THE PHYSIOLOGIST

A Publication of the American Physiological Society | Volume 29, Number 1 | February 1986

CONTENTS

EDITORIAL

Does Physiology Have a Future?

According to David Hilbert, the German mathematician, "As long as a branch of science offers an abundance of problems, so long is it alive; a lack of problems foreshadows extinction or the cessation of independent development." As we are all aware, there still remain many profound questions to be answered within physiology before we arrive at a comprehensive understanding of how living things function. Therefore, we can assume that physiology, as a discipline, has a long and bright future.

If the future for physiology is so bright, why is there so much dissatisfaction among physiologists and within the ranks of the Association of Chairmen of Departments of Physiology (ACDP). In October, I had the opportunity to attend the ACDP meeting in Houston to participate in an extensive and often-heated discussion of the topic. I would like to thank Stan Schultz for inviting me to attend and look forward to future opportunities to meet with the ACDP.

In some corners, physiology has been described as the gross anatomy of the '80s. For others, the dissatisfaction is with the image of physiology projected by APS, not with the discipline of physiology. No doubt, whether physiology and/or APS "are alive and well" will be debated again and again in the pages of *The Physiologist* and the corridors of the departments.

However, if physiology is as vital as it seems, why is the analogy made to gross anatomy. Part of the problem is that, to answer the unanswered questions, physiologists are finding themselves working in areas different from those taught to medical students. Unanswered questions can no longer be answered with the conventional techniques employed by physiologists in previous decades. Molecular and immunological approaches have been added to the armamentarium of physiologists in order to probe the inner workings of the organism.

To many in the community, this represents the "cutting edge" of physiological research. However, the collection of overhead and indirect costs is not the only responsibility of the physiology department. Physiology must also be taught; hopefully, by physiologists. In spite of the research composition of the department, the classical systems and organ approach to physiology must be taught to medical students.

The question facing ACDP is how best to accomplish a "cutting-edge" research image while continuing to teach classical physiology. For one chairperson this was accomplished by hiring an immunologist and teaching the new assistant professor of physiology the basics so that the new hire could train medical students. While this might not be bad for teaching medical students, the appropriateness of the approach is questionable. Why not hire physiologists and train them in immunology? Although the end result might be the same scientifically, the students would benefit more from the latter.

At the rate departments of physiology are being staffed by molecular biologists,

biochemists, immunologists, and other "cutting edge" scientists, one must question whether there will be anyone left to run the dog laboratory in physiology departments of the 21st century.

A repeated complaint raised at the ACDP meeting was that APS was "doing little to relate to the cutting edge of modern physiological science." This was often followed by the complaint that "the APS membership and activities do not reflect the makeup of physiology departments." This latter complaint might indeed be valid, for according to a survey by Stan Schultz only 58% of the full-time members of 113 departments are APS members.

At least in the eyes of 40% of the department membership, APS is not worthy of their membership, perhaps because it is not at the "cutting edge," or perhaps because they have not been encouraged to join and participate. If APS is not at the "cutting edge," why do the journals of APS get selected as the journals in which departmental members would submit a manuscript that "is an outstanding scientific contribution." The journals, after all, are the "cutting edge." Even the meetings of APS could be viewed as providing an avenue for communication of "cutting edge" research if the results of Stan Schultz's survey are correct. In response to the statement "If . . . you could attend only one meeting per year for scientific purposes, that meeting would be . . ." an APS Meeting for 38% (spring 35%, fall 3%) of the respondents in one tabulation and 64% (spring 54%, fall 10%) in another tabulation. While the Society may not reflect the composition of the departments according to some, its meeting and journals still receive a vote of confidence from many of the departmental members.

To express their displeasure with APS activities, the chairmen attending the ACDP retreat unanimously voted to recommend that APS cancel its Fall Meeting. To them, the Fall Meeting did not meet their needs or reflect the "cutting edge" of physiology. It is my view that their vote was premature. The issue of the Fall Meeting has been debated repeatedly without resolution. However, just because the meeting is not humming along on all cylinders does not mean you junk it. Even a car is given the benefit of a tune-up first. It appears that, for the ACDP, it is easier to "cut bait" than to try and land the prize. A little work on the Fall Meeting might be beneficial, for it might not only enhance the image of APS but strengthen the hands of the chairmen in their universities.

What APS and, according to the chairmen, the Fall Meeting needs is active participation of scientists working at the "cutting edge." However, it is important to remember that the meetings can only reflect the interests of the active members. The Program Committee can make up programs only from papers that are submitted and the symposia that are suggested. If the chairmen want APS to be at the "cutting edge," they must help to make the Society a reflection of their vision. The ACDP should encourage the members of their departments to join APS and to participate actively in its programs.

Instead of canceling the Fall Meeting, the current APS Council is trying to mend it through the development of a thematic approach. This is an approach that could provide a means for the Fall Meeting to show off the "cutting edge."

Instead of expressing the fear "that the APS does not adequately reflect the 'cutting edge' of physiological research, and thus, projects an image that has negatively affected (their) abilities to attract the 'best and the brightest'," I would urge the ACDP to get actively involved in the Society as we move to pursue the questions of membership, meetings, sectionalization, and governance. The future of physiology is not an issue that APS can address alone. For physiology to grow, prosper, and fulfill its future potential, the support of all interested parties is needed.

Martin Frank

OPINIONS

The Challenge of Adaptational Physiology

Graduate education in physiology must prepare future teachers of medical students. However, the training of graduate students requires much more than the basic physiology usually offered with a medical education. Physiology is an important biological science, and I am concerned that we should include areas not appropriate for medical students. The first of these biological areas is molecular biology. In general, graduate programs are doing well in including training in molecular mechanisms.

A second area that is usually neglected in the history of physiology. Our students are not aware of the rich tradition left by physiologists of previous generations. A third area deals with the current debates in general biological theory, and I propose that physiology holds the key to answer some of the controversial issues. Not since the post-Darwinian period have there been so many conflicting positions in biological theory. I shall list some areas of debate and note how physiology can contribute to solution of differences in theory.

Martin Frank, *Editor*

The American Physiological Society was founded in 1887 for the purpose of promoting the increase of physiological knowledge and its utilization. The APS constitution and bylaws appear in the *FASEB Membership Directory*. Officers: *President*, Howard E. Morgan, Pennsylvania State University, Hershey, PA; *Past President*, John B. West, University of California, La Jolla, CA; *President-Elect*, Franklyn G. Knox, Mayo Medical School, Rochester, MN; *Council*, Shu Chien, Harvey V. Sparks, Jr., Norman C. Staub, Aubrey E. Taylor; *Executive Secretary-Treasurer*, Martin Frank, 9650 Rockville Pike, Bethesda, MD 20814.

Publications Committee: *Chairman*, Paul C. Johnson; *Members*, William F. Ganong, Leonard R. Johnson, Franklyn G Knox, Jean McE. Marshall.

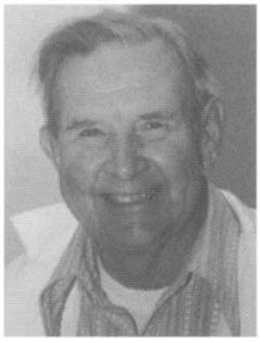
Publications Manager and Executive Editor, Stephen R. Geiger. *Production Manager*, Brenda B. Rauner, *Editorial Staff*, Ann Cahnmann, Lorraine Tucker.

The Physiologist (ISSN 0031-9376) is published bimonthly by the American Physiological Society, 9650 Rockville Pike, Bethesda, MD 20814. Subscriptions: Distributed to members as part of their membership; nonmembers and institutions, $60.00 per year in the United States; elsewhere $75.00. Single copies and back issues, including Fall Abstracts issue, when available, $15.00 each. In 1986 subscribers to *The Physiologist* will receive it, the abstracts of the fall meeting of the American Physiological Society, and *News in Physiological Sciences*. The American Physiological Society assumes no responsibility for the statements and opinions advanced by contributors to *The Physiologist*.

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

Moving? If you change your address or telephone number, please notify the central office as soon as possible.



C. Ladd Prosser

1. The gap between reductionism and holistic biology is a wide one. Molecular biologists see little to be gained from study of whole organisms, and whole-animal biologists fail to recognize the relevance of molecular studies. Mammalian physiologists seek medical applications and often consider work on nonmammalian vertebrates and invertebrates as irrelevant. Many physiology departments are so molecularly oriented that there are no teachers of systems physiology. Funds available for molecular studies exceed by several times the funds available for study of whole organisms. However, proteins and nucleic acids in vitro may function differently from how they function in intact organisms. Regulation of organ functions, e.g., blood pressure, can hardly be studied in microorganisms or cellular organelles. Within each subdiscipline there is extreme specialization, and our journals, symposia, and societies are increasingly narrow. Narrow specialization is encouraged by granting agencies. Very few generalists remain. To put molecules together into viable systems and to bridge between molecular and organismic physiology is a major task for future physiologists.

2. The hierarchial organization of living beings makes extrapolation from one level of organization to another very difficult. In neural physiology the barriers between mammals and invertebrates seem to have been broken, but extrapolations from *Aplysia* to rats to humans is possible only if the relations of neural function to life pattern of each species are understood. As restrictions on mammalian experimentation increase, it becomes more important to know the limitations and advantages of systems physiology in nonmammals. However, for an adaptational physiologist, extrapolation to humans is not so important as how physiological traits adapt an animal—insect, mollusk, or fish—to its own way of life. Some ecologists have made use of enzymology to account for differences in life forms in different habitats.

3. In general biological theory, there is conflict as to whether evolution occurs by accumulation of small changes, gradualism, or by abrupt major changes, saltation. In part, the discordant interpretations are due to the differences in the time scale of population genetics and paleontology. It is my view that natural selection results in biological diversity at all levels—from populations and subspecies to phyla and kingdoms. An objective of adaptational physiologists is to give functional meaning to the diversity of organisms.

4. There is disagreement among evolutionists as to whether natural selection can be recognized at the molecular level. The basic biochemical and biophysical patterns of life processes were established very early in evolution, before there were fossil-forming organisms. Selection acts on phenotypes—whole organisms—not on genotypes per se. Most phylogenetic descriptions are based on morphological characters. Histones are the most conserved of proteins; cytochromes are similar in both prokaryotes and eukaryotes; serum albumin is least conserved. Many biochemical characters are highly conserved for recent evolution, while structure is more variable and therefore anatomy gives more clues than biochemistry. Many proteins of blood and muscle are 98% homologous in chimpanzees and humans, but morphological and behavioral characters in these two species are very different. Variations in primary sequences of proteins are relevant to cladistic analyses. During the past 20 years, homologies of primary structure of proteins and more recently of DNA have been used to measure relations between organisms. There is disagreement as to whether phylogenetic trees constructed on the basis of protein and DNA sequences are more accurate than traditional cladograms based on structural differences. For some groups of organisms there is good agreement between the two methods, and for others there are differences. Both methods are subject to error due to convergence. Both methods are statistical in that numbers of differences, whether structural characters or numbers of homologies or antibody reactions, are plotted. Neither method considers the adaptive meaning of measured differences. All amino acid and nucleic acid sequences are treated similarly in comparing homologous regions. Amino acid sequence differences in the midregion of a molecule may be of little adaptive value, whereas functionally critical regions, such as binding sites, and higher order structure of proteins are highly conserved and have survived selection.

A related question is whether most genetic changes are neutral or adaptive. Many physiological measurements of organisms are of gross functions, and many molecular measurements are of functions so general as to be nonadaptive. However, measurements of responses to stresses and kinetic properties of functioning enzymes reveal subtle adaptive differences between proteins that may otherwise be considered neutral.

5. There is uncertainty as to why there is so much more genetic variation than there is in protein structure and in morphology. Is the excess DNA superfluous? Why are there such long noncoding regions in eukaryotic genomes, but not in prokaryotes? Why are many proteins encoded as long precursors and then cleaved posttranslationally to smaller molecules before they are used? Did some of the pre- and proproteins serve other functions at an earlier period in evolution?

6. Biologists are in conflict about the meaning of *species*. Reproductive isolation serves for animal speciation, but in plants hybridization and ecological isolation lead to taxonomic species formation. Reproductive isolation is also not relevant to asexually reproducing organisms such as bacteria. Another definition of *species* is cladistic statistical phylogeny in which species are separated according to number of sequence differences in primary structure of proteins or nucleic acids. I have proposed a physiological definition of *species* that emphasizes the uniqueness of physiological adaptation to ecological niche and geographic range. This definition contends that if we understood the complete physiology of adaptation to the total environment—physical and biotic—we would have a definition of species corresponding to that on which natural selection acts.

7. There is a lack of communication between ethologists and membrane biophysicists. Some ethologists take the position that animal behavior can be studied only in nature; the brain is to them a black box. The opposite standpoint is taken by biophysicists, who have made great strides during the past generation in understanding nerve conduction and synaptic transmission. These two views are rarely brought together. We know virtually nothing of the physiology of complex innate behaviors. Concepts such as sensation, consciousness, and intelligence have not been described in physiological terms. However, animals are highly adapted behaviorly in their way of life, and it is a challenge to bridge between animal behavior and membrane biophysics.

8. One of the most controversial aspects of modern biology concerns the relationship of neurobiology to the understanding of human nature. Sociobiologists emphasize the long evolutionary history of *Homo*

and the genetic basis for human behavior. Social scientists disagree with this view and emphasize that culture plays a far greater role than heredity in determining human characteristics. A unifying position is that there has been coevolution of genetically transmitted and culturally transmitted characters.

An essential conclusion from the preceding brief survey of conflicting positions is that no animal can survive unless it is adapted to its environment—physical and biotic. For adaptational biology, unifying themes are temporal continuity of life forms and functions, the dynamic nature of life, and the biological diversity at all levels of organization and physiological adaptation to the *total* environment—at every state of biological history.

Unfortunately, evolutionists pay little attention to physiology, and most physiologists have only a superficial knowledge of evolution. Yet, many controversial issues in biology are amenable to solution in terms of physiological adaptation. Of the Nobel prizes in physiology and medicine during the past 25 years, approximately half have direct medical applications and half deal with understanding general life processes. One role of physiology is to provide a rational basis for medical practice. However, the time is ripe for physiologists to recall their biological roots and to contribute answers to many of the controversial issues in general biological theory. Graduate training should include preparation for research that may aid in elucidating biological adaptation.

C. Ladd Prosser
University of Illinois, Urbana

To the Editor

The American Physiological Society can and should be the leading biomedical society in this country. It can regain this status by focusing on its unique role of studying how the *whole body* works. The offspring societies that have come into existence during the last century study physiological mechanisms at the cellular and molecular levels. At present, molecular biology, membrane studies, genetics, and cell biology are in fashion. These fields are being studied and *taught* to the exclusion of the study of the whole organism. Simply because these fields are fashionable, there are many people active in them, and they have many societies including ours in which to express their views. In fact, although our meetings are organized by organ systems, they are often taken over by studies at the cellular level, e.g., in my field, pulmonary physiology. The mechanism for us to learn from people investigating at the cellular level is thus already in place. Many of our members also belong to other societies, and many presentations are duplicated at various meetings. On the other hand, integrative physiology, the study of the whole awake organism, is being investigated by very few people. The reason is obvious; it is more difficult and there is no short-term payoff. However, the need for this study is enormous.

Traditionally our society has leaned toward the study of human physiology, and many of our members are M.D.'s. With the current emphasis on health care rather than disease-oriented medicine, there are springing up many subspecialies and "health-care practitioners" who teach how the body functions with very little understanding beyond outdated anatomy/physiology nurses' manuals. In many cases, teaching of physiology in medical schools isn't much better, since the research interests of the teachers are at the cellular and subcellular level.

I should like to see APS take the initiative in emphasizing the physiology of the whole organism. This means using all modern tools and technology including biophysical tools, e.g., circuit theory, and open systems thermodynamics. The society could play a pivotal role in making the necessary collaborations between various specialists possible as well as in facilitating the sharing of expensive equipment.

Second, I believe that APS has a responsibility in improving the teaching of physiology at every level but at the very least in the medical schools. The emphasis is still on teaching different organ systems separately and on memorizing bits of information for multiple-choice exams. The total number of firmly established bits of information about the whole awake organism is small. Once this is recognized and this core of information identified, real teaching can begin, using a Socratic method similar to our approach to a research problem. Most medical schools give their physiology departments sufficient time to teach in this way. This approach would give students an understanding of how the body works adequate for the primary-care physician. More importantly, it would promote an open mind and the habit of lifelong learning.

Edith Rosenberg
Associate Professor
Howard University

AAALAC Accreditation: The Seal of Good Laboratory Animal Housekeeping

Since 1965 the American Association for Accreditation of Laboratory Animal Care (AAALAC) has been the nation's independent, nongovernmental accrediting agency for laboratory animal care and use programs. Today, animal facilities at more than 500 institutions are accredited by AAALAC.

The AAALAC accreditation program is providing the scientific community with a valuable and independent means of assessing within an institution the quality of the animal care and use program. Moreover, through its accreditation process AAALAC has earned the respect of both the public and private sectors by demonstrating that meaningful self-regulation through peer review can be effective.

AAALAC also realizes that all institutions cannot afford the latest or the most expensive physical facilities, nor does the presence of facilities representing the state of the art ensure high-quality animal care. What has been demonstrated and documented, however, is that individuals who are well trained and motivated can compensate for facility deficiencies and with the involvement of good professional oversight can ensure high-quality animal care.

Founded 20 years ago by 14 scientific and professional organizations from the biomedical, research, and testing communities, AAALAC has remained a private, nonprofit agency and is unchanged in its goal to encourage optimum care for laboratory animals by providing a mechanism for peer evaluation by the scientific community of institutional animal care and use programs.

The objectives sought by AAALAC in its peer evaluations are ensurance of humane treatment of laboratory animals, protection of personnel from hazards associated with the use of animals, control of variables that could adversely affect animal research, and

preservation of freedom of scientific inquiry.

The accreditation process is designed to consider all parameters of animal care and use. The primary standard for evaluation, however, is the *NIH Guide for the Care and Use of Laboratory Animals*, thus reducing to a minimum the possibilities of guideline conflicts between AAALAC and federal agencies.

Other references utilized in its evaluations include the National Cancer Institute's safety standards for research involving chemical carcinogens and safety standards for research involving oncogenic viruses, the Center for Disease Control's classification of etiological agents on the basis of hazard, the 1978 report of the American Veterinary Medical Association's Panel of Euthanasia, and the Institute for Laboratory Animal Resources' *Species Specific Guides.*

The evaluation of an animal facility generally is made by a two-person team: one individual selected from an array of 130 consultants and the other one of the 18 members of the Association's Council of Accreditation. Both consultants and council members are selected on the basis of their expertise in laboratory animal and other biomedical sciences.

An institution seeking accreditation submits an application for review by the AAALAC staff, who schedules the site visit date and selects the visitation team. The team's report, evaluating the institution's facilities and the programmatic aspects of its animal care and use programs, is prereviewed by two council members prior to consideration by the full council for its recommendation as to accreditation status. The council's recommendation is given to the AAALAC Board of Trustees for final approval and notification of accreditation status.

After the initial awarding of accreditation status, the institution is revisited every 3 years unless earlier visits are indicated. In turn, each accredited institution is required to submit an annual report to the council and to provide information about any change in the animal care and use program at the institution.

An institution applying for accreditation may be awarded a status such as accredited or provisionally accredited. Provisional accreditation usually is based on deficiencies that in the judgment of the council and trustees are correctable. The institution is allocated a specific period of time in which to make such corrections, and upon fulfillment of the corrective measures the status is changed from provisional to accredited.

Should an applying institution have deficiencies that are extensive and in the judgment of the council and trustees are not correctable within a 24-month period, accreditation is withheld. In such instances the reasons for withholding the accreditation are stated, and the institution is invited to reapply when the deficiencies have been corrected.

Should deficiencies develop after an institution is accredited, it is placed on probation and given a period of time to make the necessary corrections. If the institution fails to make the corrections in the prescribed time, the accreditation is revoked.

With the support of its 26 sponsoring organizations, which include the American Physiological Society, AAALAC has been able to evaluate a wide diversity of animal programs in the United States, Canada, England, and France, with more than 2,200 site visits having been conducted in the last 20 years.

Recently, the trustees voted to move in early 1986 the association's national office from the southwest Chicago suburb of New Lenox to the Washington, DC, area.

Among the reasons for the move is that it will enable AAALAC to better serve as a resource for its scientific constituency, the majority of which have Washington offices. It also will permit AAALAC to provide direct input into congressional and regulatory agency deliberations concerning the care and treatment of laboratory animals.

To accomplish this, AAALAC intends to select a laboratory animal scientist to serve as its executive director and spokesperson.

Louis J. Ramazzotto
APS Representative to
AAALAC Board of Trustees and
Executive Committee Member

PUBLIC AFFAIRS

New Pressures Seen at State, Local Levels for Animal Law Reforms

Animal rights advocates are expected to increase the pressure on state and local governments to enact laws restricting the availability and use of laboratory animals for purposes of education and research.

Because the Congress and a federal agency last year acceded to 6 years of pressure for federal statutory and regulatory reforms regarding the care and treatment of laboratory animals, the animal welfare organizations which mounted that campaign are now free to join with the humane societies' efforts to seek other reforms at the state and local levels.

In 1984 The Humane Society of the United States announced as its principal goal the enactment of state laws and/or local ordinances prohibiting animal pounds and shelters from releasing unclaimed animals for any purpose other than pet adoption.

Last year the organization broadened that goal to include seeking a ban on the use of nonhuman animals in experimental psychology laboratory investigations and the reduction and eventual elimination of animals used in research and testing of human addictions, such as tobacco, alcohol, and drugs, and medically nonessential items, such as cosmetics.

The Humane Society of the United States also was instrumental last year in the formation of the National Coalition to Protect Our Pets (commonly called Pro-Pets) and is providing logistical, financial, staff, and other support the coalition may require to achieve the goal of prohibiting the release of unclaimed pound animals in all 50 states.

The coalition membership includes The Humane Society of the United States, International Society for Animal Rights, Michigan Humane Society, Massachusetts Society for the Prevention of Cruelty to Animals, New England Anti-Vivisection Society, American Society for the Prevention of Cruelty to Animals, National Anti-Vivisection Society, Animal Protection Institute, and Fund for Animals. The coalition's headquarters are in Los Angeles, and Michael Gianelli of Fund for Animals is serving as its director.

This effort to win at the state and local levels is in reality a grassroots effort by local and state humane societies but under the guidance of The Humane Society of the United States and the coalition. Last year more than 50 legislative proposals were introduced in state general assemblies and local governmental bodies, none of which was enacted. A greater number of grassroots initiatives is expected this year.

The timetable for this goal is the achievement of pound release prohibitions in 40% of the states by 1990 and a prohibition in all 50 states before the year 2000. At this time 9 states have prohibitions against the release of unclaimed pound animals to research and educational institutions.

Having achieved some of their national goals with the enactment of new federal laws and the promulgation of new federal

regulations regarding the care and treatment of laboratory animals, the animal welfare organizations that championed that effort now are free to support the grassroots movement.

The only laboratory animal issues remaining on Capitol Hill—making breakins at federally funded research institutions a federal offense, creation of a Presidential panel to review all approved federal grants that involve the use of animals, and the proposal to eliminate LD_{50} testing—are given little chance for consideration by the 99th Congress.

One of the points gained by the animal welfare organizations from the Congress last November is that care and treatment guidelines are to be established for all programs supported by the US Department of Health and Human Services that involve the use of animals. The guidelines are to include mandatory requirements for institutional animal care committees and the development of a method to ensure that institutions are in compliance with the guidelines.

The Congress also has directed the National Institutes of Health to establish programs that would provide for research and training in alternative methods, reduce the number of animals currently used in research, and lessen any pain or distress laboratory animals may experience.

The statutory provisions will require little change, if any, in current regulations, inasmuch as the Public Health Service last summer announced policy changes that mirror the intent of the Congress as does the recently revised edition of the *NIH Guide for the Care and Use of Laboratory Animals.*

The Congress also approved several amendments to the Animal Welfare Act, including a new standard that dogs must be exercised, that any facility with laboratory animals must have an animal care committee, and that a research information clearinghouse at the National Agricultural Library be established.

Twenty-Three Awarded NIH Funds to Upgrade Animal Care

More than $8.5 million has been awarded to 23 research institutions by the National Institutes of Health's Division of Research Resources for the purpose of upgrading animal care facilities, developing centralized programs of animal care, and enabling the institutions to comply with the Animal Welfare Act and the Department of Health and Human Service policies for animal care and treatment.

The awards ranged from $50,000 to $748,000. Eligibility requirements for the funds include a demonstrated need for improvements and an acceptable plan for raising the standards of the institution's animal program. A commitment of nonfederal matching funds also is required for these 1-year projects.

The largest award was given to Cornell University at Ithaca. Other major awards for alterations, renovations, and equipment went to West Virginia University ($724,000), University of Michigan ($642,000), University of Alabama at Birmingham ($604,000), University of Iowa ($600,000), University of Missouri ($581,000), and the University of California at San Francisco ($580,000).

Additional information on this program is available from Dr. John Holman of the Division of Research Resources. Phone: (301) 496-5175.

Swiss Reject by 3 to 1 Proposed Lab Animal Ban

Switzerland has rejected by nearly 3 to 1 a national referendum that called for the end of using laboratory animals in that country.

The referendum, entitled "Abolition of Vivisection," was placed on public ballot after a petition by 150,000 Swiss citizens who wanted the law to state, "The vivisection of vertebrates as well as all cruel animal experimentation shall be forbidden in Switzerland."

Swiss law requires that a referendum must not only be approved by a plurality of the voters but that the voters also must carry a majority of the cantons (states). The public vote was 1,099,864 against the referendum; 459,567 for it. The proposal also failed to carry in a single canton.

William M. Samuels, CAE

AFFILIATE APS SOCIETIES

During the past several years, the APS Council has been in the process of negotiating possible affiliations with a number of societies in the field of physiological sciences that possess mutual interests and goals of the Society. It should also provide a mechanism to stimulate new growth and interest in APS. As a result of these discussions the APS Council is pleased to announce the pending affiliation of the Microcirculatory Society with APS.

The concept of affiliation has arisen because both "APS and the Microcirculatory Society have a mutual interest in certain areas of scientific investigation and reporting," and ". . . the two societies draw some of their membership from the same segment of the scientific community." The affiliation of the Microcirculatory Society, or for that matter any society, with APS should enable both societies ". . . to accomplish their purposes in an efficient basis and to improve communication between the two societies and among the members of the two societies and with the public at large."

As part of the Compact for Affiliation, APS will provide the Microcirculatory Society with a number of services for which APS will be reimbursed. In addition, members of the affiliate society will have access to a number of APS privileges as described in the compact.

Compact for Affiliation

RECITALS

WHEREAS APS and THE MICROCIRCULATORY SOCIETY have a mutual interest in certain areas of scientific investigation and reporting; and

WHEREAS the two societies draw some of their membership from the same segment of the scientific community; and

WHEREAS the parties have agreed to become affiliated in order to accomplish their purposes in an efficient basis and to improve communication between the two societies and among the members of the two societies and with the public at large.

NOW THEREFORE, in consideration of the premises and other good and valuable consideration the parties agree as follows:

1. *Affiliation*: The parties agree that THE MICROCIRCULATORY SOCIETY shall be an affiliated society of APS and shall be entitled to the rights and privileges accorded to affiliated societies under the APS *Operational Guide* as it may be revised from time to time.

2. *Services to Be Provided by APS*: APS shall provide the personnel, material, facilities and services of others and shall perform work for THE MICROCIRCULATORY SOCIETY as agreed upon in writing from time to time between the parties. The work to be performed by APS may include: accounting, bookkeeping, billing, mailing, servicing of mailing lists, administrative, managerial, and secretarial services. APS may also provide office space, facilities, and utilities.

3. *Services to Be Provided by THE MICROCIRCULATORY SOCIETY*: THE MICROCIRCULATORY SOCIETY may undertake such duties and responsibilities under such terms as shall be agreed upon.

4. *Rights and Privileges*:

a. As an affiliated society of APS, THE MICROCIRCULATORY SOCIETY shall be entitled to identify itself in its publications and letterheads as an affiliate of APS in the manner shown below or in such other manner as may be approved by APS:

THE MICROCIRCULATORY SOCIETY
(An Affiliate of the American Physiological Society)

b. APS shall have the right to designate a representative to THE MICROCIRCULATORY SOCIETY council (non-voting) to be present when matters of concern are discussed.

c. THE MICROCIRCULATORY SOCIETY shall have the right to designate a representative to the APS council (non-voting) to be present when matters of mutual concern are discussed.

5. *Rights and Privileges of Individual Members of the Societies*:

a. Upon application and payment of dues in accordance with the schedule of dues in effect from time to time, each Regular member of THE MICROCIRCULATORY SOCIETY not presently a member of the APS shall become an Associate member of APS. As an Associate member of APS he/she shall be entitled to the rights and privileges as set forth in the *Operational Guide* of APS as revised from time to time.

b. Each member of THE MICROCIRCULATORY SOCIETY shall be entitled to subscribe to any publication of APS at the APS members' price then prevailing.

c. Each member of THE MICROCIRCULATORY SOCIETY shall be entitled to attend any scientific meeting of APS and to register at APS members' rates.

d. Each member of APS shall be entitled to subscribe to any publication of THE MICROCIRCULATORY SOCIETY at THE MICROCIRCULATORY SOCIETY members' price then prevailing.

e. Each member of APS shall be entitled to attend any meeting of THE MICROCIRCULATORY SOCIETY and to register at THE MICROCIRCULATORY SOCIETY members' rate.

f. Membership in one society does not entitle the member to rights and privileges of membership in the other society except as specifically provided for in this Agreement or otherwise provided for by the other society.

6. *Corporate Identity*: Each of the societies shall retain its own corporate identity and agrees that during the term of this Agreement it will maintain its corporate status in good standing. Each society shall determine its own membership criteria and dues and shall be responsible for billing and collecting its own income. Each society shall retain its own assets and shall be responsible for its own debts and obligations.

7. *Indemnification*: THE MICROCIRCULATORY SOCIETY agrees to indemnify and hold harmless APS in respect of any obligations incurred by THE MICROCIRCULATORY SOCIETY or claims made against THE MICROCIRCULATORY SOCIETY arising out of any act or omission committed or alleged to have been committed by THE MICROCIRCULATORY SOCIETY.

APS agrees to indemnify and hold harmless THE MICROCIRCULATORY SOCIETY in respect of any obligations incurred by APS or claims made against APS arising out of any act or omission committed or alleged to have been committed by APS.

8. *Reimbursement for Services*: Each society shall reimburse the other for any personnel, facilities, programs and services rendered to or on behalf of the other. Reimbursement shall be made in the amounts and in the manner mutually agreed upon by the parties. In the absence of any specific agreement and following consultations between the officers of the two societies, the society furnishing the service shall bill the other society and shall be reimbursed for actual cost plus overhead and general and administrative expenses not in excess of the rate chargeable to the U.S. Government for comparable services or supplies.

9. *Warranties*:

a. THE MICROCIRCULATORY SOCIETY warrants that it is a corporation organized and in good standing under the laws of Massachusetts and duly qualified as an exempt organization under Section 501(c)3 of the Internal Revenue Code, ID #04-6088271.

b. THE MICROCIRCULATORY SOCIETY warrants that the balance sheets and financial statement prepared by Davidson Eagleson and Company, for the year ending May 31, 1985, accurately represent the financial status of THE MICROCIRCULATORY SOCIETY at this time except for changes resulting from the ordinary course of business.

c. APS warrants that it is a corporation organized and in good standing under the laws of the state of Missouri and duly qualified as an exempt organization under Section 501(c)3 of the Internal Revenue Code.

d. APS warrants that the balance sheets and financial statement prepared by Coopers and Lybrand as of December 31, 1984, accurately represent the financial status of APS at this time except for changes resulting from the ordinary course of business.

e. Each party hereto warrants and covenants that it will take no action to prejudice the tax-exempt standing of the other party under Section 501(c)3.

10. *Terms of Agreement*: This Agreement shall remain in effect until terminated by action of the parties as set forth here. Either party may terminate the agreement by giving the other party One Hundred Eighty (180) days' written notice.

11. *Notices*: Notices as required hereunder shall be given by certified mail to the addresses shown below or to such other addresses as the party may designate in writing to the other party.

APS Plenary Session
Physiology in Perspective
Walter B. Cannon Memorial Lecture
Wednesday, April 16, 1986

9:00 A.M. The Lipid Transport Function of Lipoproteins in Mammalian Blood Plasma
Richard J. Havel, M.D., Director
Cardiovascular Research Institute
Univ. of California School of Medicine
San Francisco, CA 94143

10:00 A.M. APS Business Meeting
Howard E. Morgan, President
American Physiological Society

APS/FASEB Symposia Preview
April 13–18, 1986

Meet me in St. Louis . . . Meet me at the fair . . .

1986 APS/FASEB Theme: pH

Organizer: W. F. Boron

Because virtually every cellular process is pH sensitive, one might predict that cells have evolved mechanisms for regulating the pH of the cytoplasm and organelles. The past decade has witnessed a series of exciting advances, largely made possible by the development of new techniques for monitoring the pH of these cellular compartments. The theme's seven symposia highlight advances in four major areas: *i*) transport processes that regulate cytoplasmic and organellar pH, *ii*) modulation of H^+ transport and cell pH by hormones and cell activation, *iii*) use of nuclear magnetic resonance to study cell pH and metabolism, and *iv*) the cellular basis of epithelial acid-base transport.

pH Symposium 1. Ionic Mechanisms of Intracellular pH Regulation

Chairman: J. M. Russell. *Speakers*: J. M. Russell, A. Roos, W. F. Boron, P. Aronson, and J. Pouyssegur

Over the past 10 years, it has become clear that the long-term regulation of intracellular pH (pH_i) in animals is dependent on acid-base transport across the cell membrane. Two distinct ion transport mechanisms, with different pharmacological properties, have been shown to regulate pH_i. One of these requires HCO_3^-, external Na^+, and internal Cl^- (Na-dependent Cl-HCO_3 exchange), while the other requires only external Na^+ (Na-H exchange). This symposium will examine the latest findings about each of these processes.

pH Symposium 2. Role of Second Messengers in Modulating Hydrogen Ion Transport

Chairman: M. Villereal. *Speakers*: J. Pouyssegur, L. Glaser, N. Owen, S. Grinstein, and M. Villereal

A rise of pH_i, mediated by a plasma membrane Na-H exchanger, is thought to play a crucial role in the activation of several cell types by growth factors and mitogens. This symposium will emphasize the mechanisms by which the growth factor or mitogen lead to the observed rise of pH_i, as well as the role of this pH_i increase in the subsequent response of the cell. The experimental approaches to these problems include those of physiology, biochemistry, and genetics.

pH Symposium 3. Role of Hormones in Modulating Acid-Base Transport

Chairman: B. Sacktor. *Speakers*: H. Jacobson, J. Kinsella, D. Warnock, E. Nord, and B. Sacktor

This symposium will discuss new findings on how acid-base transport in epithelial tissues is regulated by various hormones of distinct class and presumed mode of action. The experimental models utilized in these studies of control mechanisms include plasma membrane vesicles, cultured renal cells, isolated cells and tubules, and intact epithelia.

pH Symposium 4. Hydrogen Ion Transport by Intracellular Organelles

Chairman: G. Rudnick. *Speakers*: G. Rudnick, I. Mellman, E. J. Bowman, S. Gluck, G. Dean, and Q. Al-Awqati

A variety of intracellular organelles in the endocytic and secretory pathways, including endosomes, lysosomes, coated vesicles, vacuoles, and secretory granules, are acidified by an ATP-driven H^+ pump in the organelle membrane. This symposium will deal with the location and properties of this H^+-pumping ATPase, particularly its differences from previously characterized ion-pumping ATPases, physiological processes for which this H^+-pumping ATPase is involved, and the modulation of organelle acidification by other membrane transporters that catalyze counterion movement.

pH Symposium 5. Intracellular pH Changes During Cell Activation

Chairman: R. Nuccitelli. *Speakers*: M. Whitaker, D. Epel, R. Schackmann, and W. Busa

Recent studies have documented that pH_i changes of 0.1–1.6 pH units occur during metabolic and developmental transition in a variety of cells. We will review the evidence for pH_i-mediated regulation of gamete activation and cellular dormancy, as well as the role of second messengers in the stimulation of the pH_i change.

pH Symposium 6. Use of Nuclear Magnetic Resonance to Study pH and Metabolism

Chairman: R. G. Shulman. *Speakers*: R. McNab, R. Gillies, M. Avison, C. Deutsch and M. Civan

Nuclear magnetic resonance is a noninvasive method that can be used to measure not only the concentrations of a wide variety of biologically important substances but intracellular pH as well. In addition to considering the methodologies for using ^{31}P and ^{19}F NMR to measure pH_i, the symposium will focus on the interrelation among pH_i, metabolism, and ion transport in a variety of cell types.

pH Symposium 7. Acid-Base Transport in Epithelial Cells: Mechanisms and Regulation

Chairman: L. Reuss. *Speakers*: P. Aronson, E. Fromter, Q. Al-Awqati, D. Eaton, and L. Reuss

This symposium will address mechanisms of H^+ and HCO_3^- transport, at the cell membrane level, in salt-transporting epithelia. The mammalian renal proximal tubule will be discussed from membrane-vesicle and electrophysiological viewpoints. Attention will also focus on regulation of Na-H exchange by cAMP, regulation of H^+ pump activity by insertion of membrane vesicle, and regulation of Na-K pump activity by pH_i.

Control of Coronary Circulation and Myocardial Function by Eicosanoids

Organizer: Gabor Kaley. *Speakers*: M. E. Gerritsen, K. M. Mullane, B. R. Lucchesi, T. H. Hintze, and S. Chierchia

The lectures in this symposium will be state-of-the-art presentations of the role of eicosanoids (metabolites of arachidonic acid) in myocardial function and the regulation of the coronary circulation. Information will be synthesized during this conference, by speakers who represent different disciplines in biology, to understand better the physiological role and pathophysiological importance of these substances. The speakers are all well known and acclaimed by those who have followed this field. Each of the speakers has been studying the significance of eicosanoids in cardiovascular function for at least a decade.

Cellular Mechanisms in Carotid Body Chemoreceptors

Organizer: Carlos Eyzaguirre. *Speakers*: D. McDonald, S. J. Fidone, P. Zapafa, H. Acker, S. Lahiri, R. S. Fitzgerald, and C. Eyzaguirre

A point in carotid body research has been reached where it is very important to define and clarify the cellular processes operating at the receptor level. This is necessary because there still is no generally accepted mechanism for the onset of the sensory discharge. Various investigators have used different approaches such as biophysics of the glomus cells, content and release of putative neurotransmitters, metabolic processes in the tissue, and pharmacological effects of the transmitters on the sensory discharge. The purpose of this symposium is to bring together a group of investigators working in these different areas, discuss results, and, if possible, come up with an overall view of these mechanisms. It is hoped that this meeting will accomplish this purpose, leading to new and better-focused research in this area.

Granulocytes in Myocardial Ischemia and Reperfusion Injury

Organizer: Robert L. Engler and Benedict R. Lucchesi. *Speakers*: G. Schmid-Schonbein, J. M. McCord, R. Engler, B. R. Lucchesi, and K. Mullane

Recent evidence suggests a much broader and earlier role of the granulocyte in acute myocardial ischemia than previously identified. Evidence from the several different areas of physiology and biochemistry suggests that granulocytes obstruct myocardial capillaries during acute ischemia, participate in edema formation and arrhythmias, and are a risk factor for survival. Investigations on the effects of highly reactive oxidents such as oxygen-free radicals suggest that these compounds contribute significantly to the damage in acute ischemia and reperfusion. It appears likely that the granulocyte is a likely source for the oxygen-free radicals which result in early myocardial damage, but endothelial cells are also sources of these toxins. The purpose of this symposium is to bring together individuals working in both physiology and biochemistry so that attendees can obtain two different perspectives and appropriately colate this new information about acute myocardial ischemia.

Ionic Control of Gene Expression

Organizer: Irwin M. Arias. *Speakers*: I. M. Arias, L. Cantley, P. M. Rosoff, H. Leffert, and R. Levinson

Although much attention is placed on gene structure and function, there is increasing evidence that

gene expression occurs in response to events on the surface of animal cells. Thus, modulation of pumps, channels, receptors, and other mechanisms alters intracellular composition and function, which, in turn, is reflected in activation or suppression of specific genes and their products. These considerations are particularly important in cellular regeneration, differentiation, transformation, and death. The speakers are expert in this rapidly developing area that bridges membrane physiology with molecular biology. Each contributes unique expertise within the overall theme.

Aging and Exercise: Physiological Interactions

Organizer: John O. Holloszy. *Speakers*: W. A. Kachadorian, E. Buskirk, J. M. Hagberg, A. A. Ehsani, G. Gerstenblith, E. G. Lakatta, and J. O. Holloszy

This symposium will deal with the effects of aging on the physiological responses to exercise and with the effects of exercise training on the deterioration in physiological function that occurs with aging. One component of the symposium will deal with maximum oxygen uptake capacity ($\dot{V}o_{2\,max}$); the topics to be covered will include the roles of changes with age in heart rate, stroke volume, and oxygen extraction in bringing about the decline in $\dot{V}o_{2\,max}$ and the extent to which this decline can be modified by exercises training. A second component of the symposium will deal with the effects of aging on the cardiovascular response to exercise and the extent to which the age-related deterioration in cardiovascular function can be modified by training. The third component of the symposium will review evidence against the concept that longevity is inversely correlated with metabolic rate, i.e., the rate-of-living theory, and that exercise, by increasing metabolic rate, accelerates aging.

Isolated Muscle Cells as a Physiological Model

Organizers: Melvyn Lieberman and Fred S. Fay. *Speakers*: Session 1—M. Lieberman, S. D. Hauschka, B. R. Eisenberg, R. Horn, A. W. Jones, J. Walker, and R. Tsien. Session 2—J. V. Walsh, F. S. Fay, R. W. Tsien, A. Fabiato, C. Ashley, and Z. Hall

Electrophysiological properties of muscle cell membranes can play an important regulatory role in the normal function of the intact tissue. In recent years, the complexities of muscle morphology have been recognized as a potential problem both for voltage-clamp and radiotracer measurements and in the interpretation of experimental data. Unfortunately, changes in ion content due to electrodiffusive and electrogenic mechanisms across the cell membrane, and particularly across regions facing restricted extracellular space, complicate the quantitative analysis of membrane channel function. Basic research concerned with consequences of diffusion and transport on cellular electrophysiology is moving in at least two directions. Some investigators are of the opinion that studying ion accumulation and depletion in extracellular space, in conjunction with the interaction of passive and active transport mechanisms, will provide the only effective means of synthesizing information basic to understandiong normal muscle cell and tissue function. Other investigators share the view that functional consequences of cellular interaction within muscle will be better understood when fundamental properties of the basic unit, the cell, are unequivocally established. An increasing number of investigators are now directing their attention to newer techniques that have enabled the successful isolation of single, functional embryonic and adult muscle cells. Although problems regarding cell purification and viability are not fully resolved, progress in obtaining physiologically relevant preparations has been both rapid and significant. Based on results presently available in the literature, isolated preparations of muscle cells and those in tissue culture should continue to provide investigators with the opportunity to design experiments that will yield results capable of discrimination between properties of the cell membrane and those modulated by changes in the restricted extracellular spaces of the tissue. If the physiological properties of individual cells within a tissue are regulated by the interaction of restricted extracellular spaces and ion transport mechanisms, then studies with isolated cells should provide important information that will allow us to predict the normal and abnormal physiology of muscle.

Pulmonary Vagal Receptors: Current Controversies

Organizer: Allan I. Pack. *Speakers*: J. Coleridge, D. MacDonald, A. Pack, G. Sant'Ambrogio, and J. Widdicombe

The major goal of this symposium is to discuss and review current controversies on pulmonary vagal receptors. Although the existence of these receptors has been known for some time, there is as yet no agreement about what the receptors respond to or about their physiological role. Particular controversy surrounds the rapidly adapting (irritant) receptors and receptors innervated by nonmyelinated afferents. Some people propose that the rapidly adapting receptors are part of the pulmonary defense system responding when there are noxious stimuli in the respiratory tract. Others assert that they are not "irritant" receptors but are more normal mechanoreceptors that play a role in reflex control of ventilation, particularly when ventilation is high. An alternative receptor system that might mediate defense reflexes is the receptors in the bronchi innervated by nonmyelinated afferents—the bronchial C-system. Whether these receptors, and like receptors in the interstitium (the J-receptors), are simply nocioceptive or play a larger role in reflex control of ventilation, particularly during exercise, and reflex control of airway smooth muscle tone is also the subject of debate. During this symposium these issues will be discussed. The symposium has been designed to bring together acknowledged experts who are actively involved in research on these topics. It is therefore our intention to bring together scientists with different viewpoints, both to see whether a consensus can be reached, although this is unlikely, and more importantly to stimulate discussion that might lead to new research directions. The symposium should prove particularly useful to the large group of scientists involved in studies of neural control of ventilation.

Vasomotor Control: Functional Hyperemia and Beyond

Organizer: Brian R. Duling. *Speakers*: B. R. Duling, P. Lelkes, H. Weigelt, R. Hogan, L. Langielle, S. Segal, and S. Vatner

Historically, students of the peripheral vasculature have tended to concentrate their attention on short-term flow regulatory processes such as those that occur during functional hyperemia associated with exercise. However, it is now clear that more complex interactions exist in the vascular system that may have profound effects on the ability of tissues to control flow and substrate supply to active cells. For example, recent evidence suggests that there may be flow control at the level of single capillaries. In the past several years, fundamental changes in our understanding of the endothelial cell biology have led to the likelihood that endothelial cell concentration per se may play an important role in controlling capillary perfusion. Furthermore, it now becomes apparent that resistance to blood flow is modulated at least in striated muscle at several points including capillaries, arteroles, and even small arteries. Responses of these diverse segments of the peripheral vasculature must all be coordinated, and several new avenues of investigation suggest extensive interactions between the various segments of the vasculature. These flow-dependent and propagated responses serve to integrate the control of flow among the various vascular segments and to ensure that flow, pressure, and regional perfusion are optimized. A final aspect of the symposium concerns a novel concept related to what might be termed long-term adaptation of the peripheral vasculature.

Regulation of the Cutaneous Circulation

Organizer: John M. Johnson. *Speakers*: G. L. Brengelmann, J. M. Johnson, J. R. S. Hales, P. M. Vanhoutte, and C. B. Wenger

The symposium will focus on the control of skin blood flow by reflexes, local factors, and longer-term factors. Dr. Brengelmann will speak on the current views of the temperature regulation group on this regulation. He will key in on recent studies in paraplegia and ectodermal dysplasia in which afferent or efferent interruption allows an examination of control in unique settings, thereby providing clues to normal regulation. Dr. Johnson will follow with an examination of whether and to what extent such regulation can be modified by reflexes of nonthemoregulatory origin. Specifically, baroreceptor reflexes and reflexes associated with exercise will be incorporated into the general scheme of regulation, an incorporation often ignored. Dr. Hales will speak on control of blood flow through nutritional and nonnutritional vessels (capillaries and arteriovenous anastamoses). He has generated most of the information and provides a perspective that is either ignored or assumed by others. His presence and talk are of particular importance to the overall symposium goals. Dr. Vanhoutte will direct attention to the fact that local factors (specifically local temperature) can affect blood flow to skin, principally via an interaction with autonomic neuroeffectors. His presentation should be most provocative, as he is the world authority on this subject, but his conclusions are not totally in accord with the opinions of the other speakers. Dr. Wenger will give the last talk on more slowly developing alterations in control. Diurnal rhythms and dehydration will be the particular examples in which the level and regulation of skin blood flow are modified by as-yet-unidentified local, neural, or endocrine effectors.

Transport Properties of Endothelial Monolayer

Organizer: Asrar B. Malik. *Speakers*: J. Bhattacharya, D. M. Shasby, B. O. Meyrick, P. Del Vecchio, G. W. Goldstein, and S. C. Silverstein

The aim of the symposium is to bring together a group of investigators pursuing in vitro studies on cultured endothelial cells obtained from pulmonary circulation, including pulmonary microvessels. The technology for culturing these cells exists, and these cells can be made to grow in a monolayer in vitro. Various workers have been experimenting with the use of these cells for the assessment of transport properties of the endothelium. The distinct advantage of using the endothelial monolayer system is that it is possible to study the permeability properties of endothelium and endothelial function in the controlled system. This obviates the complexities imposed on the system when the isolated, perfused lung or intact animals are used for transport studies. The medium surrounding the endothelial cells (on the luminal and abluminal surfaces) can be controlled, disturbances (e.g., shear stress) can be imposed, and quantitative measurements of permeability can be made. This system may also be very useful in testing drug effects on microvascular permeability. Although various investigators have been seriously using the endothelial monolayer system for assessing transport properties of the endothelium, there exists little synthesis of this formation. The intent of this symposium is to bring together some investigators who are using this system, to attempt to provide some framework to the current

studies, and more important to raise further questions. In addition, this symposium would serve to provide good communication among investigators on the various standardization procedures that will be needed, e.g., the problem of unstirred layers, what medium to use on the luminal and abluminal surfaces, whether these cells represent or approximate in vivo conditions, how best to approximate the in vivo conditions, what measures of endothelial transport should be utilized, and where transport occurs in the endothelium monolayer. These are fundamental questions that need to be addressed at this stage of the development of this potentially important technique.

The Bronchial Circulation

Organizer: John Butler. *Speakers*: G. Parsons, M. Deffebach, M. Magno, A. Wanner, H. A. Menkes, P. Paré, M. Matthay, D. Shure, and R. Albert

Over 500 years ago, Leonardo da Vinci correctly recognized the bronchial circulation as the nutrient blood supply to the lung. In addition to this fundamental role, recent studies have shown that this diminutive circulation has a myriad of other functions. In this symposium, a review of new insights into the anatomy and complex neurohumoral control of the bronchial circulation will be discussed as well as its role in the late allergic airway response, its role in removal of mediators from peripheral airways, and its possible involvement in the conditioning of inspired air. Mechanisms related to the increase in bronchial blood flow in response to acute lung injury will be explored and the role of the bronchial circulation in the removal and/or formation of pulmonary edema clarified. This symposium will illustrate the functional diversity of this previously little-studied circulation and should stimulate unexplored areas of research.

Myosin Polymorphism in Striated Muscle—Session I

Organizers: Richard L. Moss and Martin J. Kushmerick. *Speakers*: J. F. Y. Hoh, E. D. Pagani, H. L. Sweeney, P. J. Reiser, F. E. Stockdale, and D. Pette

This symposium includes a number of topics relating to the regulation and function of myosin isozymes, particularly involving, though not limited to, skeletal muscle. This area has been one of great interest to physiologists for a number of years. Recent work has led to the characterization of relations between mechanical properties and myosin composition, in terms of both native isozymes and specific subunit content, in single-fiber preparations of skeletal muscle. In our selection of speakers, we have attempted to enlist individuals whose work in this area has yielded information about the functional roles of particular myosin forms but have in addition included at least two speakers who should provide overviews of the problems that are under investigation in this field and the methodolgies that are used.

Application of the Techniques of Molecular Biology to Study of Ion Transport Mechanisms

Organizer: J. J. Gargus. *Speakers*: D. H. MacLennan, R. W. Mercer, W. Boron, J. J. Gargus, R. Kopito, and H. F. Lodish

This symposium will present an overview of genetic approaches that have been used in the analysis of membrane transport proteins, using specific proteins to illustrate each approach. It, together with an introductory symposium being given the day before, will serve to translate the techniques of molecular genetics so that they may be understood by the uninitiated cell physiologist.

Mechanisms of Chloride Transport Along the Nephron

Organizer: P. S. Aronson. *Speakers*: L. P. Karniski, P. S. Aronson, H. Oberleithner, H. Velazquez, D. H. Ellison, F. S. Wright, V. L. Schuster, J. B. Stokes, and K. W. Beyenbach

Recent evidence suggests that in each segment of the nephron there is a different transport mechanism underlying the reabsorption or secretion of chloride. This symposium will bring together for the first time a distinguished group of scientists, each of whom has contributed to understanding the mechanism of chloride transport in a different nephron segment. This symposium will be of special relevance to physiologists interested in mechanisms of renal NaCl excretion in general and in mechanisms of action of diuretics in particular.

Morphometry and Video Analysis of Histological Sections Applied to Physiological Research

Organizer: J. Gil. *Speakers*: J. Gil, E. R. Weibel, R. Sidman, O. Tretiak, and D. Silage

The main objective of the symposium is to outline what quantitative and video-analysis techniques have done and can do for physiological research. The speakers will present both the theoretical background of morphometry and explore the full range of possibilities opened by contemporary computer technology applied to video analysis. The first speaker is the unchallenged leading authority in biological morphometry; he will discuss how the morphometric principles apply to the analysis of flat images and how sound three-dimensional and quantitative information can be extracted from them. The second speaker is an accomplished neurobiologist who has achieved excellence in three-dimensional displays of neurological structures, an item that is the subject of great current interest. The third speaker is the director of a NIH-sponsored resource center committed to the development of fully automatic instrumentation for the quantitation of autoradiography, a task too tedious for manual procedures. Finally, the last speaker will discuss the use of personal computers to achieve the routine tasks needed for most video-analysis procedures. In summary, the symposium will address the concerns of researchers in many disciplines who need to extract quantitative or three-dimensional information from structures.

Chloride and Cation Across Cell Membranes

Organizer: P. K. Lauf. *Speakers*: T. J. McMannus, M. Haas, B. Forbush, J. Duhm, P. Flatman, M. H. Saier, and J. M. Russell

The symposium will address the present state of research in the field of chloride ion-dependent, digitalis-insensitive coupled transport of Na^+ and K^+ across biological membranes. Na^+-K^+-$2Cl^-$ cotransport, as this transport mechanism is widely called, occurs in practically all major mammalian cells and, together with the K^+Cl cotransport, has been implicated in the maintenance of cellular homeostasis whether challenged by anisosmotic environments or hormones (catecholamine) and other related substances. The presence of these metabolically dependent but not energy-metabolizing systems as major components of the so-called passive ion permeability of biological membranes only recently has been recognized together with their functional prominence in absorption and secretion of biological fluids. Thus, epithelial cells of the gut, endocrine glands, and the kidney have powerful cotransport mechanisms involved in the balance of salt and water of the organism. Moreover, there is evidence for presence of such transporters in the nervous system. Common to all cotransporters are their kinetic properties and their extraordinary response to loop diuretics, such as bumetamide or furosemide. This symposium brings together seven scientists who have been recognized internationally as leading in this research field. The purpose of their gathering is to crystallize the present knowledge and to sublime the most pressing problems for future research in this field.

The Neurobiology of Arterial and Cardiac Sensory Afferents

Organizer: C. Ferrario, M. Brody, and J. Trubatch

The program is designed to meet the current intense interest of experimental biologists for intimate detailed analysis of research in the field of neural control of the cardiovascular system. In this session, presentations will range from the neurochemical characteristics of sensory afferents to central nervous system integration. The emphasis will be on neurochemical mechanisms, receptor interaction, and colocalization of transmitter and peptides in the peripheral and central projections of arterial and cardiac sensory afferents.

Atrial and Other Natriuretic Factors (3 sessions)

Organizer: P. J. Mulrow and R. W. Schrier. *Speakers*: Session 1—P. J. Mulrow, A. J. deBold, K. D. Bloch, P. Needleman, S. A. Atlas, and G. Thibault. Session 2—B. J. Ballermann, P. J. Mulrow, T. Inagami, R. E. Lang, J. Rapp, and E. A. Epsiner. Session 3—H. E. deWardener, G. T. Haupert, Jr., M. P. Blaustein, and F. J. Haddy

This symposium on natriuretic factors is especially timely in view of the rapid developments in our knowledge of atrial peptides. Reports of plasma concentrations and effects of infusions of synthetic peptides into humans are already appearing. The first 2 days of the symposium will be dedicated to reviewing the biology of atrial peptides, while the last day of the symposium will focus on other natriuretic factors, particularly circulating inhibitors of Na-K-ATPase. These latter factors have been studied longer but have been more resistant to characterization than the atrial peptides. An update of the recent progress in both of these fields will be given.

The Role of the Computer in the Lecture/Discussion Setting

Organizer: H. Modell. *Speakers*: S. Levine, T. Mikiten, and W. Harless

Properly used, the computer, in conjunction with a video projector, can transform the passive learning environment of the lecture hall into one in which students become active participants in the discovery process. This symposium will focus on issues relevant to this transformation. Presentations will illustrate three examples of using the computer in a lecture/discussion setting.

The following symposia will also be held at the meeting:

Myosin Polymorphism in Striated Muscle —Session II
Organizers: S. Winegrad and J. Solaro

Expression and Function of Neuropeptides Within Endocrine Tissues
Organizer: Susan E. Leeman

Transport Abnormalities in Cystic Fibrosis
Organizer: P. M. Quinton

Body Fluid Volume and Blood Pressure Regulation
Organizer: J. E. Hall

Prospectives in Neuroscience
Organizer: J. M. Lipton

Direct Assessment of Renal Microcirculatory Dynamics
Organizers: J. P. Gilmore and L. G. Navar

User of Cellular and Molecular Biology Techniques in Neuroendocrinology
Organizers: M. Susan Smith and P. M. Conn

Joint Meeting of The Physiological Society and The American Physiological Society, Cambridge, England

Minutes of the joint meeting with the American Physiological Society held at Cambridge, September 12–14, 1985.

A joint scientific meeting of the Physiological Society and the American Physiological Society was held September 12–14 at the Agricultural and Food Research Council Institute of Animal Physiology, Babraham, at the invitation of B. A. Cross and at the Physiological Laboratory, Cambridge, at the invitation of R. D. Keynes.

The meeting started with a full-day symposium in honour of Alan Hodgkin. It continued with 19 demonstrations and 25 poster communications at Babraham. One hundred eight-five communications, of which five were illustrated, 14 demonstrations, and 66 poster communications were presented at the Cambridge part of the meeting. A joint discussion on animal legislation brought the meeting to a close. This meant that Cambridge had allowed Oxford to hold the record for the largest meeting of the Society for only 2 months.

At 9:30 A.M. on September 12th a symposium entitled "Transduction at the Receptor Level in the Visual and Auditory Systems," in honor of Sir Alan Hodgkin, began. Clearly, the university authorities intended it to be well advertised, for on the railings in Tennis Court Road and on the botany building were large signs that read "HODGKIN'S CONSTRUCTION." The theatre was packed, and the symposium was opened by the Chairman, Sir Andrew Huxley, who reminded us of the debt that physiology owes to Sir Alan and pointed out that, although recent surgery on his hips had left him with a limp, his brain was as active as ever. Perhaps this was a warning to those who were to speak later at the meeting. It was at this very moment that the new and nervous meeting secretary realized why he was suffering from such an acute bout of déjà vu. It was in this very theatre that he gave his first communication to the Society in 1963.

The first paper, by A. Flock, was on the responses of the hair cells of the inner ear. He gave an excellent and stimulating lecture with simple but impressive visual aids, which simulated the effect of sound waves striking the receptors and the flow of impulses in the afferent and efferent nerve connections of the hair cells. When asked how he had done it, his answer was less than informative. He said it was an American idea, the Scandinavian agent of which had gone bankrupt, and he had purchased the entire stock.

Further stimulating papers on the hair cells of the inner ear followed, but before lunch the meeting secretary set off for Babraham with part of the conference. In the afternoon, the Hodgkin Symposium continued with papers on visual sensory cells. At Babraham, the British summer had at last arrived. It was therefore a pleasure to wander from one building to the next, even if one wondered whether one might bump into a biochemist-physiologist chimera. There was the usual high standard of demonstrations, many of which involved live animals. B. A. Baldwin and K. M. Kendrick demonstrated recordings from single units in the brain of a conscious sheep. Their records illustrated the habituation of units that responded to different foods placed in the animal's mouth and that correlated well with the behavior of the sheep. The sheep and the unit liked goat nuts more than sheep nuts and liked both much more than oats. Other units responded as though they recognized a human face (presumably attached to a body bringing goat nuts).

After tea, with homemade cakes, the posters were on view in the Conference Centre. Promptly at 5:15 P.M. B. A. Cross asked those present to consider the demonstrations and posters for publication. With some alterations, generally to allow the abstract to appear on one page of the journal, they were accepted. Those at Babraham then joined the symposiumeers for a reception at Trinity College.

On Friday the meeting continued at the Physiological Laboratory with five simultaneous sessions. In theatre 1 the theme of the Hodgkin Symposium was continued. The areas to be presented elsewhere were in theatre 2, cardiovascular physiology; in 3, respiratory physiology; in 4, ionic channels and intracellular ionic regulation; and in 5, reproductive and endocrinological studies.

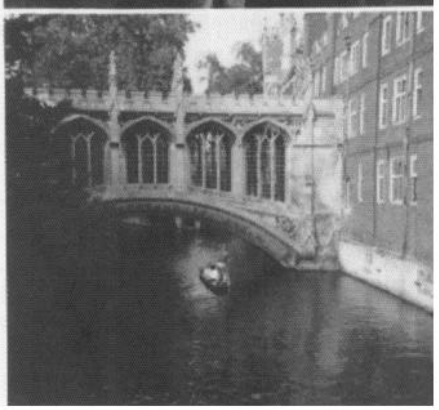
In theatre 2, a paper by G. R. J. Gabbot and D. R. Jones entitled "Psychogenic influences on the cardiac response of the duck (*Anas platyrhynchos*) to forced submersion" was introduced as "forced submission." This faux pas was most appropriate, for D. R. Jones informed us that the duck was a redhead and dabbled as much as 200 times a day.

At 1:00 P.M. lunch was taken in the Physiological Teaching Laboratory, and a pleasant variety of accents could be overheard discussing the morning sessions.

The afternoon session started at 2:00 P.M. in four threatres: theatre 1 with neurophysiology; theatre 2 with cardiovascular physiology; theatre 3 with respiratory physiology; and theatre 4 with a variety of more biophysical topics. In theatre 4, discussion was often heated as the accuracy and pitfalls of the various methods of measuring intracellular ionic contents were compared. A new technique was described by R. Godt, who in collaboration with P. Good, D. Maughan, D. Port, and B. Tanner described how 5-picolitre samples of sarcoplasm were taken up on a minute Sephadex bead when it touched the surface of a skinned skeletal muscle fibre surrounded by oil. Such samples were then subjected to laser-microprobe mass analysis. The data showed that all the naturally occurring isotopes of the appropriate elements could be observed.

At 4:00 P.M. tea was taken in the Teaching Laboratory, where most of the 66 posters were on view. The two Honorary Secretaries divided the list between them and set off to discuss the text abbreviations that were necessary with the authors. At the approval, there were some 75 demonstrations and posters to be considered. "For if it were done when it is done then it were well it were done quickly." That was exactly how it was done, for Sir Andrew Huxley deftly took the meeting through the colour-coded list of suggested amendments that appeared on the blackboard, well in time for sherry on the lawn at Pembroke College.

At 7:30 P.M. we gathered for dinner at King's, with an overflow at the University Centre. After dinner the minutes of the last meeting were read, approved, and signed. Then, Wilhelm Feldberg rose to give the vote of thanks and to welcome the American Physiological Society. He explained to our guests that in Britain there were more speeches per square meal than elsewhere. He said that he had two duties. The first was to thank R. D. Keynes for a most successful meeting, although he made a number of suggestions as to what the meeting might have been like if Keynes had really been involved in its organisation. The second was to welcome the American physiologists. He noted that this meeting had a



real international flavour, for of the 185 oral communications 98 were from the UK and 44 from the US, with the remainder from 13 other countries. He welcomed all to Cambridge, the center of the universe. He finished with a string of jokes, the most memorable of which was the story that, if the first Lord Adrian had been offered the choice between the Mastership of Trinity and the Seat of the Almighty, he would have chosen the former. He added that Adrian did later become Master of Trinity but didn't yet know whether Lord Adrian had obtained the other post.

R. D. Keynes then replied. He recalled that in 1939 as an undergraduate he had been taught by a newly arrived chemical wizard, the previous speaker. He made the traditional claim that he had done little in the organisation of the meeting beyond typing his own letters, while Margaret Twinn and her helpers had done everything else. He welcomed the officers and members of the American Physiological Society, the President of the International Union of Physiological Sciences, Knut Schmidt-Nielsen, and members of his council, and Dr. Eva Sykova from the Institute of Physiological Relations in Prague, who was a foreign guest of the Society. He recalled that the American Physiological Society was founded at the very end of 1887 while members of the Physiological Society were being urged to take advantage of the cheap return rail fare from London to Cambridge, which was 7/2d. He thanked the Wellcome Trust, Cambridge University Press, the Institute of Animal Physiology, and the University Treasurer for their support and Trinity College for the reception of the previous evening. He ended by thanking the Provost of King's College in whose hall we were dining.

John A. West replied on behalf of APS (as they call it in the US). He thanked R. D. Keynes and his staff for a marvellous meeting and the Provost of King's for the spectacular venue for the dinner. He stressed earlier associations between the two societies, for Michael Foster had asked I. V. Bowdich to become an editor of the newly formed *Journal of Physiology*. APS had been founded with the Physiological Society as a model, but they do not vote on the papers as we do. He hoped that no papers emanating from the US would receive thumbs down. He ended by thanking Tony Angel and Michael Jackson for their efforts in the setting up of the meeting and looked forward to future joint ventures.

On Saturday morning the scientific programme continued in five parallel sessions: neurophysiology in theatre 1, hormonal matters in theatre 2, gastric and pancreatic studies in theatre 3, ionic transport in theatre 4, and a cardiac muscle session in theatre 5. After a paper by H. A. Fozzard, D. A. Hanck, J. C. Makielski, and M. F. Sheets entitled "Shift in inactivation and activation parameters of Na-current in internally dialysed canine cardiac Purkinje cells," The Chairman, R. D. Keynes, said he would have been scared to death if he had seen similar results in squid giant axons. The session continued in front of a loyal and relatively large audience and finished appropriately when, during a paper by D. K. Bartschat and M. P. Blaustein, the latter described phencyclidine as a drug of abuse in the US known on the streets as Angel Dust.

Thereby, the scientific part of the largest and, in many ways, one of the most enjoyable meetings of the Society came to an end. Lunch was again prised from plastic containers, and at 2:00 P.M. a Joint Discussion Meeting on Animal Legislation, chaired by D. Whitteridge, continued until tea at 4:30 P.M.

As we all left to go, many of us thousands of miles away from Cambridge, everyone agreed that we should not wait so long for the second joint meeting. I felt, unlike the joke made by Feldberg during the Vote of Thanks, that the British and Americans were not divided by a common language but endowed with certain inalienable rights, among these life, liberty, and the pursuit of physiology.

R. A. Chapman
Honorary Secretary
The Physiological Society

Future Meetings

1986	
FASEB Annual Meeting	April 13–18, St. Louis
IUPS Congress	July 12–18, Vancouver, Canada
APS Fall Meeting	October 5–10, New Orleans
1987	
* FASEB Annual Meeting	March 29–April 3, Washington, DC
APS Fall Meeting	October 11–16, San Diego
1988	
FASEB Annual Meeting	May 1–6, Las Vegas
Joint APS/ASPET Fall Meeting	October 9–14, Montreal

* APS Centennial Celebration

APS NEWS

News From Senior Physiologists

Letters to Arthur B. Otis:

Andre Cournand writes that since his last report to the Committee his main activities have been connected with the forthcoming publication of his intellectual and scientific biography by Gardner Press and with the preparation of a phonograph album sponsored by Bayer AG, which will include a description of his research in cardiology and two of his favorite musical compositions. His 90th birthday last September was celebrated at home by five generations of family and friends and at P & S by a luncheon attended by many former members of the Cardiopulmonary Laboratory of Bellevue Hospital. He says that, while he is "adverse to making final pronouncements addressed to young physiologists," he can observe that, "because of my Gallic temperment, in pursuing my life I try to take things tragically rather than Germanically."

Ts'ai-fan Yu is still continuing his scientific and clinical activities and adding publications to his bibliography. During vacation time for the past 2 years he visited China, where he made lecture tours of 11 medical schools in 1984 and 8 in 1985. He writes, "So many interesting studies are being carried on in China and here, I am glad to be able to comprehend the progress. Learning does not cease with aging as Confucius stated 2,500 years ago."

Hurley L. Motley writes that he is now completely retired except for some consulting and that he has been made an honorary member of the American Association of Respiratory Therapists. He and Mrs. Motley still go to the Dodger baseball games and the USC football and basketball games. He reads *The Physiologist* with interest, this section especially.

Ragnar Granit writes that at the age of 85 he has retired from "the kind of 'elder-statesman' activities" that he has upheld since his retirement from the Chair of Neurophysiology at the Karolinska Institutet in 1967. In 1983 he published his autobiography, *Hur det kom sig* (*How it came about*), written "against a background of people and places in several Western countries." In 1984 he enjoyed taking part in the formal opening of a Sherrington Room in the Oxford Physiological Laboratory.

Letter to Roy Greep:

Bert Mudge observes that "one of the great advantages of a rural medical school is that there's no need to move to the country on retirement." After he retired 4 years ago, he "quickly learned that doing a small amount of research on a part time basis is a contradiction in terms." Instead, he has become involved with a local environmental organization and with working on two short books, a teaching manual for medical students and a history of acid-base physiology.

Fall Meeting Statistics

The following figures are from the APS Fall Meeting, October 13–18, 1985, in Niagara Falls, NY:

Scientific Registration	
Members	524*
Nonmembers	280
Students	182
Retired Members	2
Total Scientific Registration	988
Guests of Scientists	54
Exhibitors	33
Press	8
Total Registration	1,083

* Membership breakdown: American Physiological Society, 413; Canadian Physiological Society, 16; American Society of Zoologists, DCPB, 25; Canadian Society of Zoology, SCPB, 5; Commission on Gravitational Physiology, IUPS, 25; American Society for Gravitational and Space Biology, 40.

BOOKS RECEIVED

Cancer Biology. E. C. Friedberg (Editor). New York: Freeman, 1985, 156 pp., illus., index, $12.95.

Fundamental Neuroanatomy. W. J. H. Nauta and M. Feirtag. New York: Freeman, 1985, 340 pp., illus., index, $39.95.

Hand Function and the Neocortex. A. W. Goodwin and I. Darian-Smith (Editors). New York: Springer-Verlag, 1985, 314 pp., illus., index, $34.50.

Biochemistry of Plant Cell Walls. C. T. Brett and J. R. Hillman (Editors). New York: Cambridge, 1985, 312 pp., illus., index, $34.50.

Biophysics and Biochemistry at Low Temperatures. F. Franks. New York: Cambridge, 1985, 210 pp., illus., index, $44.50.

Cellular Physiology of Nerve and Muscle. G. G. Matthews. Palo Alto, CA: Blackwell, 1985, 207 pp., illus., index, $14.95.

Endothelial Cell Vesicles. K. Messmer and F. Hammersen (Editors). Basel: Karger, 1985, vol. 24, 174 pp., illus., index, $33.75.

Physiological Ecology of Lichens. K. A. Kershaw. New York: Cambridge, 1985, 293 pp., illus., index, $59.50.

Progress in Neuroscience. R. F. Thompson (Editor). New York: Freeman, 1985, 151 pp., illus., index, $21.95.

Regulation of Pituitary Function. Tj. B. van Wimersma Greidanus and S. W. J. Lamberts (Editors). Basel: Karger, 1985, 215 pp., illus., index, $76.25.

Reproduction in Sheep. D. R. Lindsay and D. T. Pearce (Editors). New York: Cambridge, 1985, 403 pp., illus., index, $79.50.

Animal Research Video Program

Every once in a while there comes along an honest attempt to give a fair and objective presentation of the two sides of a question. *Animal Research: The Cost of Hope* is one of those attempts that turned out to be successful.

Unlike the growing number of film documentaries on the laboratory animal issue that focus on the views of the groups that produced it, *The Cost of Hope* explores both sides of the issue without casting any shadow as to right or wrong.

The 25-minute video gives equal time to both the animal rights activists and to the researchers and the beneficiaries of their research. It also displays and discusses the realities of the animal laboratory and the animal shelter.

The stated purpose of the video is to dispel some of the myths and misinformation surrounding the issue and to give a better understanding of the nature of the controversy of using live animal models for research. It achieved its purpose.

William M. Samuels, CAE

Animal Research: The Cost of Hope. Price: $125. Available in ¾-in. U-Matic, ½-in. VHS, and Beta. Not available for preview, purchase only on 30-day, no-risk approval basis. Check or purchase order should be sent to Medical Electronic Educational Services, Inc., P.O. Box 50700, Tucson, AZ 85703. Phone: (602) 624-4401.

PEOPLE AND PLACES . . . .

APS member **Bernice Grafstein**, Ph.D., has been elected President of the Society for Neuroscience. Dr. Grafstein is currently at Cornell University Medical College, where she holds the position of Professor of Physiology and Vincent and Brooke Astor Distinguished Professor of Neuroscience. Dr. Grafstein, who is also Adjunct Professor at Rockefeller University, has been interested in the correlation between function and structure in nervous tissue. Her current work emphasizes the interaction between the growing axon and the nerve cell body from which it originates.

Howard D. Colby, Ph.D., has moved to the University of Illinois, College of Medicine at Rockford, to become Chairman of Biological Sciences. Dr. Colby, former Professor of Physiology at West Virginia University School of Medicine at Morgantown, has been an APS member since 1974.

Eric R. Kandel, M.D., Senior Investigator at the Howard Hughes Institute of Molecular Biology and Behavior of Columbia University, delivered the 1985 Salmon Lectures, "Steps Toward A Biology of Learning and of Short- and Long-Term Memory."

In the 1985 Salmon Lectures, Dr. Kandel addressed "one of the most fascinating problems facing psychiatry—perhaps its ultimate challenge—the neurobiology of mentation." "The recent increase in technical and conceptual strength of both psychology and biology now makes it possible to confront the boundary between these two disciplines," Dr. Kandel maintained. Dr. Kandel has been an APS member since 1964.

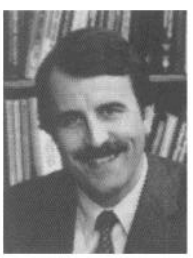
Bernard Fisher, Recipient of Lasker Award

Bernard Fisher, M.D., Professor of Surgery, University of Pittsburgh School of Medicine, was the winner of the 1985 Clinical Medical Research Award, one of five 1985 Lasker Awards given by the Albert and Mary Lasker Foundation. He was honored for his pioneering studies in the pathophysiology and treatment of breast cancer.

In the late 1950s and 1960s, he demonstrated that the regional lymph nodes were not a barrier to the dissemination of tumor cells, as postulated earlier, but were routes traversed by tumor cells to gain access to the circulating blood and lymph systems. From this work came a new understanding of breast cancer, based on the premise that the disease was systemic from its inception. Dr. Fisher was instrumental in organizing large-scale clinical trials, as a result of which he was able to improve dramatically the survival rate for women with breast cancer and to establish alternatives to radical mastectomy. He has been a member of APS since 1956.

1985 Bowditch Lecturer

The 30th annual Bowditch Lecture of the American Physiological Society was presented by Martin C. Moore-Ede on October 16, 1985, at the APS Fall Meeting in Niagara Falls, NY. Dr. Moore-Ede's topic was "Physiology of the Circadian Timing System."



The Bowditch Lectureship, established in 1956, honors the first elected President of APS, Henry Pickering Bowditch. The lecturer is selected by the President of the Society from among the members who have done outstanding work and are under 40 years of age. The honorarium for the lectureship is funded by the income from investment of an unrestricted bequest from former Society member Caroline tum Suden.

Dr. Moore-Ede, born in London, England, in 1945, has been a member of APS since 1976. He received the B.Sc. degree in physiology with first-class honors from the University of London in 1967 and subsequently obtained his medical degrees from Guy's Hospital Medical School in 1970 and the Ph.D. in physiology in 1974 from Harvard Medical School. In 1975 he joined the Faculty of Harvard Medical School as Assistant Professor of Physiology and became Associate Professor of Physiology in 1981. From 1977 to 1982 he was the recipient of an NIH Career Development Award. Since 1982 he has been Chairman of the IUPS Commission on Circadian Rhythms and Sleep Physiology, a member of the Space Biology and Medicine Committee of the National Academy of Sciences, and Associate Editor of the *American Journal of Physiology: Regulatory, Integrative and Comparative Physiology.*

Dr. Moore-Ede's research has focused on the normal structure and function, as well as the pathophysiology, of circadian rhythms in humans and nonhuman primates. These timekeeping processes, evolved by organisms in response to the regular 24-hour day-night cycle, modulate many aspects of their physiology and behavior. Dr. Moore-Ede's studies have addressed the neurobiology of circadian pacemakers, the mechanisms by which temporal information is conveyed both from the environment and between tissues within the organism, and the mathematical modeling of the dynamic behaviors of circadian rhythms in sleep and wakefulness, rest and activity, feeding, drinking, temperature regulation, endocrine function, reproductive function, and the renal excretion of fluid and electrolytes. From these studies has come the appreciation that a circadian timing system, with its own specialized structures, mechanisms, and functions, can be defined that is entirely analogous to the other recognized mammalian physiological systems (e.g., cardiovascular and respiratory). These concepts were developed in some depth in the book *The Clocks That Time Us: Physiology of the Circadian Timing System* (Harvard Univ. Press, 1982).

In the 1985 Bowditch Lecture, Dr. Moore-Ede discussed his development of a theoretical construct to understand the functional importance of circadian rhythmicity. He argued that maintaining homeostasis in an inconstant world requires not only reacting to environmental challenges (Cannon's classic concept of homeostasis) but also predicting and initiating appropriate responses in advance of regular cyclic events. A special class of predictive homeostatic mechanisms was described, regulated by the circadian timing system. These play an important role in activating processes that have significant time delays, such as the 1–2 hours it takes to synthesize transport and enzyme proteins. The time has come, he argued, to understand homeostatic regulation in both its reactive and predictive roles.

The 1985 Bowditch Lecture is scheduled to be published in 1986 in the *American Journal of Physiology: Regulatory, Integrative and Comparative Physiology.*

Deadline Extended

The IUPS Congress abstract deadline has been extended to March 1, 1986.

ANNOUNCEMENTS

Workshop Series: Care and Use of Lab Animals

The National Institutes of Health (NIH), Office for Protection from Research Risks (OPRR), is continuing to sponsor a series of workshops on implementing the revised "Public Health Service Policy on the Humane Care and Use of Laboratory Animals by Awardee Institutions" and the *NIH Guide for the Care and Use of Laboratory Animals*. The workshops are open to institutional administrators, animal care committee members, laboratory animal veterinarians, investigators, and others who share in responsibility for sound management of humane animal research.

The current schedule includes a workshop in Little Rock, AR, on March 12, 1986. *Information*: Ms. Kathleen Masterson, University of Arkansas Medical Center, 4301 W. Markham, Mail Slot 636, Little Rock, AR 77205. Phone: (501)661-5502. Also, a workshop will be held in Boston, MA, on April 4, 1986. *Information*: Mrs. Virginia B. Werwath, Harvard Medical School, NERPRC, One Pine Hill Dr., Southborough, MA 01772. Phone: (617)481-0400, Ext. 202. Additional workshops will be announced later. *Further information regarding education programs*: Roberta H. Garfinkle, Education Program Coordinator, Office for Protection from Research Risks, NIH, Bld. 31, Rm. 4B09, 9000 Rockville Pike, Bethesda, MD 20892.

XXX IUPS Congress

The XXX IUPS Congress to be held in Vancouver, July 1986, includes two forums for the presentation of material on physiology teaching. The first is a series of four midday workshops dealing with the following topics: *1)* "The Role of Human and Animal Experiments in Teaching Physiology" on Tuesday, July 15, *2)* "Computers in Physiology Teaching" on Wednesday, *3)* "Physiology Teaching in High Schools and Community Colleges—A Source of Future Physiologists—What is our Role?" on Thursday, and *4)* "Difficulties and Problems Experienced by Those Who Teach Physiology in Developing Countries" on Friday. In addition, there will be an exhibition of teaching materials (a wide variety of facilities and equipment will be available to support demonstrations). The exact format for these sessions has not yet been determined. If you have ideas for what and/or how these topics should be programmed or specific proposals for materials or presentations, contact Dr. Joel A. Michael, who has been appointed the APS contact person for IUPS educational programs. Dr. J. A. Michael, Dept. of Physiology, Rush Medical College, 1750 West Harrison, Chicago, IL 60612. Phone: (312) 942-6426.

MEDINFO 86

The Fifth World Congress on Medical Informatics (MEDINFO 86) will be held in Washington, DC, USA, October 26–30, 1986. These congresses, presented by The International Medical Informatics Association (IMIA) have been successfully held in Stockholm (1974), Toronto (1977), Tokyo (1980), and Amsterdam (1983). The Organizing Committee has been appointed by IMIA at the request of the US Council for MEDINFO 86, a nonprofit corporation sponsored by 12 leading medical and engineering societies in the US. MEDINFO 86 will endeavor to promote all aspects of medical and health-care computing from all countries of the world, as has been accomplished so successfully in the four previous congresses. Participation will be sought from health-information scientists, medical computing specialists, public health and hospital administrators, physicians, nurses, dentists, allied health personnel, and consultants in the various health fields. *Information*: Secretariat, % George Washington University Medical Center, Office of Continuing Medical Education, 2300 K St., NW, Washington, DC 20037. Phone: (202)676-8929.

Comparative Aspects of Physiology of Digestion in Ruminants

An international symposium on "Comparative Aspects of Physiology of Digestion in Ruminants" will be held at Cornell University, Ithaca, on July 21–23, 1986. This satellite meeting of the 30th International Congress of the International Union of Physiological Societies will include invited papers and poster sessions. Topics will include not only comparative aspects but also microbiology, gastrointestinal physiology, metabolism, and pathophysiology. *Information*: A. Dobson, Dept. of Physiology, NY State College of Veterinary Medicine, Ithaca, NY 14853.

Orr Reynolds Award

The Orr Reynolds Award will be given annually by the American Physiological Society for the best historical article submitted by a member of the Society.

Articles may deal with any aspect of the history of physiology including the development of physiological ideas and their application, instrumentation, individual and collective biography, departmental and institutional history, history of societies including APS, and physiology in its public context. Manuscripts submitted for the award should represent original research and be adequately documented. Articles published in APS journals or books during the prior calendar year are also eligible for the award upon request by the author(s). The award is open to all classes of APS membership except for those members who have advanced degrees in the history of science and medicine. A member may receive the award only once.

The awardee will receive $500 plus expenses to attend the APS Spring Meeting. If the awardee wishes, and there is a suitable place on the program, an oral presentation will be made at the Spring or subsequent Fall Meeting at the beginning of an appropriate scientific session. It is hoped that, after appropriate peer review, the article will be published in one of the APS journals.

Manuscripts will be evaluated by a committee consisting of three members of APS appointed annually by Council in consultation with the Chairman of the Section of the History of Physiology. At least one of the members will be a professional historian.

Manuscripts should be typed and double-spaced with wide margins on 8½ x 11 paper and should conform to the style used in APS journals. (Instructions will be sent on request.) Three copies should be submitted for use of the review committee. To be considered for the 1987 award, manuscripts should be sent to Orr Reynolds Award, American Physiological Society, 9650 Rockville Pike, Bethesda, MD 20814, by December 1, 1986. The recipient of the award will be announced at the 1987 Spring Meeting.

POSITIONS AVAILABLE

Department Chairman. The Louisiana State University School of Medicine, Shreveport, invites nominations and applications for the chairmanship of an expanding Department of Physiology and Biophysics. Candidates must have an outstanding record of research, a strong commitment to medical and graduate teaching, and the vision and experience to establish and lead a department of excellence. Applicants must provide a curriculum vitae, names of three references, and statement of research interests to Dr. Dennis J. O'Callaghan, Chairman, Physiology Search Committee, Louisiana State University Medical Center, 1501 Kings Highway, Shreveport, LA 71130. [EOAAE]

Research Associate. A 2- to 3-year position at the rank of Postdoctoral Research Associate is available at the University of Tennessee, Memphis, to work with Dr. William R. Crowley (Dept. of Pharmacology) and Dr. C. E. Grosvenor (Dept. of Physiology) on research dealing with neurochemical and cellular mechanisms regulating luteinizing hormone, prolactin, and oxytocin secretion. Candidates should have a Ph.D. or M.D. degree. Send a curriculum vitae, brief statement of research interests, and the names of three references to either Dr. Clark Grosvenor, Professor, Dept. of Physiology and Biophysics, or Dr. William R. Crowley, Associate Professor of Pharmacology, University of Tennessee, Memphis, TN 38163. [EOAAE]

Research Medical Officer. The Aeromedical Research Branch of the Civil Aeromedical Institute (CAMI), Oklahoma City, seeks candidates for the position of Research Medical Officer to conduct and direct pharmaceutical research as well as to monitor related contracts. A candidate who has had at least 4 years of experience in medical research is preferred; the salary, by way of example, is in the range of $51,000–$63,000. CAMI is charged with the investigation of a broad range of aviation health and safety topics. This includes the study of human clinical and physiological responses to altitude and work aspects of civil aviation. Interested persons should contact Jerry R. Hordinsky, M.D., Manager, Aeromedical Research Branch, AAM-110, CAMI, FAA, Mike Monroney Aeronautical Center, P.O. Box 25082, Oklahoma City, OK 73125.

Assistant Professor. The School of Human Biology at the University of Guelph invites applications for a tenure-track position at the Assistant Professor level. The person we are seeking should have a Ph.D. or equivalent doctoral degree, an active research program, and teaching experience in one or more of the school's areas of interest. Responsibilities will include teaching of undergraduate and graduate courses in human biomechanics, supervision of graduate students, and pursuance of an independent research program in one of the school's areas of strength. The School of Human Biology is in a phase of growth and interactive development. The school's strengths group themselves into two general areas: applied human physiology and structure function relationships; and human evolutionary biology, development and morphology. Specific current research interests include neurophysiology of motor control, muscle metabolism, cardiovascular and pulmonary physiology, quantitative biomechanics, ergonomics, physical anthropology, morphology, human and medical genetics, and biological basis of behavior. Applications for this position (which is subject to budgetary approval) should include a curriculum vitae and names of three referees and should be sent, prior to March 15, 1986, to Dr. Stan R. Blecher, M.D., FCCMG, Professor and Director, School of Human Biology, University of Guelph, Guelph, Ontario N1G 2W1, Canada. In accordance with Canadian immigration requirements priority will be given to Canadian citizens and permanent residents of Canada.

There is a $25 charge per issue for each position listed. A check or money order payable to the American Physiological Society must accompany the copy. Purchase orders will not be accepted unless accompanied by payment. **Ads not prepaid will not be printed.** Copy must be typed double-spaced and limited to 150 words. All copy is subject to the editorial policy of *The Physiologist*. EOAAE indicates Equal Opportunity/Affirmative Action Employer and appears only where given on original copy. **Copy deadline:** copy must reach the APS office before the 15th of the month 2 months preceding the month of issue (e.g., before December 15 for the February 1986 issue). Mail copy to APS, 9650 Rockville Pike, Bethesda, MD 20814.

APS Sustaining Associate Members

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

Abbott Laboratories
American College of Surgeons
American Critical Care
American Medical Association
Burroughs Wellcome Company
Ciba-Geigy Corporation
Dagan Corporation
E. I. du Pont de Nemours & Company
Grass Instrument Company
Hoechst-Roussel Pharmaceuticals, Inc.
Hoffman-La Roche, Inc.
International Minerals and Chemical Corporation
Lederle Laboratories
Lilly Research Laboratories
Marion Laboratories, Inc.
McNeil Laboratories
Merck Institute for Therapeutic Research
Miles Institute for Preclinical Pharmacology
Pfizer, Inc.
Pillsbury Corporation
A. H. Robins Company
Sandoz, Inc.
G. D. Searle and Company
E. R. Squibb & Sons, Inc.
Stuart Pharmaceuticals
The Upjohn Company
Waverly Press, Inc.
Wyeth Laboratories