-Aligned Van



American, Chinese, and Russian physiologists arriving at the XXXI International Congress of Physiological Sciences, in Helsinki, Finland, July 1989. (l-r) Y. H. Xu (China), O. S. Adrianov (USSR), G. N. Kryzhanovsky (USSR), Vernon S. Bishop (USA), K. V. Sudakov (USSR), Osmo Hänninen (Finland), Martin Frank (USA), A. K. Murashov (USSR), C. C. Wang (China), and M. C. Chen (China)

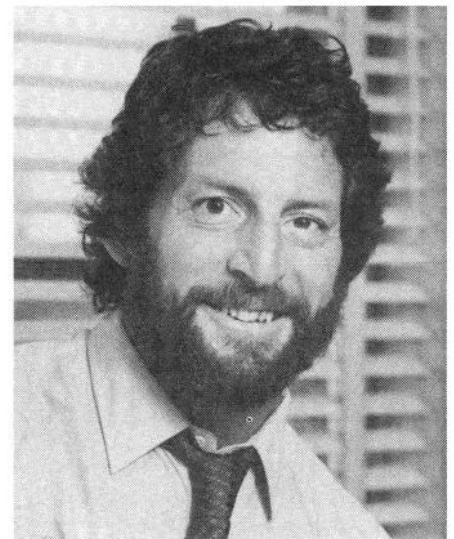
Nadel to Head Pierce Foundation Laboratory

Ethan R. Nadel, PhD, a fellow of the John B. Pierce Foundation Laboratory and professor in the departments of public health and cellular and molecular physiology at the Yale University School of Medicine, has been named Director of the John B. Pierce Foundation Laboratory for a five-year term.

Internationally recognized for his research into the physiological control of energy transfers in humans, Nadel plans to continue laboratory work. He and his colleagues are studying blood pressure regulation, describing the reflexes that affect the distribution of blood flow in different conditions. Changes in these reflexes with physical activity may provide increased resistance to chronic circulatory problems in the aging process. Other studies in his laboratory concern the control of body water balance, emphasizing the factors that influence recovery from dehydration.

A member since 1972, Nadel has served on the editorial board of the *Journal of Applied Physiology* and is a member of the Long-Range Planning Committee.

Nadel succeeds **Arthur B. DuBois**, MD, who has returned to full-time teaching and research.



Ethan R. Nadel

Junior Faculty Position. The Department of Physiology, The University of Wisconsin-Madison, invites applications for a tenure-track junior faculty position in cellular and molecular physiology. The department especially encourages applications from individuals with research interests in regulatory or developmental aspects of cellular and subcellular function, but will give serious consideration to outstanding applications in other areas. The search will favor individuals whose research entails the use of biochemical, biophysical, or molecular biological probes of physiologically relevant processes. Excellent opportunities exist for participation in campuswide interdisciplinary research and training programs.

These positions will be available after July 1, 1990. Women and minorities are specifically encouraged to apply.

Applicants should send curriculum vitae, a summary of research interests and plans, and letters from three references to Dr. Richard L. Moss, Chair, Department of Physiology, University of Wisconsin, 1300 University Ave., Madison, WI 53706. [AAEOE]

Physiologist wanted. The APS, in conjunction with The Little Big Horn College, Crowe Agency, Montana, is looking for an instructor in physiology to teach a two-week laboratory/demonstration course in June 1990. Course content to be determined by the instructor. Students will have taken a course in anatomy/physiology. For additional information, contact Martin

Frank, APS, 9650 Rockville Pike, Bethesda, MD 20814.

Assistant professor. The Department of Sport, Leisure, and Exercise Sciences of the University of Connecticut is seeking an assistant professor for an anticipated full-time, tenure track, nine-month appointment to begin September 1990. The chosen individual will be responsible for teaching undergraduate and graduate courses in sport/exercise science concentrations, being directly involved in the Sport Laboratory for People with Disabilities, pursuing scholarly research through publications and extramural funding, and coordinating the undergraduate sport medicine concentration. An earned PhD in human physiology and/or sport/exercise science is required. Salary commensurate with rank. Applicants should submit vitae, transcripts of graduate work, three letters of recommendation, and related materials to Carl M. Maresh, Chair, Sport/Exercise Science Search Committee, Department of Sport, Leisure, and Exercise Sciences, Box U-110, Rm. 223, 2095 Hillside Rd., Storrs, CT 06269-1110. Screening will begin immediately and will continue until position is filled. [AAEOE]

Faculty positions in physiology. Applications are invited for tenure-track appointments at all ranks. Candidates should hold the PhD or MD degree, have a record of excellence in research, and be committed to teaching medical and graduate students. Research areas marked for expansion include, but are not limited to, cardiovascular/renal, cellular/molecular, and membrane transport physiology. Previous applicants need only send updated material and a letter indicating continued interest. Send a resume, description of research program, reprints, and four letters of recommendation to Dr. L. Gabriel Navar, Chairman, Department of Physiology, Tulane University School of Medicine, 1430 Tulane Ave., New Orleans, LA 70112. [AAEOE]

Positions Available

There is a \$25 charge per issue for each position listed. A check or money order payable to the American Physiological Society must accompany the copy. Purchase orders will not be accepted unless accompanied by payment. Ads not prepaid will not be printed. Copy must be typed double-spaced and limited to 150 words. All copy is subject to the editorial policy of *The Physiologist*. EOAAE indicates Equal Opportunity/Affirmative Action Employer and appears only where given on original copy. Copy deadline: copy must reach the APS office before the 15th of the month, 2 months preceding the month of issue (e.g., before February 15 for the April issue). Mail copy to APS, 9650 Rockville Pike, Bethesda, MD 20814.

Scientific Meetings and Congresses

The Barriers and Fluids of the Eye and Brain Symposium. London, UK, December 11-13, 1989. *Information:* Thomas Segal, Sherrington School of Physiology, UMDS at Guy's & St. Thomas' Hospitals, St. Thomas' Campus, Lambeth Palace Road, London, SE1 7EH.

Hyperlipidemia in Childhood and the Development of Atherosclerosis. Hyatt Regency, Bethesda, MD, May 2-4, 1990. *Information:* Conference Dept., The New York Academy of Sciences, 2 E. 63rd St., New York, NY 10021. Phone: (212) 838-0230.

A NASA symposium on **The Influence of Gravity and Activity on Muscle and Bone** will be held on January 29-30, 1990, at the NASA/Ames Research Center (Moffett Field), Mountain View, CA. *Information:* Joellen Stolarik, Bionetics, Ames Research Center/SL: 239-17, Moffett Field, CA 94035. Phone: (415) 694-5745.

Association for the Advancement of Medical Instrumentation. Marriott Hotel, Anaheim, CA, May 5-9, 1990. *Information:* AAMI, 3330 Washington Blvd., Ste. 400, Arlington, VA 22201-4598.

International Symposium Cell to Cell Interaction. Basel, Switzerland, September 13-15, 1990. *Information:* S. Karger AG, Cell to Cell Interaction, Box CH-4009, Basel, Switzerland. Phone: (61)390990/3061111; FAX: (61)385383/3061234.

People and Places notices come almost exclusively from information provided by members and interested institutions. To ensure timely publication, announcements must be received at least *three months* (by the 5th of the month) before the desired publication date. Send all information to Martin Frank, Editor, *The Physiologist*, APS, 9650 Rockville Pike, Bethesda, MD 20814.

*Neuromethods. Vol. 8.
Imaging and Correlative Physicochemical
Techniques*

Alan A. Boulton, Glen B. Baker, and Donald P. J. Boisvert, editors
Clifton, NJ: Humana, 1988, 460 pp., illus., index, \$69.50

This is the eighth volume in a series on *Neuromethods* in Series I for Neurochemistry that was initially published by Humana Press in 1985. This volume contains nine chapters that describe a variety of physical-chemical techniques for studying the brain, including measurement of cerebral blood flow, pial vessel hemodynamics, autoradiography, positron emission tomography, NMR spectroscopy in vivo, NMR imaging, in vitro measurement of cerebral ions, immunocytological procedures, and sensory-evoked potentials.

The chapters are provided by different authors and presumably modified appropriately by the editors. However, the overall treatment of the selection of topics is uneven and in some cases quite superficial. Although an index is provided to cover the entire text, it is not in every instance indicative of the contents of the chapters. The book is endowed with a short preface to the series that puts it in perspective relative to the preceding books, but the additional one page preface of this particular volume is woefully insufficient as an integrating introduction to the differentiated topics.

In the preface, what the editor cited as the primary value of the book, namely its scope and diversity (and therefore presumed usefulness to both clinical and laboratory neuroscientists), is in fact its downfall. The material is so diverse and broad that little cohesiveness or continuity is attained, and the reader of individual topics is often left short of sufficient details or information on methodology that could prove useful in routine practice.

Of particular concern is the overwhelming majority of outdated references. Most of them refer to the period of the early to mid-1980s, with almost no references cited after 1987. In several of the methodologies covered in the chapters, there have been recent important technological developments not described or referenced at all. For example, the very first chapter on measurement of cerebral blood flow using diffusible gases mentions the technique of X-ray CT scanning with a single reference, dated 1981. It is difficult to believe that such a treatment and reference could be useful to the reader. In addition, the section on NMR imaging, which currently is more commonly referred to as MR imaging, explains MRI physics in just a few pages. This exposition is, on the one hand, too complex as an introduction, and on the other hand, too superficial and out of date for contemporary MRI users. The important techniques of 3-D data acquisition, partial tip angle methods, flow compen-

sation, and flow imaging, among others, are not treated at all in this chapter. The material may be of some historical significance but provides an obsolete view of what is state-of-the-art, and cannot be recommended as an introduction to the interested neuroscientist. Similar comments would apply to the section on in vivo magnetic resonance spectroscopy of the brain. It is out of date, and extensive recent work with surface coil methods and advances in instrumentation are not covered. The important use of ^{23}Na spectroscopy is not mentioned.

The second chapter on pial hemodynamics is the best chapter in the book, being exceptionally well illustrated and clearly written. This chapter is an example of what the book perhaps should have been, i.e., a collection of carefully edited and updated chapters on very specialized methods that emphasize the basic problems, practical solutions to these problems, and specific applications of specialized techniques demonstrated by illustrations, tables, diagrams, charts, and carefully worded text.

The figures throughout the book are mixed and uneven in quality as well. Some of the diagrams are truly helpful and insightful, but in particular the image chapters on positron-emission tomography and NMR imaging include too few figures, and those are of relatively low quality by current standards. In particular, the chapter on NMR imaging of the central nervous system included only two actual images obtained from an MR-imaging system. This is unfortunate, especially with the current richness of pulse sequences and field-effect parameters used in MRI that provide exquisite anatomic information, gray matter and white matter differentiation, and pathology in the central nervous system. Such a chapter is found seriously wanting by comparison to other treatises on this subject.

In summary, although the intentions of this volume are laudable and the individual contributions in some instances meritorious, the scope and diversity of the subject material is too ambitious to effectively provide a useful, enduring reference for neuroscientists. So many topics based on specialized technology that is so rapidly evolving and changing would be better handled with a special issue of a journal rather than a hardback book. It is difficult to enthusiastically recommend a text that is in large measure already obsolete, whose readability is uneven at best, and whose practical value in the laboratory in light of current advances is questionable. There may be some value in the book as a historical reference, but superior offerings in this regard are already available for many of the topics included in this volume.

(Additional comments for this review were provided by
Dr. Michael Vannier, Washington University, St. Louis, MO.)

Richard A. Robb
Dept. of Physiology and Biophysics
Mayo Clinic

BOOKS RECEIVED

Neuromethods. Vol. 2. Carbohydrates and Energy Metabolism. A. A. Boulton, G. B. Baker, and R. F. Butterworth (editors). Clifton, NJ: Humana, 1989, 416 pp., illus., index, \$74.50.

Human Physiology. (2nd ed.) Robert F. Schmidt and Gerhard Thews (editors). Secaucus, NJ: Springer-Verlag, 1989, 825 pp., illus., index, \$79.00.

Geometric Reasoning. Deepak Kapur and Joseph L. Mundy (editors). Cambridge, MA: MIT Press, 1989, 512 pp., illus., index, \$27.50.

Psychoactive Drugs: Tolerance and Sensitization. A. J. Goudie and M. W. Emmett-

Oglesby (editors). Clifton, NJ: Humana, 1989, 608 pp., illus., index, \$79.50.

Methods in Neuronal Modeling: From Synapses to Networks. Cambridge, MA: MIT Press, 1989, 524 pp., illus., index, \$45.00.

Human Gastrointestinal Development. Emanuel Leibel (editor). New York: Raven, 1989, 844 pp., illus., index, \$145.00.

The Muscarinic Receptors. Joan Heller Brown (editor). Clifton, NJ: Humana, 1989, 568 pp., illus., index, \$89.50.

Simple Minds. Dan Lloyd. Cambridge, MA: MIT Press, 1989, 266 pp., illus., index, \$25.00.

Respiratory Physiology: the Essentials. (4th ed.) John B. West. Baltimore, MD: Williams & Wilkins, 1989, 185 pp., illus., index, \$21.00.

Thyrotropin-Releasing Hormone: Biomedical Significance. (Annals of the New York Academy of Sciences, vol. 553.) Geoffrey Metcalf and Ivor M. D. Jackson (editors). New York: New York Academy of Sciences, 1989, 627 pp., illus., index.

Hormones and Sport. (Seroni Symposium Publications, vol. 55.) Z. Laron and A. D. Rogol (editors). New York: Raven, 1989, 336 pp., illus., index, \$70.00.

APS Sustaining Associate Members

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



American Medical Association
Beckman Instruments, Inc.
Berlex Laboratories
*Boehringer Ingelheim
Burroughs Wellcome Company
Ciba-Geigy Corporation
Coulbourn Instruments, Inc.
Dagan Corporation
E. I. du Pont de Nemours & Company
Fisons Pharmaceuticals
Glaxo, Inc.
Gould, Inc.
Grass Foundation
Harvard Apparatus
Hoechst-Roussel Pharmaceuticals, Inc.

*Hoffman-La Roche, Inc.
ICI Pharmaceuticals Group
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Sutter Instruments Company
*The Upjohn Company
*Warner-Lambert/Parke Davis
Waverly Press
Wyeth-Ayerst Laboratories

*Second Century Corporate Founders

Human Frontier Science Program

The Human Frontier Science Program (HFSP) is an international program, which was proposed by the Japanese Government at the Venice Economic Summit Meeting in 1987, and which has been discussed at the Toronto Economic Summit Meeting and at the meetings of eminent scientists and experts from the economic summit member countries and the Commission of the European Communities. The HFSP aims at promoting, through international cooperation, basic research focused on the elucidation of the sophisticated and complex mechanisms of living organisms. To the fullest possible extent the research results will be used for the benefit of all humans. The HFSP is also intended to encourage international interdisciplinary research by researchers early in their careers who are expected to play an important role in originating and pursuing creative research.

Research areas of the HFSP are basic research for the elucidation of brain functions: 1) perception and cognition, 2) movement and behavior, 3) memory and learning, and 4) language and thinking; and basic research for the elucidation of biological functions through molecular level approaches: 1) expression of genetic information, 2) morphogenesis, 3) molecular recognition and responses, and 4) energy conversion.

Information: until the organization is established in Strasbourg (France) this fall, the Task Force on the HFSP of the Japanese Government will undertake preparatory activities on behalf of the organization. The Task Force on the HFSP, c/o Science and Technology Agency, The Japanese Government, 2-2-1, Kasumigaseki, Chiyoda-ku, Tokyo, 100, Japan. FAX: (Japan 81)-3-581-3079, 3-581-5698; TEL: (Japan 81)-3-501-3490.

Fellowship for Physicians

The Howard Hughes Medical Institute has postdoctoral research fellowships for physicians that provide three years of support to MDs and MD/PhDs for full-time research on basic biological processes and disease mechanisms. Applicants must have completed at least two years of clinical training and no more than three years of research training (subsequent to the last graduate degree) by the time the fellowship begins. The deadline for receipt of part one of the applications is March 1, 1990. Awards will be announced in October 1990 and fellowship tenure may begin January 1991-July 1992. *Information:* Howard Hughes Medical Institute, Office of Grants and Special Programs, 6701 Rockledge Dr., Bethesda, MD 20817. Phone: (301) 571-0324.

1990 Research Awards

The American Liver Foundation announces the availability of research awards for 1990 for investigational work related to liver physiology and disease.

The *Postdoctoral Research Fellowship Award* is designed as a one-year supplement to augment NIH or private fellowship stipends. This \$7,500 supplement is targeted to novice clinical investigators who have already undergone critical evaluation of their research or research potential by the NIH and directors of institutional training programs in liver function and disease.

Student Research Fellowship Awards are available to MD and PhD students to encourage them to gain exposure in the research laboratory, and possibly consider liver research as a career option. Each fellowship is for a three-month period and carries a stipend of \$500 per month, totaling \$1,500.

The *Liver Scholar Award* is available to scientists who have completed research training and who have attained the status of an independent research scientist. Liver scholars will receive \$33,000 annually for a period of three years following national competition.

For applications and guidelines write: American Liver Foundation, 1425 Pompton Ave., Cedar Grove, NJ 07009. Deadline: February 1, 1990.