THE PHYSIOLOGIST

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Women Scientists of the American Physiological Society

The Women in Physiology Committee maintains a database on women members of the Society that allows us to track the professional characteristics of women physiologists. The database is compiled through a questionnaire that is periodically sent to all women members. In addition to providing information for our members on the status of women in physiology, the trends and statistics produced by the database is made available to other organizations that are interested in the status of women scientists. Women who complete the questionnaire can indicate whether they would like to have their names made available to prospective employers. Departmental chairs, search committees, and other employers are encouraged to contact the APS office to obtain a list of women physiologists who are interested in academic, industrial, or administrative positions.

According to the most current APS membership statistics, 866 members (12%) of the Society are women, out of a total membership of 7,321. A total of 567 women scientists have responded to the questionnaire; thus about 65% of the women members of the Society are now in the database. The following information was compiled from the current database for women in physiology. Female members of the Society who have not received a questionnaire or who would like to update a previously submitted questionnaire should contact the APS office.

Figure 1 shows the distribution of academic and other positions held by the respondents. The "other" category includes positions or ranks that did not fit in any of the categories listed, including "research physiologist," "clinical assistant professor," etc.

Four hundred fifty-eight women in the database hold PhD degrees. MD degrees are held by 78; 58 women have master's degrees, and 42 checked "other." The years of receipt of these degrees are indicated in Table 1. In terms of postgraduate training, 54 of the respondents stated they had received 1 year of postdoctoral training; 119 indicated 2 years; 111 indicated 3 years; 49 indicated 4 years; and 89 respondents indicated receiving greater than 5 years of postdoctoral training.

Of 556 respondents, 330 indicated physiology as their field of training and 226 indicated "other." The areas of specialization among the respondents are shown in Figure 2.

Information on technological expertise and numbers of peer-reviewed publications was also requested in the questionnaire. The responses are shown in Table 2 and Figure 3.

The questionnaire requested information on grant support, which could include grants currently held as well as previous grants; responses are shown in Table 3. Professional activities of women in the database are shown in Table 4.

With regard to teaching experience, 395 respondents indicated they had taught at the medical/dental/nursing/veterinary levels. Two hundred ninety-eight respondents indicated undergraduate teaching, 114 respondents were involved in secondary education, and 80 checked "other." The latter category included 40 graduate students presumably serving as teaching assistants. One hundred eleven women in the database indicated that they were willing to spend 20%–30%

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WOMEN PHYSIOLOGISTS
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of their time teaching. Another 93 indicated 10%–20% time teaching, 31 indicated 30%–40%, 28 indicated 40%– 50%, and 26 indicated they were willing to spend over 50% of their time teaching.

In terms of job status, 199 respondents indicated that they would consider moving from their present positions; 65 were actively searching for jobs, and 173 were satisfied with their current positions. Of those interested in moving to other positions, 193 indicated their interest in positions in medical/dental/nursing/veterinary schools; 48 indicated undergraduate institutions; 48 indicated graduate schools; 87 checked private research foundations; 91 indicated industry/R&D; and 35 checked "other." When asked if they would like their information released to prospective employers, 349 indicated yes and 218 answered no.

Based on the results of the questionnaire, it appears that the majority of women in the American Physiological Society are highly productive scientists who are involved in a variety of research, administrative, and teaching activities. The large number of respondents indicating cardiovascular as their present area of specialization reflects the general makeup of the membership of the APS as a whole. However, 149 respondents checked "other" for this question, suggesting that a significant number of women in the Society are working in research areas that are not traditional physiological fields. The broad range of technological expertise shown in the database indicates that women physiologists as a whole are trained in both traditional techniques as well as more modern technologies.

Despite the range of professional activities that women physiologists are engaged in, there are still relatively few members of the Society who serve as APS section councillors, section chairs, members and chairs of APS committees, or on the APS council. The Society welcomes the active par-

Table 1. Year Degree Awarded

	No. of Respondents
Before 1950	19
1950–1959	45
1960–1969	78
1970–1979	179
1980–1989	174
1990–1999	41
No year given	32

Table 2. Technological Expertise

	No. of Respondents
Antibody production	40
Biomedical engineering	37
Electron microscopy	45
Electrophysiology	132
Fluorescence spectroscopy	49
Immunohistochemistry	63
Molecular biology	52
Protein isolation/ purification/sequencing	69
Radioimmunoassay	166
Surgery	207
Video image analysis	53
Other	174

Table 3. Grant Support

	No. of Respondents
NSF	55
NIH	272
RO1	140
RCDA	32
FIRST	38
NRSA	72
Private foundation	65
NIH training grant	45
Other	143
American Heart	42
Canadian	10
VA	8
NASA	4

Table 4. Professional Activities

	No. of Respondents
Journal editor	30
Journal editorial board	125
Study section member	106
Officer in major society	67
National committee member	78
Ad hoc reviewer	301
Other	39

ticipation of women in all of these areas. To this end, women physiologists are encouraged to nominate themselves and have colleagues nominate them for positions on APS committees and to actively participate in their respective sections. The Committee on Women in Physiology serves as a resource for information and support for women physiologists and welcomes input from the membership on issues that pertain to women scientists.

Hannah V. Carey, Chair

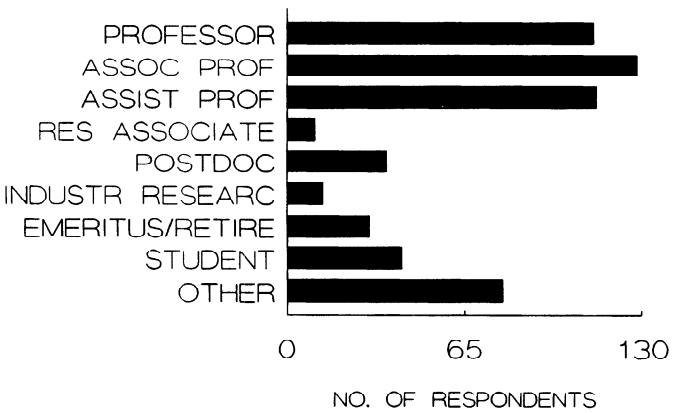


Figure 1. Rank

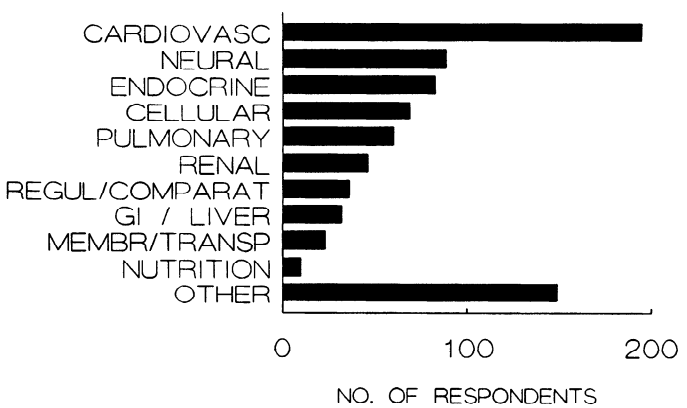


Figure 2. Specialization

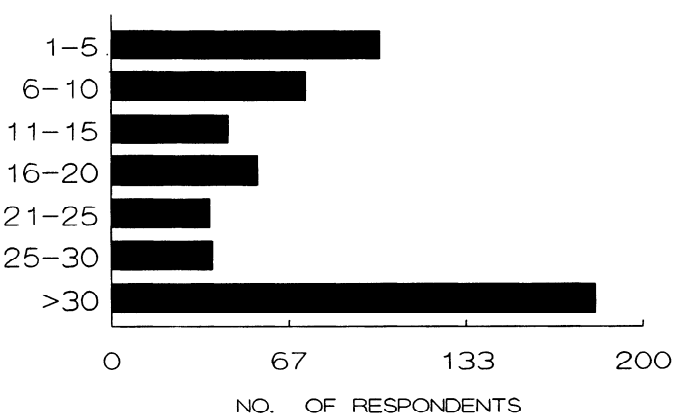


Figure 3. Publications

Meetings

Experimental Biology '93

March 28–April 1, 1993
New Orleans, Louisiana

Molecular and Cellular Mechanisms of Baroreceptor Reflex Control

Theme area: Cardiovascular Biology and Neuroregulation. *Sponsors:* APS Cardiovascular and Neural Control & Autonomic Regulation Sections. *Chairs:* F. M. Abboud and D. L. Kunze. *Participants:* F. M. Abboud, C. Kung, G. Hajduczok, M. W. Chapleau, D. L. Kunze, and M. C. Andresen.

The magnitude of the afferent baroreceptor input to the central nervous system is a major determinant of baroreflex control of the circulation. Increases in arterial pressure and vascular stretch trigger increases in baroreceptor discharge that provides a synaptic input to central neurons in nucleus tractus solitarius (NTS). This symposium focuses on the 1) cellular and molecular mechanisms that mediate mechanoelectrical transduction in cells in general and in baroreceptor nerve endings in particular; 2) modulation of baroreceptor activity by paracrine factors released from nearby cells including vascular endothelium and activated platelets; and 3) mechanisms of presynaptic modulation of the baroreceptor input at the level of the central synapse in NTS. Experimental approaches include measurement of ion channel activity and intracellular concentration of Ca^{2+} in isolated membrane patches and cells, recordings of baroreceptor discharge from baroreceptor fibers in anesthetized animals, and studies of synaptic transmission in the NTS brain slice preparation. The diverse experimental approaches taken by the symposium participants should ensure an exciting and unique scientific interchange leading to enhanced understanding of baroreceptor function.

Protein Phosphorylation During Smooth Muscle Contraction

Theme area: Cardiovascular Biology. Sponsor: APS Myo-Bio (Muscle) Group. *Chair:* M. Bárány. *Participants:* M. Bárány, K. Bárány, R. A. Murphy, K. E. Kamm, K. G. Morgan, H. A. Singer, and R. S. Adelstein.

Protein phosphorylation is a key reaction in the regulation of smooth muscle contraction. The main question is whether myosin light chain (MLC) phosphorylation is the only regulatory mechanism or phosphorylation of other proteins is also involved in the regulation. Various approaches will be used to get an answer: 1) measuring protein phosphorylation-dephosphorylation-rephosphorylation in consort with the contraction-relaxation-recontraction cycle of the muscle; 2) measuring force and MLC phosphorylation in muscles with varying intracellular Ca^{2+} concentration; 3) attenuating MLC phosphorylation by phosphorylating myosin light chain kinase in the intact muscle; 4) studying the role of protein kinase C in smooth muscle contraction; 5) studying Ca^{2+}/calmodulin-dependent protein kinase II activities in smooth muscle; and 6) application of molecular-biology techniques.

Research on arterial tracheal, uterine, and gizzard smooth muscles will be the topic of the symposium. Differences in theories of the speakers and discussions by the audience should help to elucidate the molecular mechanism of smooth muscle contraction.

Urinary Concentrating Ability of the Kidney: A Comparative Approach

Sponsor: APS Comparative Physiology Section. *Chairs:* E. J. Braun and C. A. Beuchat. *Participants:* I. Sperber, R. L. Jamison, B. Schmidt-Nielsen, E. J. Braun, L. W. Greenwald, and C. A. Beuchat.

How the different components of the mammalian kidney (and avian kidney) function as a unit to concentrate the urine continues to be the focus of active debate. In mammals, for example, the function of the pelvic fornices, the importance of nephron heterogeneity, and the significance of urea recycling in the medulla to the urinary concentrating mechanism remain unclear. Similarly in birds, how the loopless and looped nephrons function as a unit in the urinary concentration process is not fully understood. A recent concern in both groups of animals is the possibility that the scaling of cellular metabolism in the medullary tissue could play a central role in determining concentrating ability. The kidney is unique among vertebrate organs with respect to extraordinary amount of physiological and morphological information that is available on a diverse assemblage of species. This symposium aims to bring together individuals with broad and varied perspectives who can exploit this enormous database and bring into focus the wide range of problems in comparative renal physiology and functional renal morphology as they concern current models of the countercurrent multiplier system (CCM). In addition, we seek to explore the little appreciated influence that ecology and phylogeny have on renal form and function and thus the CCM system.

Remodeling of the Extracellular Matrix of the Heart and Vessels

Theme area: Cardiovascular Biology. *Sponsor:* APS Cardiovascular Section. *Chair:* J. W. Covell. *Participants:* J. W. Covell, A. M. Samarel, T. K. Borg, S. M. Factor, and M. Rabinovitch.

The heart and vasculature respond to stress with remodeling of both structural and contractile systems. Recent studies have shown that structural changes in the extracellular matrix play a major role in the functional changes observed following stress. In many aspects our understanding of the metabolism of the extracellular matrix under normal and pathologic conditions is fragmented. However, within the past five years substantial strides have been made in our understanding of not only the correlations between the function of the heart and great vessels and the structure of the extracellular matrix but also the metabolism of extracellular matrix proteins. The purpose of this symposium is to review the metabolism of the major structural extracellular matrix structural proteins in the heart and vasculature and their response to injury. Presentations will focus on the balance between synthesis and degradation of procollagen, on metalloproteinases, on integrins, and on the structural remodeling of the extracellular matrix of the heart and great vessels occurring in response to hemodynamic and ischemial stimuli.

Tutorial: Strategies for the Study of Gene Expression and its Regulation

Theme area: Epithelial Cell Biology and Mechanisms of Molecular Regulation. *Sponsors:* APS Renal Section and Education Committee. *Chair:* L. Ercolani. *Participants:* L. Ercolani, B. Wold, R. N. Eisenman, D. M. Moore, and L. Gold.

This tutorial focuses on current strategies for the study of gene expression and its regulation. To cover this broad and evolving topic, each speaker in the tutorial has been chosen based on their respective innovative contributions to the field of gene expression. The chairman will provide a framework for the session by giving a brief overview of the approaches to study gene expression in the '80s and the latest approaches in the '90s that also highlights the contributions of each speaker. Each speaker will emphasize the basic requirements for their approach(s), for example, how easy/difficult is the approach; what are the pitfalls; how generally applicable is the approach? B. Wold will emphasize in vivo footprinting and forced-dimer factor analysis of protein-DNA interactions. R. N. Eisenman will emphasize the use of recombinant bacterial fusion proteins to study gene expression and to discover novel transcription factor ligands utilizing the myc/mac oncogene system as a model. D. M. Moore will emphasize the stereochemistry of dimerization utilized by many transcription factors. He will emphasize the novel use of prokaryotic/phage systems to understand eukaryotic steroid (thyroid) hormone factor gene regulation. L. Gold will emphasize the importance of RNA structural motifs for the regulation of post-transcriptional gene expression. He will discuss the in vitro development of novel RNA and single stranded DNA affinity ligands for the study gene expression utilizing the "SELEX" system. Each speaker's talk will close with information regarding future directions or approaches to their work. A question and answer session concerning the methodology employed will then follow each talk.

The information presented by the participants should be of great interest to physiologists as well as other scientists who are interested in the study of gene regulation. Because many of the techniques described can also be adapted to the study of other physiological, cell biological, and biochemical mechanisms (e.g., mutagenesis, SELEX, generation of bacterial fusion proteins, etc.) this session should also be generally informative to investigators in many other field.

The L-Arginine/Nitric Oxide Pathway and Renal-Cardiovascular Integration

Theme area: Cardiovascular Biology. *Sponsors:* APS Water & Electrolyte Homeostasis and Renal Sections. *Chairs:* R. H. Freeman and W. H. Beierwaltes. *Participants:* B. J. Ballerman, J. C. Romero, C. Baylis, R. H. Freeman, and W. H. Beierwaltes.

The overall theme of this symposium is focused on the L-arginine/nitric oxide biosynthetic pathway and its potential role in the integration of renal-cardiovascular function. Research in this area is vital to the further understanding of basic physiological mechanisms that directly and indirectly modulate arterial pressure via changes in both the capacitance and the filling volume of the circulatory system. The symposium will address the following questions: 1) What do we know about the role of nitric oxide as a paracrine-autocrine signal transduction mechanism for the regulation of cellular function in diverse renal cell populations? 2) What are the physiological consequences of nitric oxide regulation of cellular function with respect to renal hemodynamics and excretion? 3) What are the physiological consequences of nitric oxide regulation of cellular function at the level of the individual nephron? 4) How does the L-arginine/nitric oxide pathway interact with other intrarenal and systemic mechanisms for the control of renin release? 5) What is the pathophysiological importance of the endothelium in the development and maintenance of arterial hypertension in well-defined animal models of hypertension?

Calcium: From Calcium-Transporting Proteins to Renal Calcium Transport

Theme area: Epithelial Cell Biology. *Sponsor:* APS Renal Section. *Chair:* P. A. Friedman. *Participants:* to be announced. Summary from original proposal.

This symposium will address selected cellular mechanisms that are involved in mediating calcium transport and how they interact in polarized epithelial cells to accomplish net transcellular calcium transport. The transport mechanisms that will be addressed include calcium channels, plasma membrane Ca^{2+}-ATPases, and Na^{+}/Ca^{2+}

exchangers. Similar transport proteins mediate uptake and efflux in electrically excitable or nonpolarized cells as in polarized, calcium transporting epithelial cells. However, in the latter, these proteins are arranged to permit net vectorial movement. Calcium subserves a variety of intracellular roles. In epithelia these include signal transduction and regulation of ion permeability. These functions require maintaining intracellular calcium at low ionic activity. Hence, in calcium-transporting epithelial cells, transcellular calcium transport must be accomplished in a manner that preserves the integrity of other calcium-dependent processes. The objective of this symposium is to bring together leading investigators who are characterizing calcium channels, Ca^{2+}-ATPases, and Na^{2+}/Ca^{2+} exchangers in electrically excitable or non-polarized cells with researchers who are exploring these transport mechanisms and their regulation in polarized epithelial cells of the kidney. The symposium is organized into paired presentations of a state-of-the-art talk for each transporter, accompanied by a presentation of work in progress on the same transport protein in calcium-transporting renal epithelial cells. This format should help bridge work at the forefront of calcium transport with work on calcium transport in renal epithelia. Speakers will focus on new insights obtained from electrophysiological and molecular biological approaches. Each speaker will incorporate this information into an integrated view of cell function. The information presented in this symposium should be of interest to investigators working on problems in calcium transport, cell physiology, and epithelial and renal physiology.

Experimental Biology '93
New Orleans, Louisiana
Monday, March 29, 1993, 5:30 pm

Bowditch Lecture

"Leukocyte Transit Through the Lungs"

Claire M. Doerschuk
Associate Professor of Pediatrics
Section of Pulmonology
Indiana University School of Medicine

Imaging Techniques for Assessing Cell Function

Sponsor: APS Education Committee. *Chairs:* F. S. Fay and L. J. Heller. *Participants:* D. L. Taylor, R. Y. Tsien, S. Block, F. S. Fay, and L. J. Heller.

In recent years, new methods for visualizing cellular structure and function has greatly increased our understanding of basic cellular processes. Because of extensive interest in these techniques, the Education Committee of the American Physiological Society is presenting this symposium aimed at providing basic information and broad descriptions of several current imaging techniques. The presentations will include descriptions of the use of fluorescent analogs, fluorescent indiciators, caged compounds, opitcal traps and the digital imaging microscope for imaging cytoskeletal structures, signal transduction mechanisms, and cellular function. The use of these techniques in a variety of cell and tissue types will be presented with special emphasis on vascular smooth muscle and blood vessels.

Cardiorespiratory Interactions During Sleep

Theme areas: Cardiovascular Biology and Neuroregulation. *Sponsor:* APS Clinical Committee. *Chair:* C. Gaultier. *Participants:* to be announced. Summary from original proposal.

This symposium addresses the question of the mechanisms of the cardiorespiratory interactions during sleep from the brain stem cellular level to the peripheral effectors. The specific goals are 1) to review work in progress to understanding neural coordination of respiratory-cardiovascular function during sleep; 2) to assess the pathophysiological and developmental aspects of cardiorespiratory interactions during sleep; and 3) to identify areas for future innovative research and collaboration to elucidate mechanisms by which sleep and cardiorespiratory systems interacts in health and disease.

Physiological Adaptations and Countermeasures to Long-Duration Space Flight

Theme area: Cell Injury. *Sponsor:* APS Environmental & Exercise Physiology Section. *Chairs:* A. R. Hargens and C. M. Tipton. *Participants:* A. R. Hargens, I. B. Kozlovskaya, V. R. Edgerton, V. Schneider, G. A. Nelson, J. Vernikos, and C. M. Tipton.

On Earth, gravity normally imposes gradients of blood pressure on the cardiovascular system and gradients of weight on the musculoskeletal system. On the other hand, actual microgravity (space flight) and simulated microgravity (head-down tilt, supine bed rest) nullify these gradients of stress to a large degree. Recent

results from short-term shuttle flights, long-duration Mir missions, and ground-based simulations indicate that inflight performance of crew members is decreased because of a combination of space motion sickness, fluid shifts and losses, muscle atrophy, bone loss, cardiovascular dysfunction, and decreased exercise capacity. Cosmic radiation is a serious hazard for moon and interplanetary missions. Previous evidence from USSR suggests that some of the adaptations to long-duration space flight may be irreversible. Orthostatic intolerance, musculoskeletal weakness, and poor motor coordination are major problems following space flight. Therefore, this symposium will present mechanisms of adaptation to microgravity for multiple physiological systems with a view toward development of countermeasures based on an understanding of these mechanisms. Countermeasure development has not always followed a clear understanding of basic mechanisms. Therefore, speakers will discuss gaps in present knowledge and the needs and opportunities for future research.

Expression of Transport Proteins in Heterologous Systems: What Can This Tell Us About Structure-Function Relationships?

Theme area: Epithelial Cell Biology. *Sponsors:* APS Cell & General Physiology Section, Epithelial Transport Group, and The Society of General Physiologists. *Chairs:* P. A. Knauf and J. R. Riordan. *Participants:* R. Kopito, H. Passow, J. Pouyssegur, E. M. Wright, M. J. Welsh, J. R. Riordan, and P. A. Knauf.

This symposium deals with the expression of mammalian membrane transport proteins in heterologous systems, such as mammalian tissue culture cells, insect cells, and Xenopus oocytes. Recent advances, largely by the symposium participants, have permitted for the first time careful examination of the functional properties of ion exchanges and regulated ion channels in artificial expression systems. This permits analysis of systems that are not easy to examine in situ (e.g., anion or cation exchangers that are expressed in secretory or absorptive epithelia, brain neurons, or heart cells). It also allows alteration of transporter structure by mutation for analysis of structure/function relationships at the molecular level. Finally, it permits detection of the functional properties of gene products involved in disease processes such as cystic fibrosis or glucose/galactose malabsorption. This symposium brings together some of the pioneers in this field to discuss the strengths and weaknesses of the various approaches that have been used so far, as well as possibilities for future development. By providing a demonstration of what such approaches can accomplish, it should stimulate much additional research involving the use of molecular biology together with sophisticated electrophysiological and kinetic methods to investigate fundamental transport questions of great physiological significance.

Leukocyte Adhesion in the Presence of Shear Stress: Mechanics and Molecules

Theme area: Cardiovascular Biology. *Sponsor:* APS Cardiovascular Section. *Chairs:* K. Ley and C. W. Smith. *Participants:* S. Chien, H. H. Lipowsky, G. W. Schmid-Schönbein, C. W. Smith, M. B. Lawrence, K. Ley, and A. Tözeren.

A new family of adhesion molecules, the vascular selectins, mediate leukocyte adhesion in the presence of shear stress, while integrins cannot arrest cells in the presence of blood flow. S. Chien will give an introduction on fluid dynamics of blood flow. G. W. Schmid-Schönbein and H. H. Lipkowsky will cover the forces exerted on rolling and firmly adherent leukocytes in vivo and the role of cell deformation. C. W. Smith will introduce the leukocyte-endothelial adhesion molecules and report on selectin- and integrin-mediated leukocyte adhesion in vitro. M. B. Lawrence will focus on P-selectin in a reconstitution assay. The role of selectins for leukocyte adhesion in vivo will be covered by K. Ley. A. Tözeren will present model calculations relating molecular binding affinities to mechanical adhesive forces. This symposium will integrate the biomechanical and the molecular approach to leukocyte adhesion.

Vesicle-Mediated Transporter Redistributions in Regulation of Epithelial Transport

Theme area: Epithelial Cell Biology. *Sponsors:* APS Cell & General Physiology Section and Epithelial Transport Group. *Chairs:* A. K. Mircheff and J. G. Forte. *Participants:* J. G. Forte, D. Brown, A. Doucet, S. A. Kempson, A. K. Mircheff, and K. L. Kirk.

We have known for some time that redistributions of transport proteins, i.e., recruitment from intracellular reserves or retrieval from the plasma membrane, mediate the rapid regulation of acid secretion in the stomach and the regulation of water reabsorption, acid reabsorption, and acid secretion in renal and urinary bladder epithelia. More recently, evidence has been found for regulation of several additional epithelial transport processes by translocation events, including CFTR-mediated Cl^- transport, Na-Phosphate symport and Na/H antiport renal cells, and Na-K-ATPase-driven fluxes through antiporter arrays in exocrine acinar cells. The variety of tissues and the diversity of transport processes involved suggest that vesicle-mediated transporter redistribution might be a widely employed regulatory strategy. The speakers have employed a range of experimental approaches to examine redistribution mechanisms at the cellular, subcellular, and molecular levels. They will present the current status of our knowledge, drawn from the best-recognized and longest-known examples and from the more recently appreciated systems.

This symposium is offered with the hope that, in addition to outlining future directions for the specific topics being addressed, it will catalyze progress in the understanding of the roles played by insertion and retrieval mechanisms in the regulation of other epithelial transport processes and in the regulation of transport in nonpolarized cells.

Physiology and Pharmacology Disciplines for the Twenty-First Century

Sponsor: APS Education Committee. *Chair:* M. Printz and H. Nishimura. *Participants:* A. W. Cowley, M. I. Phillips, G. Sachs, W. H. Dantzler, L. E. Limbird, J. C. Garrison, J. C. McGiff, E. H. Blaine, M. Printz, W. S. Spielman, and H. Nishimura.

The symposium will bring together brief state-of-the-art research lectures and position papers on educational requirements for the disciplines of physiology and pharmacology for the present and, especially, for the twenty-first century. The underlying issue is whether research drives the discipline or the discipline drives the research. In other words, how do the educational requirements of a discipline relate or adapt to changing emphasis and/or directions of the research conducted within the discipline? The importance of this issue lies in the major shift of graduate student training away from the more traditional aspects of physiology and pharmacology to molecular biology and molecular cell biology. The symposium will begin with 20-minute state-of-the-art oral research papers in four subdisciplines (organ system physiology, A. W. Cowley; cell physiology, G. Sachs; molecular pharmacology, L. E. Limbird; and physiological pharmacology, J. C. McGiff), discussing "cutting-edge" research in the subdisciplines, each followed by a short position paper on the educational requirements for that subdiscipline and on various current and future problems. The above-mentioned essential question of the symposium will be open for general discussion at the end of the symposium by the audience and panel members. The symposium should appeal to graduate students, postdoctoral fellows, faculty members involved in the respective disciplines and in soliciting for research training grants, and NIH, NSF, and other granting agency staffs involved in developing and/or planning training programs in physiology and pharmacology.

Charge Translocation by Electrogenic Carriers and Ion Pumps

Theme area: Epithelial Cell Biology. *Sponsors:* APS Cell & General Physiology Section and Epithelial Transport Group. *Chairs:* R. F. Rakowski and P. De Weer. *Participants:* D. C. Gadsby, H.-J. Appell, W. Schwarz, D. W. Hilgemann, W. J. Lederer, E. Bamberg, R. F. Rakowski, and P. De Weer.

A central question in the field of biological transport is "How does an ion pump pump?" Although the outlines of a definitive answer to this general question are only beginning to be clear, considerable progress recently has been made in answering a more specific question, namely "What is the mechanism by which ions are translocated through the membrane by ion pumps?" Although it has been generally thought that the charge translocation process is likely to be associated with the major inside-to-outside-facing conformational change of the pump protein, recent evidence from several different experimental approaches has resulted in the conclusion that a major part of the ion translocation process takes place within an external high field access channel (ion well). This symposium is intended to honor the late Professor Peter Läuger, whose life's work was devoted to understanding the mechanism of ion permeation through biological membranes. The symposium will examine the evidence for the existence of ion wells. A variety of complementary methods will be discussed, including 1) pre–steady state charge movement (pump gating current) measured with the whole-cell patch clamp technique; 2) the use of fluorescent dyes that report changes in the electric field in one-half of the lipid membrane leaflet; 3) molecular biological techniques that allow the modification of charged residues within the portion of the pump molecule associated with an ion binding site; 4) measurement of charge translocation in reconstituted lipid vesicles and planar bilayers in response to flash photolysis of caged ATP or Mg^{2+}, and 5) measurement of charge translocation in a cloned cotransporter by expression of mRNA in Xenopus oocytes. Evidence for the existence of "conformational currents" will also be discussed that conflicts with the ion well hypothesis. The principal take-home message for the intended audience, however, is that it is necessary to consider the possibility of a voltage-dependent apparent affinity for substrate binding when considering pump- or carrier-mediated transport processes. The work to be presented is at the forefront of current research and is an excellent example of how physiological methods produce results that precede and shape the direction of research at the molecular level.

Biomedical Research in Developing Countries: Current Problems in Malnutrition

Sponsors: APS International Committee and the American Institute of Nutrition. *Chairs:* D. R. Richardson and K. M. Rasmussen. *Participants:* D. R. Richardson, L. H. Allen, F. Viteri, A. Tompkins, and K. M. Rasmussen.

This will be the third in a series of APS symposia on fostering physiology in developing countries, and it will be centered around a current world health problem (malnutrition) that could benefit from collaborative research between American scientists and scientists in developing countries. The symposium will present a selection of current world health problems in malnutrition by investigators who are recognized for their collaborative research in developing countries. The selected topics are iron and trace mineral deficiencies, protein-energy malnutrition, vitamin deficiencies and parasitic diseases, and malnutrition and reproduction. Since the overall objective of this symposium series is to foster biomedical research in developing countries, each presenter will emphasize current questions that need to be addressed and how collaborative efforts between American scientists and researchers in developing countries might assist in leading to answers.

Lung Surfactant: Molecular and Cellular Processing

Theme area: Epithelial Cell Biology. *Sponsor:* APS Respiration Section. *Chairs:* S. A. Rooney and J. R. Wright. *Participants:* C. R. Mendelson, S. W. Glasser, T. Akino, S. A. Rooney, L. Dobbs, A. Chander, S. L. Young, and J. R. Wright.

The lung epithelial type II cell is an example of a classical secretory cell that synthesizes and packages lung surfactant components into lamellar bodies prior to secretion into the alveolar lumen. The proposed symposium deals with distinct yet related topics on regulatory mechanisms for synthesis, secretion, extracellular processing, and internalization of various components of lung surfactant. This symposium provides a unique blend of molecular genetics and cell biological approach to investigate various aspects of life cycle of surfactant in both fetal and adult lung. The focus of molecular genetics is on the regulation of gene expression of surfactant proteins and the interaction of such proteins in the regulation of secretion of surfactant phospholipids. Presentations on cell biology of lung surfactant secretion will discuss intracellular transduction mechanisms including G-proteins, phosphoinositide and phosphatidylcholine metabolism, and membrane-fusion for exocytosis. Finally, extracellular enzymatic conversion of surfactant components is expected to provide the up-to-date information on the overall life cycle of lung surfactant. This symposium is expected to initiate a meaningful dialogue among various groups currently studying lung surfactant, to attract new investigators to this dynamic field, and provide interactions with cell physiologists working with a variety of other systems.

Mechanical Force Regulation of Gene Expression in Vascular Cells

Theme area: Cardiovascular Biology. *Sponsor:* Biomedical Engineering Society. *Chair:* J. A. Frangos. *Participants:* S. Izumo, B. Sumpio, M. Gimbrone, N. Resnick, B. Berk, S. Diamond, and J. A. Frangos.

It has become increasingly apparent that physical forces are important determinants of cardiovascular physiology. Significant progress has been made in this area by interdisciplinary teams of physiologists, cell biologists, biochemists, and engineers. In the last few years, attention has turned to how physical forces, such as the strain caused by blood pressure and the shear produced by blood flow, may be controlling heart and blood vessel physiology and remodeling at the level of gene expression. A diverse group of pathologists, biochemists, and engineers will be brought together to discuss the timely topic of how external physical forces regulate gene expression. This session, although restricted to cardiovascular physiology, will have an impact on other areas as well.

The issues that are to be addressed will include the importance of proto-oncogenes in indicating any response to physical forces, the regulatory sites for physical force-induced gene, regulation, and signal transductions mechanisms.

Respiratory Physiology: Historical Perspectives

Sponsor: APS History of Physiology Group. *Chairs:* G. Sant'Ambrogio and D. L. Gilbert. *Participants:* A. Otis, N. C. Staub, J. B. West, D. L. Gilbert, J. G. Widdicombe, and G. Sant'Ambrogio.

This symposium is organized around five different aspects of respiratory physiology that have greatly developed in recent decades: respiratory mechanics; lung microvasculature-fluid balance; ventilation/perfusion relationship and its role in gas exchange; oxygen toxicity; and control of breathing. The speakers are leading authorities in their respective fields, having been not only eye-witnesses of major developments in our understanding of respiratory functions but in many instances having been themselves the actual discoverers. Their presentations should thus give unique personal accounts that could greatly enlighten their talks. In some cases we may learn that the accurate, logical planning described in the published papers is far from what really happened. They can "tell it like it was."

Experimental Biology '93
New Orleans, Louisiana
Wednesday, March 31, 1993, 5:30 pm

Physiology in Perspective:
Walter B. Cannon Memorial Lecture*

"Potassium Homeostasis: Regulation Through Pumps and Channels"

Gerhard Giebisch
Department of Cellular and Molecular Physiology
School of Medicine
Yale University

*Sponsored by The Grass Foundation

Regulation of Myocardial Substrate Metabolism

Theme areas: Cardiovascular Biology and Metabolism. *Sponsor:* APS Endocrinology & Metabolism Section. *Chairs:* W. C. Stanley and R. S. Balaban. *Participants:* H. Taegtmeyer, R. S. Balaban, J. A. Wisneski, L. H. Young, W. C. Stanley, and A. J. Liedtke.

This symposium will examine the regulation of myocardial substrate metabolism under physiological and pathological conditions. The speakers will discuss a wide range of topics concerned with metabolic regulation in myocardium, from the control of citric acid cycle flux and mitochondrial oxidative phosphorylation to carbohydrate and protein metabolism in the healthy heart subjected to physiological perturbations such as hyperinsulinemia, hyperglycemia, or exercise. In addition, substrate use and its regulation during myocardial ischemia and reperfusion will be examined. The speakers will present data obtained using several experimental approaches, from isolated rat hearts to intact healthy humans. Directions for future research will be emphasized.

Humoral Modulation of Pulmonary Vascular Resistance During Hypoxia

Theme area: Cardiovascular Biology. *Sponsors:* APS Hypoxia Group and Respiration and Cardiovascular Sections. *Chairs:* B. R. Walker and P. A. Murray. *Participants:* B. R. Walker, S. Oparil, I. F. McMurtry, H. L. Lippton, M. Rabinovitch, and P. A. Murray.

Hypoxic exposure associated with travel to high altitude or with pulmonary disease states results in pulmonary vasoconstriction. If exposure is prolonged, both vasoconstriction and vascular remodeling contribute to the development of sustained pulmonary hypertension. However, recent evidence suggests that a number of humoral factors released in response to hypoxia may modify the tone of the pulmonary vasculature and also affect the long-term development of hypertension. The symposium will examine the responses to a number of these humoral agents including arginine vasopressin, angiotensin II, atrial natriuretic peptide, EDRF, and endothelin. Findings from a variety of experimental approaches will be presented, ranging from experiments on conscious animals to in vitro studies at the organ, tissue and cell/molecular levels. This symposium will offer insight into the complexities of the pulmonary circulatory response to hypoxia with emphasis on the integrative nature of cardiovascular control. All speakers will be encouraged to not only report on past findings but also to emphasize future directions of research in this area.

Experimental Biology '93 Symposium

Imaging Techniques for Assessing Cell Function

F. S. Fay and L. J. Heller, Chairs
Sponsored by
The APS Education Committee

Rheology of Metastasis

Sponsor: North American Society of Biorheology. *Chairs:* H. L. Goldsmith and D. A. Hammer. *Participants:* D. Needham, K. Ward-Anderson, D. A. Hammer, U. Bagge, L. Weiss, E. Barberá-Guillem, R. Jain, and H. L. Goldsmith.

One of the most feared complications of cancer is metastasis, in which cancer cells are released from the primary cancer and form noncontiguous lesions in other sites. Overall, the most important disseminative route for cancer cells is via the bloodstream, leading to cancer cell arrest in the microvasculature of target organs. Very few of the arrested cells survive to grow into metastases, because of slow and fast events occurring after arrest. Although there have been many meetings on metastasis over the last few years, very few have dealt with metastasis from the viewpoint of rheology. This symposium will focus on the rheologic properties of cancer cells and their variability, the mechanics of adhesion and arrest of cancer cells in the vasculature, the intravascular deformation and destruction of cancer cells in the microcirculation, and these phenomena viewed as a rate regulator for the metastatic process, and the deformation of cancer cells in the liver sinusoids, together with the associated deformation of the sinusoids and liver parenchyma by the cancer cells. Finally, the role of flow and fluid mechanical stresses in the use of cytotoxic lymphocytes in the destruction of tumors will be considered.

Biofunctional Materials for Tissue Engineering

Theme area: Cardiovascular Biology. *Sponsor:* Biomedical Engineering Society. *Chairs:* J. A. Hubbell and W. M. Saltzman. *Participants:* J. R. Glass, J. Cappello, P. Aebischer, J. A. Hubbell, W. M. Saltzman, and F. Grinnell.

The focus of this symposium session is the development of materials that interact bioactively with cells and the use of those materials in tissue engineering. Five papers will address such biofunctional materials as synthetic extracellular matrices with biological recognition for cell-surface adhesion receptors. Research will be presented on recombinant biopolymers that contain novel adhesion signals for the use in materials fabrication and in materials coating and in the modification of biopolymer and synthetic polymers to incorporate Arg-Gly-Asp peptide ligands for the integrin superfamily

of adhesion receptors. This approach has been tailored to materials for use in tissue engineering of vascular grafts, materials for hepatic cell transplantation, and materials for the promotion of nerve regeneration. One paper will be presented on the role of the cell's physical environment in regulating its synthesis of extracellular matrix upon collagen gels.

In Search of a Hepatic Stem Cell

Sponsor: Society for Experimental Biology and Medicine. *Convener:* E. R. Jaffé. *Chair:* D. A. Shafritz. *Participants:* N. Fausto, D. A. Shafritz, S. S. Thorgeirsson, L. M. Reid, J. W. Grisham, D. C. Hixson, D. A. Shafritz, and E. R. Jaffé.

The symposium will provide an opportunity for the presentation and discussion of state-of-the-art information about the cellular and molecular biology of liver cell differentiation from a putative hepatic stem cell. Evidence for the existence of such a stem cell and contrary views will be discussed. Anatomic, embryologic, genetic, and pathologic elements will be addressed. The session will provide the audience with the latest information about how hepatic cells are formed, from where they arise, what happens in liver regeneration after partial resection or other forms of inflammatory or toxic damage, and the changes that occur in oncogenesis leading to liver cancer. Relevant aspects of eukaryotic gene regulation and specific messenger RNA expression in relation to lineage progression in hepatocyte differentiation will be considered. The directions for future studies will be outlined by investigators actively engaged in these research endeavors.

APS: A Keystroke Away

The APS offices are now accessible to the membership via e-mail through CompuServe. Access is easy and only a few keystrokes away. To reach any indivudual on the APS staff, it is only necessary to know their first name. Send a message over e-mail as follows: *user name@APS.MHS.COMPUSERVE.COM.*

The following individuals and/or offices can be reached.

Executive Director: Martin Frank *(marty@APS)*	(301-530-7164)
Publications: Brenda Rauner *(brenda)*	(-7070)
Production: Laurie Chambers *(laurie)*	(-7072)
Business: Jim Liakos *(jim)*	(-7160)
Membership/Meetings: Linda Buckler *(linda)*	(-7171)
Subscriptions: Samer Masri *(sam)*	(-7080)

These are only a few of the individuals working for the membership at APS. If you have a specific issue or activity not encompassed by the above offices, please send your message to the Executive Director.

Opportunity to Help With High School Students and Teachers at Experimental Biology '93

There are still some spots open for members of the Teaching Section to assist Norman Staub with High School Day at Experimental Biology '93 in New Orleans. In particular, we need volunteers to mentor small groups of teachers and students through the maze of posters and papers for one half day sometime during the spring meeting. Anyone interested please write, phone, or fax:

Daniel Richardson, Department of Physiology, University of Kentucky College of Medicine, Lexington, KY 40536-0084. Tel: 606-233-5649; Fax: 606-258-1070.

Abstract Deadline

November 17, 1992

Membership

APS Honorary Memberships Given To Four Renowned Scientists

The American Physiological Society has awarded honorary memberships to four renowned European scientists: Michael J Berridge, United Kingdom; Michel Jouvet, France; Bert Sakmann, Germany; and Janos Szentagothai, Hungary.

Their election brings to 31 the number of honorary members.

Michael J Berridge

Michael J Berridge is best known for his discovery of the second messenger inositol trisphosphate (IP_3), which plays a universal role in regulating most cellular processes, including cell growth and synaptic transmission in the nervous system.

His studies on cell signaling began with his interest in trying to understand the control of fluid secretion by an insect salivary gland. The introduction and development of this simple model system paved the way for a number of significant observations that culminated in the major breakthrough of uncovering a new second messenger system responsible for regulating intercellular homeostasis.

A role for second messengers in controlling secretion was first recognized when cyclic AMP was found to mimic the stimulatory action of 5-hydroxytryptamine. Subsequent studies revealed that calcium was also important, and Berridge was one of the first to draw attention to the integrated action of the cyclic AMP and calcium messenger systems.

Focusing on the latter, Berridge showed that signal calcium could be derived from both external and internal reservoirs. Appreciation of the central role of internal calcium in cell regulation led to a search for the way in which calcium homeostasis was controlled. Working in collaboration with John Fain, Berridge provided the first direct evidence to support Michell's hypothesis that the hydrolysis of inositol lipids played a role in calcium signaling.

The current interest in the role of inositol phosphates as second messengers began when Berridge developed the new approach of measuring the formation of inositol phosphates as a direct way to study receptor-mediated inositol lipid hydrolysis. Of particular significance was Berridge's introduction of the lithium amplification technique, which rapidly has been adopted as the method of choice for measuring inositol lipid turnover.

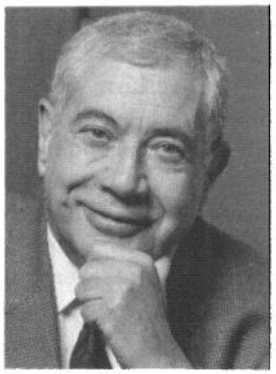
Using these new methods, Berridge demonstrated that 5-hydroxytryptamine stimulated a rapid formation of IP_3, which led him to propose that this metabolite might function as a second messenger. Such a messenger role was rapidly verified when IP_3 was found to mobilize calcium when added to permeabilized cells or injected into intact cells. It is generally agreed that, together with Nishizuka, Berridge has been the catalyst who has sparked a worldwide interest in the role of this signaling system that has a central role in cell regulation.

Berridge received with honors his bachelor of science degree in 1960 from the University College of Rhodesia and Nyasaland and earned his doctorate at the University of Cambridge in 1964. He did postdoctoral studies at the University of Virginia and at Case Western Reserve University, where he developed his interest in second messengers.

In 1969 Berridge returned to Cambridge, where he now is the most senior research scientist at the institution's research council. He became a Fellow of Trinity College in 1972 and was elected a Fellow of the Royal Society in 1984. For his work on second messengers Berridge has received numerous prizes and awards including The King Faisal International Prize in Science, The Louis Jeantet Prize in Medicine, the Gairdner Foundation International Award, and the 1989 Albert Lasker Basic Medical Research Award.

In 1959, with the support of United States Air Force grants, **Michel Jouvet** began his scientific career, which he describes, "by discovering with serendipity and together with Francois Michel the muscular atonia during paradoxical sleep (PS) in chronic pontine cats in which they were studying habituation of the arousal action." This finding led Jouvet to the hypothesis that PS might be a third state of the brain, different from waking and slow wave sleep.

In that same year he published the first clinical and polygraphic observation of brain death in human patients and described the EEG criteria (flat isolectic EEG), which became the cri-



Michel Jouvet

teria for the diagnosis of brain death. Since then Jouvet has been studying mostly PS mechanisms.

Jouvet fought with the "Maquis" in the Jura Mountains during the German occupation of France; following the liberation he served as an infantry sergeant with the Alpine troops in the Alps and Alsace. After the war he began his medical education at the medical school in Lyons, earning his MD degree in 1956. He took a break from his medical training in 1954 when he was awarded a Fulbright fellowship and spent one year in the United States in H. W. Magoun's laboratory at the Long Beach Veterans Administration Hospital, where he worked on learning, habituation, and attention.

Since 1956 Jouvet's research has been in neurophysiology and neurobiology of sleep. He was named professor and chairman of experimental medicine of the Claude Bernard University in Lyons in 1968 and director of INSERM U 52 of molecular onirology and of CNRS Associate Laboratory on the states of vigilance. He also is head of the department of sleep research in the Neurological Hospital in Lyons.

Jouvet was elected to the French Academy of Sciences in 1977. Among his awards are Prix Petit d'Ormoy of the French Academy of Science, Prix Bing of the Swiss Academy, Intra-Science Award (together with W. C. Dement), French Award for Medical Research, and the Gold Medal of the CNRS, which is considered the foremost scientific French Award. This year he was the recipient of the Cino del Duca World Award and the Recherche et Sante Award from the Institut des Sciences de la Sante.

Reflecting upon his career, Nobel laureate **Bert Sakmann** said, "Looking back, I feel very fortunate that I began my career in two laboratories that guided me into important scientific issues that interested me for the rest of my life. The scientists that influenced me most were Otto Creutzfeldt (then at the Kraepelin Institute in Munich), who made me decide to take up a scientific career in neurophysiology, and Bernard Katz in whose department at the University College in London I trained in cellular biophysics and who still remains as my mentor."

With the exception of three postdoctoral years (1970-73), Sakmann has been affiliated with the Max-Planck-Gesellschaft, where currently he is the director of the department of cell physiology at the Max-Planck-Institute for Medical Research and the acting director of the institute.

Last year Sakmann and Erwin Neher shared the Nobel Prize for Medicine for their work in the 1970s

Honorary Members of APS

Michael J Berridge	Cambridge, United Kingdom
Pierre Dejours	Strasbourg, France
Derek A. Denton	Victoria, Australia
Setsuro Ebashi	Okazaki, Japan
Sir John Eccles	Contra, Switzerland
T. P. Feng	Shanghai, People's Republic of China
Bjorn Folkow	Goteborg, Sweden
Oleg Gazenko	Moscow, Russia
Ian Michael Glynn	Cambridge, United Kingdom
Ragnar Granit	Stockholm, Sweden
Roderic A. Gregory	Liverpool, United Lingdom
Bela Halasz	Budapest, Hungary
Sir Allan Hodgkin	Cambridge, United Kingdom
Tomas Hokfelt	Stockholm, Sweden
Sir Andrew Huxley	Cambridge, United Kingdom
Hugh E. Huxley	Waltham, MA
Masao Ito	Saitama, Japan
Michel Jouvet	Lyon, France
Sir Bernard Katz	London, United Kingdom
Giuseppe Moruzzi	Pisa, Italy
Erwin Neher	Goettingen, Germany
A. S. Paintal	Delhi, India
Johannes Piiper	Goettingen, Germany
Bert Sakmann	Heidelberg, Germany
Jens Christian Skou	Aarhus, Denmark
Janos Szentagothai	Budapest, Hungary
Karl J. Ullrich	Frankfort, Germany
Hans H. Ussing	Copenhagen, Denmark
Sir John Vane	London, United Kingdom
Ewald R. Weibel	Berne, Switzerland
Silvo Weidmann	Berne, Switzerland

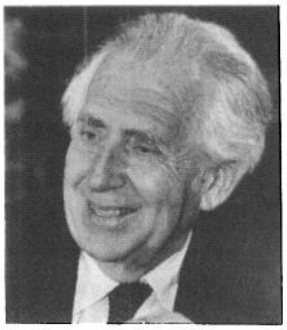
Bert Sakmann

and 1980s in discoveries concerning the function of single ion channels in cells. In the official citation it said that the two researchers "contributed to the understanding of the cellular mechanisms underlying several diseases, including diabetes and cystic fibrosis."

"With Erwin Neher I shared an exciting and wonderful 16 years of scientific adventures and `basteln' on methods at the Max-Planck-Institute in Gottingen," Sakmann has said. "In our collaboration it has always proven important to spend a good part of our time developing methods and instruments, and it has paid off to share newly developed methods with fellow scientists as freely as possible, leading always to improvements and simplifications making the techniques easier to use."

In addition to the Nobel Prize, Sakmann has been awarded the Nernst Prize, Feldberg Prize, Magnes Award, Spencer Prize, Adolf Fick Prize, Zottermann Prize, Gross-Horwitz Prize, Leibniz Prize, Louis Jeantet Prize, Gairdner Prize, Ernst Hellmut Vits Prize, Carus Medal, Harvey Prize, Gerard Prize, and Landesforschungspreis Baden-Wurttemberg.

Janos Szentagothai has successfully combined two careers, being both a scientist and a member of parliament.



Janos Szentagothai

He started his career in science in 1931 as a hobby microscopist; more recently he began a second career in 1985 when he was elected to the Hungarian Parliament.

Szentagothai is a 1936 graduate of Budapest University's medical school where he returned in 1963 as professor and chairman of the department of anatomy. From 1946 to 1963 he was professor and chairman of the anatomy department at Pecs University. In 1977 he had to give up the chairmanship when he was elected president of the Hungarian Academy of Sciences but continued to teach neuroanatomy.

In 1985 after two terms as president he became president emeritus and research professor, heading an Academy research group at the medical school and lecturing on anatomy to a German class and participating in lectures to an English-speaking class.

Also in 1985 Szentagothai was first elected as an independent to the Hungarian Parliament. He was reelected in 1990 to the new parliament of the Hungarian Democratic Forum.

Szentagothai has received many honors for his work including membership in the Leopoldina Academy, Germany; Mainz Academy; Royal Belgian Academy of Medicine; Royal Society, London; National Academy of Sciences, Washington; American Academy of Arts and Sciences; Royal Swedish Academy; Norwegian Academy; Soviet and Medical Academies; Pontifical Academy, Vatican; Finish Academy; and Academy of Science of France. He also has honorary degrees from Oxford University and Turku University.

His field of study includes functional anatomy of synapses, tracing of reflex connections in the spinal cord and the brain stem; vestibulo-ocular reflexes; cerebellar pathways; hypothalamic neuron systems, etc., by aid of experimental degeneration; and neuron circuit models of the cerebellar and the cerebral cortex. He recently became involved in the study of "self-organization" in neural centers and in brain theories.

Nominations for Honorary Membership

Members are invited to submit nominations for honorary membership. Send nominations and documenation of the candidate's contributions to physiology to the APS Honorary Membership Committee, 9650 Rockville Pike, Bethesda, MD 20814, by December 1.

Spring Meeting of the Council of Academic Societies

The spring meeting of the Council of Academic Societies (CAS) of the Association of American Medical Colleges (AAMC) was held in Palm Springs, California. A morning session was devoted to Affinity Group discussions of Basic Science, Clinical Research, Undergraduate Medical Education, and Graduate Medical Education, with the focus on identification of areas of concern within the medical education/research setting. The Basic Science group largely confined its discussion to research, emphasizing the need for increased research funding and ways in which CAS and AAMC might participate to a greater degree in future planning for the basic sciences, including setting of priorities for funding allocations. The discussants felt that the public's perception of scientists is not as positive as it has been in the past and this may have had an effect on the overall biomedical research budget set by Congress. They felt that this very serious issue might be alleviated by better public relations and increased attention paid to addressing the public's concerns. Suggestions for grassroots strategies included increased outreach to the community and greater participation in volunteer health organizations by scientists. Both are strategies for helping the public understand the relation of basic research to public health issues. They also emphasized the need for scientists to support and participate in organizations like Research! America, which acquaints both the public and legislators with the need to increase support of biomedical research. Although most of the discussants didn't feel they could individually set priorities for research funding, they stressed that basic scientists should acquaint themselves with the global issues, i.e., the whole range of important health issues outside their own immediate area of interest, and participate in discussions of priorities, because whoever makes the decisions about how the research budget is to be allocated needs informed input from all areas of the scientific community.

The Clinical Research group discussed the multidisciplinary nature of clinical research and the need for new training programs that will provide rigorous training in clinical research methodology. The Robert Wood Johnson Clinical Scholars Program was cited as one exemplary program. The high medical education debt that physicians are still trying to discharge early in their careers is considered a strong disincentive for careers that require further training. Medical schools might be able to turn this to their own advantage, however, by offering innovative programs that would forgive part of the debt for those of their young faculty who have a demonstrated aptitude for clinical research and who would like to enter a rigorous training program in clinical research methodology. The group also discussed efforts to increase public awareness of, and appreciation for, biomedical and behavioral research and endorsed the efforts of organizations like Connecticut United for Research Excellence (CURE), which is comprised of 53 member organizations representing most of the state's educational and research institutions, pharmaceutical and biotechnology firms, hospitals, professional societies, and voluntary health organizations, and has as its objective the education of the public about health and research issues.

The Undergraduate Medical Education group joined the AAMC Group on Educational Affairs in a workshop on problem-based learning to experience one of the newer methods of teaching across disciplines. They found the workshop to be extremely challenging, but a good learning experience, and suggested that CAS should continue to provide opportunities for members to experience and discuss new developments in educational techniques.

The Graduate Medical Education group discussed several important questions relating to the educational process in medical schools where there are new emphases on primary care (i.e., how will an increased emphasis on primary care affect the teaching of specialities?); health coverage by managed care organizations that do not want to pay for teaching no matter how it is related to the care of the patient; and clinical faculty who are increasingly sending their patients to community hospitals that charge less than large urban medical centers (i.e., what happens to the quality of the teaching program at the medical center?). Another pertinent question was how graduate medical education should be paid for, since the federal government and the managed care plans increasingly reluctant to pay for it. The group suggested that there are no standard or easy answers to the questions and that clinical societies within CAS should be encouraged to discuss them.

AAMC Advisory Panel on Biomedical Research (APBR)

In response to the changes in research funding that have occured in recent years, both as to the amount of money available for research and the policies regarding its alloca-

(continued on p. 262)

APS Receives Bequest

The American Physiological Society has received a bequest from the estate of Frances A. Hellebrandt, who died February 2 in Columbus, OH. She was 90.

"The Society is both grateful and honored by the gift Dr. Hellebrandt provided for the Society," APS Executive Director Martin Frank said upon receiving notification of the bequest. "It is an unrestricted gift and it will be used to implement some of the member service program goals defined by the Society's strategic plan."

Hellebrandt was a 59-year member of APS. She was a 1929 graduate of the University of Wisconsin Medical School, where she taught anatomy, physiology, and physical medicine until 1944 when she was appointed professor of physical medicine and director of the Baruch Center for Physical Medicine at the Medical College of Virginia. In 1951 she was named professor and head of the Department of Physical Medicine at the University of Illinois.

Although Hellebrandt retired in 1955, she returned to the University of Wisconsin in 1959 on a parttime basis for five years as professor of medicine and education, during which time she established and served as the first director of the Motor Learning Research Laboratory.

Hellebrandt served on the editorial boards of several scientific journals, including the *Journal of Applied Physiology.* She also was a member of the board of trustees of the Easter Seals Research Foundation.

At the age of 68, she wrote in a Senior Physiologist Letter in *The Physiologist*, ". . . I began to study the violin because I thought this might be a good way to observe the influence of aging on the acquisition of a complex skill involving the dissimilar use of the right and left upper extremities." This exercise led to a series of papers in 1969-71 on the neurophysiological basis of violin playing.

In one of her last letters to Senior Physiologists, Hellebrandt wrote, "I continue in relatively good health. Percy Dawson taught me that the hardest thing about being a physiologist is to live physiologically. I have never forgotten that—ride my stationary bike for eight miles daily before breakfast, walk regularly (25 miles a week), and I am introspective and analytical about the limitations imposed by a rapidly deteriorating vision and an impaired proprioception. Nobody writes about the deterrents and hazards of exercise in the old-old, but I am living them and monitoring my own physical performance.

"A physiologist has a wealth of interesting phenomena to observe in himself as he ages. We are among the lucky with the know-how to appreciate the wisdom of the body and to get pleasure from its unfolding."

COUNCIL ON ACADEMIC SOCIETIES
(continued from p. 261)

tion, the AAMC has established the Advisory Panel on Biomedical Research (APBR) to help guide the Association's efforts in biomedical research advocacy, education, and strategy development. In the last few years, the AAMC has perceived a greatly increased need for biomedical scientists to be able to impact the legislative process with regard to research funding, as well as a need to participate in the development of policy and programs of the National Institutes of Health (NIH) and the Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA) regarding funding priorities, ethical issues, humane use of animals, and research education. AAMC has a vested interest in aiding the formation of such an advocacy group since it represents 126 medical schools, 450 teaching hospitals, and 60,000 constituent faculty who, either as institutions or individual scientists, receive over half of the NIH extramural research budget. The APBR is meeting on a regular basis to discuss research issues regarding policy positions and funding priorities, to foster interactions with governmental agency officials and Congressional members, and to sponsor forums to review biomedical research policy positions.

Sarah D. Gray
University California, Davis

George A. Hedge
West Virginia University

APS Representatives
Council of Academic Societies

APS Members Named to Institute of Medicine

The Institute of Medicine (IOM) has named 50 new members, elected seven to senior membership, and selected one foreign associate. APS members named by the IOM include the following.

M. R. C. Greenwood

M. R. C. Greenwood is dean of graduate studies and professor in the departments of nutrition and internal medicine at the University of California, Davis. Greenwood's research interests are in developmental cell biology and physiology and nutrition. Her work on the regulation of the enzyme lipoprotein lipase and the genetic basis of obesity and diabetes is known internationally.

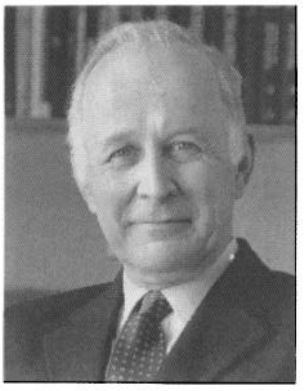
Greenwood was graduated from Vassar College, earned her PhD at Rockefeller University, and did postdoctoral research on human nutrition at the Institute for Human Nutrition art Columbia University. She returned to Vassar in 1978 where she served as the John Guy Vassar Professor of Natural Sciences, chairperson of the Department of Biology, and director of the Undergraduate Research Summer Institute before accepting her current position in 1989.

Greenwood also is the chairperson of the Food and Nutrition Board of the IOM/National Academy of Sciences and treasurer of the International Association for the Study of Obesity. She has served as director of the National Institutes of Health's (NIH) Obesity Research Animal Model Center CORE Laboratory and is a past president of the North American Association for the Study of Obesity.

The career of **Paul R. McHugh** has three interrelated themes. The first is to create a model department of academic psychiatry producing leaders in research, education, and patient care by emphasizing concepts of contemporary biopsychology. The second is to teach how the brain-mind problem is embedded in these concepts and affects the thought and actions of psychiatrists. The third is to investigate the motivated or driven behaviors that are open in this era to multiple levels of analysis from molecular biology to social science. These career themes are evident by the direction he has given the Department of Psychiatry and Behavioral Science at The John Hopkins University, the careers he has fostered, and the books and papers he has written.

McHugh received his medical education at Harvard Medical School and his residency training in neurology and neuropathology at the Massachusetts General Hospital. He continued his education at the Institute of Psychiatry, University of London, and at the Division of Neuropsychiatry at the Walter Reed Army Institute of Research.

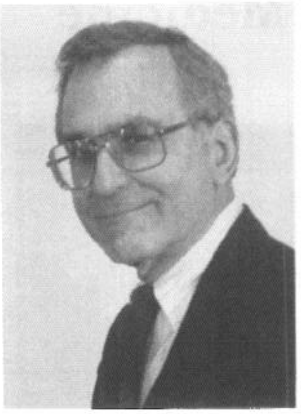
After his training he became a member of the faculty at the Cornell University School of Medicine and clinical director and director of residency education at the New York Hospital-Westchester Division at Cornell, where he founded and served as the first director of the Bourne Behavioral Research Laboratory; was professor and chairman of the Department of Psychiatry at the Oregon Health Sciences Center; and in 1987 he was named to his current positions, Henry Phipps Professor of Psychiatry, director of the Department of Psychiatry and Behavioral Sciences at the School of Medicine and Hospital, and professor of mental hygiene at the School of Hygiene and Public Health.



Paul R. McHugh

McHugh has served since 1982 as associate editor of the *American Journal of Physiology: Regulatory, Integrative, and Comparative Physiology.* He also serves on the editorial boards of several psychiatry journals and book series including *Psychological Medicine, Comprehensive Psychiatry,* and the *Handbook of Psychiatry.* He is a member of the board of trustees of the Association for Research in Nervous and Mental Diseases and has received the William C. Menninger Award, American College of Physicians.

Research has been the main focus of work for **Ralph L. Nachman**, chairman of the Department of Medicine and chief of the Division of Hematology-Oncology at the New York Hospital-Cornell University Medical College (NYH-CUMC). Specifically, his interests lie in endothelial cell and platelet biology and the blood vessel wall as it relates to thrombosis. His research group was among the first to apply the basic principles of cell and molecular biology to investigation of major killers such as strokes and heart attacks.



Ralph L. Nachman

Following his medical school training and an internship at Vanderbilt University, Nachman came to NYH-CUMC for a fellowship in pathology. After serving in the military and two years on the internal medicine house staff at Montefiore Hospital, he returned to NYH-CUMC in 1962 as a fellow in medicine. Six years later he was appointed chief of hematology-oncology.

He is the E. Hugh Luckey Distinguished Professor in Medicine, head of the SCOR in Thrombosis, and until recently was co-director of the Rockefeller-Cornell MD/PhD program. Nachman is a member of the American Federation of Clinical Research, serves on the program project committee of the Heart and Lung Institute of NIH, and is a member of editorial and advisory boards of several medical journals.

Robert M. Nerem is both an Institute Professor and Paul H. Petit Distinguished Chairman for Engineering in Medicine at the School of Mechanical Engineering at Georgia Tech. His research interests include biofluid mechanics, cardiovascular devices, cellular engineering, vascular biology, and atherosclerosis.

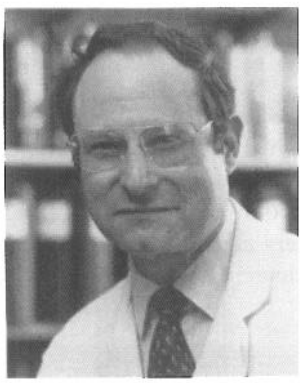
Nerem earned his PhD degree in 1964 at Ohio State University and joined the faculty there in the department of aeronautical and astronautical engineering. He was appointed associate dean for research in the Graduate School in 1975. In 1979 Nerem accepted the chairmanship of the Department of Mechanical Engineering at the University of Houston. He has been at Georgia Tech since 1987.

Nerem is president of the International Union for Physical and Engineering Sciences in Medicine, immediate past president of the International Federation for Medical and Biological Engineering, and the initial president of the newly established American Institute of Medical and Biological Engineering. He serves as technical editor of the ASME *Journal of Biomedical Engineering* and is the immediate past chairman of the US National Committee on Biomechanics.

Robert M. Nerem

Nerem also has been elected fellow in the Council of Arteriosclerosis, American Heart Association, American Physical Society, American Society of Mechanical Engineers, and the American Association for the Advancement of Science. This year he was appointed to the State of Georgia Governor's Advisory Council on Science and Technology.

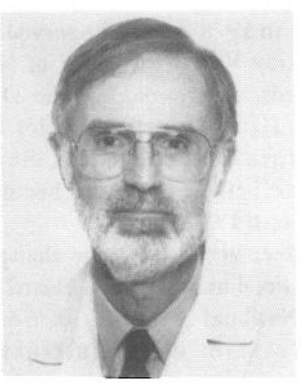
Jerome B. Posner, founder and chairman of the Department of Neurology at the Memorial Sloan-Kettering Cancer Center, is renowned as a specialist in nervous system tumors and is a leading contributor to the establishment of neuro-oncology as a subspecialty. His department has trained most of the nation's clinical investigators in neuro-oncology.



Jerome B. Posner

His recent research has concentrated on paraneoplastic syndromes, which are neurological ailments associated with but not caused by cancer. In these disorders, cancer cells generate proteins normally found only in nerve cells. When the immune system fights the cancer, it assumes that all cells marked with these proteins are cancerous and attacks cells of the nervous system. Increased understanding of paraneoplastic syndromes may shed new light on how the body fights tumors. Posner earned both a baccalaureate and medical degrees from the University of Washington.

Marcus E. Raichle, professor of neurology and radiology at Washington University, is a pioneer in using position emission tomography (PET) to map areas of the brain used in speci-

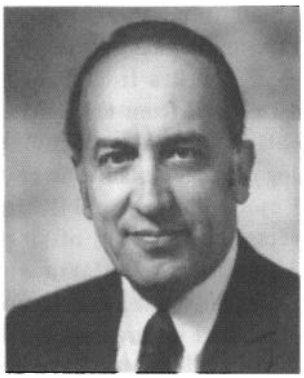


Marcus E. Raichle

fic tasks such as seeing, hearing, and speaking. PET, developed at Washington University in the 1970s, allows researchers to look safely at the living human brain and to track and record its functions.

The work by Raichle has provided a vast amount of information about how the brain performs daily tasks. The goal of the research is to create a brain atlas that specifically maps regions responsible for such tasks as language processing, thought, and attention. Raichle has pinpointed the origin of abnormal brain activity that occurs when a person has a panic attack, and he has been able to show how the brain responds when a person is asked to memorize words or to think sad thoughts.

Raichle received his medical degree from the University of Washington and his training in neurology and his introduction to neurological research at the Cornell University Medical Center.



Thomas A. Waldman

The work of **Thomas A. Waldman**, chief of the metabolism branch of the NIH's National Cancer Institute, has focused on the regulation of the human immune response and how its disruption can lead to autoimmune, malignant, and immunodeficiency diseases. The knowledge he gained from basic research has benefitted patients.

Waldman's most recent studies have focused on the control played by the receptor for interleukin-2 (IL-2) in the growth and differentiation of normal and neoplastic T-lymphocytes. Cellular immune responses require that T cells change from a resting to an activated state. IL-2 is a lymphokine synthesized by T cells following activation. Resting T cells do not express IL-2 receptors, but receptors are rapidly expressed on T cell following their interaction with antigen.

Using a monoclonal antibody, anti-Tac, directed toward the IL-2 receptor, Waldman defined the structure of the multisubunit IL-2 receptor, cloned the gene encoding one of the key subunits, and defined the immune functions that require IL-2–IL-2 receptor interaction.

Waldman received his medical degree from Harvard University in 1955 and joined NIH the following year. He has been in his present position since 1971.

APS Membership

Membership applications may be obtained from APS Membership Services, 9650 Rockville Pike, Bethesda, MD 20814-3991. Applications are reviewed and approved by Council on a regular basis throughout the year.

News From Senior Physiologists

Letters to Helen M. Tepperman

"I am retired, feel well, and keep active (gardening and home improvements)," writes **George F. Fulton** from his home in Columbia, SC. Last year Fulton attended the 5th World Congress on Microcirculatory, where he received a medallion. He is one of the microcirculatory group founders.

S. R. Baker says, "I have found opportunities to be helpful (and/or interfering) around campus in a variety of ways, since I have been here (University of Alabama-Birmingham) so long. I still come in every morning and the UAB maintains an office for me. I stay in touch with campus activities by going to seminars and major lectures, although I must admit to some difficulty keeping up with terminology in genetics and my awareness level becomes rather low at 4 or 5 p.m.

"A long-term interest in art of all kinds, but especially three-dimensional (sculpture), has become of prime importance, very largely because it brings me into close contact with an enthusiastic group of young creative people. I can even participate usefully. It's quite impressive that they are more concerned about making a living than in putting prices up to what the market will bear. Of course, they are far from world famous, as yet. In any event, I have been able to persuade the University to let me place nearly 20 sculptures around campus."

"I am semi-retired in Clearwater, FL," **Pietro O. Bramantre** writes. "After my retirement from the University of Illinois in Chicago, I obtained my board certification in anatomic pathology and practiced for a while. Presently, I am not engaged in

any significant high level physiology. I teach occasionally at an elementary level in local junior high schools and in vocational adult schools (medical, pharmacy, and nursing assistants, practical nursing). I enjoy every minute of it. They are so grateful. Could one say the same about today's sophisticated medical and graduate students?

"Aside from that and being president of the local chess club, I teach a course in conversational Italian to adults in as local evening class. Considering the ignorance of foreign languages in our country, I feel that my efforts are not in vain."

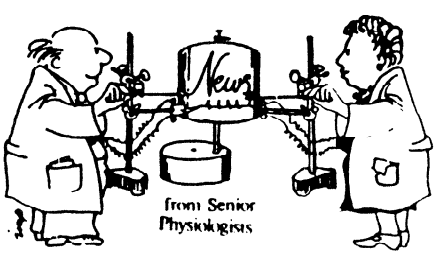
Nathan Brewer wrote from Chicago just after his 88th birthday that he is still very active, adding, "I am still trying to collate information showing species differences in the physiology of laboratory animals. I have just finished a chapter on the physiology of the rabbit for the second edition of *Biology of the Rabbit.*"

"I have not retired and continue an active laboratory mainly on studies of physiologic alterations brought about by injury," **John F. Burke** pens. "As in the past, these studies concentrate on metabolic and immunologic alterations." Burke, who is Helen Andrus Benedict Professor of Surgery at Harvard Medical School and visiting surgeon at Massachusetts General Hospital, reports that he has given up on direct clinical activity.

"At the moment I am a member of the respiratory epidemiology unit of the Department of Epidemiology at Biostatistics at McGill University and actively engaged in research, teaching, and patient care," **Margaret R. Becklake** reports from Montreal. "I am also an active member of the international respiratory disease research unit of the International Union Against Tuberculosis and Lung Disease and I am one of several collaborators with a project in Kenya on the determinants of asthma in childhood."

David V. Bates, who was dean of medical school at the University of British Columbia for five years, retiring in 1977, writes from Vancouver, "When I retired from that, being too old to attempt to master molecular physiology, I began studies in environmental epidemiology, publishing on the adverse health effects of air pollutants in southern Ontario and in Vancouver. This third career got me deeply involved in environmental epidemiology—an interest I have continued beyond my retirement in 1987. Next year I am to give the Danz Lectures at the University of Washington and this year I will have published four major papers.

"I have, therefore, made the journey from physiology to environmental epidemiology, a relatively rare transition I would think. I still keep in touch with many fellows who worked with me during my physiological years, but I am no longer up to date in the field as a whole. I read the news items in *The Physiologist,* which tells me of the activities of many past friends. I advise anyone retiring to master a word processor before they lose secretarial support."



Letters to John T. Reeves

H. J. C. Swan writes, "I am about to become an emeritus professor of medicine at UCLA, but retain my title as Senior Consultant in Cardiology at Cedars-Sinai Medical Center." He also reports that he has a small consulting practice and continues to review and edit for a number of clinical cardiology journals.

"My particular interests at the present time are on the broader application of thrombolytic therapy and in the prevention of the common causes of heart failure. My particular 'beef' is the unwarranted reliance on results of large scale randomized trials in a variety of cardiovascular conditions. A particular concern is the enormous effort on a national basis to reduce coronary artery disease by behavior modification on lipid lowering.

"However, in this instance, Meta analysis of the available randomized trials indicates no benefit to lipid lowering in a great majority of population. Yet, it is followed as a national crusade."

"I am still active and a full time member of the faculty of the Department of Pediatrics at Vanderbilt University, although I gave up being head of the Division of Neonatology almost two years ago," writes **Mildred T. Stahlman.** "I spend most of my time in my laboratory and teaching. I make teaching rounds one day a week, which really are learning rounds for me and an excellent method for me to keep up with what is going on in my clinical field.

"I am fortunate enough to still be funded by the NIH on our fifth generation of pulmonary SCOR and have a project that has to do with surfactant apoproteins and lung development, injury, and repair. We also are still interested in the neuroendocrine cells of the developing and injured lung and I am coinvestigator on a SCOR project that has to do with the role of vitamin A in lung development, injury, and repair.

"When I am not working I spend time at my farm about 65 miles from Nashville where I have six horses, which I still enjoy riding regularly."

Harold S. Weiss says, "Although I retired in 1991, I have been fortunate in being able to stay involved with the

Department of Physiology in the College of Medicine at Ohio State University. As an emeritus professor I am associated with Jackie Wood in a study of spontaneous ulcerative colitis in the cotton top tamarin. Part of our work relates to the role of metabolism and environmental temperature in the incidence and severity of colitis, both in captive and wild animals."

Letter to Horace W. Davenport

"I am officially retired, i.e., I am on a pension, but I still have my laboratory and do experiments on most days," **Keith E. Cooper** writes from Calgary, Alberta, Canada. "The nice thing is that if the weather is right I can in good conscience go fishing and there are no University committees. My present work concerns the role of arginine vasopressin secreted into the ventral septum and apparently acting as an endogenous 'antipyretic,' and recently the reason for fever suppression by KCl-induced frontal cortical spreading depresion, etc., etc.

"I am under contract to produce a monograph for Cambridge University Press by the end of the year entitled 'The role of the nervous system in fever and antipyresis.'

"In addition I am in my last year as the Chair of the IUPS Commission on Teaching Physiology, and we are hectically working to set up a workshop and training session for our colleagues in the Third World, to be held in Inverness, Scotland the week prior to the IUPS Glasgow Congress and as part of that Congress. At the last such workshop, the African Association of Physiological Sciences (AAPS) was set up, and George Somjen and I, at least, will represent the Commission at the first AAPS congress in Nairobi in September 1992."

Sections

Cardiovascular Section Annual Report

The annual banquet and business meeting was held on Tuesday, April 7, 1992 in the Pacific Ballroom B of the Anaheim Hilton in Anaheim, California.

Section Committee Membership for 1993

The new Cardiovascular Section Chairman will be James Covell, and Harris Granger will assume the position of Treasurer. Hermes Kontos was elected the new Secretary. James E. Faber was elected to a three-year term on the Nominating Committee (1995). The remaining members of the committee are Kim P. Gallagher (1993) and D. Neil Granger (1994). Gallagher will act as Chairman of the Nominating Committee. The two Program Advisory Committee (PAC) Representatives are Erik L. Ritman and Diana L. Kunze. Richard J. Traystman is the Section Advisory Committee (SAC) Representative (1992). Frank C. Yin will serve as the representative of the Cardiac Mechanics Subsection, and D. Neil Granger will serve as the representative of the Splanchnic Circulation Subsection.

Section Membership and Fellowship

The Cardiovascular Section is open to any American Physiological Society member. The current primary regular membership of the Cardiovascular Section is 960. Fellows are those members of the Cardiovascular Section who have made contributions to our understanding of cardiovascular physiology. At the annual business meeting of the Cardiovascular Section, reference was made to contributions that are expected by Fellows of our section. These contributions are to be significant in the field of cardiovascular physiology. Nominations for new Fellows must be made by two active Fellows of the Cardiovascular Section with support letters optional. Nomination materials are sent to the Secretary of the Cardiovascular Section. These nominations are then voted upon by the Steering Committee. In 1992, the following members were elected to Fellowship: Glen A. Laine, Texas A & M University; Donald D. Lund, University of Iowa; William Talman, University of Iowa; and Ronald G. Victor, University of Texas Southwestern Medical Center. There are now 294 Fellows.

Awards

The Cardiovascular Section presents two awards annually. The Lamport Award is presented to an outstanding investigator less than 36 years of age who has made contributions to cardiovascular physiology. The Lamport Award has traditionally been selected by the Wiggers Awardee of the previous year. Norman Alpert selected Arthur S. Rovner, Assistant Professor at the Albert Einstein College of Medicine in New York, as the 1992 Lamport Awardee. At the Cardiovascular Banquet, Rovner was presented with a certificate and a check for $200 from the Cardiovascular Section as the Lamport Awardee.

The Carl J. Wiggers Award is presented in honor of the founder of the Cardiovascular Section. Each year at the Cardiovascular Section Banquet the award is presented to an outstanding cardiovascular physiologist in recognition of contin-

ued contribution to cardiovascular physiology. The award for 1992 was presented to Jere Mitchell from the University of Texas Southwestern Medical School. He was presented with a bronze plaque and delivered a lecture entitled "Investigating the Neural Control of the Circulation During Exercise: A Picaresque Adventure."

Banquet Program

At the annual banquet Richard Traystman introduced the participants in the Chairman's Symposium, which was held on Wednesday, April 8, 1992. The symposium was entitled "Advances in Understanding Cerebral Ischemia/Reperfusion Damage" and consisted of the following presentations:

"Chairman's Introduction" by Richard J. Traystman, Johns Hopkins Medical Institutions;

"The Role of the Endothelial Cell" by Gary W. Goldstein, Kennedy-Krieger Institute;

"Protein Synthesis" by T. Nowak, Jr., National Institutes of Health;

"Calcium" by Richard Kraig, University of Chicago;

"Free Radicals" by Pak Chan, University of California, San Francisco;

"Metabolic Alterations" by Frank Welch, University of Pennsylvania;

"Integrative Aspects" by Raymond C. Koehler, Johns Hopkins Medical Institutions.

Dick Traystman introduced Hermes Kontos as the new Secretary with the theme being "Our Man in Greece."

Harris Granger gave the Secretary's Report and introduced the new member of the Nominating Committee, James Faber. Granger also presented the new Fellows to the Cardiovascular Section.

The Treasurer's Report was presented by James Covell, who indicated that the section's finances were sound.

Traystman introduced Jim Covell as the new Chairman of the Cardiovascular Section, and he then went on to introduce Jere Mitchell as the Wiggers Awardee for 1992, who then presented his lecture. The banquet was then adjourned.

This report is respectfully submitted to the American Physiological Society.

Richard J. Traystman, Chair

Correction

Eric A. Glende, Jr., Cleveland, OH, was inadvertantly listed with deceased members of APS in the August issue of *The Physiologist* [35(4): 132, 1992.]

Young Investigator Award for Regulatory and Integrative Physiology

Purpose

Young Investigator Awards in Regulatory and Integrative Physiology will encourage young investigators to continue research careers in cardiovascular, renal, and neuroendocrine integration. The award will consist of $500, a plaque, and free registration to the annual Experimental Biology meeting. This award will be presented at the annual business luncheon of the Water and Electrolyte Homeostasis Section of the American Physiological Society to a young investigator (less than 35 years old) who has made important contributions to our understanding on the integrative aspects of cardiovascular, renal, and neuroendocrine physiology in health and/or disease. The award will be presented annually.

Nominating Procedures

Nominations will be solicited annually and reviewed by the Awards Committee of the Water and Electrolyte Homeostasis Section. Each nomination should include

1. A curriculum vitae of the nominees;
2. A brief (1 page or less) summary and analysis of the research contributions of the nominee;
3. A complete list of publications;
4. An abstract of the paper that will be presented at the FASEB meeting of the year that the award is made;
5. A letter of nomination from a member of the American Physiological Society and a seconding letter.

Deadline

The nomination and supporting documents must be received no later than February 1, 1993.

Section Procedure

Recipients will be chosen by vote of the Awards Committee, which will consist of the chairman, secretary-treasurer, and program representative of the Water and Electrolyte Homeostasis Section of the APS.

Award Presentation

The Young Investigator Award for Regulatory and Integrative Physiology will be presented at the annual business meeting of the Water and Electrolyte Homeostasis Section of the APS, which will be held during the Experimental Biology meeting.

A Matter of Opinion

Footnotes

The animal rights movement has brought about two pieces of Congressional legislation of special significance to the American Physiological Society: the Food Security Act of 1985 and the Animal Enterprise Protection Act of 1992.

While the laws speak clearly as to where the nation stands in its regards for the caring and using of animals, the statutes lack footnotes citing the roles the Society played in each of the initiatives, the key players, and the cast of thousands of APS members who wrote letters, made telephone calls, and visited with Congressional delegations.

The Food Security Act of 1985 was the legislative authority for the US Department of Agriculture (USDA), including amendments to the Animal Welfare Act that brought about the establishment of institutional animal care and use committees, exercise for dogs, and provisions for the psychological well-being of primates.

The proposal to amend the Animal Welfare Act, however, goes back to 1982 when the then APS President Francis Haddy made public the Society's first legislative proposal concerning laboratory animals. APS was opposing a bill by former Representative Doug Walgren (D-PA) that would have established an additional authority governing the care and use of laboratory animals. Walgren's legislation for laboratory animal reform stemmed from a police raid and confiscation of laboratory monkeys at a Silver Spring research facility.

It was during a meeting of organizations representing the scientific community, animal welfare groups, and animal rights activists held at the US House of Representatives that Haddy said:

"We already have one federal agency (USDA) charged by the Animal Welfare Act to monitor the care, use, and treatment of laboratory animals and since no one has as yet to prove that the Animal Welfare Act is broken, it makes absolutely no sense to re-invent a duplicate program. What APS proposes is that we work to improve the shortcomings of the present system by getting the Congress to amend the Animal Welfare Act rather than legislating a duplicate system."

Christine Stevens, president of the Animal Welfare Institute, immediately agreed with the proposal and others voiced qualified support. (Only the People for the Ethical Treatment of Animals opposed totally the proposal.) Thus, by Haddy's proposal, a concept was initiated that led to the rejection of the Walgren bill when Congress moved to amend the Animal Welfare Act.

The second APS legislative initiative also urged amending the Animal Welfare Act, this time, however, urging the Congress to provide penalties for persons involved in interstate vandalism of federally funded animal research facilities. By 1984, animal activists had conducted more than a dozen raids on university and federal animal research facilities and avoided prosecution by crossing state lines.

The then APS President Walter Randall told a Congressional subcommittee in 1984 of the need to protect the nation's animal research enterprise from interstate saboteurs. (Text of Randall's remarks are in the story on the research facilities protection law in the Public Affairs section of *The Physiologist*, p. 270).

Randall's proposal met with strong opposition from animal activists, and the Congress took little interest in providing for federal penalties until this year, by which time animal activists had struck at more than 90 university and federal animal research facilities, causing untold millions of dollars of damage by acts of arson, theft of equipment and animals, and destruction of property and research data.

In the enactment of both legislative initiatives, much credit goes to a coalition of scientific societies that actively campaigned for the amendments to the Animal Welfare Act and the provision for federal penalties for interstate vandalism. But neither of these laws would have been enacted if it was not for the letter writing, telephone calls, and visits with Congressional delegations by the grassroots constituents.

For these efforts, APS members are to be applauded.

W. M. Samuels

Congress Enacts Animal Facility Protection Law

Congress has enacted and the President has signed legislation that makes breaking into, vandalizing, destroying or stealing property, or disruption at an animal enterprise subject to federal penalties.

"The Animal Facilities Protection Act of 1992" provides penalties for anyone convicted of traveling, using the mail, or any facility in interstate or foreign commerce for the purpose of causing physical disruption to the functioning of an animal enterprise; or intentionally causing physical disruption to an animal enterprise by stealing, damaging, or causing the loss of any property (including animal and records) in excess of $10,000.

Conviction carries a fine or a maximum jail term of one year or both. Serious bodily injury resulting from an offense carries a fine or a maximum prison sentence of 10 years or both. A death as a result of an offense carries a fine or a maximum prison term of life or both.

The law also provides for restitution for reasonable costs of repeating any experiment that was interrupted or invalidated as a result of the offense.

"The law has special significance for the Society, as it was APS that issued the first call for legislation to protect federally funded research facilities from attacks by animal rights activists," APS President **Stanley G. Schultz** said. "Although it has been eight years since that first call, we are pleased that it has become a reality and, hopefully, will deter the animal activists from their destructive methods of protest."

The term "animal enterprise" is defined by the law as a commercial or academic enterprise that uses animals for food or fiber production, agriculture, research, or testing; a zoo, aquarium, circus rodeo, or lawful competitive animal event; any fair or similar event intended to advance agricultural arts and sciences. The term "physical disruption" does not include any lawful disruptions by public, government, or employees.

The Congress also has directed the Attorney General and Secretary of Agriculture to jointly conduct a study of the extent and effects of domestic and international terrorism on animal enterprises and to submit the study and recommendations to the Congress within a year.

The law has special significance for the American Physiological Society, which is somewhat responsible for its being considered by the Congress.

Testifying in 1984 before the House Agriculture Subcommittee on Department Operations, Research, and Foreign Agriculture on the proposed "Improved Standards for Laboratory Animals Act," a bill that would amend the Animal Welfare Act, APS President Walter Randall said:

"The Society would like to offer to the Subcommittee an amendment to the Animal Welfare Act which was proposed at the annual meeting of the APS membership last month and has been unanimously endorsed by the Society's governing board.

"The basis for this proposed amendment is the recent criminal events at more than a dozen federally supported research institutions where laboratories were trashed, equipment vandalized, research data destroyed, and animals stolen. Such actions have caused the loss of untold millions of federal dollars and a waste of incalculable numbers of scientific man hours of work. Each of the projects which were interrupted by such actions will have to be re-started with the expense being borne by the federal government. It is ironic that these actions also double the animal usage for research.

"The Society urges the Congress to add a provision to the Animal Welfare Act authorizing federal prosecution of those persons involved either directly or indirectly in the interference with federally funded research by the destruction and/or theft of equipment, animals, data, or materials as well as the prosecution of those persons who obtain such stole equipment, animals, data or materials.

"Those who are convicted of such offenses should be held liable for both punitive damages and the cost of replacing materials, data, equipment, animals, or records which may have been damaged or cannot be returned as well as the cost for repeating the experiments that have been interrupted or invalidated."

The proposal was endorsed by both the National Society for Medical Research and the Association of American Medical Colleges and berated by animal welfare organizations. The next year, following a raid by the Animal Liberation Front on the University of California at Riverside, Rep. George E. Brown (D-CA) introduce the break-in bill proposed by APS. That bill died in committee, however, when the 99th Congress adjourned four months later.

It wasn't until the 101st Congress that animal facilities protection bills were reintroduced in the Congress by Sen. Howell Heflin (D-AL) and Rep. Charles Stenholm (D-TX). Their actions were prompted by the Animal Liberation Front's raid and burning of a research facility at the University of Arizona. Although the Heflin bill passed the Senate by unanimous consent, Stenholm's bill died in a House committee.

Both Heflin and Stenholm reintroduced their bills in the 102d Congress with both passing their respective chambers on voice votes.

W. M. Samuels

NIH Animal Care Workshop Set

The National Institutes of Health's Office for Protection from Research Risks is sponsoring with Vanderbilt University and Meharry Medical College a two-day workshop on minimizing pain and distress in laboratory animals.

The workshop will be conducted at Loews Vanderbilt Plaza in Nashville, TN, on December 3–4 and is open to institutional administrators, members of institutional animal care and use committees, laboratory animal veterinarians, investigators, and other institutional staff with responsibility for the management of institutional animal care and use programs.

To register, contact Marilyn Dasaro, Division of Continuing Medical Education, D-8211 Medical Center North, Vanderbilt University, Nashville, TN 37232-2337. Telephone: 615-822-4030; Fax: 601-343-0809.

NSF Proposes Conflict of Interest Rules

The National Science Foundation (NSF) has proposed regulations to deal with potential conflicts of interest in projects it supports.

The proposed rules, if promulgated, would require institutions with more than 50 employees to obtain from employees involved with NSF-funded projects information as to the interest they, their family, and/or business associates may have in:

- off-campus entrepreneurial ventures or business;
- consulting or other paid employment;
- financial ties with or research support from any company that is marketing, producing, or testing for production a product that the NSF project is intended to evaluate or further develop;
- financial ties with suppliers of equipment, materials, or services for work being performed by the grantee or persons supervised by the grantee;
- financial interests with parties whose finances would be or seem to be directly and significantly affected by the research.

The proposed rules exclude the reporting of small holdings of common stock or other corporate securities.

The institution would be required to tell the NSF of an individual's financial ties as they regard commercial entities whose product is proposed for evaluation, whose business or operations are likely to be affected by the work, or when the investigator's consultant services could bear upon the project.

Alternatives and Animal Use Are Topics for World Congress

The first World Congress on Alternatives and Animal Use in the Life Sciences: Education, Research, Testing will be held November 14-19 in Baltimore, MD.

Planned by an international consortium of scientists, the purpose of the Congress is to review progress made toward refining, reducing, and replacing the use of animals in education, research, and safety testing; to develop a realistic understanding of the current validity and status of alternatives; to illuminate the existing tripartite approach to the advancement of science and understanding of biology and disease (incorporating animal use, clinical studies, and in vitro methods); and to develop a dialogue between the animal protection movement and the scientific community.

The Congress will address issues of interest to an international audience of scientific researchers, corporate scientists, government regulators, educators, and the public. The format is designed to provide an opportunity for scientists, government officials, and lay persons interested in the issues to discuss the current status of animals and alternatives with researchers and theorists.

To register or be placed on the mailing list, contact the World Congress Coordinator, Office of Continuing Education, Johns Hopkins Medical Institutions, 720 Rutland Avenue, Turner 20, Baltimore, MD 21205-2195. Tel: 410-995-2959; Fax: 410-955-0807.

Pennsylvania Enacts Dissection Law

Pennsylvania has joined California and Maine as states that have enacted legislation dealing with the use of animals in education.

The Pennsylvania law grants the legal right to students in grades K–12 to refuse to participate in classroom activities that "dissect, vivisect, or otherwise harm or destroy animals."

A student who elects not to participate in or observe a part of a course of instruction must be offered an alternative means to obtain the knowledge, information, or experience required by the course study. Pupils shall not be penalized or discriminated against because they chose an alternative educational option.

The Pennsylvania law defines an animal as any living organism, cadaver or severed parts of a cadaver "of the kingdom animalia in the phylum chordata, organisms which have a notochord."

(continued on p. 272)

Polls Reveal Opinions on Research, NIH, Congress

Three surveys reveal that the American public strongly supports medical research, that principal investigators believe that improvements are needed to better utilize the National Institutes of Health's limited research funds, and that Congressional offices pay more attention to personal communications from constituents than any other source.

Medical Research

A survey by Louis Harris and Associates of 1,255 people indicates that medical research is still an American public favorite, with 49% of those polled rating it as "most valuable" and 91% saying that the nation should spend more on medical research.

Second to medical research among the eight categories sampled was environmental research, which was considered most valuable by 29%. Energy research was third with 10%. When asked whether more money should be spent on environmental and energy research, 85% and 86%, respectively, said yes.

Of the remaining five categories—electronics, computers, space, defense, and transportation—each received most valuable ratings from 3% to 1% of those polled.

National Institutes of Health

A survey by the US Department of Health and Human Services's Inspector General (IG) indicates a need for the National Institutes of Health (NIH) to improve its award process.

The IG interviewed 94 principal investigators (PI) from a universe of 11,453 grant awards to 39 universities throughout the United States, asking their opinions about the NIH award process. Eighty percent of the PIs concerns fell into four areas:

- NIH's funding priorities often are targeted toward predetermined areas of research rather than being based on the scientific merit of proposals;
- NIH's application and review process takes an inordinate amount of time and effort to complete;
- an absence of feedback from NIH; and
- indirect costs of research have questionable values.

Other areas of concern voiced by the investigators were the downward adjustments of proposed research projects and the awarding of a relatively small proportion of funds to less-experienced PIs.

Congress

A survey of 170 congressional offices suggests that the best way to be heard on Capitol Hill is personal contact from a constituent. And the best way for personal contact is by letter.

The survey, commissioned by Washington public relation firm Burson-Marsteller, was conducted by Peter D. Hart Associates to assess the changes in congressional communications since the previous survey 10 years ago.

Survey respondents reported that congressional offices pay more attention to personal communications from constituents than any other source and that the best way to gain the attention of congressional staffs is to contact them personally by letter, telephone call, or office visit.

Ninety percent of the offices said that most attention is paid to spontaneous mail from constituents. Congressional staffs also had four rules for communicating with your congressional delegation: keep it local, keep it personal, keep it concise, and put it in writing.

The major change in the survey from 10 years ago is the increase number of communications of all sorts coming to congressional offices. This adds to the need for those who communicate with congressional offices to keep their messages short and informative.

European Community Sets Date for Banning Cosmetic Animal Tests

The European Community (EC) may ban cosmetic firms from testing cosmetic products on animals after January 1998. The proposed directive still must be approved by the Council of Europe.

After a campaign by animal welfare groups, the EC's European Commission and Parliament agreed on a compromise directive that limits the ban to only beauty products. Tests on animals for purposes other than cosmetic products will be permitted.

The Commission originally refused to include the ban in the legislation on the content and labeling of cosmetics, but the compromise was reached when the date for starting the test ban was extended from 1994 to 1998.

"This is a historic decision, the first time that the parliament and the commission have agreed on the need to end one form of animal testing," said Dagmar Roth-Behrendt, a German member of the Parliament who negotiated the compromise.

A total of 12,090 animals were used to test cosmetics and toiletry products in Britain in 1989, according to figures from the British Home Office, and an estimated 50,000 animals are used each year through the whole European community.

The Origin, Evolution, and Distribution of Life in the Universe

Cyril Ponnamperuma
Department of Chemistry
and Biochemistry
University of Maryland at College Park

Cyril Ponnamperuma

I would like to welcome you to the Third Annual Space Life Sciences lecture.

The series of lectures began three years ago at the suggestion of the principal investigators of Spacelab Space Life Sciences I (SLS-1), which flew in June 1991.

The objective of the Annual Space Life Sciences Lecture is to increase the awareness of Space Life Sciences within the biomedical community. The two previous lectures were on aspects of human physiology in microgravity. However, since there will be a symposium on the results from SLS-1, and because there was a workshop on Space Station Freedom which also discussed aspects of human physiology during space flight, the selection committee thought that we should turn to a different aspect of space life sciences for this lecture, namely exobiology. We are grateful to Lockheed Missiles and Space Systems for their generous support of the lecture.

Our speaker is Dr. Cyril Ponnamperuma of the University of Maryland, where he is Professor of Chemistry and Director of the Laboratory of Chemical Evolution. Dr. Ponnamper-uma obtained his Bachelor of Science degree from the University of London in 1959 and his PhD from the University of California Berkeley in 1962, where he studied with Nobel Laureate Melvin Calvin. He then spent periods at the NASA Ames Research Center and Stanford University and since 1971 has held his present position at the University of Maryland. He has had numerous awards including several honorary doctorate degrees, he was principal investigator on analysis of organic compounds in lunar samples returned from the Apollo mission, and he was made Chevalier de Lettres et des Artes by the Government of France. Dr. Ponnamperuma is the author of many articles, and he has edited several books on the topic of chemical evolution.

John B. West

Introduction

According to the Oparin-Haldane Hypothesis of Chemical Evolution, the formation of molecules of biological significance was a necessary preamble to the emergence of life on Earth. The analysis of carbonaceous chondrites has revealed the presence of these same molecules in the early samples of the solar system. Radio astronomers have discovered a vast array of organic molecules in the interstellar medium. We are thus led to the inescapable conclusion that life must be commonplace in the Cosmos. Laboratory experiments help us to retrace the path of chemical evolution on earth. Planetary probes search for evidence of life in our solar system. Radio signals from outer space may reveal the presence of our distant neighbors.

In an authoritative document, the National Academy of Sciences has set down the search for extraterrestrial life as the prime goal of space biology (1):

> It is not since Darwin and, before him, Copernicus, that science has had the opportunity for so great an impact on man's understanding of man. The scientific question at stake in exobiology is the most exciting, the most challenging, and profound issue, not only of this century, but of the entire naturalistic movement that has characterized the history of western thought for over three hundred years. If there is life on Mars and if we can demonstrate its independent origin, then we shall have an enlightening answer to the question of the im-

The Third Annual Space Life Sciences Lecture was given at the FASEB Spring Meeting, April 7, 1992, Anaheim, California.

probability and uniqueness in the origin of life. Arising twice in a single planetary system, it must surely occur abundantly elsewhere in the staggering number of comparable planetary systems.

Evidence for Life in the Universe

Modern astronomy by its exhaustive study of galactic, stellar, and planetary evolution has come to the inescapable conclusion that life in the universe must be of common occurrence. On the basis of our sampling of galaxy populations to the limit attainable by present-day telescopes, we can readily compute that there are more than 10^{20} stars in the universe. Each one of these can maintain the photochemical reactions that are the basis of plant and animal life. Let us impose a number of restrictions in considering the stars that can support life. Suppose that because of doubling, clustering, and secondary collisions, only one star in a thousand has a planetary system and has a planet at the right distance from a star to provide the water and the warmth that protoplasm requires. In our own planetary system, we have two such planets. Further, let us suppose that only one out of a thousand of those stars with planets at the right distance has a planet large enough to hold an atmosphere. In our planetary system at least seven of the nine can do that. Suppose a further restriction is made, and we suggest that the right chemical composition for life to arise occurs only once in a thousand times. Assuming all these four restrictions, we come to the conclusion that there are at least a hundred million possibilities for the existence of life. This is a conservative estimate made by Harlow Shapley (2).

The astronomer Su-Shu Huang has been less rigorous in his requirements for the existence of life in the universe (3). In considering the time scales of biological and stellar evolution, the habitable zones of a star, dynamic and other considerations, he has come to the astonishing conclusion that at least five percent of the stars in the universe must support life. This means that there are at least a hundred billion, billion sites for the existence of life.

The conclusion that astronomers have reached by the rigorous analysis of scientific data has already been prophetically foretold by Giovanni Bruno in the sixteenth century (4):

> Sky, universe, all-embracing ether, and immeasurable space alive with movement . . . all these are of one nature. In space there are countless constellations, suns and planets; we see only the suns because they give light; the planets remain invisible, for they are small and dark. There are also numberless earths circling around their suns, no worse and no less that this globe of ours. For no reasonable mind can assume that heavenly bodies which may be far more magnificent than ours would not bear upon them creatures similar or even superior to those upon our human Earth.

The Search

In our search for the existence of extraterrestrial life, three possible approaches present themselves to us.

First, we have the experimental attack on the problem. Here life is considered an inevitable consequence of the evolution of matter. Since the laws of chemistry and physics are universal laws, the retracing, in the laboratory, of the path by which life appeared on earth would give strong support to our belief in its existence elsewhere in the universe.

Second, the landing of instruments or man somewhere in the universe. With our present knowledge, this attempt would undoubtedly by restricted to our own planetary system.

A final method is via radio contact with civilizations in outer space. This presupposes the existence of intelligent beings in space with a technology as advanced or even greater than our own.

The Experimental Approach

Laboratory experiments on earth can reveal which materials and conditions available in the universe might give rise to chemical components and structural attributes of life as we know it. As we noted earlier, the retracing of the pattern by which life appeared on earth would give strong support to the theory of its existence elsewhere in the universe. This is the study of chemical evolution.

The Darwinian theory of evolution was postulated the unity of the earth's entire biosphere. According to Darwin, the higher forms of life evolved from the lower over a very extended period in the life of this planet (5). Fossil analysis has shown that the oldest known forms of life may be about three billion years old. Geochemical data tell us that the earth is about four and one-half billion years old. Life, indeed, had a beginning on this planet. A question immediately arises as to the history of our own planet between its birth four and one-half billion years ago and the emergence of life. This idea was uppermost in the mind of the physicist Tyndall, when in 1871 he wrote in his *Fragments of Science of Unscientific People* (6):

> Darwin placed at the root of life a primordial germ, from which he conceived that the amazing richness and variety of the life now upon the earth's surface might have deduced. If this hypothesis were true, it would not be final. The human imagination would infallibly look beyond the germ and, however hopeless the attempt, would enquire into the history of its genesis. . . . A desire immediately arises to connect the present life of our planet with the past. We wish to know something of our remotest ancestry. . . . Does life belong to what we know as matter, or is it an independent principle inserted into matter at some suitable epoch, when the physical conditions became such as to permit the development of life?

The consideration of biological evolution thus leads us logically to another form of evolution, namely, chemical evolution.

Recent biochemical discoveries have underlined the remarkable unity of living matter. In all living organisms, from the smallest microbe to the largest mammal, there are two basic molecules. Their interaction appears to result in that unique property of matter which is generally described by the word "life." These two molecules are the nucleic acids and protein. While each one of these molecules is complex in form, the units comprising them are few in number. The nucleic acid molecule consists of nucleotides strung together like beads along a chain. The nucleotides, in turn, are made up of a purine of pyrimidine base, a sugar, and a phosphate. In the protein molecule, 20 amino acids link up with one another to give the macromolecule. A study of the composition of living matter thus leads us to the inescapable conclusion that all living organisms must have had some common chemical ancestry. A form of evolution purely chemical in nature must of necessity have preceded biological evolution.

Chemical evolution may be considered to have taken place in three stages. From inorganic chemistry to organic chemistry and from organic chemistry to biological chemistry. The first stage of chemical evolution perhaps began with the very origin of matter. In a series of cataclysmic reactions during the birth of a star, the elements of the periodic table must have been formed. Almost 15 billion years later, when the solar system was being formed, the highly reactive elements that occur in living organisms probably existed in combination with hydrogen—carbon as methane, nitrogen as ammonia, and oxygen as water. Four and one-half billion years ago, when the planet earth was being born from the primitive dust cloud, the rudimentary molecules, which were the forerunners of the complex biological polymers of today, were perhaps already in existence. Within this framework, life appears to be a special property of matter, a property that arose at a particular period in the existence of our planet and that resulted from its orderly development.

The idea of life arising from non-life, or the theory of spontaneous generation, had been accepted for centuries. One had only to accept the evidence of the senses, thought the ancients: worms from mud, maggots from decaying meat, and mice from old linen. Aristotle had propounded the doctrine of spontaneous generation in his *Metaphysics*. He had traced the generation of fireflies to morning dew and the birth of mice to moist soil. His teaching was accepted by the long line of Western thinkers who had turned to him as the final authority in matters metaphysical and physical. Newton, Harvey, Descartes, van Helmont, all accepted the idea of spontaneous generation without serious question. Even the English Jesuit, John Tuberville Needham, could subscribe to this view, for Genesis tells not that God created plants and animals directly but that he bade the earth and waters to bring them forth. The world's literature is full of allusions to this popular belief in spontaneous generation. Virgil in his *Georgics* tells us how a swarm of bees arose from the carcass of a calf. Recall *Anthony and Cleopatra*, Act II, Scene VII, where Lepidus tells Mark Antony, "Your serpent of Egypt is bred . . . now of your mud by the operation of your sun—so is your crocodile."

The great impetus, however, to the experimental study of the origin of life began with the Russian pointing out "that there was no fundamental difference between a living organism and brute matter. The complex combination of manifestations and properties so characteristic of life must have arisen in the process of the evolution of matter." According to Oparin (7):

> . . . at first there were the simple solutions of organic substances whose behaviour was governed by the properties of their component atoms and the arrangement of these atoms in the molecular structure. But gradually, as a result of growth, and increasing complexity of the molecules, new properties have come into being and a new colloidal chemical order was imposed on the more simple organic chemical relations. These newer properties were determined by the spatial arrangement and mutual relationship of the molecules. In this process biological orderliness already comes into prominence.

Independently of Oparin, Haldane in 1928 had speculated on the early conditions suitable for the emergence of terrestrial life (8):

> When ultraviolet light acts on a mixture of water, carbon dioxide and ammonia, a variety of organic substances are made, including sugars and apparently some of the materials from which proteins are built up. Before the origin of life they must have accumulated until the primitive oceans reached the constituency of a hot dilute soup.

A starting point for any experimental consideration of the origin of life must turn round the question of the cosmic distribution of elements. Astronomical spectroscopy reveals that with surprising uniformity the most abundant elements in our galaxy are, in the order of rank: hydrogen, helium, oxygen, nitrogen, and carbon. Hydrogen, oxygen, nitrogen, and carbon are indeed the basic constituents of living systems. The table on the composition of the sun illustrates the distribution of these elements very clearly (Table 1). In the presence of hydrogen, carbon will be in the form of methane, oxygen as water, and nitrogen as ammonia. It is this atmosphere of water vapor, methane, ammonia, and small amounts of hydrogen that will be considered in this discussion as the primitive atmosphere of the earth.

The energies available for the synthesis of organic compounds under primitive earth conditions are ultraviolet light

Table 1. Composition of the Sun

	Percent
Hydrogen	87.0
Helium	12.9
Oxygen	0.025
Nitrogen	0.02
Carbon	0.01
Magnesium	0.003
Silicon	0.002
Iron	0.001
Sulfur	0.001
Others	0.038

from the sun, electric discharges, ionizing radiation, and heat. It is evident that sunlight was the principal source of energy. Photochemical reactions would have taken place in the upper atmosphere and the products transferred by convection. Next in importance as a source of energy are electric discharges such as lighting and corona discharges from pointed objects. These occur close to the earth's surface, and hence, would more efficiently deposit the reaction products in the primitive oceans. A certain amount of energy was also available from the disintegration of uranium, thorium, and potassium 40. While some of this energy may have been expended on the solid material such as rocks, a certain proportion of it was available in the oceans and the atmosphere. Heat from volcanoes may also have been effective in primordial organic synthesis. In comparison to the energy from the sun and electric discharges, this was, perhaps, not too widely distributed and its effect may have been only local on the sides of volcanoes, for example. Most of these forms of energy have been used in the laboratory for the synthesis of organic molecules. Simulation experiments have been devised to study the effect of ionizing radiation, electric discharges, heat, and ultraviolet light on the assumed early atmosphere of the earth. The analysis of the end products has often yielded, very surprisingly, the very compounds that we consider today as important for living systems.

In the experiments in our own laboratory, we have adopted the simple working hypothesis that the molecules that are fundamental now were fundamental at the time of the origin of life. We are analyzing "the primordial soup" described by Haldane. The various forms of energy that are thought to have been present in the primitive earth have been used by us in a series of experiments. In the experiments with methane, ammonia, and water, electron irradiation was used as convenient source of ionizing radiation simulating the K40 on the primitive earth. The results of this investigation clearly establish adenine as a product of the irradiation of methane, ammonia, and water. It is the single largest nonvolatile compound produced. The apparent preference for adenine synthesis may be related to adenine's multiple roles in biological systems. Not only is it a constituent of both the nucleic acids DNA and RNA, but it is also a unit of many important cofactors. In these and other experiments, most of the molecules necessary for life have been synthesized (9).

Life on Mars

Our effort to land an instrument or eventually a scientist astronaut on the neighboring planet is primarily directed to the planet Mars. The possibility of life on Mars has often been raised. The "canal-like structures" on Mars and the seasonal wave of darkening across the planet have led many to believe that there must be some form of life on Mars. Some have suggested the existence of highly intelligent beings, who by incredible feats of engineering, have saved for themselves the depleting water supply on the planet by building mammoth canals crisscrossing the planet. All these speculations have fired the imagination of the planetary scientist and have made him determined to find out the answer to the question, "Is there life on Mars?"

When we leave speculation aside and consider the actual conditions that exist on Mars today, we must very likely exclude the existence of advanced forms of life. However, the physical conditions are such that low forms of life, such as microorganisms, could survive on the planet. The atmosphere of Mars is made up of a small amount of carbon dioxide and a trace of water. Oxygen has not been detected, and if it exists at all, it must be in very low concentration. There must be a high ultraviolet flux that reaches the surface of Mars, since the Martian atmosphere does not appear to have a built-in protection from ultraviolet light as does the earth. With this high incidence of ultraviolet radiation, Martian organisms would have to protect themselves by burrowing into the surface, or they may have evolved a mechanism compatible with the existence of a high ultraviolet flux.

Polarization data have shown that the polar caps of Mars consist of solid carbon dioxide mixed with ice. They wax and wane with the seasons. They are probably extremely thin and perhaps not more than a few centimeters in thickness. In the summer, the pole cap recedes by about 35 kilometers per day. As one pole cap recedes, the other is under a cloud. A dark band has been observed to follow the receding pole cap. It is this dark band that has led many to speculate on the existence of vegetation. The wave of darkening proceeds from pole to equator at the rate of about 35 kilometers per day during the spring and summer. It seems attractive to interpret this wave of darkening as a gradual growth of vegetation across the planet. The average temperature of Mars is considerably lower than the average temperature of the earth. However, the extremes may not be incompatible with life.

The atmospheric pressure on Mars was long disputed. The recent data confirm the low estimate that it is only one-hundredth of that of the earth. While this low pressure may not in itself be a factor that affects the survival of microorganisms, it might have an effect on the availability of water. The amount of water present on Mars is about one-thou-

sandth of that found in the earth's atmosphere. This again does not preclude the existence of microenvironments in which above average accumulations of water occur.

A very sketchy survey of the physical parameters of Mars indicate to us that, although the conditions are rigorous as compared to the earth, they are within the range in which microorganisms can survive. Indeed, laboratory experiments in which these conditions have been simulated have shown that some earth microorganisms can survive and even multiply under such conditions. Furthermore, if we consider planetary evolution, on account of the smallness of the planet Mars, the processes of chemical evolution may have proceeded very rapidly. Life may have evolved and disappeared. Visitors to Mars may be greeted by relics or fossils of a once thriving biosphere.

To celebrate the 200th anniversary of the birth of the United States, two spacecraft—Viking I and Viking II—were landed on Mars in July 1976. On board were a series of experiments—a camera to take photographs of Mars, a weather station, devices for chemical analysis, and of the greatest interest to all of us, a life detection package.

The photographs were magnificent and revealed a most stunning landscape of the red planet. The mass spectrometer, on the other hand, gave us the astonishing result that the total amount of carbon on the planet was less than five parts per billion. The life detection experiments performed well. There were some exciting preliminary signals. However, in the absence of organic matter, we had to interpret these as a result of the surface of Mars mimicking Biology. The Viking mission did not give any evidence of life on Mars.

Intelligent Life

According to our calculations of the distribution of life in the universe, it is reasonable to assume that intelligent life must have evolved in a large number of sites. An estimate of the distribution of intelligent life in the universe, made by Professor Carl Sagan of Cornell University, puts the figure at a million in our own galaxy. The distance between these civilizations may be as large as thousand light years. The separation between civilization seems to be almost infinite by human standards.

Pindar, in the sixth *Nemean Ode*, wrote:

> There is one race of men; once race of gods; both have breath of life from a single mother. But sundered power holds us divided, so that one is nothing, while for the other the brazen sky is established their sure citadel forever.

Among the methods available for interstellar communication, nuclear particle radiation and electromagnetic radiation present themselves as possible methods. Nuclear particle radiation can carry information at the speed of light while known useful nuclear particles possess far more energy than photons; their information content is very similar to that of electromagnetic radiation. Electromagnetic radiation may travel at the velocity of light with little interference to distances of a thousand light years or more.

If electromagnetic communication is chosen as the best methods of solving the problem, the next question centers around the best wave length at which to transmit a message. The first theoretical discussion of this was made in 1959 by Cocconi and Morrison, who suggested that of the hydrogen line at 21 centimeters (10). The subharmonics and harmonics of the hydrogen line frequency have also been suggested as possible candidates. One search for intelligent signals has already been made on the hydrogen line frequency. The hydrogen line at 21 centimeters has been considered to be the one that intelligent beings somewhere in the universe might use. This is presumably because frequencies of lower wave length will be jammed by natural radio noise. According to Professor Frank Drake, who directed Project Ozma, this monumental search for intelligent beings in the universe may be compared to meeting a friend in New York City without making arrangements in advance about a meeting place (11). One does not just wander the streets looking everywhere. Instead, the most likely places to look are the places that are already familiar—Grand Central Station, for instance, or Times Square. There are similar places in every city with which most people are acquainted. This is what the radio astronomer is in search of—a Grand Central Station of the galaxy—some special frequency about which everyone in the Milky Way would know. This indeed is the emanation of the hydrogen line.

Perhaps the best place to seek for intelligent signals with our present state of knowledge seems to concentrate on the nearest stars. The two nearest for consideration are Tau Ceti in the Constellation of Cetus and Epsilon Eridani in the Constellation of Eridanus. Both of these are about 10 light years away.

In the search conducted at the Green Bank Observatory, each day at three in the morning the telescope was pointed to Tau Ceti. When Tau Ceti set beyond the mountains, the telescope was swung to Epsilon Eridani, and the search carried on. A signal was picked up twice; the same signal each time. The discovery was exciting, but moving the antenna showed that these were actually signals from the earth and not from space. At the end of two months endeavor, no evidence of signals from space could be found on the records. These were the first steps of the endeavor at the National Astronomical Observatory in the Project Ozma, named after the Princess Os, who lived in the mythical land of Oz. It is clear that one should not be disappointed or discouraged because the first attempts of Project Ozma to find another civilization have failed. It will take many long years with larger radio-telescopes and more sensitive receivers to have a good chance of success. Let us assume that after years of futile listening, we receive a peculiar series of pulses and spaces from Eridani.

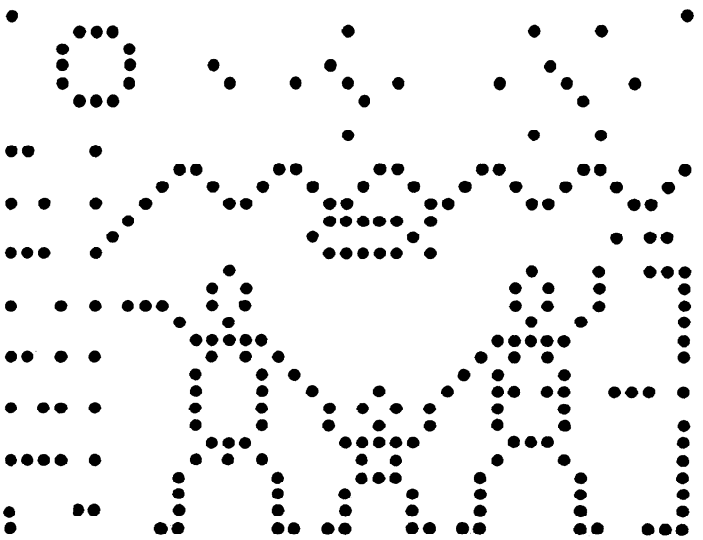


Figure 1. Extraterrestial message.

The message is repeated every 22 hours and 53 minutes, apparently the length of their day. The pulses occur at separations that are integral multiples of a minimum separation. Writing ones for pulses, and filling the blanks with the appropriate numbers of zeros, we get a binary series. It consists of 1,271 ones and zeros. 1,271 is the product of two prime numbers, 31 x 41. This strongly suggests that we arrange the message in a 31 x 41 array (Figure 1). When we do so, putting blanks for zeros and a dot for each pulse, we get the nonrandom pattern. Apparently we are in touch with a race of erect bipeds who reproduce sexually; there is even a suggestion that they might be mammals. The crude circle and column of dots at the left suggest their sun and planetary systems. The figure is pointing to the fourth planet, evidently their home. The wavy line over the third planet indicates that it is covered with water and the fish-like form shows that there is marine life there. The bipeds know this so they must have space travel.

Conclusion

There is no reason to doubt that we shall rediscover, one by one, the path of chemical evolution. We may even reproduce the intermediate steps in the laboratory. Looking back upon the biochemical understanding gained during the span of one human generation, we have the right to be quite optimistic. In contrast to unconscious nature that had to spend billions of years, conscious nature has a purpose and we know the outcome.

Before the dawn of the twenty-first century, further manned exploration of the solar system may tell us whether we are alone in our solar system. Radio telescopes scanning the distant galaxies for intelligible messages may reveal the presence of our more remote neighbors. Laboratory experiments will endeavor to retrace the path of chemical evolution and may support our belief in the existence of extraterrestrial life.

To conclude with Harlow Sharpley (2):

> The new discoveries and developments contribute to the unfolding of a magnificent universe, . . . with our confreres on distant planets; with our fellow animals and plants of land, air and sea; with the rocks and waters of all planetary crusts and the photons and atoms that make up the stars . . . with all these we are associated in an existence and an evolution . . . and as groping philosophers and scientists we are thankful for the mysteries that still lie beyond our grasp.

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Edward H. Blaine has been named Director of the John M. Dalton Research Center, University of Missouri, Columbia. An active member since 1975, Blaine is a member of the APS Committee on Committees and served on the Society's Financial Development and Liaison With Industry Committees.

David J. Skorton, professor, division of Internal Medicine, University of Iowa, has been appointed Vice President for Research.

Formerly at the Water Reed ARmy Institute for Research, **John P. Johnson** has moved to the Presbyterian University Hospital, Pittsburgh, PA. Johnson has been a member of APS since 1983.

Roy D. Russ, University of New Mexico School of Medicine, has accepted an appointment in the Division of Basic Medical Science, Mercer University School of Medicine, Macon, GA.

Daniel Burkhoff, Johns Hopkins Hospital, has moved to Columbia Presbyterian Hopital, Division of Circulatory Physiology, New York.

Race L. Kao, who has been at the Allegheny General Hospital in Pittsburgh, PA, is now in the Department of Surgery, East Tennessee State University, Johnson City.

Formerly at the Stanford University Medical Center, **Bernard A. Cooper** has joined the Royal Victoria Hospital, Montreal, Quebec, Canada. Cooper was elected to membership in 1965.

William P. Dole has been appointed Vice President, Cardiovascular Research, Berlex Biosciences, Richmond, CA.

Kurt A. Mossberg has moved from the Department of Medicine and Cardiology, University of Texas at Houston to the Department of Physical Therapy, University of Texas Medical Branch at Galveston.

Lu-Yuan Lee, University of Kentucky College of Medicine, Lexington, is a visiting professor in the Department of Pharmacology, Karolinska Institute, Stockholm, Sweden.

Formerly at Virginia Polytechnic Institute, **Judith S. Bond** has moved to Pennsylvania State University College of Medicine, Department of Biological Chemistry, Hershey.

Jose E. Krieger, Division of Cardiovascular Medicine, Stanford University, is now at the University of Sao Paolo Heart Institute, Sao Paolo, Brazil.

Hiroshi Kawamura, a member since 1970, has moved to the University of East Asia, Shiminiseki-shi, Japan, from Mitsubishi Kasei Life Sciences Institute, Tokyo.

Formerly at Tulane University School of Medicine, **Peter V. Moulder** has moved to Louisiana State University Medical Center, Department of Surgery, New Orleans.

Jack R. Layne has accepted a position in the Department of Biology, Slippery Rock University, Slippery Rock, PA. Layne was at Nazareth College, Rochester, NY.

Donald L. Bredle, who was at Kent State University, is now at Northeastern Ohio University College of Medicine, Rootstown, OH.

Harvey J. Berger, Centocor Inc., has moved to ARIAD Pharmaceuticals, Cambridge, MA.

Charles L. Rice, University of Washington, has accepted a position as Chairman, Division of General Surgery, University of Texas Southwestern Medical School, Dallas.

Mitchell Friedman, formerly at the University of North Carolina at Chapel Hill, has moved to Tulane University Medical Center, New Orleans.

Formerly at the Washington University, **Jack R. Hessler** is the Executive Director of Animal Resources, Sandoz Research Institute, East Hanover, NJ.

Alexander J. Rouch, University of Alabama, Birmingham, has moved to the College of Osteopathic Medicine, Oklahoma State University, Tulsa.

Michael F. Flessner has moved from NIH to the University of Rochester Medical Center, Department of Medicine, Rochester.

Formerly at the Washington University Medical School, **Nigel W. Daw** has accepted a postion in the Department of Ophthalmology and Visual Science, Yale University School of Medicine, New Haven.

Ann Ouyang has accepted an appointment in the Department of Medicine, Milton S. Hershey Medical Center, Pennsylvania State University.

Leslie B. Marshall, University of Iowa, has moved to the University of Hawaii School of Medicine, Honolulu.

David Megirian has returned from the University Hospital in Belgium and is now at Mayo Clinic, Rochester, MN.

Formerly at the Rose F. Kennedy Center, **George J. Schwartz** is now Chief of Pediatric Nephrology, University of Rochester, NY.

Fisher Elected President of ASCO

Bernard Fisher has been elected president of the American Society of Clinical Oncology, an 8,500-member organization that promotes the exchange of information and ideas about cancer research and treatment. Fisher is a Distinguished Service Professor of surgery at the University of Pittsburgh, where he earned both his bachelor's and medical degrees and has been a member of the medical faculty for 33 years. He has been a member of APS since 1956.

Gebhart on SCAW Board

Gerald F. Gebhart has been appointed to the Board of Trustees of the Scientists Center for Animal Welfare. Gebhart is a professor in the Department of Pharmacology, College of Medicine at the University of Iowa, Iowa City, where he earned both his MS and PhD degrees in pharmacology.

Get Ready for Glasgow

The 1993 IUPS Meeting is scheduled for Glasgow, Scotland, August 1–6. Glasgow combines the thrill of one of Europe's most exiting Cultural Capitals and the unmistakable Scottish charm of the six distinctive districts within the city region. Glasgow's galleries and museums range from the famous Burrell Collection to the fascinating Tenement House and the McLellan Galleries.

Glasgow's skyline is a kaleidoscope of architectural gems, encompassing the magnificent twelfth century Cathedral, the stunning Victorian cityscape, and the unmistakable Art Nouveau designs of Charles Rennie Mackintosh.

You should not come to Glasgow, however, only for the cultural diversions. Plan on being in Glasgow to enjoy the science that will grace the Scottish Exhibition and Conference Centre and the University of Glasgow. The sessions at The University will also provide attendees with an opportunity to reflect on the history of physiology in Glasgow that dates to the 18th century.

The scientific program has been planned to bring evolving areas of research into the Congress itself. Thus the posters are a major component of the program and will be given prominence in the program and the meeting facilities. The XXXII IUPS Congress will incorporate the satellite meetings into the main meeting program. Each of the 25 parallel themes consists of multiple symposia and lectures by world leaders in physiology.

The Organizers of the Congress invite you to come to Glasgow to meet with colleagues from throughout the world and to participate in scientific discussions designed to define the challenge of integrative physiology.

Travel Grant Applications Available for IUPS Congress in Glasgow

The US National Committee for the International Union for Physiological Sciences is seeking applications for travel awards for the XXXII IUPS Congress in Glasgow, Scotland, August 1–6, 1993.

The Committee will screen the applications, and the awards will be made by APS, which is raising funds for the travel. The travel awards will be approximately $200 less than the lowest-cost round-trip air fare from the recipients' nearest gateway city to Glasgow.

The awards are intended for individuals who have no other source of funds to attend the Congress. Federal employees are eligible.

It is anticipated that more applications will be received than can be funded. To achieve as high a rank as possible, the following factors should be considered.

- Complete all questions on the application.
- Provide copies of letters of invitation if you have been invited to the Congress to make a presentation.
- Provide an indication of participation in the Congress, including presentations and attendance for most or all sessions.
- Have travel plans that include other professional visits or work.

Deadline for submission of application for travel award is December 15, 1992. The application is on p. 281. All applicants must submit six copies of the application to USNC/IUPS, National Academy of Sciences, Attn: Robin Schoen, 2101 Constitution Avenue NW, Washington, DC 20418.

SURNAME_____

XXXII IUPS CONGRESS
Glasgow, Scotland
August 1–6, 1992

1. Name and degrees:_____ Year of highest degree:_____
2. Faculty position or employment title:_____ Year of birth: _____
3. Address:_____
   _____ Phone: _____
4. Country of citizenship:_____ Visa status if not US citizen:_____
5. Underrepresented Minority Applicants: Please circle ethnic group to which you belong:
   African American Hispanic Native American Pacific Islander
6. Attending entire Congress? Yes_____ No_____ If not, which days will you attend? _____
   Will you present an invited paper or poster at the Congress? Yes_____ No_____
   If so, please indicate the sessions you will address. **If invited, attach letter of invitation.**
   Invited to give public lecture (give title) _____
   _____
   Invited to Congress symposium (give title; indicate if chairman)_____
   _____
7. Do you intend to submit a poster? (if yes, please give title) _____
   _____
8. Please describe your area of specialty (e.g., cell physiology, cardiovascular physiology, neurophysiology, etc.)
   _____
9. Member of: APS_____ SGP_____ Div. Comp. Physiol. & Biochem., ASZ_____ Soc.Neurosci. _____
   BMES_____ Microcirc. Soc._____ Other _____
10. Are you employed by the federal government more than half-time? Yes_____ No_____
11. Travel: a. City of departure_____ b. Support requested _____
    c. Amount of other support available (excluding personal) _____
12. Recent publications (not more that 5 titles, giving full refs). If listing abstracts or manuscripts in press, please indicate.

Deadline for postmark of applications: December 15, 1992.
Submit six (6) copies to USNC/IUPS, National Academy of Sciences, 2101 Consitution Avenue NW, Washington, DC 20418.
Attn: Robin Schoen. (OVER)

SURNAME_____

13. ABSTRACT (not more than 250 words on paper or poster you plan to present at the Congress, including names of author and coauthors and indicate presenter. If none, abstract of current work.)

14. Give a brief resume of the scientific purposes and goals of your trip, including other meetings, satellite symposia, laboratories you plan to visit, work on collaborations, etc., in addition to attending the Congress.

Diagnostic Pathology of the Liver and Biliary Tract

Boris H. Ruebner, Carolyn K. Montgomery, and Samuel W. French
Bristol, PA: Taylor and Francis, 1991, 2nd ed., 492 pp., illus., index, $125.00.

Nine years have elapsed since the first edition of this textbook, and the second edition, considered in toto, is a worthy successor. The new edition has gained a third author, Samual French, who is widely known for his investigations of Mallory bodies in alcoholic liver disease. This book has grown in size as well, from 371 to 492 pages, and each chapter's references have been updated, including many as recent as 1990. In the chapter on drug and chemical hepatic injury, for example, there are 117 new references in the current edition. The increase in the size of the book is attributable primarily to the salutary inclusion of new chapters, including hepatic disorders associated with liver transplantation, the liver in acquired immune deficiency syndrome (AIDS), and the liver in pregnancy and in systemic diseases, among others. One of the particularly useful features of the text is the retention of chapters on pathologic lesions of the gallbladder and bile ducts, topics not covered in detail in several other popular textbooks concerning the interpretation of liver biopsies. The coverage here includes normal histology, anomalies, and pathologic lesions, all material that might well have constituted a separate textbook.

The reader will find sections devoted to the pathology of acute and chronic hepatitis, infectious agents, hepatic granulomas, alcoholic liver injury, fatty liver, cholestasis in adults and children, fibropolycystic disease, metabolic diseases, pigment and vascular lesions, nodules and cirrhosis, and neoplasms (in addition to the new chapters). An early chapter on specimen handling provides very useful details on preparing liver tissue for frozen sections, for electron microscopy, for plastic embedding, and for assessing metal content (copper, iron). The method for orcein staining (for hepatitis B virus surface antigen, elastic tissue fibers, and copper-binding protein) is given complete and with recommendations for sources for the orcein stain itself. Immunohistochemical methods for hepatitis B surface antigen, alphafetoprotein, alpha-1-antitrypsin, carcinoembryonic antigen, IgA, and cytokeratins are also mentioned (the latter three are newly discussed in this edition, reflecting progress in the fields of bile duct–canalicular morphology, alcoholic liver disease, and development of hepatocytes and bile duct epithelium, respectively).

One of the most attractive qualities of this book is its user-friendliness. I have consulted it on numerous occasions during the past several months of review, and even when searching for a fairly arcane topic I found it adequately discussed and well referenced. My largest complaint concerns the illustrations. Many photomicrographs, since the prior edition, now appear too dark. Some are not quite in focus. In occasional instances, cracked press-on arrows have been applied to the micrographs (surely more care should have been taken in such situations), while sometimes a capital letter press-on is too large and obscures an important part of the picture. Overall, the quality of the photomicrographs is "good." "Excellent" would have been preferable. Whereas some other textbooks opt for selected color plates (for variety and demonstrating certain lesions more suitably), all the illustrations are in black and white.

This textbook may be of value to physiologists investigating perturbed states of hepatic function and/or structure, but one should be forewarned that the authors' intent was not to present extensive information about liver physiology and cell biology. The specialty approach of this book is also not appropriate for its use by medical students. The book will be a most valuable benchside tool, however, for pathologists whose practice involves interpretation of needle biopsy and postmortem liver specimens. The price is highly attractive for a book of this size, and the index is generous. In re-titling the book *Diagnostic Pathology of the Liver and Biliary Tract*, attention has been focused on diagnosis and the problems attending histopathologic changes that may be mixed. With clear text discussions, the authors have fulfilled their goal of making this a practical book for handling the difficult or unusual microscopic problems in liver pathology.

Jay H. Lefkowitch
Columbia University
College of Physicians and Surgeons

Molecular and Clinical Advances and Pituitary Disorders

Shlomo Melmed and Richard J. Robbins (Editors)
Current Issues in Endocrinology and Metabolism
Jerome M. Hershman (Editor)
Cambridge, MA: Blackwell Scientific Publications, 1991, 300 pp., illus., index, $59.95.

Despite its title, this book deals solely with the anterior lobe of the pituitary gland, including regulation of its section and its diseases. It is the second book in a projected series, Current Issues in Endocrinology and Metabolism, edited by Jerome Hershman. It contains 25 papers presented at the Second International Pituitary Congress in 1989. The book has a total of 300 pages including the index, so each paper is short; the average length is just under 12 pages. Most chapters have multiple authors, and there are a total of 87 contributors.

The authorship of the papers in this volume is international and includes most of the established leaders in the field. It is often difficult to pull together papers from a meeting into a cohesive book, and the contributions are often uneven and disjointed. However, this book is an exception. The editors, Melmed and Robbins, have done an excellent job in crafting a cohesive four-part volume that summarizes new advances in an exciting and rapidly moving area. There are 6 papers on the regulation of gene expression in the anterior pituitary, a field of research that has provided unique insights into the development of the pituitary and the hypothalamus as well as hormone processing in the gland. A second group of 11 papers deals broadly with autocrine, paracrine, and endocrine relationships in the context of anterior pituitary function. This section includes several papers on the interrelations between the hypothalamus, the anterior pituitary, and the immune system, one aspect of the new discipline that has come to be known as neuroimmunology. In the third section, 4 papers deal with the pathogenesis of pituitary tumors. This topic is of appreciable interest because in the endocrine system, feedback controls are well worked out and elimination of negative feedback can lead to hyperplasia and, at least in some instances, neoplasia. A striking development in this field has been the demonstration that in some somatotrope tumors, the abnormal growth is

apparently due to a mutation that reduces the GTPase activity of the subunit of a heterotrimeric G protein. This causes the separated GTP-alpha subunit to be active for a longer period than normal, leading to increased somatotrope secretion and hyperplasia. Details of this development are not provided, but it is summarized in the paper by Faglia and associates. In the final section, 4 papers deal with the clinical diagnosis and management of anterior pituitary disease. These describe up-to-date laboratory methods, provide information on the microsurgical approach to pituitary tumors that has proved so successful, and describe the new technique of somatostatin receptor imaging that permits visualization of some pituitary tumors.

Overall, therefore, this book is a valuable contribution to the literature. It will be of interest to endocrine physiologists who want to update their knowledge about the anterior pituitary, to molecular and cellular biologists who are concerned with applications of their techniques to the analysis of disease states, and to clinicians who make a point of keeping up to date on the physiological basis of their practice in the field of endocrinology.

William F. Ganong
University of California, San Francisco

A Source Book of Practical Experiments in Physiology Requiring Minimal Equipment

International Union of Physiological Sciences (IUPS) Commission on Teaching Physiology, World Scientific Publishing Company, Pte, Ltd, Singapore, 1991

Last fall, I was asked to review *A Source Book of Practical Experiments in Physiology Requiring Minimal Equipment.* As a high school anatomy and physiology teacher, and recipient of the 1990 American Physiological Society summer fellowship, I was in a position to field test this book under the approximate conditions for which it was intended to be used. *A Source Book . . .* is a thin, compact lab manual prepared by the International Union of Physiological Sciences (IUPS) Commission on Teaching Physiology. It was developed for use in teaching a practical physiology course in developing countries where adequate equipment, facilities, and economic and/or cultural support are lacking. This book demonstrated that basic principles of physiology can be taught with simple techniques using (mainly) human subjects. *A Source Book . .* is not an exhaustive text or lab manual for university level physiology courses.

I should note here that one of the expressed difficulties of teaching physiology under less than ideal conditions has led to a pedagogical bonus for high school applications where we place more emphasis on learning as a process as opposed to learning content material. As indicated in the preface, "The absence of complex apparatus requires more acute observation and deduction than often, but not always, are used when highly sophisticated equipment is used." My students, who primarily used the book to seed ideas and techniques for independent research projects, benefitted from this. I would recommend the book to other high school teachers for this reason alone.

There are difficulties with *A Source Book . . .*, however, which make it a very poor choice as a primary lab text for student use. It appears to be a collaborative effort with contributions by individuals from several different countries. This has led to an editing nightmare. In this edition, the words are translated into English; but the readability level, syntax, and continuity of presentation of ideas is irregular and often illogical. Different contributors, presenting experiments adjacent to one another, sequence their information in dissimilar formats. This makes the book extremely difficult to understand. I assume that the same conditions hold true for translation into other languages.

The book is divided into four sections. As a teacher, I found the arrangement and amount of information among and within sections inconsistent and therefore very difficult to use. Although there is a table of contents, there is no index to quickly access specific topics. The first section includes a broad selection of approximately 60 fairly standard physiology experiments that cover the main topics included in most introductory physiology courses. Some, but not all, exercises include preparation comments for instructors and questions for students to answer. Please note: there is no answer key. The second section suggests ideas or asks extension-type questions for which students would have to devise experimental protocols. The third section contains notes on simple apparatus to be used for additional experiments. Since the information in these three sections is arranged by topic, e.g., "Circulation," it would be more appropriate to include that information directly at the end of the topic in the first section, thus eliminating the need to search for additional information in other sections. The fourth section describes the use and applicability of local animal species, some of which are vertebrates. It is left to the reader to correlate that information with animal welfare issues. The book should include a reminder of this.

I have one final, very important criticism. There is minimal, inconsistent, and often inadequate attention to safety issues, most of which appear in a brief "Caution" at the beginning of the book. I do not think this is adequate notification of possible dangers, especially since this book is intended for use in developing countries where sanitation and sterilization techniques are often lacking. Each experimental topic should include a comprehensive noting of possible safety concerns. It is appalling that the first exercise in the "Blood" topic deals with taking human blood using needles and syringes. Although a reference is made to sterilization of this equipment and to the need for caution in handling instruments and blood because of AIDS and hepatitis, there is no mention of specific disinfection procedures or the (in my school, mandated) use of rubber gloves.

As the book is presented now, I would recommend its use as reference, for teachers and instructors only. It is inappropriate for student use without extensive editing as previously noted. If the editing corrections were made, *A Source Book . . .* would be a valuable addition to physiology courses.

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Thomas S. Wootton High School
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Advances in Industrial Ergonomics and Safety II

Biman Das (Editor)
Philadelphis, PA: Taylor and Francis, 1990, 1,039 pp., illus., index, $160.00

This book represents the Proceedings of the Annual International Industrial Ergonomics and Safety Conference held in Montreal, Quebec, Canada, 10-13 June 1990. *Advances in Industrial Ergonomics and Safety II* includes 135 papers, authored by 275 international researchers and industrial practitioners. These papers are grouped into 20 sections by topic with topics arranged in alphabetical order. The topic sections are 1)Aging and Industrial Performance, 2) Back Injury and Rehabilitation, 3) Bioinstrumentation and Electromyography, 4)Cumulative Trauma Disorders, 5)Engineering Anthropometry, 6) Equipment Design and Ergonomics, 7) Human Computer Interaction, 8) Human Performance and Worker Satisfaction, 9) Human Strength and Testing, 10) Industrial Accidents and Prevention, 11) Industrial Biomechanics, 12) Injuries in Health Care, 13) Manual Materials Handing, 14) Noise and Vibration Effects, 15) Occupational Health and Safety, 16) Robots and Agricultural Machinery Safety, 17) Statistics and Modelling in Ergonomics, 18) Work Environment, 19) Workplace Safety Analysis, and 20) Workstation Design. There is little question that the wide range of research topics and variety of industrial applications included in this volume should be of great value to those concerned with industrial ergonomics and safety.

Only a few of the topic sections and associated papers would be of interest to physiologists, and primarily those belonging to the Environmental and Exercise Section of this Society. Those Section members possibly interested would be concerned with applied environmental/exercise physiology or ergonomics. The pertinent topics would appear to be a) Aging and Industrial Performance, b) Bioinstrumentation and Electromyography, c)Human Strength and Testing, d) Manual Materials Handling, and e) Work Environment. In addition, not all of the papers in these five sections would necessarily be of concern. Unfortunately, this book has limited information of interest to physiologists and, coupled with its relatively high cost, may deter members of this Society from purchasing it.

Kent B. Pandolf
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Mathematical Approaches to Brain Functioning Diagnostics

I. Dvorak and A. V. Holden (Editors)
New York, NY: Manchester University Press, 1991, 463 pp., illus., index., $120.00

The dynamics of brain function pose questions that are among the most pressing and engaging modern science has to offer. This field is at an early stage and accommodates, with apparent ease, a diversity of approaches, from mathematical to mystical, from neural mechanisms to mentalism. In the past years the analysis of complex biological systems has been enlivened by parallel advances in nonlinear dynamics. Convergence of these disciplines is found both in the application of nonlinear theory to the analysis of neural signals and in the elaboration of theoretical models, both conceptual and computational, with a new and constructive formalism.

Mathematical approaches to brain functioning diagnostics depicts a horizon where neurobiology meets mathematics. The view is not panoramic but restricts itself to the characterization and modeling of electrophysiological signals. This volume, in a series on nonlinear science, is the edited proceedings of an international symposium held under the auspices of the International Brain Research Organization and the Society for Mathematical Biology (September 1990). It contains 28 contributions from 67 authors. Three main areas are covered, organized into seven sections: 1) the analysis of spontaneous and evoked EEG signals, 2) the nonlinear characterization of electrophysiological dynamics, and 3) computational modeling of neural dynamics. The order and structure of the book is itself slightly nonlinear and chaotic, but this means several important themes are covered recurrently, from different perspectives and levels.

The first section comprises a series of introductory and orientating articles. Notable among these are those by Friedrich et al., Holden et al., and Babloyantz et al., which define the application of nonlinear dynamics to spatiotemporal EEG patterns. The notion of spatial modes is introduced along with the idea that the macroscopic dynamics of a complex system can be described with a small number of parameters. This idea translated into the reconstruction of EEG attractors, which have a small (not necessarily integral) number of dimensions. Measurements of this dimensionality, such as the Liapunov exponents and correlation dimension (D2, or correlation exponent) are briefly described and placed in the context of the general theory of dissipative systems. The role of these mathematical abstractions in neurobiology and issues of their empirical determination are addressed. The ideas are dealt with well and capture the imagination. A more complete picture emerges in later sections that elaborate the concepts in a concrete neurobiological setting and provide more details.

The second and third sections deal with parametric and nonparametric methods of spontaneous and evoked EEG analysis. These sections contain a balanced and progressive critique of analytical approaches to EEG data that include inferring the direction of propagated electrical activity using a directed transfer function, source localization using a Fast Fourier Transform Dipole approximation, multivariate regression techniques exemplified by Matousek's normality quotient, stochastic parametric identification in mapping evoked potentials, and nonparametric estimation of evoked signals. Achimowicz describes visually evoked potential classification in the phase domain, a theme developed extensively in later sections. In particular he proposes that stimulus-induced oscillations and stimulus-locked transients is a similar concept introduced later. A short section on computer modeling of neural activity includes a discussion by Reitboeck et al. of phase-locking and its potential role in forming associations in the object domain. The fifth section contains two papers concentrating more on application and diagnosis. The first by Albrecht et al. uses the long-term changes in EEG spectra (spectral dynamics) to assess the effects of acute drug administration and typifies those contributions that explicitly ad-

dress the clinical and research utility of the various mathematical approaches discussed.

The penultimate section returns to the nonlinear characterization of EEG attractors, focusing on the constraints imposing by data acquisition and on interpretation. The chapter by Mayer-Kress et al. on spatiotemporal patterns derived from multielectrode recording in the olfactory bulb introduces a distinction between increasing spatiotemporal complexity resulting form an increase in the number of spatial modes and the increasing complexity of temporal dynamics in pre-existing modes. This distinction and its conceptual underpinnings appear in a different from in a subsequent paper by Dvorak et al. These authors use estimates of the correlation dimension to discriminate between a single, spatially distributed, brain attractor and multiple, locally coupled attractors. Palus et al. analyze orthonormal spatial modes (elgenvectors of singular vectors) following a Karhunen Loeve expansion in a series of concentric subpartitions of the space defined by multichannel EEG time series. They demonstrate a remarkable correspondence between the linear complexity (describing the distribution of singular values associated with each node) and correlation dimension. Implicit is the message that the correlation dimension reflects the average number and degree to which spatial modes contribute to dynamics. This challenges its (simple) interpretation as the dimension of a hypothetical attractor underlying an EEG generator. The functional correlates of these mathematical constructs are highlighted by the work of Pl jn and Lopez da Silva confirming seizure activity has an unnaturally low correlation dimension.

The final three papers address the mathematical basis of perception with two applications in psychophysics and an engaging paper by Eckhorn et al. The latter reviews the temporal and functional relationships between stimulus-locked transients and stimulus-induced oscillations both within and between (extra)striate areas. They invoke distinctions between linking and feeding connections in mediating reactive and constructive modes of cortical processing in a convincing if slightly informal way.

The conviction that transients, brain attractors, spatial modes, and dimensionality will relate in a meaningful way to neurophysiological principles or current theories of brain function appears, at the moment, to be an act of faith. One's faith is strengthened, however, on reading the book. A number of questions immediately spring to mind. For example, how do spatial modes, characterizing macrodynamics, link to the broader notions of functional connectivity and re-entry? Are the transients and limits cycles observed with microelectrodes epiphenomena or do they have causal significance for neural and ethological mechanisms? One is impressed by the elegance and internal consistency of most areas described. At the same time it is clear that there are unresolved issues and that direct relevance to general neurobiology needs to be established. Mathematical approaches to brain functioning diagnostics has breadth in terms of content, quality, and levels of analysis. It will be uniformly appealing only to neuroscientists with a special interest in EEG and multi-electrode recordings; however, some sections contain ideas, techniques, and references of wider interest. Judging by the length of this book and the momentum in this field, I suspect this will be one of the last opportunities to find such a collection of papers in one volume.

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Visual Agnosia

Martha J. Farah
Cambridge, MA: MIT Press, 1990, 184 pp., illus., index, $25.00.

Perhaps the best way to describe the importance of this book is to make a prediction: When the agnosias are finally figured out, Farah's monograph will be one of the sources that is cited by that even more ingenious author of the future. She has made a major contribution, but the fundamental problem still remains: Can we adequately explain these fascinating disturbances of perception within the paradigms and limitations of the contemporary neural and cognitive sciences? The problem seems to be related to hierarchical levels of explanation, at lease to some extent.

The agnosias have been one of the central themes of behavioral neurology since the field began to emerge out of general neurology and psychiatry in the late nineteenth century. That historical process started with the "discovery" and definition of aphasia by Broca, Jackson, and others. Wernicke's insight into the separate identity and localization of auditory language comprehension then laid the foundation for all subsequent work on related syndromes. Therein lies the first level of the cognitive hierarchy. We can know that a person has disordered perception only if we first know that we can communicate with him in some reliable way. So language must be intact in some modality before an agnosia can be diagnosed. But I have gotten ahead of myself.

Clearly the precognitive beginning of the hierarchy is elementary sensation. If it is not intact, or if we cannot ascertain that it is intact, then it is logically unsound and probably fruitless to try to analyze high processes. Farah's monograph is limited to agnosias in the visual modality, which is both scientifically reasonable and historically sanctioned. The tactile agnosias are interesting but limited in scope, and the auditory agnosias can be hopelessly intertwined with the aphasias themselves. Even within the visual modality, Farah does not address issues related to problems at the interface of elementary sensation and its cognitive processing. Her stated goal is simply to try to make sense of the existing case literature on "disorders of visual object recognition."

Farah's strategy for completing her self assignment is appropriate and straightforward. First, she reviewed and digested the enormous case literature on her subject. For that feat alone, her book would be recommended as a valuable source. In the process of this review, she has tried to make sense of the widely disparate data by working out a taxonomy of the visual agnosias. Her initial basis for this taxonomy is Lissauer's classical (and hierarchical) distinction between the "apperceptive" and the "associative" agnosias. In the former, there is thought to be an "impairment of visual perception," despite intact sensation. In the latter, the associative agnosias, perception is intact, but there is a failure of "recognition." Beyond this hierarchical dichotomy, Farah is forced to be inventive by the complexity of the material.

Among the apperceptive agnosias, she distinguishes four types: apperceptive agnosia (narrow sense), dorsal simultanagnosia, ventral simultanagnosia, and perceptual categorization deficit. From the names alone, it is apparent that the bases for these distinctions are empirical, i.e., eclectic at the theoretical level. The division of dorsal and ventral visual agnosias appealed to this anatomically oriented reviewer, but clearly the separate definition of "perceptual categorization deficit" depends on a different level of analysis.

The second part of Farah's strategy is to try to explain the visu-

al agnosias within the paradigms of modern cognitive science. Thus, chapter 3 is devoted to "Interpreting the Apperceptive Agnosias in Terms of Theories of Normal Visual Object Recognition." Since the deficit in the apperceptive agnosias is supposed to be in perception rather than recognition, one wonders why theories of perception are not brought to bear, but this may be just a semantic quibble.

The same process of categorization and interpretation is repeated for the associative visual agnosias in chapters 4 and 5. Farah's taxonomy of the associative agnosias is even more eclectic, because the relevant clinical phenomena are also thus. Her attempts to explain the associative visual agnosias are again couched "in terms of theories of normal object recognition." Especially in this chapter (5), she is quite clear that the available paradigms for the analysis of recognition are interesting and applicable but probably inadequate.

So the final work on the visual agnosias is not yet in. Nonetheless, Farah's effort has clearly pushed us further along the path toward it.

Samual H. Greenblatt
Brown University Program in Neurosurgery

The Child's Theory of Mind

Henry M. Wellman
Cambridge, MA: MIT Press, 1990, 358 pp., illus., index, $35.00

What is "mind"? What would be included in a theory of mind? Are such theories scientific? Have empirical data been collected on the nature of a person's "theory of mind"? How does theory of mind change from infancy through adulthood? Henry Wellman, a developmental psychologist at the University of Michigan, poses and attempts to answer these and many more specific questions in his book *The Child's Theory of Mind.*

Wellman develops the thesis that "mind is an intermediary that interprets and directs all perception and action; it is, in current terms, a central information processor" (p. 11). The focus of this book, however, is not on mind per se but on the way laymen conceptualize mind and how this conceptualizing allows them to function in the physical and social world.

Wellman, consistent with much current discussion in the philosophy of science, considers theories to have three distinguishing characteristics: 1) cohesion (the elements of the theory are embedded in each other as the definition of planets is embedded in the solar system); 2) ontological distinctions (agreements among theorists concerning the elements and categories of the phenomenon such as the agreement that stars are planets like the sun, not pinpoints of light); and 3) causal relations (a framework for making predictions and providing an explanation of phenomena). Wellman calls a person's conceptualizations of mind a "framework theory" that has some characteristics of scientific theories but is different because it develops without the use of scientific method. Such a theory is developed by an individual to make sense of the physical and social world (in much the same way that a child develops an everyday theory of biology, which develops later in childhood). We know there are differences between thoughts and things, between beliefs and actuality, between desires and outcomes, between fantasy and actuality, between one person's mind and another's, and between mind and body. These distinctions are not based on a scientific theory of mind but are based on an everyday theory of mind that begins to develop in early childhood.

Wellman's approach draws on considerable empirical research with children from two to eight years of age. Much of the research reviewed is his own, but he integrates a great deal of work from other investigators and theorists (such as Piaget, Keil, Bretherton, Johnson, Harris, Chandler, Perner, Leslie, and Flavell). Most of Wellman's empirical studies involve showing young children picture stories and asking the child to make predictions about the protagonist's actions, beliefs, or emotions. Through a series of cleverly designed experiments, Wellman presents evidence that children as young as three years of age understand the basic ontological distinction between mind and world, between beliefs and desires, and how mind-related concepts such as intentions could be used to make predictions and understand the behavior of others.

These elements of a child's theory of mind are similar in many ways to the everyday theories of mind held by adults. Wellman's theory, then, is contrary to the naive realism theory of Piaget, who held that the nature of a young child's world is based exclusively on immediate perceptual experience and is thus qualitatively different from that of an adult, who can make ontological distinctions between perception and reality, between thought and the external world.

Although there is commonality in the elements of the theories of mind by children and adults (a fact that allows us to understand the reality of the child and communicate about our world), Wellman's research supports the conclusion that young children and adults have different underlying metaphors for their everyday theories of mind. Between the ages of three and six years of age, children use a "container" metaphor of mind in which the mind "holds" mentalistic entities such a beliefs, desires, and intentions. After the age of six, the child's theory of mind relies more on a "person-within-a-person" metaphor. This homuncular metaphor allows a fuller understanding of mind as active and constructive interpreter of information and thus represents an advance over the passive receptacle theory of younger children.

What would a biological scientist find interesting and useful in this book? The book provides a broad overview of how children conceptualize and understand the world and how these conceptualizations change in substantial ways during childhood. At some point, it may be possible to understand the biological foundations of these conceptualizations (although the scientist looking for hints on where to start work on these biological foundations will be disappointed because this is outside the scope and purpose of Wellman's work). The general reader will find this book of considerable value because to understand the development of cognition brings us closer to understanding ourselves, in both a scientific and a personal sense.

Norman W. Bray
University of Alabama at Birmingham

Instructor/Assistant Professor. The Department of Physiology of the Ponce School of Medicine announces an immediate opening for applicants with an interest in cardiovascular physiology. It is preferred to fill the position at the instructor/asistant professor level. A PhD is required. Applicants must also have a strong commitment to assist in the teaching of medical physiology and advanced gaduate courses. Curriculum vitae, statement of teaching and research interest, and the names of three references should be sent to Howard Mass, Chairman, Department of Physiology, Ponce School of Medicine, PO Box 7004, Ponce, Puerto Rico 00732. [EOEAA]

Postdoctoral Position, Molecular Neurobiology, UCLA. Well-funded systems neurobiology laboratory studying control of movement seeks a molecular biologist to study properties of functionally defined neurons in a novel in vitro system (*Science* 254: 726–729, 1991). The goal is to establish unique molecular markers and genetic properties. Send curriculum vitae, including references, to Jack L. Feldman, Department of Physiological Science, UCLA, 405 Hilgaard Avenue, Los Angeles, CA 90024-1527.

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 order. Purchase orders will not be accepted unless accompanied by payment. Ads not prepaid will not be printed. Copy must be typed double spaced and is 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 when 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 15th for the April issue). Mail copy to APS, 9650 Rockville Pike, Bethesda, MD 20814.

BOOKS RECEIVED

Behavioral Endocrinology. Jill B. Becker, S. Marc Breedlove, and David Crews (Editors). Cambridge, MA: MIT Press, 1992, 574 pp., illus., index, $34.95.

Advances in Body Composition Assessment: Current Issues in Exercise Science Series. Monograph No. 3. Timothy G. Lohman. Champaign, IL: Human Kinetics, 1992, 150 pp., illus., index, $18.00.

Auditory Physiology and Perception. Y. Cazals, K. Horner, and L. Demany (Editors). Elmsford, NY: Pergamon, 1992, 655 pp., illus., index, $95.00. (Proc. 9th Int. Symp. Hearing, Carcens, France, 1991).

Environmental and Metabolic Animal Physiology: Comparative Animal Physiology, 4th Edition. C. Ladd Prosser (Editor). New York: Wiley-Liss, 1991, 578 pp., illus., index, $89.90 (set).

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1994 APS Conferences and Meetings

APS Intersociety Meeting
Regulation, Integration, Adaptation: A Species Approach

APS Conference
Physiology of the Release and Activity of Cytokines

APS Conference
Mechanotransduction and the Regulation of Growth and Differentiation

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Future Meetings

1992

APS Conference
The Cellular and Molecular Biology of Membrane Transport — November 4–7, Orlando, FL

1993

Experimental Biology '93 — March 28–April 1, New Orleans, LA

APS Conference
Physiology and Pharmacology of Motor Control — October 3–6, San Diego, CA

APS Conference
Signal Transduction and Gene Regulation — November 17–20, San Francisco, CA

1994

Experimental Biology '94 — April 24–29, Anaheim, CA

IACUC Guidebook Available

The National Institutes of Health's Office for Protection from Research Risks (OPRR) has announced the availability of the newly published "Institutional Animal Care and Use Guidebook." The guidebook was produced by the Applied Research Ethics National Association in conjunction with OPRR.

Copies may be purchased for $13.00 from Applied Research Ethics National Association, 132 Boylston Street, Boston, MA 02116. Fax: 617-423-1185; or from Superintendent of Documents, US Government Printing Office, Washington, DC, Stock Number #017-040-00520-2. Fax: 202-512-2491.

Scientific Meetings and Congresses

32nd Annual Meeting of The American Society of Cell Biology, Denver, CO, November 15–17, 1992. *Information*: ASCB Meetings Office, 9650 Rockville Pike, Bethesda, MD 20814-3992. Tel: 301-530-7153; Fax: 301-530-7139.

Molecular Basis of Ion Channels and Receptors Involved in Nerve Excitation, Synaptic Transmission and Muscle Contraction, Tokyo, Japan, January 12–15, 1993. *Information:* Conference Department, New York Academy of Sciences, 2 East 63rd Street, New York, NY 10021. Tel: 212-838-0230; Fax: 212-888-2894.

International Society of Arterial Chemoreception, Dublin, Ireland, August 9–13, 1993. *Information:* Dublin Chemoreceptor Meeting, R. G. O'Regan, Medical School Office, Earlsfort Terrace, Dublin 2, Ireland.

Neuropeptide Y, University of Cambridge, United Kingdom, mid-August, 1993. *Information:* Janet Allen, University of Cambridge, Downing Site, Cambridge CB2 3EG, England, UK. Fax: +44 223 333840.

XII International Congress of Pharmacology, Montreal, Quebec, Canada, July 24–30, 1994. *Information:* XII International Congress of Pharmacology, Conference Services, Montreal Road, Ottawa, Ontario, Canada K1A 0R6. Tel: 613-993-9009; Fax: 613-957-9828.

APS Sustaining Associate Members

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

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* The Upjohn Company
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Waverly Press
Wyeth-Ayerst Laboratories

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NASA Research Associate Awards Available

The advent of the shuttle program has produced a new era for space biology that offers exceptional opportunites for research. NASA is offering research associate awards at the postdoctoral level for scientists to conduct space biology research in a laboratory of your choice that can provide the necessary facilities and research enviroment. Projects may be in any space biology discipline. The awards vary from $20,000 to $24,000, based on experience, and are made for a 12-month period, with the possibility of renewal. Funding will begin July 1 to October 1, 1993. United States citizens and permanent resident aliens with PhD, MD, DVM, DMD, or equivalent degrees are eligible to apply. Proposals are due February 15, 1993. For information, contact Gerald Sonnenfeld, Department of Microbiology & Immunology, School of Medicine, University of Louisville, Louisville, KY 40292. Tel: 502-588-8317; Fax: 502-588-7043; or Thora Halstead, Life Sciences Division, NASA Headquarters, Washington, DC 20546.

Promoting Active Learning in the Physiology Classroom

A workshop on Promoting Active Learning in the Physiology Classroom will be held February 12–14, 1993 in the Radisson Plaza Hotel, Lexington, KY. The workshop is sponsored by the New York Academy of Sciences. Co-chairs are Harold Modell, National Resource for Computers in Life Science Education, Seattle, and Joel Michael, Rush Medical College, Chicago.

This workshop is designed to help attendees understand the power of an active learning enviroment and learn techniques that they can use in their own classrooms to help students integrate and use physiological concepts. The program is designed to allow all attendees to participate in all sessions.

There will be a contributed poster session in conjunction with this workshop. The deadline for submission of poster abstracts is November 1, 1992. For information and poster submission, contact Joel Michael, Department of Physiology, Rush Medical College, 1750 West Harrison Street, Chicago, IL 60612. Tel: 312-942-6426.

Basic Research Opportunity

The Life Science Division of NASA solicits proposals to establish NASA Specialized Centers of Research and Training in integrated physiology. This solicitation is open to all US and foreign proposers in all categories of governmental and private sector organizations, agencies, and institutions. Proposals may be submitted through October 23, 1992. A more detailed description of the opportunity and specific guidelines for proposal preparation are available from Ronald J. White, Life Sciences Division, Code SB, NASA Headquarters, Washington, DC 20546.

Workshop on Physical Activity

A workshop on Physical Activity and Obesity cosponsored by NIH and the National Taskforce on Prevention and Treatment of Obesity will be held December 15–17, 1992 at NIH. Information: Van S. Hubbard, Westwood Building, Room 3A18, NIH, Bethesda, MD 20892. Tel: 301-496-7823; Fax: 301-402-1278.

MEMBERSHIP HAS ITS BENEFITS!

. . . Join your colleagues in the **American Physiological Society,** the nation's oldest medical sciences society, and receive . . .

- *The Physiologist, News in Physiological Sciences,* and *Advances in Physiology Education*
- Member rates (50% discount) on APS's renowned, primary research journals
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- Educational programs and materials
- Continuing medical education programs for physicians
- An opportunity to network with your peers
- Access to all the benefits and privileges available to FASEB Society members, including the *FASEB Directory of Members*
- An opportunity to participate in the scientific section of your choice and join our members in the promotion of the physiological sciences

. . . if these benefits sound good, complete the form below and mail to:

Membership Services Department
American Physiological Society
9650 Rockville Pike
Bethesda, Maryland 20814

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Please send information and a membership application to:

Name: ..... (Please Print)

Address: .....

City: ..... State: ..... Zip: .....

CONTENTS

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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. Fax: 301-571-1814.

MEDICAL EDUCATION
(continued from p. 291)

bling of medical class sizes since 1970 was also noted by several schools as presenting an environment that discouraged highly complex laboratory exercises. This factor probably relates to most schools.

The 34 schools included institutions ranging widely in their missions or emphases. Two schools pointed out that their emphasis in producing primary care physicians precluded the need to concentrate on the principles gained from live animal laboratories. By contrast, two research-intensive medical schools noted that medical student involvement in individual research projects gave them adequate first-hand experience dealing with living animals in a research protocol.

One of the most interesting observations alluded to by several schools was that students have become decreasingly proficient in the laboratory skills necessary to undertake successful animal exercises and that increasingly faculty have also lost those skills.

Only two schools indicated that pressure from animal rights activists played any role in discontinuation of animal laboratories. Likewise, two schools indicated that student complaints played a strong role. One school indicated its intention to reinstate animal laboratories.

With regard to alternatives utilized by the 34 schools, three-fourths indicated extensive use of videotapes of laboratory exercises, video disc simulations, and (especially) computer modeling. Six schools each have come to rely on small group discussions (including problem-based learning) or the use of students as the subjects of experiments (exercise physiology, diuresis, blood analysis, EKG, etc.). Two schools mentioned the fact that basic surgical skills (e.g., suturing) are now introduced utilizing fresh animal tissue (e.g., pig's feet).

Taken together this information allows one to construct a number of scenarios that have influenced the 34 schools. At one extreme, research-intensive institutions, deeply involved in the explosion of new biology and technology and highly dependent on research funding since the 1960s, have found it desirable to convert teaching space to research laboratories and encourage curricular structure that has preserved faculty time for research activity and competition for funding. Their students can find an outlet for laboratory experiences (often involving animals) in the research venue. At the other extreme, some institutions less devoted to research and founded for, or recently dedicated to, the production of a large proportion of primary-care physicians among their graduates argue that the use of laboratory animal exercises is superfluous for the development of the empathetic skills they wish to emphasize. Many schools present intermediate rationales.

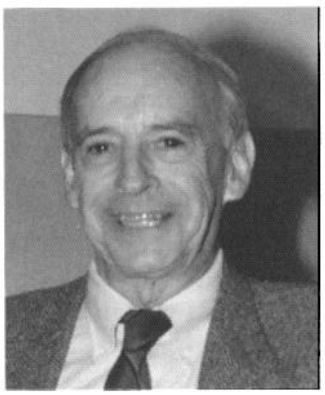
The response to the survey illustrates well that there is no single mission or product that is characteristic of all or perhaps even a majority of the medical schools. Moreover one detects a variety of trends and pressures that have influenced curricular design during and since major curricular revisions initiated in the late 1960s. Many of them have discouraged laboratory

Thank You!

The October issue of *The Physiologist* carried an Opinion piece written by William (Bill) M. Samuels, APS Public Affairs Officer, designed to place some "Footnotes" on the Society's role in the passage of two Acts impacting on the efforts of the animal rights movement. While Bill's recollections are essentially correct, they do not adequately reflect the role he played in the passage of the Food Security Act of 1985 and the Animal Enterprise Act of 1992.

Without the excellent staff work of Bill Samuels on this legislation, as well as many other public affairs efforts, the Society could never have made the positive impact alluded to in his Opinion piece. As always, Bill has allowed the Society to gain the accolades for an action instead of accepting any of the honors for himself.

Bill arrived at APS in 1981 to coordinate the Society's response to the animal rights movement and the break-in of Ed Taub's laboratory in Silver Spring, Maryland. Bill's employment arose from the fact that our FASEB sister societies did not believe that the animal rights movement was a significant threat to their members. The APS Council did find the movement a threat and hired the former executive director of the National Society for Medical Research, a precursor of the National Association for Biomedical Research, as its public affairs consultant. Over the years, Bill focused the Society's attention on the animal issue through his reports in *The Physiologist*, mailings to the membership, and his brochure "How to Be Heard on the Hill." He also kept us informed in the areas of biomedical research appropriations, fetal tissue research, and scientific misconduct. He coordinated the public affairs activities of the APS Centennial celebration, including our visit with then Vice President George Bush. Bill was the ace reporter for *The Physiologist*, drawing on his experience as a reporter and managing editor of The Courier-Journal newspaper of Louisville, Kentucky.



When I arrived at APS in 1985, I discovered in Bill an individual knowledgeable in the ways of associations and an individual who was most helpful to me as I made the transition from an NIH health scientist administrator to APS Executive Director. I also found in Bill an individual who could guide me through the tunnels in the basement of the Capital as we attempted to provide our elected representatives with the Society's opinions.

Public accolades are something that Bill has always shunned. However, in light of his recent announcement to Council that he planned to retire from APS and fly off with his wife to become Florida snowbirds, I believe that this opinion piece is warranted.

Those of us who have worked with Bill over the years appreciate his efforts, and those who have not had the pleasure of working with Bill have benefited from his efforts. For that reason, I would like to say thank you, Bill, for all that you have done for the Society. And as Stan Schultz and the Council said in Colorado Springs, may your retirement present you with a kaleidoscope of opportunities.

Thank you, Bill—we will miss you!

Martin Frank

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experiences of nearly all kinds for medical students during the past 20 years. Still, nearly three-fourths of the medical schools find value in the utilization of live animals during at least some part of their regular medical curriculum. Their activities have increasingly come under the scrutiny and control of local animal care and use committees to ensure humane practices. One can probably expect some shifts as alternatives are tried and adopted or rejected. Under these circumstances, it seems clear that medical school faculty have and will continue to utilize many talents and approaches to provide the requisite training for the many types of physicians required by society.

Proceedings of a conference on "Animal Care and Use Programs: Regulatory Compliance and Education in an Age of Fiscal Constraint." March 21–22, 1991, Boston, MA. Reprinted with permission from PRIM&R.

The assistance of Daria Chapelsky and Jennifer Sutton in conducting the survey is gratefully acknowledged.

References

1. Office of Technology Assessment, US Congress: *Alternatives to Animal Use in Research, Testing and Education* (OTA BS 273). Washington, DC: US Government Printing Office, 1986.

2. Greenwald, G. S.: ACDP survey on use of animals in teaching physiology. *The Physiologist* 28: 478–479, 1985.

3. Barnard, N. D., J. Stolz, and L. Baron: Use of and alternatives to animals in laboratory courses at U.S. medical schools. *J. Med. Educ.* 63:720-722, 1988.

INSTRUCTIONS FOR APPLYING FOR APS MEMBERSHIP

One application form serves all membership categories. There are, however, specific sets of instructions for each category. Therefore, it is essential that sponsors and applicants carefully follow the specific instructions in their desired category.

GENERAL INSTRUCTIONS

Check the box indicating the category of membership for which you are applying. Type the requested information on the application. Fill out all applicable spaces. Only completed applications will be reviewed. **Do NOT include a curriculum vitae or reprints.**

Alien Residents. Alien residents of the United States must enter the Alien Registration Receipt Card number under the address block on the application. Canadian residents should furnish a copy of "Landed Immigrant Status" form. Mexican residents should furnish a copy of their form FM-2. Central and South American residents must provide documentation as required by their country/government.

The Bibliography must be submitted in the form found in the Society's journals. An example of the current form is:

JONES, A. B., and C. D. Smith. Effect of organic ions on the neuromuscular junction in the frog. Am. J. Physiol. 220:110-115, 1974.

DEADLINE DATES

Completed applications for Regular and Corresponding membership received between February 1 and July 1 are considered for nomination by the Council in the Fall. Regular and Corresponding membership applications received between July 1 and February 1 are considered for nomination by the Council at the Annual Spring Meeting. Associate, Associate Corresponding and Student applications are accepted monthly upon approval of the Executive Director of the Society. Applications are not complete until all materials, including sponsors' letters, are received.

QUALIFICATIONS (Except Students)

The following categories are used when evaluating an application:

1. **Educational History.** Academic degree and postdoctoral training are evaluated and assessed with regard to how closely the applicant's training has been tied to physiology.

2. **Occupational History.** Particular emphasis is given to those applicants who have a full-time position in a department of physiology, or closely allied field. Relatively high ratings are given to individuals with positions in clinical departments and to those functioning as independent investigators in commercial or government laboratories.

3. **Interest in the Society.** Evaluation of this category is based on attendance at APS meetings and the applicant's remarks in the statement of "Interest in the Society."

4. **Interest in and Commitment to Teaching Physiology.** This evaluation is based on: (1) the fraction of the applicant's time devoted to teaching, (2) publications related to activities as a teacher including production of educational materials, and (3) special awards or other recognition the applicant has received for outstanding teaching effectiveness.

5. **Contributions to Physiological Literature.** This category is of major importance. The applicant's bibliography is evaluated on the basis of publications in major, referred journals which are concerned with problems judged to be primarily physiological in nature. Emphasis is given to papers published as the result of original research. Publications on which the applicant is sole author or first author are accepted as clear evidence of the applicant's independence.

6. **Special Considerations.** This category permits the Membership Committee to acknowledge unique accomplishments of an applicant. Such accomplishments may be excellence in a specific area, unusual contributions to physiology resulting from talents, interest or background substantially different from the average.

In general, persons who qualify for **Regular membership** will have a doctoral degree in physiology or related area and will have published several papers in referred journals. It should be clear that they have played a major role in research. They should have a position other than as a trainee in physiological research, teaching, administration, or related area.

Individuals who qualify for **Corresponding membership** should meet the requirements for Regular membership and live outside of The Americas.

In general, applicants will be considered for **Associate membership** if they have an advanced degree in physiology or related area and are doing research and/or teaching of physiology. Professional historians are eligible for Associate membership. Associate members may later be proposed for Regular membership.

Individuals considered for **Associate Corresponding membership** should meet the requirements for Associate membership and live outside of The Americas.

Applicants will be considered for **Student membership** if they are actively engaged in physiologic work which should lead to an advanced degree in physiology or related area. No individual may remain in this category for more than five years, without reapplying.

SPONSORS

Each of the two sponsors are required to write a confidential letter concerning the candidate's qualifications, using the criteria described above. Only one letter is required for evaluating applicants for Student membership.

Primary responsibility for membership rests with the two sponsors who must be Regular members of the Society or, for applications for Corresponding member category, a Corresponding member and a Regular member. Emeritus and Honorary members also may serve as sponsors. Sponsors should discuss the appropriateness of the class of membership with prospective applicants.

Each sponsor must write a confidential letter concerning the candidate which addresses the six categories listed above. An original and seven copies should be sent to the Membership Secretary. In the case of student applicants, two sponsors must sign the application form however, only one sponsor letter is required.

CHECK LIST

1. Original copy of the application signed by both sponsors.
2. Application form, including bibliography (1 original and 7 copies.
3. Mail the original, signed by two sponsors, plus 7 copies to: Membership Secretary, American Physiological Society, 9650 Rockville Pike, Bethesda, Maryland 20814.

RIGHTS AND PRIVILEGES OF EACH MEMBERSHIP CATEGORY

REGULAR MEMBERSHIP

1. Hold elective office.
2. Vote at Society meetings.
3. Serve on committees, boards and task forces.
4. Serve on Federation boards and committees.
5. Serve as sponsor on membership applications.
6. May present only one contributed paper, but may co-author and/or sponsor more than one contributed paper by a non-member at the Annual Spring (FASEB) and Specialty Meetings of the Society.
7. Receive *The Physiologist, NIPS,* and *Advances in Physiology Education.*
8. Receive the *FASEB Journal,* the FASEB Public Affairs *Newsletters,* and the annual FASEB Membership Directory.
9. Subscribe to books and periodicals published by the Society at member rates.
10. Register to attend scientific meetings of FASEB and APS at membership rates.
11. Participate in FASEB Member's Life Insurance Program, Disability Program and Hospital Protection Plan. (For residents of the United States, it territories or possessions).
12. Eligible to receive the Daggs Award.
13. Eligible to be selected as Bowditch Lecturer (members under 40 years of age).

CORRESPONDING MEMBERSHIP

1. Serve on Society committees, boards, and task forces.
2. Serve as one sponsor for a Corresponding membership application (one Regular member must be the other sponsor of a Corresponding member).
3. May present only one contributed paper, but may co-author and/or sponsor more than one contributed paper by a non-member at the Annual Spring (FASEB) and Specialty Meetings of the Society.
4. Receive *The Physiologist, NIPS* and *Advances in Physiology Education.*
5. Receive the *FASEB Journal* and annual FASEB Membership Directory.
6. Subscribe to books and periodicals published by the Society at member rates.
7. Register to attend scientific meetings of FASEB and APS at member rates.

ASSOCIATE MEMBERSHIP

Same as for Regular members with the following exclusions:

1. Holding elective office, or membership on certain committees.
2. Voting at Society meetings.
3. Sponsoring membership applications.
4. Eligibility for receiving the Daggs Award.
5. Privilege of selection as Bowditch Lecturer.
6. May sponsor only those abstracts on which they are listed as first author or co-author.

ASSOCIATE CORRESPONDING MEMBERSHIP

Same as for Associate members with the exception of receiving the FASEB Public Affairs Newsletter.

STUDENT MEMBERSHIP

1. Present one contributed paper at the FASEB and APS Meeting with the endorsement of the student's advisor.
2. Receive *The Physiologist, NIPS* and *Advances in Physiology Education.*
3. Subscribe to books and periodicals at member rates.
4. Register to attend scientific meetings of FASEB and APS at student rates.

THE AMERICAN PHYSIOLOGICAL SOCIETY

THE AMERICAN PHYSIOLOGICAL SOCIETY

9650 Rockville Pike, Bethesda, MD 20814

Date _____ LAST NAME _____

MEMBERSHIP APPLICATION

Submit original and 7 copies of application and supporting documents

REGULAR	☐	ASSOCIATE	☐
CORRESPONDING	☐	ASSOCIATE CORRESPONDING	☐
		STUDENT	☐

Current Membership and year elected _____

Refer to Instructions Before Continuing

Name of Applicant: _____

First Middle Last

Mailing _____ Birth Date: _____

Address _____ Citizenship: _____

_____ *Country of Permanent Residence:

_____ _____

*Alien Residents of The Americas enter proof of permanent residency or attach documentation. _____

1. EDUCATIONAL HISTORY

Dates	Degree	Institution	Major Field	Advisor

Doctoral Dissertation Title (if any): _____

_____

Postdoctoral Research Topic: _____

_____

SPONSORS

#1. Name: _____ #2. Name: _____

Mailing Address: _____ Mailing Address: _____

_____ _____

_____ _____

_____ _____

Telephone No. Telephone No.

I have read the guidelines and this application and attest that the applicant is qualified for membership.

#1 Signature _____ #2 Signature _____

Each sponsor must submit an original and 7 copies of a confidential letter of recommendation to the Society.

NAME _____

2. OCCUPATIONAL HISTORY

Present Position: _____

_____

Prior Positions:

Dates	Title	Institution	Department	Supervisor

3. INTEREST IN THE SOCIETY

a. Have you attended meetings of the APS (Y/N)? _____

b. In the space provided state why you want to join the Society.

4. TEACHING

a. Do you teach physiology (Y/N)? _____

b. What percentage of your time/effort is devoted to teaching (lectures, conferences, etc.) physiology? _____

c. Do you supervise graduate and/or postgraduate students (Y/N)? _____

d. Have you produced teaching aids (textbook chapters, films, computer assisted instruction, etc.) (Y/N)? _____

5. RESEARCH

a. What percentage of your time/effort is devoted to research? _____

b. If your research is funded state source: _____

Are you a principal _____ or co-principal investigator _____ ?

6. BIBLIOGRAPHY

On a **separate sheet** list your publications reported during the past 5 years. Star those in refereed journals.

THE AMERICAN PHYSIOLOGICAL SOCIETY
9650 Rockville Pike, Bethesda, MD 20814

MEMBERSHIP RECORDS QUESTIONNAIRE

PLEASE MARK ALL ENTRIES IN RED.

CURRENT MAILING LABEL OR
PRINT NAME & ADDRESS

DATE _____

DATE OF BIRTH
Month Day Year

EMERITUS MEMBERS: Check, if you would consider temporary or part time employment ☐

OPTIONAL PERSONAL DATA

SEX
☐ Female ☐ Male

A ☐ American Indian or Alaskan Native
B ☐ Asian or Pacific Islander
C ☐ Black
D ☐ White E ☐ Hispanic

POSITION TITLE CODE (SEE REVERSE) ☐☐

TYPE OF INSTITUTION Check one. (If retired, or unemployed check descriptors appropriate to last position held.)

MEDICAL SCHOOLS
33 _____ Physiology Departments
34 _____ Other Preclinical Departments
35 _____ Clinical
36 _____ Administration

OTHER
37 _____ Hospitals and Clinics
38 _____ Veterinary Schools
39 _____ Dental Schools
40 _____ Public Health and Graduate Schools
41 _____ College or University
42 _____ Commercial Companies
43 _____ Government (Inc. V.A.)
44 _____ Institutes and Foundations
45 _____ Private Practice
99 _____ Other (Specify)

EARNED DEGREE CODE (SEE REVERSE) NOT MORE THAN TWO ☐☐

Keyline: _____ (from mailing label)

MAJOR TYPE OF WORK (Check not more than one.)

04 _____ Research 05 _____ Teaching 06 _____ Administration 07 _____ Clinical

SECONDARY TYPE OF WORK (Check one only if it represents a significant portion of time and is different from your major type of work.)

04 _____ Research 05 _____ Teaching 06 _____ Administration 07 _____ Clinical

PRIMARY INTEREST AREA: (Enter the appropriate number from the list of interest area codes on the reverse also enter the letter under the area selected which best describes your specific interest.)

☐☐ MAJOR AREA ☐ SPECIFIC INTEREST

SECONDARY INTEREST AREA (If appropriate)

☐☐ MAJOR AREA ☐ SPECIFIC INTEREST

IF YOU HAVE SERVED ON A GROUP OR COMMITTEE WHICH IS ADVISORY TO THE GOVERNMENT CHECK AS APPROPRIATE.

A _____ Presidents Scientific Advisory
B _____ National Academy of Sciences
C _____ National Institutes of Health
D _____ Nat'l Aeronautical and Space
E _____ Dept. of Interior
F _____ Dept. of Defense (or Constituent Dept.)
G _____ Dept. of Agriculture
H _____ Congressional (Specify)

APS Sections

Please identify and rank those sections to which you desire affiliation (i.e., 1 = primary affiliation, 2 = secondary affiliation, 3 = tertiary affiliation). Only one section can be selected for primary affiliation.

A ___Cardiovascular Section
B ___Cell & General Physiology Section
C ___Comparative Physiology Section
D ___Endocrinology & Metabolism Section
E ___Environmental, Thermal & Exercise Physiology Section
G ___Gastrointestinal Section
J ___Section on the Nervous System
K ___Neural Control & Autonomic Regulation Section
L ___Renal Section
M ___Respiratory Section
N ___Teaching of Physiology Section
O ___Section on Water & Electrolyte Homeostasis

APS Groups

Select any or all by placing an "x" next to the group

F ___Epithelial Transport Group
H ___History of Physiology
I ___Muscle Group

IF YOU HAVE EVER SERVED ON THE FOLLOWING APS GROUPS PLEASE CHECK AS APPROPRIATE.

A _____ Council
B _____ Education Committee
C _____ Finance Committee
D _____ Membership Committee
E _____ Program Committee
F _____ Publications Committee
G _____ Editorial Board (Specify)
H _____ Session Chairman
I _____ Symposia Speaker
J _____ Public Affairs
K _____ Public Information
L _____ Senior Physiologists
M _____ Porter Development
N _____ Animal Care & Experimentation
O _____ Committee on Committees
P _____ Centennial
Q _____ Financial Development
R _____ Career Opportunities in Phys.
S _____ Educational Materials Review Board

(OVER)

I AM A MEMBER OF THE FOLLOWING NATIONAL PROFESSIONAL SOCIETIES: Outside of FASEB:

A _____ American Association of Anatomists
B _____ American Institute of Biological Sciences
C _____ American Chemical Society
D _____ American Society for Cell Biology
E _____ American Society for Clinical Investigation
F _____ American Society of Mechanical Engineers
G _____ American Society of Microbiology
H _____ American Society for Neurochemistry
I _____ American Society of Plant Physiologsts
J _____ American Society of Zoologists (DCP&B)
K _____ Association of Chairmen of Departments of Physiology
L _____ Biomedical Engineering Society
M _____ Biophysical Society
N _____ Endocrine Society
O _____ Institute of Electrical and Electronic Engineers
P _____ Society of General Physiologists
Q _____ Society for Neuroscience
R _____ Canadian Phys. Society
S _____ American Medical Association
Z _____ Other (Specify)_____

POSITION TITLE CODES (use most closely related description)

A. Director or Deputy
B. Chairman
C. Professor
D. Research Associate
E. Sr. Research Associate
F. Associate Professor
G. Assistant Professor
H. Laboratory or Research Director
I. Institute Director
J. Dean or Associate Dean
K. Executive Secretary
L. Academician
M. Corresponding Academican
N. Private Practice or Consultant
0. Researcher
P. Medical Intern
Z. Other

EARNED DEGREE CODES

CODE	DESCRIPTION
01	PH.D. or Dr. Phil.
03	M.D. or Dr. Med.
05	D.V.M. or Dr. Vet.
06	ScD.
07	D.D.S., D. Odont or D.O.
10	ED.D or Dr. Ed.
25	Cand. Med.

INTEREST AREA CODES

01. Anesthesia

02. Anatomy and Embryology
A. Microscopic
B. General
C. Fetal physiology

03. Anthropology

04. Biochemistry
A. General
B. Clinical

05. Biophysics

06. Biomedical Engineering

07. Blood
A. General
B. Erythrocytes
C. Hematology
D. Cell formation
E. Volume
F. Coagulation
G. Platelets
H. Plasma proteins
I. Rheology

08. Cardiovascular
A. General
B. Heart
C. EKG
D. Cardiac output
E. Artificial heart
F. Coronary
G. Cardiac dynamics
H. Cardiology
I. Blood flow
J. Peripheral circulation
K. Hemodynamics
L. Hypertension
M. Blood pressure
N. Atherosclerosis
O. Hemorrhage
P. Blood capillaries
Q. Venous return
R. Shock
S. Pulmonary circulation
T. Splanchnic circulation
U. Control

09. Cellular and Tissue
A. Cytology
B. Mitochondria
C. Protoplasm
D. Cell membranes
E. Cell surface chemistry
F. Histochemistry
G. Electron microscopy
H. Tissue culture
I. Tissue metabolism
J. Tissue elasticity
K. Connective tissue

10. Comparative Physiology
A. General
B. Insects
C. Fish
D. Reptiles
E. Avian
F. Plants
G. Marine biology
H. Crustacean
I. Mammalian

11. Electrolytes and Water Balance
A. General
B. Active transport
C. Ion transport
D. Body fluids
E. Lymph
F. Salt and water balance

12. Endocrines
A. General
B. Neuroendocrines
C. Pituitary
D. Thyroid
E. Parathyroid
F. Insulin
G. Adrenal/Medulla
H. Adrenal cortex
I. Sex hormones

13. Energy Metabolism & Temperature Regulation
A. Energy metabolism
B. Calorimetry
C. Exercise
D. Fatigue
E. Temperature regulation

14. Environmental
A. Aviation
B. High Altitude
C. Space Medicine
D. Underwater
E. Bioclimatology
F. Hypothermia and cold
G. Hibernation
H. Shivering
I. Adaptation
J. Hyperthermia and heat
K. Sweating
L. Industrial health
M. Air pollution

15. Enzymes
A. General
B. Kenetics
C. Antienzymes
D. Digestive enzymes

16. Gastrointestinal
A. General
B. Deglutation
C. Gastric secretion
D. Gastric mucosa
E. Gastroenterology
F. Pancreatic juice
G. Absorption
H. Intestinal motility
I. Digestion
J. Gastrointestinal surgery
K. Salivary secretion
L. Intestinal secretion
M. Gastric Motility

17. General Physiology

18. Gerontology
A. Aging
B. Degenerative diseases
C. Geriatrics

19. Immunology

20. Liver and Bile

21. Lipids and Steroids
A. General
B. Fat metabolism
C. Cholesterol metabolism
D. Obesity
E. Fatty acids
F. Other (Specify)

22. Microbiology
A. General
B. Bacteria
C. Viruses
D. Yeasts
E. Cancer cells

23. Minerals, Bone and Teeth
A. General
B. Bone
C. Calcium metabolism
D. Calcification
E. Dental caries
F. Mineral metabolism

24. Muscle and Exercise
A. General
B. Muscle metabolism
C. Muscular contraction
D. Skeletal muscle
E. Heart muscle
F. Smooth muscle
G. Muscle cells
H. Muscle chemistry
I. Muscle enzymes
J. Muscle-physical processes

24. Muscle and Exercise (Cont'd)
K. Muscle-nerve
L. Exercise

25. Neurosciences
A. General
B. Brain
C. EEG
D. Cerebral cortex
E. Mid brain
F. Brain stem
G. Spinal cord
H. Autonomic regulation
I. Peripheral nerve
J. Nerve cells
K. Vision and optics
L. Hearing and acoustics
M. Taste
N. Speech
O. Other senses
P. Sleep
Q. Learning
R. Behavior
S. Conditioned responses
T. Comparative
U. Neurological diseases
V. Psychiatry
W. Psychology
X. Cerebellum
Y. Hypothalamus
Z. Pain
Reflexes

26. Nutrition and Food
A. General
B. Diet
C. Nutritional value of foods
D. Chemistry of foods
E. Vitamins
F. Digestion
G. Carbohydrate metabolism
H. Protein metabolism
I. Fat metabolism
J. Nutritional diseases

27. Pathology

28. Pharmacology
A. Pharmacodynamics
B. Evaluation of drugs
C. Autonomic drugs
D. Cardiac drugs
E. Anticonvulsant drugs
F. Analgesics
G. Toxicology
H. Therapeutics
I. Chemotherapy
J. Antibiotics
K. Neuropharmacology

29. Radiology
A. Radiobiology
B. Ionizing radiation
C. Ultra-violet
D. Thermal burns
E. Cosmic rays

30. Renal
A. General
B. Tubular
C. Urinary tract
D. Renal disease
E. Comparative
F. Diuretics
G. Artificial Kidney

31. Reproduction
A. Fertilization
B. Pregnancy
C. Fetal physiology
D. Lactation
E. Obstetrics & Gynecology

32. Respiration
A. Pulmonary physiology
B. Respiration mechanics
C. Pulmonary diffusion
D. O_2 and CO_2 transport
E. Tissue respiration
F. Anoxia
G. O_2 poisoning
H. Asphyxia
I. Respiratory diseases
J. Chest diseases
K. Hypercapnia
L. Artifical lungs
M. Resuscitation
N. Control

99. Other
Z. Other