THE PHYSIOLOGIST

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A Matter of Opinion

RO1s: An Endangered Species?

Investigator-initiated, unsolicited research might become an endangered species if the NIH Strategic Plan and NIH appropriation process goes according to early indications. The problem is rooted in the limitations on available resources and a desire by Bernadine Healy to have NIH focus on programs rather than mechanisms.

The Bush administration's budget for FY 1993 requested $9.396 billion for the NIH, an increase of $443 million (5%) over FY 1992. While the request would support a record number of research project grants (22,132), it would only provide support for approximately 5,800 new and competing renewal research project grants, and that only by reducing the budgets by 18%–20%.

Unfortunately, the possibility that Congress will ride in on its white horse and provide the research community with additional funds appears unlikely because of a number of factors affecting this year's budget process. The Budget Enforcement Act imposes spending caps and budget walls that limit outlays and do not allow for the movement of funds from defense to domestic programs. The Labor-HHS-Education appropriation delayed the obligation of approximately $4.3 billion in budget authority until September 30, 1992, pushing the outlays associated with these appropriations into FY 1993. This had the effect of lowering the FY 1993 outlay cap even further. The riots in Los Angeles will also impact the NIH budget because it has emphasized the need to provide additional funding for a wide range of social and educational programs.

The Congressional budget resolution assumes $9.436 billion for NIH, a mere $40 million over the President's request. This is a far cry from the level advocated by Stanley G. Schultz in his testimony to the House Appropriations Subcommittee on Labor-HHS-Education and Related Agencies. In his testimony, he advocated an appropriation of $10.47 billion in FY 1993 to ensure that the United States remains at the forefront in biomedical research. In seeking additional funding for NIH, Schultz stated, "Investigator-initiated research is the foundation of biomedical research."

While Schultz's statement represents the view of most scientists, it apparently is not the view of those involved in the development of the NIH Strategic Plan. According to Bernadine Healy, the research community has focused too long on research mechanisms, not on the programmatic areas that need to be addressed by our nation. By shifting the focus from mechanisms to scientific programs and opportunities, Healy hopes to be able to increase funding for NIH. According to Healy, the focus on RO1s and mechanisms is "getting a little tired" and has become counterproductive because it "dominates and sometimes cannibalizes" other budgetary line items such as training, centers, and infrastructure.

When viewed in the context of Healy's efforts to sell the NIH Strategic Plan through a continuing series of regional and National Task Force meetings, Healy's comments that "investigator-initiated research is not spelled RO1" and that the RO1 is not the "Holy Grail" are most troubling. The scientific community's advocacy for numbers, whether 5,000,

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(continued from p. 77)

6,000, or 7,000, has been based on the perception that without stable funding, the opportunities to attack the diseases afflicting the public would be jeopardized. Stability ensured that there was a critical mass of scientists pursuing the health-related problems of our nation and served as an incentive to attract bright young students into the sciences.

During the recent National Task Force meeting on the NIH Strategic Plan, held June 23–25, APS joined with our sister societies urging the NIH administration to forgo its emphasis on program and instead to focus on the promotion and encouragement of unsolicited, investigator-initiated research. Such awards have a proven record, producing the scientific breakthroughs that have revolutionized the practice of medicine and contributed to the development of the biotechnology industry. Bernadine Healy was urged to continue to emphasize this proven and successful means of managing NIH resources.

Whether Healy and the NIH administration will listen to the scientific community's urgings should be known by the time you read this issue of *The Physiologist.* NIH has scheduled an NIH institute and center director's retreat for July 15 and 16. At that time, the Framework for Discussion of Strategies for NIH will be revised to accommodate the suggestions made by the scientific community at the various regional meetings.

The APS and the scientific community look forward to the doubling of the NIH budget as advocated by Bernadine Healy, and we will work closely with her to ensure that Congress provides the necessary funds. What we can't do is advocate a doubling of the budget at the expense of the investigator funded through an unsolicited research grant. The endangered species list is already too long to add another.

Martin Frank

American Physiological Society 145th Business Meeting

Time: 5:45 PM, Wednesday, April 8, 1992
Place: Anaheim Convention Center, Anaheim, CA

I. Call to Order

The meeting was called to order by President **Norman C. Staub**, who welcomed the members to the 145th Business Meeting of the American Physiological Society. The election ballot for new members and a list of recipients of 1991 APS Awards and a list of APS Conferences and Society meetings were distributed with the agenda. President Staub selected John West as parliamentarian.

II. Report on Membership

Stanley G. Schultz, President-Elect, presented the report on the status of the Society membership.

A. Summary of Membership Status

As of March 8, the membership has risen to 7,321, of which 4,917 were regular members, 27 honorary, 800 emeritus, 317 corresponding, 768 associate, 45 associate corresponding, and 447 student members (see p. 126).

B. Deceased Members

With a deep sense of sorrow, Stanley G. Schultz read the names of 41 deceased members. The membership observed a moment of silence in

President Norman C. Staub

tribute to their dedication to physiology (see p. 132).

III. Election of Officers and Society Affairs

The Executive Director, **Martin Frank**, reported that the procedure for the election of officers continues to run smoothly. The Nominating Committee, consisting of Section officers, selected a slate of candidates from the nominees advanced by the membership. **Mary Anne Frey** and **Don Watkins** audited 1,610 ballots. As result of the election by mail ballot, **William H. Dantzler** was elected President-Elect (1992–1993). **Mordecai P. Blaustein** and **James A. Schafer** were elected for three-year terms (1992–1995).

Following an introduction of the APS staff in attendance, he announced that we continue to respond to the membership. At the offices in Bethesda, a local area network system is being installed, and we will able to communicate with our members via "E Mail" by the end of the year. Also, a bulletin board is being planned that will provide the table of contents of various journals and listings of the various scientific meetings as well as public information.

There have been changes in the scientific meeting. For all of us, this will be the last FASEB Meeting. Next year, the meeting will be called "Experimental Biology '93," and four of the FASEB member societies will participate in addition to three guest societies. The meeting will be held in New Orleans, March 28–April 1, 1993. Instead of a theme program, there will be cooperative intersociety programming with symposia, minisymposia, oral presentations, and poster sessions, which will be clustered by scientific topics. The eight planned topics are cardiovascular biology; cell injury; immunoregulation; neural control and regulation; epithelial cell function; molecular regulation of cell function; growth, development, aging; and energy metabolism, diet, and energy, which will be carried over from year to year. Also, each society will continue to program sessions in their traditional areas of interest. We encourage all members to come to the spring meeting.

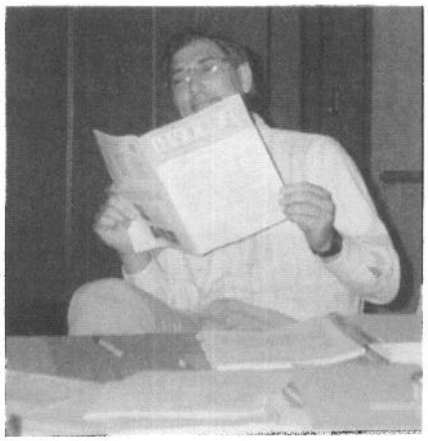
Two APS Conferences will be held in 1992, one in Colorado Springs, Colorado, September 23–26 entitled "Integrative Biology of Exercise." The second conference, "The Cellular and Molecular Biology of Membrane Transport," will be held in Orlando, Florida, November 4–7. In 1993, two conferences will be held: "Physiology and Pharmacology of Motor Control" will be held in San Diego, October 2–5, and "Signal Transduction and Gene Regulation," is scheduled for San

Francisco, November 17–20. Also, Council has approved two additional conferences for 1994 as well as an intersociety meeting to be organized by the Comparative Physiology Section.

IV. State of the Society

Norman Staub was delighted to announce that he only has good news to report. **The Society is in good financial health**. APS membership is increasing in all categories. For the ninth year, Council has voted not to increase membership dues. Also, this is the third year that journal subscription rates have remained unchanged, and the journals continue to publish more pages every year. He described the three-tier subscription rate system in which members will pay one-third of the institutional subscription rate beginning in 1993.

One of the major issues during the past year was development of a **strategic plan** by Council. Council decided that the Society needed a strong working plan for future direction. A retreat was held last January to outline major goals and objectives for the next several years, which resulted in a preliminary document. These have been shared with members of the Section Advisory Committee, who will discuss them with their respective section members. He seeks input from the membership on the proposed goals and objectives, which will be published in *The Physiologist*. The strategic plan will be reviewed and modified continually, and President Staub urges members to send their views and comments to him. He presented the following goals and described the objectives. [Refer to the June 1993 issue of *The Physiologist*, pages 37–43, for more detail.]



Discriminating reader Brian Duling.

Publications: To promote the publication of the highest quality journals, books, and pamphlets; to foster and facilitate the dissemination and understanding of physiological knowledge; and, to promote the image of APS.

Meetings: To make the scientific meetings of the APS so exciting that the best minds in science will be attracted to the field of physiology.

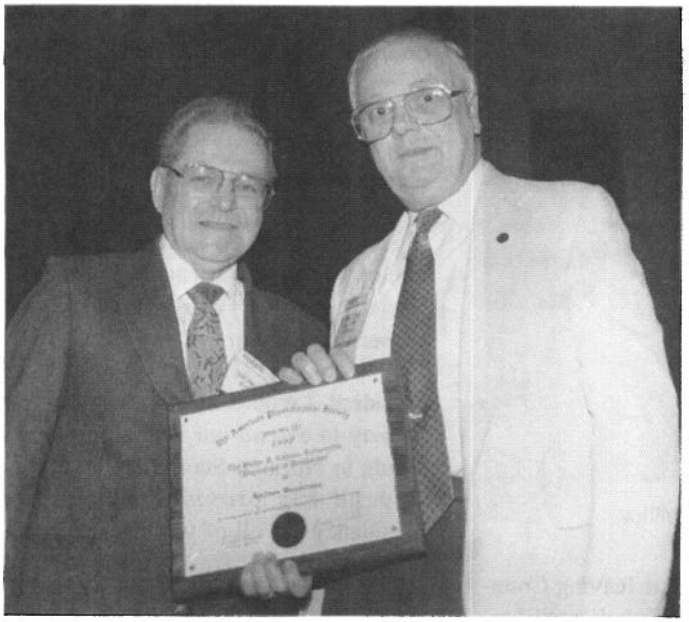
Education: To foster excellence in physiology education appropriate for each constituency of the APS.

Public Policy: To develop and maintain a proactive program designed to influence governmental, professional, and institutional organizations, as well as the public-at-large in their formulation of policies and activities related to the interests of APS.

Organization/Operation: To maintain and enhance the organization and operation of the APS in an efficient manner.

Finance: To maintain the fiscal health of the APS.

APS Council. Top row (l-r): H. Cooke, B. Duling, M. Frank, J. Hall, H. Valtin, F. Powell, Jr., D. Ramsay, L. G. Navar. Front row (l-r): L. Jefferson, S. Schultz, N. Staub, S. Chien, W. Dantzler, A. Cowley, Jr.



Karlman Wasserman, 1992 APS Cannon Lectuer, and APS President Norman Staub.

Roger Tsien, 1992 Bowditch Lecturer, and Shu Chien.

Awards and Grants: To utilize the awards and grants program to strengthen the discipline and to recognize and recruit new members.

Society Organization: To match headquarters staff to the needs of an annually reviewed strategic plan.

Governance: To develop representational governance.

V. Awards

A. Ray G. Daggs Award

Howard E. Morgan, 58th President of the Society, was selected to receive the 1992 the Ray G. Daggs Award. For health reasons he could not be in attendance. The statement of recognition was read by President Staub in his absence (see p. 119).

B. Caroline tum Suden Professional Opportunity Awards

The Caroline tum Suden Professional Opportunity Awards are open to graduate students or postdoctoral fellows presenting papers at the spring meeting. The awards consist of a $500 check to attend the meeting, complimentary registration, and access to the FASEB Placement Service. **Hannah Carey**, chairperson of the Women in Physiology Committee, presented the awards to **Karen Goncz** (Lawrence Berkeley Laboratory), **Yue Lin** (University of Virginia), **Harold I. Magazine** (Albany Medical College), **Susan E. Mulroney** (Georgetown University), **Peipei Ping** (University of North Carolina), and **Karyn M. Todd-Turia** (University of Michigan).

C. Procter & Gamble Professional Opportunity Awards

Gary Howell of the Procter & Gamble Company was recognized for providing support for professional opportunity awards. Eighteen predoctoral students, who are within 12–18 months of receiving their PhD degree and presenting a paper as first author at the spring meeting, were selected by the APS Sections. Each of the recipients was presented a $500 check and complimentary registration (see p. 125).

D. NIDDK Travel Fellowships for Minority Physiologists

The Society has a grant from the National Institute of Diabetes, and Digestive and Kidney Diseases (NIDDK), which provides travel fellowship awards to minority physiologists to attend and present a paper at the spring meeting and APS conferences. Twenty-four undergraduate, predoctoral, and postdoctoral scientists were recognized (see p. 123).

VI. Arthur C. Guyton Teacher of the Year Award

Robert Thies announced the Teaching of Physiology Section's sponsorship of the Arthur C. Guyton Teacher of the Year Award by the W. B. Saunders Company. The first award will be presented at the spring 1993 meeting. The criteria for the awards are described on page 122.

VII. Presentation of the APS Centennial Flag Flown on SLS-1

Robert Phillips of NASA expressed pleasure in returning to the APS its 1987 Centennial Flag, which was flown on NASA Space Life Science 1 (SLS-1) shuttle last June. It was the first shuttle mission dedicated to biomedicine. He presented the President with a certificate of authenticity, which read:

"National Aeronautics and Space Administration
Lyndon B. Johnson Space Center
Houston, TX

Certificate of Authenticity
STS-40
Forty-First Flight of the Space Shuttle

This 100-Year Centennial Flag was flown aboard the United States Shuttle, COLUMBIA June 5 through June 14, 1991, for the American Physiological Society, Bethesda, Maryland.

Launching from the Kennedy Space Center, Florida, COLUMBIA completed 146 orbits, traveling 3.8 million nautical miles before landing at Edward Air Force Base, California.

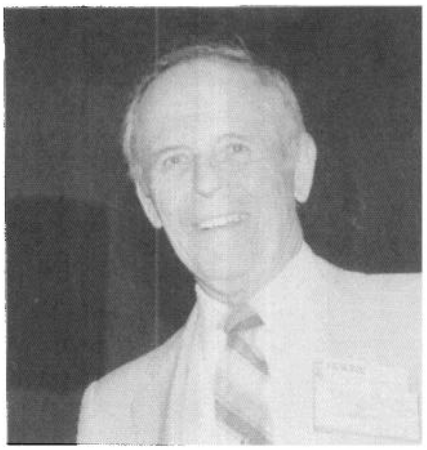
Rhea Seddon, MD

Mission Specialist, STS-40"

Accepting the flag and certificate on behalf of the Society, Norman Staub expressed delight and said they will be hung in a place of honor in the APS Headquarters to be shared by others in the years to come.

VIII. Recognition

Norman Staub stated that many members work very hard for the Society. At the close of this meeting two members, **Brian Duling**, University of Virginia, and **John Hall**, University of Mississippi, are leaving Council after three years of dedicated service. He was pleased to present certificates to them.



Robert Phillips

President Staub then passed the gavel to Stanley Schultz, University of Texas at Houston, as the 65th President of the American Physiological Society. Stanley Schultz stated, "Twenty-seven years ago on the other side of the continent in Atlantic City, I was told by my mentor, Professor A. K. Solmon of the Harvard Medical School, that if I continued my good work, he would nominate me the next year for membership in the American Physiological Society. Twenty-six years ago I was first honored by having been elected to membership in the Society. Needless to say, I am very deeply honored having been asked to assume the Presidency of the American Physiological Society. I will try very hard next year to merit that honor.

"As my first official act as President, I would like on behalf of the Society to extend our very sincere graditude to Norman Staub for the leadership he has provided during his Presidency. As all of you should appreciate from the presentation of the Strategic Plan, it was under his stewardship that the Society has postured itself to take on new and important directions in the very exciting and trying years ahead. It is now up to us to begin the job of bringing to fruition many of the plans that Norman has put into the ground. Thank you Norman."

With no other business, the meeting was adjourned at 6:45 PM, April 8, 1992.

Stanley G. Schultz
President-Elect

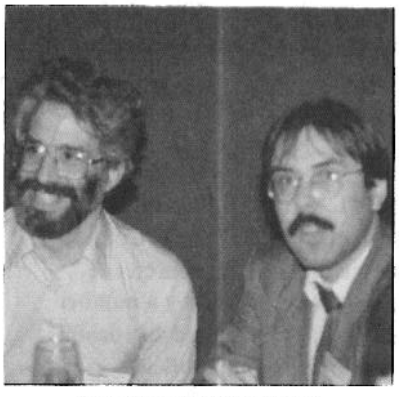
Outgoing President Norman C. Staub passing the gavel to incoming President Stanley G. Schultz.

APS Spring Meeting
Anaheim, California

APS Mixer

P. M. Cala, S. G. Schultz, and L. Mandel

Y. H. Ma, M. Shirahata, Na. C. Tkacs, and M. M. Engler



T. E. Pisarri and P. Baluk

E. Braun, H. Cooke, W. Dantzler, and J. Schafer

J. Piiper and R. E. Forster II

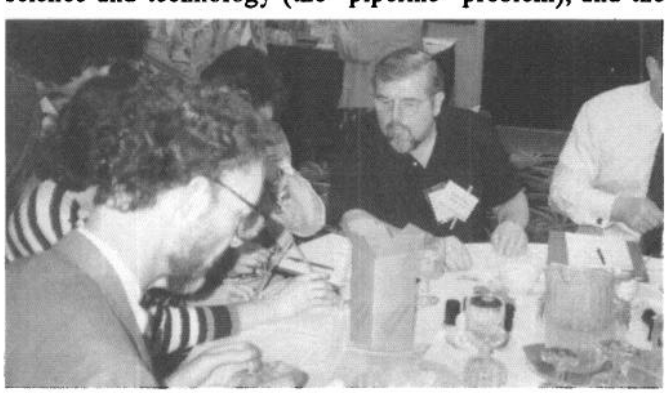
Education

APS Hosts Pre-College Science Education Training Workshop for Scientists

Picture a group of some 30 scientists, including a member of the National Academy of Sciences, competing as four-person teams to build the tallest, weight-bearing structures they can, using only drinking straws and paper clips. Could this be a case of overindulgence during the APS mixer at the FASEB meeting? Nice try, but no cigar. Is it possible that the NIH has issued an RFA on drinking straw and paper clip buildings? Come on, be serious. Might these 30 souls have unexpectedly been sent back to the third grade? Believe it or not, you're on the right track now.

This unusual scene was part of the Pre-College Science Education Workshop for Scientists hosted by the APS on Sunday, April 5, 1992 in the Anaheim Hilton. The workshop was planned by Maureen Shiflett of the Coordinating Council for Education of the National Research Council (CCE/NRC), which underwrote the costs of the conference.

The scientists at the conference were joined by a number of school teachers and administrators who shared the desire to improve the way science is taught in the pre-college years. Dr. Shiflett introduced the conference by listing various shortcomings of the present state of science education in the US—viz., decreasing numbers of students pursuing careers in science and technology (the "pipeline" problem), and the failure of the system to produce scientifically informed citizens (the "literacy" problem), especially within less advantaged socioeconomic groups (the "equity" problem). Increasingly, individual scientists and the science establishment are recognizing the need to become involved actively in addressing these critical problems. The goals of this and similar workshops conducted recently for other groups of biological scientists were, in Dr. Shiflett's view, to begin a dialogue on these issues between scientists and between scientists and school teachers and to give the scientist participants some ideas on what they can do and where they can go for relevant help and information.



Bruce Alberts, professor of biochemistry at the University of California, San Francisco and a member of the National Academy of Sciences, gave the keynote address. Dr. Alberts stressed textbooks and standardized tests as two of the major problems with the current state of affairs, at least in the biological sciences. The two dozen pre-college biology textbooks currently in use throughout the country are, in general, far too broad in scope and contain little or no depth. Mostly they consist of vocabulary terms, which contribute little to the student's understanding of basic biological processes. Students develop little or no feeling for the process of science. Standardized testing, using the multiple choice format, reinforces these unfortunate trends and drives curricula toward memorization of essentially isolated facts. Many teachers, textbook writers, and others responsible for curriculum development report that they have been told by scientists that students need to know all these facts to be prepared for college and graduate study, which means that the science establishment is also part of the problem. In the K–6 grades, there is actually very little science, and what is taught is often presented in a manner that turns students away from their natural interest in science. The hope for the future, Dr. Alberts noted, is that there are many elementary and secondary school teachers who care deeply about science education and want to effect substantial and significant reform. The role of scientists should be to support these teachers in these efforts. Dr. Alberts' "bottom line" message was twofold. First, science should represent a significant part of the curriculum in every school grade and it should be presented in an interesting way. Second, pre-college science teaching should be regarded as an attractive profession, worthy of respect from the public and from scientists themselves. These teachers should be empowered to do their jobs without being required to perform superhuman feats.

Next came the "fun" portion of the workshop. Barbara Bray, an elementary school teacher from the Pasadena public school system, passed out the drinking straws and paper clips and gave the group their assignment. As the various structures took shape, she pointed out how this exercise gets her students thinking about the various buildings, towers, bridges

and other structures in their own neighborhoods and those they have seen in books, movies, and on television. The students make lists of these structures and engage in verbal comparisons of their features. A key element is that the students are encouraged to experiment with their own straw and paper clip models. Might a triangular base work better than a square one, etc.? The students learn to observe, analyze, hypothesize, and test their theories. They learn that ideas don't always work out, a lesson also learned by more than one of the building groups at the workshop. Bray also noted how this exercise branched into analysis of the structure of the students' own bodies. Easy analogies could also be made to molecular structures. The major portion of the science curriculum is spent in similar "hands-on" activities. Many other aspects of the children's schoolwork, such as thematic writing and reading, are spun out of these activities, making science, in fact, the "core" of the curriculum.

Paul Williams, a plant pathologist at the University of Wisconsin, then gave a brief demonstration of his "Fast Plants." Williams developed these fast-growing cabbage plants for use in his research. He also recognized, however, the immense potential of these plants for student laboratory exercises. In fact, he has worked up a whole series of experiments on geotropism, phototropism, germination, speciation, genetic variability, and other topics. The experiments can all be performed with inexpensive, readily available items, such as plastic film canisters, soda bottles, paper towels, toothpicks, etc.

The next phase of the workshop consisted of far-ranging discussions between the scientists, teachers, and school administrators participating in the workshop. Presenting teachers' perspectives on problems encountered in teaching science and some strategies and tactics that have worked for them were Elene Kallimanis (Kellogg Polytechnic Elementary School, Pomona, CA), Dolores Jones (Almeira Middle School, Fontana, CA), and Travis Barnes (Granbury [TX] High School). The comments by Kallimanis and Jones reinforced and amplified many of the themes introduced earlier by Alberts. Barnes, a former recipient of an APS High School Science Teacher Summer Research Fellowship, spoke about how that particular experience had invigorated his teaching. Dolores Villasenor (principal of the Kellogg School), Bob Higgins (principal, Etiwanda [CA] High School) and Arie Korporaal (Science Consultant, Los Angeles County Schools) provided insight into many of the problems faced by their schools, which mirror problems found throughout the country, with regard to fiscal limitations, the influence of various socioeconomic factors on student performance, and the process and politics of curriculum reform.

Finally, four of the scientists in the workshop described their ongoing collaborations with school teachers. Jim Bower, a professor of biology at the California Institute of Technology, described Project SEED (Science for Early

Educational Development). This ambitious project, which involves faculty at Cal Tech and the Pasadena (CA) public school system, is aimed at reforming the entire public elementary school science curriculum as a "hands-on, inquiry-based" approach. The scientists and teachers in SEED have designed numerous "kits" based on activities such as the structure building demonstrated earlier in the workshop. The Cal Tech faculty and the teachers who develop each kit run "in service" programs to familiarize other teachers with the kits, the scientific theories behind them, and the ways they can be linked to other school activities. Bruce Alberts described the "San Francisco Project", which is a collaborative effort between the University of California, San Francisco and the San Francisco public schools. This project comprises a number of components including in-service programs, summer lab opportunities for students, a visiting scientist program, and opportunities for one-day visits to active laboratories. There is an annual competition in which students work in pairs to develop lesson plans that they present to younger students. The University provides staff support for clearinghouse functions to aid teachers in locating surplus supplies and equipment and other teaching tools. Mare Taagepera, a professor of chemistry at the University of California, Irvine described the several types of summer in-service workshops her university offers to school teachers. Francis Belloni, associate professor of physiology at New York Medical College, described the APS's High School Science Teacher Summer Research Fellowship Program.

The consensus opinion of the workshop participants was that it had accomplished its immediate goals of raising consciousness and beginning a dialogue among the participants. The scientists who attended also left with a better understanding of the need for significant efforts by many people if the quality of our children's science education is to be improved. The problem is urgent. As APS Past President Norman Staub observed later, "Those who will enter scientific laboratories twenty years from now are already in elementary school." The workshop organizers hoped would that the scientist participants would take home the message that their

help was needed at many levels—to provide factual and theoretical support for elementary and secondary school science teachers, to provide opportunities for continuing education of these teachers in the various scientific disciplines, to help the teachers in showing their students that science is an exciting area with good career opportunities, to conduct research on the development of conceptual understanding, and to participate in policy making and curriculum development at all levels from the national level down through the level of local school districts.

Individuals interested in learning more about "hands-on" science teaching can contact the National Science Resources Center, Smithsonian Institution, Arts and Industries Building, Room 1201, Washington, DC 20560. The North Carolina Museum of Life and Science provides an informative booklet for scientists who desire some tips on how to approach children in the science classroom. The booklet is entitled "Sharing Science with Children: A Survival Guide for Scientists and Engineers" and is available from Georgiana M. Searles, Director of Education, North Carolina Museum of Life and Science, PO Box 15190, Durham, NC 27704. Anyone interested in developing APS initiatives in this area should contact APS headquarters in Bethesda.

Francis L. Belloni

Coalition for Education in the Life Sciences

The Coalition for Education in the Life Sciences (CELS) is a fledging organization made up of representatives of more than 20 professional life science societies (including the American Physiological Society). It was first conceived in February 1991 at a National Life Science Education Conference sponsored by the American Society for Microbiology and The Johnsons Foundation at Wingspread in Racine, Wisconsin. This conference was called to address the deteriorating state of science education in our nation's schools and public perception of science issues. Unlike the chemical and engineering societies, the life sciences societies have not had a common forum through which to act. Therefore this Coalition was established 1) to enhance the ability of the life science community to speak with a unified voice regarding life science education and 2) to promote public understanding of important life science concepts.

At the end of this initial conference, an executive committee was established to set up the structure of the organization and to begin to conduct activities related to the goals listed above. A second conference was held at Wingspread in February 1992 at which time the delegates identified a set of issues that help define life science and its relationship to society as a whole (e.g., wellness, resource utilization). In addition, several areas for action were identified. These areas include 1) policy advocacy for public policy change and implementation on behalf of life science education, 2) clearinghouse activities to disseminate information about available materials, programs, and scientific expertise to support life science education, 3) strategies for successful teaching especially as may apply to large enrollment undergraduate introductory life science courses, 4) regional CELS initiatives to promote statewide alliances bringing together life scientists to improve local science education agendas, and 5) CELS information distribution in the form of a flyer describing its mission and activities to be used for establishing industry support, for lobbying efforts, and for promoting awareness of the combined efforts of the affiliated organizations in the area of life science education. Specific programs currently being planned include a "Briefing about CELS" to be held on June 9, 1992 in Washington, DC to inform the scientific community as well as the public and private agencies about CELS and a conference entitled "Strategies for Teaching Biology" planned for the winter of 1993.

Then confronted with the facts about how our public educational system has failed to provide our citizens with basic knowledge in critical life science fields, it is obvious that something must be done. To this end, our own society has sponsored several programs (e.g., the high school teachers' summers research opportunities, the conferences for science teachers and students at the society's meetings, the interaction with undergraduate life science professional organizations). These activities have had some impact (albeit for the most part, unmeasurable) on the individuals involved and their local communities. It seems obvious that the impact of such activities could be multiplied if they were part of a larger program. CELS has the potential to play a pivotal role in such program development as well as in areas of policy making. The people involved in the CELS organization are an energetic, concerned, and committed group with wide-ranging plans, the success of which depends on the support of the membership of the affiliated organizations. I was pleased to represent the APS at both of the Wingspread conferences and encourage our society's continued involvement with the CELS organization.

Lois J. Heller
APS Education Committee

Imaging Techniques for Assessing Cell Function

Fluorescent analogues as tools for study of cytoskeletal structure

D. L. Taylor, Center for Light Microscope Imaging and Biotechnology, Carnegie-Mellon University

The renaissance and revolution in the use of the light microscope in biomedical research has yielded both new reagents and machine-vision light microscopes that enable researchers to explore the chemical and molecular dynamics in living cells and tissues. We have developed two classes of protein fluorescent analogues to define the temporal-spatial signaling and contractile response of cells stimulated with growth factors. The simplest fluorescent analogues are proteins that have been labeled covalently with fluorescent probes while maintaining biochemical and functional activity. When incorporated into living cells, they report the distribution and dynamics of the protein during cell activity. The second class of fluorescent analogues are proteins or peptides that are designed as "optical biosensors" of chemical or molecular activity. Environmentally sensitive fluorescent probes are attached in specific locations to report chemical or molecular changes in the labeled molecule. A simple fluorescent analogue of myosin II, one of the cellular motors responsible for movements, permits the analysis of contractile activity in cells. An optical biosensor of calcium binding to calmodulin, MeroCam, defines when and where in the cell that calmodulin is activated by binding calcium. In addition, an optical biosensor of myosin regulatory light chain phosphorylation is under development. The combined use of specific reagents and advanced machine-vision light microscopes will play a major role in defining cell functions.

Fluorescent indicators and caged compounds as tools for study of signal transduction

R. Y. Tsien, University of California, San Diego

Fluorescent indicators form the basis for one of the fastest-growing applications of optical microscopey, the quantitative measurement and dynamic imaging of intracellular activities of important ions and messengers such as Ca^{2+}, Na^{+}, H^{-}, Mg^{2+}, Cl^{-}, and cyclic adenosine 3'5'-monophosphate (cAMP). Molecular engineering has now produced indicators with quite good selectivity and sensitivity for these ions and messengers. Often these probes can be introduced into large populations of intact cells by means of membrane-permeant derivatives, so that the plasma membrane need never by disrupted or breached by any point. It is desirable for the analyte to shift the indicator's excitation or emission spectrum along the wavelength axis, no just alter its intensity, because wavelength shifts, unlike intensities, can be measured independently of the indicator concentration, bleaching or extrusion, cell path length, absolute brightness of the light source, or absolute sensitivity of detection. Like many other optical microscopic techniques, fluorescent indicators are readily applied to study living cells with an unparalleled combination of spatial and temporal resolution. They offer one of the few methods for monitoring dynamic intracellular biochemistry and signal transduction at the level of single cells or subregions of cells and often reveal remarkable heterogeneity between neighboring regions and complex patters such as waves and oscillations. Optical imaging is also a promising approach for simultaneous parallel recording of activity from large numbers of functional units, an important step in analyzing neurobiological signal processing. Finally, observation of the temporal and spatial intricacies of second messenger signaling needs to be complemented by tests for their physiological significance. Thus one would like to suppress the endogenous transients or generate matching artificial ones to see whether those signals are necessary or sufficient for the cell response. Reagents that are photochemically triggered to release to take up the second messenger offer the best available spatial and temporal resolution for such manipulations.

Optical trapping as a tool for studying molecular motors

J. Finer, J. A. Spudich, S. Chu, and R. M. Simmons, Stanford University and King's College London

The optical trap (or optical tweezers) technique is finding a number of biological applications, both in vivo, in manipulating cells and subcellular organelles, and in vitro, as in our own work, in studying the movement and forces produces by molecular motors. In this technique, a beam of laser light is brought to a diffraction-limited focus by a microscope objective. A refractile particle that comes into the vicinity of the focus can be trapped and manipulated in three dimensions in aqueous solution. In our studies of the actin-myosin interaction, we have improved the technique to allow us to study nanometer movements and subpiconewton forces with millisecond resolution. In these experiments, small beads attached to fluorescently labeled actin filaments can be observed to move over a myosin-coated coverslip in the presence of ATP. By stopping moving beads with the trap, we are able to study the force fluctuations arising from the interaction of one or a small number of myosin motors with a single actin filament. A quadrant photodiode detector, aligned with the optical trap and placed in an image plane of the microscope, allows us to measure the position of the trapped bead relative to the center of the trap. The displacement of the bead over much of the range of the trap is proportional to the applied force so that the trapped bead serves as a force transducer. The stiffness of

The APS Education Committee sponsored this symposium at APS/FASEB meeting, April 5, 1992, Anaheim CA.

the trap can be substantially increased by feedback control to deflect the laser beam via an acouto-optic modulator. Ultimately we hope to develop this system to allow us to directly measure the elementary force and displacement produced by a single ATP hydrolysis. We also hope to extend this technology to study the fundamental properties of other cytoskeletal motors and motors that drive processes involving DNA and RNA. The advantages and limitations of this technique will be discussed.

The digital imaging microscope as a tool for the study of local molecular changes underlying cell function

F. S. Fay, University of Massachusetts Medical School

Changes in virtually all cell functions are believed to be driven by changes in the level and/or distribution of specific molecules. The recent development of bright fluorescent indicators that have a high degree of molecular specificity provides a means for following changes in molecular distribution underlying changes in living cells. To utilize such probes to understand the changes in molecular distribution underlying changes in cell function, we have developed a digital imaging microscope specifically adapted for imaging the distribution of fluorescent indicators in living cells. The digital imaging microscope is a unique combination of hardware, algorithms, and software to facilitate the four basic steps involved in such studies: 1) image acquisition, 2) image restoration to reverse the distortion introduced by the microscope and to suppress noise in the images, 3) image feature extraction to identify characteristic patterns of organization of molecules within the image, and 4) image visualization and analysis to allow the cell physiologiest to comprehend the information generated by the microscope. The system that has been developed has the ability to acquire multi-wavelength images of ratiometric fluorescent indicators in as short as three milliseconds and to provide high-resolution two-dimensional and three-dimensional images in live cells at high speed (about 15 ms). The principles of operation of the microscope is illustrated by discussing examples of its application to problems involving the organization of the nucleus to produce and precess messenger RNA, the generation of specific calcium signals in the cytoplasm of motile cells, and the function and chemistry of individual mitochondria in living cells.

F. S. Fay and L. J. Heller
Chairs

The kind support of corporate sponsors **Carl Zeiss, Inc.; CSP, Inc.;** and **Omega Optical** for the symposium "Imaging Techniques for Assessing Cell Function" is gratefully acknowledged.

APS Hosts High School Science Teachers

The APS continued its efforts in pre-college science education during the recent FASEB meeting in Anaheim, California by hosting more than 70 teachers for a special one-day program. Participating in the In-Service Training Workshop on "Physiology for High School Teachers" were 64 high school science teachers from the Southern California region and 9 of the 1991 APS High School Science Teacher Summer Research Fellows.

The morning session included seminars on modern physiological research presented by APS members. The workshop opened with Frank L. Powell, Chair of the Education Committee, welcoming the teachers. Norman C. Staub, President, provided the attendees with information about the APS and its efforts in physiology education. Following the opening presentations, Stephen E. DiCarlo, Northeastern Ohio Universities College of Medicine, Rootstown, focused on "The effects of exercise training on cardiovascular regulation" and Raymond A. Frizzell, University of Alabama, Birmingham, talked on "Cystic fibrosis: Lessons on the interplay between physiology and molecular biology." The research presentations were accompanied by background papers that the teachers could use to develop materials for their classrooms.

The teachers from the Southern California region were then invited to visit the exhibits and poster sessions in the Anaheim Convention Center. For many, this proved to be the most beneficial and exciting aspect of the program. It provided them with the opportunity to view the tools of science and to see first hand the types of research being conducted in laboratories throughout the United States.

Since the APS Teacher Summer Research Fellows were the Society's guests in Anaheim for the week, they spent their time talking with the members of Council, Education Committee, and their summer research mentors during a special luncheon in their honor. Following lunch, the APS Fellows met with the teachers from the Southern California area and told them about their research experiences and how they integrated their research program into their teaching program. During the sharing session, a number of the Fellows presented lesson plans, laboratory exercises, and other materials that were developed as a result of the program.

Roy Baldwin, John Marshall High School, San Antonio, told the attendees of his experiences in the laboratory of Roger McCarter, University of Texas, San Antonio. According to Baldwin, ". . . [T]o say that this summer experience was interesting and challenging would be an understate-

ment." He said that ". . . I suppose that I have always known that research seldom goes smoothly, but to live it first-hand for 10 weeks was truly a sobering experience!" In taking his experiences back to the classroom, he told the teachers that he took back ". . . a much broader understanding of the research process in general and of muscle physiology." For Baldwin, the greatest contribution he can make to his high school students ". . . is not some new lab exercise or physiologic content, but rather a healthy enthusiastic appreciation for the value and importance of scientific research in our society today [and that] the use of vertebrate animals of all types in research must be supported by the general population."

Cecilia Duenas, Washington Preparatory High School, Los Angeles, spent her summer in the laboratory of Ken Roos, UCLA, where she worked with cardiac myocytes. She found her ". . . overall research experience valuable and rewarding [and] most importantly, it was a good motivating factor for me as a teacher. Spending time in the laboratory gave me some space and time to think about lesson plans, learn new research techniques, and share ideas with other teachers." Duenas has translated her experiences into the classroom by bringing live cells into school to demonstrate properties of muscle and by taking her students to Ken Roos' laboratory to observe cell preparations and experiments. She also used pictures from her summer to focus on a discussion of the importance of animals in research. According to Duenas, "The research program certainly provided me with the motivation necessary to teach science with enthusiasm."

Stanley Krantz, Cherry Hills East High School, Cherry Hill, NJ, spent the summer in the laboratory of Allan Lefer, Jefferson Medical College, Philadelphia, where he worked on several projects focusing on circulatory shock. In his report on his summer experiences, Krantz expressed his gratitude and excitement arising from his association with Dr. Lefer and his staff. Krantz stated that ". . . I have begun more instructional and curricular initiatives this year than at any time in my career with the possible exception of my first few years of teaching. I have indeed been reborn." Some of the most important elements arising from his program have been the development of a dynamic instructional program, staff in-service programs in the areas of critical thinking, the process of science and careers, and the creation of classroom activities, including visits by Allan Lefer and his staff to Cherry Hills East and student visits to Jefferson Medical College.

Overall, the participating APS Research Fellows had high praise for the program and encouraged the Society to continue its efforts. It was their view that while the program only touches a few teachers each year, their rebirth and the resulting enthusiasm for science each teacher gains is expanded several hundredfold through their contact with their students.

The APS program has been continued for a third year with the support being provided for 13 teachers to work in laboratories during the summer of 1992 (see p. 90). These Fellows will be hosted by the Society at the Experimental Biology '93 meeting in New Orleans, LA. In addition, teachers and students from the New Orleans area will be invited to the meeting to participate in an all-day workshop being organized by Norman C. Staub.

1991 Summer Research Fellows with N. C. Staub and S. G. Schultz, 1992 APS/FASEB Spring Meeting, Anaheim, CA.

1992 High School Science Teachers Summer Research Program

Thirteen high school science teachers were selected for the 1992 Summer Research Program sponsored by the American Physiological Society. The program, in its third year, provides high school science teachers with experiences in modern physiology research.

The 13 teachers, selected in a national competition, were awarded grants that included up to a $5,000 stipend plus $750 to support the teachers' attendance at the March 1993 Experimental Biology meeting in New Orleans, where they will participate in a workshop and be honored at a luncheon.

Listed are the teachers, their high schools, and their host institutions and mentors.

- James Baglivi, Shoreham-Wading River High School, Riverhead, NY; State University of New York, Downstate Medical Center, Seiichi Yasumara.
- Sheryal L. Balding, Shelton High School, Shelton, WA; University of Washington, Martin Kushmerick.
- Stephanie Baron, Patrick Henry High School, La Mesa CA; University of California, San Diego, Richard Lieber.
- Lawrence Blanchard, Warren Easton Senior High School, New Orleans, LA; Tulane University, Norman Kreisman.
- Glenda Brunato, George Washington High School Pacifica, CA; University of California, San Francisco, Norman Staub.
- Ruben C. Dunlap, Northwestern High School, Detroit, MI; Wayne State University, Donal O'Leary.
- Roy J. Fete, Glen Oak High School, Massillon, OH; Northeastern Ohio University, Gary Niehaus.
- Armando Flores, Sidney Lanier High School, San Antonio, TX; University of Texas, San Antonio, Vernon S. Bishop.
- Kathleen Huckabee, Granbury High School, Stephenville, TX; Texas College of Osteopathic Medicine, Fred Downey.
- Edwina Kraemer, Gaither High School, Tampa, FL; University of South Florida, Carleton Baker.
- Elizabeth Meyers-Schanhals, Benton Harbor High School, Holland, MI; Hope College, Christopher Barney.
- Karl Schwenk, Tuscarawas Valley High School, North Canton, OH; Northeastern Ohio University, Stephen DiCarlo.
- Nadine A. Tibbs, Redford High School, Detroit, MI; Wayne State University, Ricardo Brown.

High School Science Teachers Research in Physiology Program

The American Physiological Society is pleased to announce the continuation of a program aimed at providing high school science teachers with experience in physiology research. The program will be carried out through the awarding of grants on a competitive basis to individual members of the APS. The grants will fund the involvement of a high school science teacher in the research program ongoing in the APS member's laboratory. Grants will be made for up to $5,750, which includes a $750 allowance for the high school teacher to attend the annual Experimental Biology meeting. Cost sharing of the teacher's stipend or travel award by the APS member's institution is encouraged but not required. The stipend supports full-time participation of the high school teacher for up to 10 weeks during the summer. In addition to participation and research, it is expected that the high school teacher will take part in a variety of activities at the APS member's institutions such as seminars, journal clubs, laboratory rotations, etc. At the Experimental Biology meeting, a special luncheon for the high school teachers and their sponsors will be held so participants can share their experiences.

Grant awards will be based on the overall quality of the program, including the level of involvement in the research activities of the laboratory; the background and teaching responsibilities of the high school teacher; the quality of the research program as indicated by publication record and financial support of the APS member; plans for other activities in which the high school teacher will take part; plans for continued interaction between the high school teacher and the APS member or the respective institution; and an indication of the expected impact of the high school teacher's participation in his/her own school.

Additional information and application forms can be obtained from High School Teachers Physiology Research Program, American Physiological Society, 9650 Rockville Pike, Bethesda, MD 20814-3991. Tel: (301) 530-7164; Fax: (301) 571-1814.

The program encourages the participation of minority groups by making special efforts to include high school science teachers who are members of underrepresented minority groups or who teach significant numbers of minority students.

Application Deadline: January 15, 1993

APS Participates in 43rd ISEF

The American Physiological Society participated in the 43rd International Science and Engineering Fair (ISEF), Nashville, Tennessee, May 13–14, 1992. The ISEF, the "World Series" of science fairs, is held annually and marks the culmination of a selection process involving thousands of schools and regional fairs. In Nashville, APS joined with 44 other professional organizations making awards in a variety of disciplines.

The APS selection committee consisted of David H. Wasserman, David M. Regen, and Owen P. McGuinness from the Department of Molecular Physiology and Biophysics, Vanderbilt University; James G. Townsel, Hubert Rucker, and Mukul R. Banerjee from the Department of Physiology, Meharry Medical College; and Martin Frank, American Physiological Society. The selection committee had the difficult task of first identifying which of the 752 ISEF finalists had projects related to the physiological sciences. From a potential pool of 131 projects, the committee then had to visit and interview the candidates to select the awardees.

During the awards ceremony, the APS presented four awards for excellence in the physiological sciences: a first award of $250 and three honorable mention awards. All winners received certificates, subscriptions to *News in Physiological Sciences*, and APS T-shirts "Physiologists Know the Inside Story."

The recipients of the Honorable Mention Awards were Brian R. Knab, Langley High School, McLean, Virginia for "The Embryotoxicity of Pesticides on the Circulatory System of Chick Embryos"; David H. Dennison, Yorktown High School, Arlington, Virginia for "Mediator of Atrial Natriuretic Factor Secretion From Thyroid Cells"; and Richard C. Kramer, Curtis High School, Staten Island, New York for "Effects of Prozac on Serotonin-Induced Regeneration in Planaria."

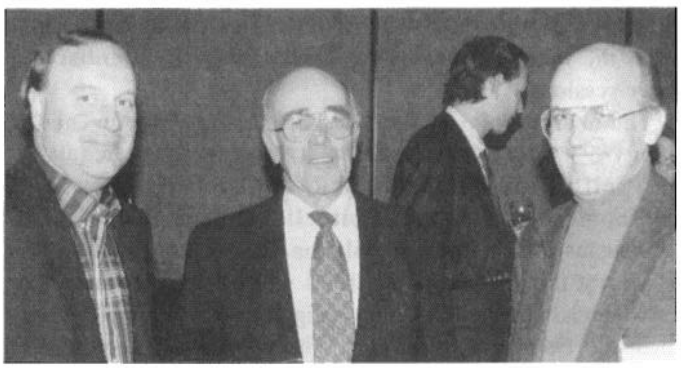
The first prize recipient was Jade J. Sung, Central High School, Little Rock, Arkansas for "Inhibitors of Angiogenesis."

The judging committee regretted that it was only able to make four awards, because there were so many outstanding projects.

M. Frank presenting physiology awards at ISEF.

Robert A. Mitchell and John W. Severinghaus

UCSF Retirement Party at
1992 APS/FASEB Spring Meeting
Anaheim, CA



Marc P. Kaufman, Robert A. Mitchell, and Charles A. Richardson

William F. Ganong, Elinor Severinghaus, John W. Severinghaus, and David J. Ramsay

Meetings and Conferences

Experimental Biology '93

New Orleans, LA
March 28–April 1

The new spring meeting format is taking shape, thanks to the efforts of the members of the participating society program committees. Meeting in Bethesda, the scientists defined the focus of the eight interdisciplinary theme areas, identified topic categories for the submission of volunteered abstracts, and selected symposia and mini-symposia for inclusion in each theme. The sessions selected were previously approved for presentation in the spring by the participating society program committees. The APS contribution to Experimental Biology '93 follows.

The societies working together to make Experimental Biology '93 a success include APS, ASPET, AAP, AIN, and AAI. Each participating society will continue to schedule oral and poster sessions of interest to their members. In addition, they will work to develop the theme areas as meetings within the meeting, providing basic scientists interdisciplinary sessions.

The interdisciplinary themes scheduled for Experimental Biology '93 include Cardiovascular Biology; Neuroregulation; Cell Injury; Inflammation; Metabolism; Growth, Development and Aging; Epithelial Cell Biology; and Mechanisms of Molecular Regulation. For each theme, a special area of the convention facilities will be set aside for the week. Special areas will also be designated for theme posters, which will be displayed all day. The participating societies have planned a coordinated program for symposia, mini-symposia, and slide sessions designed to minimize scheduling conflicts and to provide maximal exposure of the scientific progress in the theme areas.

Experimental Biology '93 is scheduled for March 28–April 1 in New Orleans, LA. The abstract deadline is November 17, 1992. Details of the meeting and the abstract forms will be mailed early in the fall. Scientists who are not members of one of the participating societies may request the Call for Papers from the FASEB Office of Scientific Meetings at (301) 530-7010.

APS-Sponsored Symposia

Urinary Concentrating Ability of the Kidney: A Comparative Persepctive. C. Beuchat, *Comparative*

Physiology and Pharmacology Disciplines for the 21st Century. M. Printz and H. Nishimura, *Education Committee*

Respiratory Physiology: Historical Perspectives. G. Sant'Ambrogio, *History of Physiology*

Workshop: Biomedical Research in Developing Countries: Current Problems in Malnutrition. D. Richardson and K. Rasmussen, *International Committee and AIN*

In Search of a Hepatic Stem Cell. E. R. Jaffe, *SEBM*

Rheology of Metastasis. H. L. Goldsmith, *NASB*

APS Symposia Integrated Into Theme Areas

Cardiovascular Biology

Remodeling of the Extracellular Matrix of the Heart and Vessels. J. W. Covell, *Cardiovascular*

Leukocyte Adhesion in the Presence of Shear Stress: Mechanics and Molecules. K. Ley, *Cardiovascular*

Mechanisms of Baroreflex Control. F. M. Abboud, *Cardiovascular* and *Neural Control & Autonomic Regulation*

Cardio-Respiratory Interactions During Sleep. C. Gaultier and L. B. Rowell, *Clinical Committee*

Regulation of Myocardial Substrate Metabolism. W. C. Stanley and R. S. Balaban, *Endocrinology & Metabolism*

Humoral Modulation of Pulmonary Vascular Resistance During Hypoxia. B. R. Walker, *Hypoxia, Cardiovascular,* and *Respiration*

Protein Phosphorylation During Smooth Muscle Contraction. M. Barany, *Myo-Bio (Muscle)*

The L-Arginine/Nitric Oxide Pathway and Renal-Cardiovascular Integration. R. H. Freeman and W. H. Bierwaltes, *Water & Electrolyte Homeostasis* and *Renal*

Mechanical Force Regulation of Gene Expression in Vascular Cells. J. Frangos, *BMES*

Biofunctional Materials for Tissue Engineering. J. Hubbell, *BMES*

Epithelial Cell Biology

Vesicle-Mediated Transporter Redistributions in Regulation of Epithelial Transport. A. K. Mircheff, *Cell* and *Epithelial Transport*

Expression of Transport Proteins in Heterologous Systems: What Can This Tell Us About Structure-Function Relationships. P. A. Knauf and J. R. Riordan, *Cell, Epithelial Transport,* and *Society of General Physiologists*

Charge Translocation by Electrogenic Carriers and Pumps. R. F. Rakowski and P. DeWeer, *Cell* and *Epithelial Transport*

Calcium: From Calcium-Transporting Proteins to Renal Calcium Transport. P. A. Friedman, *Renal*

Tutorial: Strategies for Study of Gene Expression and Its Regulation. L. Ercolani, *Renal*

Lung Surfactant: Molecular and Cellular Processing. S. A. Rooney and J. R. Wright, *Respiration Section*

Neuroregulation

Mechanisms of Baroreflex Control. F. M. Abboud, *Cardiovascular* and *Neural Control & Autonomic Regulation*

Cardio-Respiratory Interactions During Sleep. C. Gaultier and L. B. Rowell, *Clinical Committee*

Metabolism

Regulation of Myocardial Substrate Metabolism. W. C. Stanley and R. S. Balaban, *Endocrinology & Metabolism*

Cell Injury

Physiological Adaptations and Countermeasures to Long-Duration Space Flight. A. R. Hargens and C. M. Tipton, *Environmental & Exercise Physiology*

Mechanisms of Molecular Regulation

Tutorial: Strategies for Study of Gene Expression and Its Regulation. L. Ercolani, *Renal*

Abstract Deadline

November 17, 1992

Call for Symposia Topics—Spring 1994

Members are invited to submit proposals for APS symposia to their Section Program Advisory Committee representative. Organizers should consider multidisciplinary approaches with other sections and the contribution by experimentation at multiple levels of investigation.

What specific questions will the symposium address? Are there two or three conflicting issues that warrant presentation and discussion? What does the symposium offer to the intended audience? Are future directions considered in the material to be presented?

Symposia proposals are welcome for the annual spring meeting, Experimental Biology '94. Symposia will be considered for presentation as part of the traditional APS symposia program that highlights areas of interest to the physiological community. In addition, symposia will be considered for inclusion in the cross-society program focusing on one of eight theme areas: Cardiovascular Biology; Epithelial Cell Biology; Mechanisms of Molecular Regulation; Neuroregulation; Cell Injury; Inflammation; Growth, Development and Aging; and Metabolism.

Proposals should be submitted to the appropriate Section Program Advisory Committee representative by January 15, 1993. All proposals should include the following: 1) title; 2) organizer and address; 3) abstract (150 words); 4) number of half-day sessions required; 5) names of session chairperson(s); 6) presentors-discussants—approximately six per half day (list the participant's name and title of presentation as it would appear in the program); 7) brief biographical sketch (2–3 sentences) of each speaker in the symposium; and 8) budget information. To coordinate fund-raising efforts by the national office, the anticipated costs to support the travel and lodging of symposia speakers are needed. Symposia are evaluated on the basis of their scientific merit. Organizers will be notified shortly after the 1993 Spring Meeting on acceptance of their symposia.

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1994 APS Conferences and Meetings

Intersociety Meeting:

Regulation, Integration, Adaptation: A Species Approach
Organizers: E. J. Braun, J. R. Hazel, and S. H. Wright
Sponsor: Comparative Physiology Section

APS Conferences:

Physiology of the Release and Activity of Cytokines
Organizers: J. T. Stitt, J. G. Cannon, G. W. Duff, M. J. Kluger, A. J. Lewis, and I. G. Otterness
Sponsor: Environmental & Exercise Physiology Section

Mechanotransduction and the Regulation of Growth and Differentiation
Organizers: H. E. Morgan, P. A. Watson, D. E. Rannels, F. Sachs, M. Schwartz, and H. Vandenburgh
Sponsor: None provided

Physiology and FASEB 1992

The 1992 FASEB Meeting in Anaheim, California was a joint meeting of five FASEB member Societies and several guest societies. Over all, 6,572 volunteered abstracts were submitted. Of this total, 2,230 papers were submitted by the APS membership and the three APS guest societies: Society of Experimental Biology and Medicine (SEBM), Biomedical Engineering Society (BMES), and North American Society for Biorheology (NASB). The physiology component of FASEB '92 represented 30% of the total short communications presented.

Of the 2,230 abstracts processed by APS, 21% (468) represented women physiologists as first authors and 7% (156) were by members from outside the Americas. In addition, 9% (190) were received from US government laboratories and 5% (104) were received from physiologists employed by industry. Table 1 provides information on the various departmental abstracts received by APS, of which 25% (567) were received from departments of physiology; 4% (88) were received from departments of physiology and biophysics.

Of the 2,230 APS member–spon-

Table 1. **Author Affiliations of Programmed Volunteered Papers**

Department	No. of Papers	% Total
Physiology	567	25
Physiology & Biophysics	88	4
Medicine	166	7
Pharmacology	91	4
Biology	88	4
Surgery	68	3
Anesthesiology	84	4
Pediatrics	39	2
Biochemistry	15	1
Anatomy	14	1
Pathology	17	1
Other	374	16

Table 2. **Volunteered Papers Sponsored by APS, BMES, and SEBM for FASEB 92**

Society	Total Received	FASEB Program Designation						Total
		APS	Other	ASPET	AAP	AIN	AAI	
APS	2,090 (94%)	1,552 (74%)	3 (.1%)	183 (9%)	277 (13%)	55 (3%)	20 (1%)	2,090
BMES	63	54	0	4	4	1	0	63
SEBM	77	20	1	18	29	9	0	77
Total	2,230	1,626	4	205	310	65	20	2,230

Table 3. **APS Scientific Sessions at FASEB 92**

Section	Slide	Poster	Poster Discussion	Symposia/ Invited	Total
Cardiovascular	20	20		4	44
Cell & general		9		2	11
Comparative	2	6		1	9
Endocrinology & metabolism	2	14		2	18
Environmental & exercise	6	4		1	11
Epithelial	2	2		3	7
Gastrointestinal	4	1		1	6
History		1			1
Hypoxia				1	1
Muscle	1	3		2	6
Nervous system		2			2
Neural control and autonomic regulation	3	1		1	5
Renal	1	4	1	3	9
Respiration	7	8	4	4	23
Teaching			1	1	2
Water & electrolyte	3	5		1	9
BMES	2	3		3	8
SEBM				1	1
Public Affiars				2	2
NASB				2	2
Education Committee				1	1
Career Opportunities Committee				1	1
International Committee				1	1
Other*				5	5
Total	53	83	6	43	165

*Includes Bowditch Lecture, Cannon Lecture, Past-President's Symposium, Space Life Sciences Lecture, and Spacelab SLS-1 Symposium.

sored abstracts, 27% (604) were designated by authors for inclusion in topics programmed by other FASEB societies (Table 2).

Table 3 displays the number of sessions of volunteered papers, programmed by APS and its guest societies, in relation to Society Sections. Of the 1,945 papers programmed by the Program Advisory Committee, 107 (5%) were scheduled as poster-discussion presentations, 634 (33%) as slide presentations, and 1,204 (62%) as poster presentations. Over all, there were a total of 6 poster-discussion sessions, 43 symposia/invited sessions, 53 slide sessions, and 83 poster sessions. A total of 165 physiology sessions were scheduled during FASEB '92.

Table 4 displays the total number of abstracts programmed by each section. The Cardiovascular Section programmed 593 abstracts (31%), followed by the Respiration Section, which programmed 371 abstracts (19%).

Table 4. **Programming of Volunteered Papers by Sections/Groups**

Section	Number of Abstracts
Cardiovascular	593
Cell & general	86
Comparative	52
Endocrinology & metabolism	161
Environmental & exercise	148
Epithelial	81
Gastrointestinal	53
History	1
Hypoxia	5
Muscle	68
Nervous system	17
Neural control and autonomic regulation	66
Renal	94
Respiration	371
Teaching	14
Water & electrolyte	88
BMES	47
Total	1,945

APS Council and Section Advisory Committee

Standing (l-r): E. Nadel, J. Resko, E. Braun, M. Frank, J. Rodarte, D. Richardson, J. Hall, R. Traystman, M. Lieberman, H. Valtin, M. Kaufman, R. Hawkins, F. Powell, and W. Boron. Seated (l-r): B. Duling, H. Cooke, L. Jefferson, S. Schultz, N. Staub, S. Chien, W. Dantzler, A. Cowley, D. Ramsey, and L. Navar.

APS CONFERENCE
The Cellular and Molecular Biology of Membrane Transport

Lecture: Molecular Properties of Voltage-Gated Ion Channels
Speaker: W. Catterall

Symposium: Structure and Function of Membrane Ion Channels
Chair: D.C. Eaton
Speakers: O.S. Andersen, R.W. Aldrich, O. Pongs, A.M. Brown, and D.J. Benos

Symposium: Structure and Function of Membrane Channels II: Molecular Approaches to the Properties of Calcium Channels
Chair: W. Agnew
Speakers: S. Fleischer, K.G. Beam, G. Meissner, and R.W. Tsien

Symposium: Structure and Function of Membrane Carriers
Chair: D.M. Fambrough
Speakers: J. Pouyssegur, G.I. Bell, E. Wright, R. R. Kopito, and J.J. Gargus

Banquet Lecture: The Ins and Outs of Lactose Permease of *Escherichia coli*
Speaker: H.R. Kaback

Symposium: Cellular Modulation of Membrane Transport
Chair: L. Mandel
Speakers: J.H. Kaplan, D.M. Fambrough, M.M. Gottesman, J.S. Handler, and W.S. Agnew

Symposium: Posttranslational Regulation of Ion Channels
Chair: J.H. Kaplan
Speakers: D.L. Armstrong, L.K. Kaczmarek, R.A. Frizzell, D.A. Ausiello, and D.C. Eaton

NOVEMBER 4-7, 1992

ORLANDO, FLORIDA

FOR INFORMATION: Membership Services, American Physiological Society,
9650 Rockville Pike, Bethesda, Maryland 20814
Phone: (301) 530-7172 FAX: (301) 571-1814

APS Conferences

For the past several years, the American Physiological Society has been transforming its fall meeting from one encompassing all aspects of physiology to one embracing a clearly defined theme or topic. Culmination of that transition has been the scheduling of the APS Conferences for 1992–1994. A listing of their topics can be found on p. 132.

The APS Conferences offer the Society membership the ultimate in programming opportunities. The organizing committee will select the theme or topic, meeting format, abstract categories, method of presentation, and duration of the meeting. The APS will be responsible for all aspects of meeting management and financial support. In essence, the Society is simply asking you to help organize a meeting that presents the best science, and it will provide the space and resources to support you. What more could you possibly ask?

Listed below are more specific guidelines to follow in organizing an APS Conference. Any questions regarding the organization of such meetings should be directed to Heinz Valtin, Chairperson, APS Program Committee, or Martin Frank at the APS office. The deadline for proposals to be considered for 1995 is **February 1, 1993**.

Guidelines

Scope

These meetings should focus on a circumscribed area of physiology that attracts a limited (300–500) audience. A concerted effort should be made to integrate overlapping fields of study and levels of investigation, i.e., from molecular biology through systemic physiology.

Organizing Committee

The Program Committee should provide direction by identifying select persons, groups, or perhaps Sections and requesting them to organize a specialty meeting. The "organizing committee" will be responsible for providing APS with 1) a list of potential meeting sites, 2) contacts from other societies who may wish to attend or participate in the meeting, 3) potential outside funding, and 4) a budget detailing the cost of the meeting.

Management

The APS staff will be responsible for booking site selection, advertisement, setting the registration fee, attracting exhibitors if desired, and solicitation of supporting funds.

Abstracts

Inclusion of volunteered papers on the program is desired. There should be a format that provides graduate and postdoctoral students the opportunity to present their date if the material falls within the scope of the conference. Abstracts will be accepted without evaluation and published by the Society. The organizing committee will be responsible for generating a list of topic categories that fall within the scope of the APS Conference.

Location

The site of the meeting will be flexible. The Society requires at least two years advance notice of proposed meeting sites to book meeting space.

Duration

The meeting should be scheduled for two to three days, preferably over a weekend to take advantage of reduced travel costs.

Program Advisory Committee

The Program Committee will evaluate and contribute to the framework of the meeting. Once this has taken place, and the Program Committee has given its approval, the final content will be presented to Council for their endorsement and approval.

Joint Sponsorship

Joint sponsorship with other societies will be considered.

Number of Meetings

The number of meetings will depend on the needs of the membership. From 1992 through 1995, not more than two meetings per year will be sponsored by the Society.

Reimbursement Policy

Partial reimbursement for member and nonmember invited speaker expenses may be provided by the Society based on availability of funding.

Time of Year

The meetings should be scheduled from June through December to avoid overlap with preparations for the Experimental Biology meeting.

Committees and Reports

1992 Officers and Standing Committees

APS Council

Officers
Stanley G. Schultz, President (1993)
William H. Dantzler, President-Elect (1993)
Norman C. Staub, Past President (1993)

Councillors
Mordecai P. Blaustein (1995)
Helen J. Cooke (1994)
Allen W. Cowley, Jr. (1993)
L. Gabriel Navar (1994)
David J. Ramsay, (1993)
James A. Schafer (1995)

ex officio members
Franklyn G. Knox, Finance (1992)
Leonard S. Jefferson, Section Advisory (1993)
Frank L. Powell, Jr., Education (1994)
Charles M. Tipton, Publications (1992)
Heinz Valtin, Program (1994)

Society Standing Committees

Animal Care and Experimentation

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

Virginia M. Miller, Chair (1992)
Kenneth M. Baldwin (1993)
Phyllis M. Gootman (1992)
Joseph R. Haywood (1994)
Charles W. Leffler (1993)
Charles E. Wade (1994)
Stephen F. Flaim, *ex officio* (1993)
Gabor Kaley, *ex officio* (1993)
William M. Samuels, *ex officio*

Career Opportunities in Physiology

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

Mary A. Frey, Chair (1993)
Stephen L. Bealer (1994)
Ronald R. Geller (1993)
Susan J. Gunst (1994)
M. Harold Laughlin (1992)
Paul A. Murray (1992)
Mary A. Rokitka (1994)

Committee on Committees

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

Brian R. Duling, Chair (1992)
Edward H. Blaine (1992)
Elsworth R. Buskirk (1992)
Stanley M. Cain (1993)
Catherine S. Chew (1994)
Helen J. Cooke (1994)
M. Roger Fedde (1994)
John T. Stitt (1993)

Ray G. Daggs Award

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

Walter C. Randall, Chair (1992)
A. Clifford Barger (1993)
Arthur C. Guyton (1994)

Education

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

Frank L. Powell, Jr., Chair (1994)
Mukul R. Banerjee (1992)
Francis L. Belloni (1993)
Jack A. Boulant (1994)
Lois J. Heller (1992)
Barbara A. Horwitz (1993)
Lynne E. Olson (1993)
Carol F. Whitfield (1994)
R. G. Carroll, *ex officio* (1993)

Finance

Reviews the proposed annual budget and fiscal plan for all Society activities and recommends a final budget and implementation plan to Council. Supervises the investment of the Society's financial resources subject to approval of Council.

Franklyn G. Knox, Chair (1992)
Robert W. Gore (1994)
M. Ian Phillips (1993)
William H. Dantzler, *ex officio* (1993)
Charles M. Tipton, *ex officio* (1992)
Martin Frank, *ex officio* (indefinite)
James C. Liakos, *ex officio* (indefinite)

Honorary Membership

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

William F. Ganong, Chair (1992)
Ernst Knobil (1994)
Aubrey E. Taylor (1993)

International Physiology

Handles all matters pertaining to international physiological affairs, with an emphasis on developing countires; maintains a clearinghouse for linkages with developing countries; and recommends to Council APS members to participate in the US/USSR Bilateral Exchange Program in Physiology.

Donald B. Jennings, Chair (1994)
Clark M. Blatteis (1992)
Emile Boulpaep (1994)
Dike N. Kalu (1992)
Daniel R. Richardson (1993)
John B. West (1993)
Bodil Schmidt-Nielsen, *ex officio* (1994)
Harvey V. Sparks, Jr., *ex officio* (1993)

Liaison With Industry

Fosters interactions and improved relations between the Society and industry; cooperates with the Career Opportunities in Physiology Committee to encourage high school and college students to choose a career in physiology.

Stephen F. Flaim, Chair (1993)
David P. Brooks (1993)
David L. Crandall (1994)
Michael J. Cronin (1993)
Steven S. Segal (1994)
Andrea A. Seymour (1994)
Mary A. Frey, *ex officio* (1993)
Frank L. Powell, Jr., *ex officio* (1994)
Heinz Valtin, *ex officio* (1994)

Long-Range Planning

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

Francis J. Haddy, Chair (1993)
Clark M. Blatteis (1994)
J. Jay Gargus (1994)
John E. Hall (1993)
Ralph Lydic (1992)
Donald J. Marsh (1993)
David J. Ramsay (1993)
Jack D. Wood (1992)

Membership

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

Eugene M. Renkin, Chair (1992)
Jahar Bhattacharya (1993)
Michael J. Davis (1994)
James G. Dobson, Jr. (1992)
Suzanne M. Fortney (1993)
Diana Marver (1994)
Jay A. Nadel (1993)

Perkins Memorial Fellowship

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

Bodil Schmidt-Nielsen, Chair (1994)
Jerome A. Dempsey (1994)
Robert F. Grover (1992)
Nicholas Sperelakis (1992)
Molly P. Hauck, *ex officio* (indefinite)

Porter Physiology Development

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

H. Maurice Goodman, CoChair (1992)
Eleanor L. Ison-Franklin, CoChair (1993)
Douglas C. Eaton (1993)
Richard M. Effros (1993)
Reynoldo Elizondo (1994)
Pamela Gunter-Smith (1993)
David E. Mohrman (1992)
David Robertshaw (1994)
Fleur L. Strand (1993)
James G. Townsel (1994)

Program

Developments the scientific programs for the Society with the assistance of the Program Advisory Committee; assists Council in shaping policy for scientific programs and in the organization of fall conferences.

Heinz Valtin, Chair (1994)
Larry I. Crawshaw (1993)
James M. Downey (1992)
George A. Hedge (1992)
Ethan R. Nadel (1994)
William H. Dantzler, *ex officio* (1993)
Martin Frank, *ex officio* (indefinite)

Program Advisory

Recommends to the Program Committee scientific programs for the APS meetings; organizes contributed abstracts into sessions; selects session chairs and introductory speakers.

Cardiovascular—Erik L. Ritman (1992) & Diana L. Kunze (1994)
Cell and General Physiology—Peter M. Cala (1993)
Central Nervous System—Richard A. Hawkins (1995)
Comparative Physiology—Stephen H. Wright (1994)
Endocrinology and Metabolism—David Wasserman (1992)
Environmental and Exercise Physiology—Barbara A. Horwitz (1993)
Gastrointestinal Physiology—Gilbert A. Castro (1993)
Neural Control and Autonomic Regulation—Marc P. Kaufman (1993)
Renal Physiology—Mark A. Knepper (1992) & Bruce M. Koeppen (1993)
Respiratory Physiology—Aron B. Fisher (1994)
Teaching of Physiology—Philip A. McHale (1993)
Water and Electrolyte Homeostasis—Ian A. Reid (1995)
Clinical Physiology Group—to be appointed
Epithelial Transport Group—John Cuppoletti (1995)
History of Physiology Group—Giuseppe Sant'Ambrogio (1994)
Hypoxia Group—Reed W. Hoyt (1996)
Myobio Group—Jack A. Rall (1992)
Liaison with Industry—Stephen F. Flaim (1993)
Education Committee—Frank L. Powell, Jr. (1994)

Public Affairs

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

Gabor Kaley, Chair (1993)
John R. Claybaugh (1992)
Claude Desjardins (1992)
Eric O. Feigl (1994)
Virginia H. Huxley (1993)
George A. Ordway (1994)
Stephen F. Flaim, *ex officio* (1993)
Virginia M. Miller, *ex officio* (1992)
William M. Samuels, *ex officio* (indefinite)

Publications

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

Charles M. Tipton, Chair (1992)
Diana L. Kunze (1994)
Loring B. Rowell (1993)
James A. Schafer (1993)
Stanley G. Schultz, *ex officio* (1993)
Martin Frank, *ex officio* (indefinite)
Brenda B. Rauner, *ex officio* (indefinite)

Section Advisory

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

Leonard S. Jefferson, Chair (1993)
Cardiovascular Section—James Covell (1993)
Cell and General Physiology Section—Melvyn Lieberman (1995)
Central Nervous System—Richard A. Hawkins (1995)
Comparative Physiology Section—Eldon J. Braun (1994)
Endocrinology and Metabolism Section—Charles Blake (1995)
Environmental and Exercise Physiology Section—Ethan R. Nadel (1994)
Gastrointestinal Physiology Section—Jack D. Wood (1994)
Neural Control & Autonomic Regulation Section—Marc R. Kaufman (1993)
Renal Physiology Section—Walter F. Boron (1993)
Respiratory Physiology Section—Joe R. Rodarte (1993)
Teaching of Physiology Section—Daniel Richardson (1993)
Water and Electrolyte Homeostasis Section—John E. Hall (1994)

Senior Physiologists

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

Helen Tepperman, chair (1994)
Horace W. Davenport (1992)
A. Pharo Gagge (1993)
Steven M. Horvath (1992)
Ralph H. Kellogg (1994)
John T. Reeves (1993)

Women in Physiology

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

Hannah V. Carey, Chair (1993)
Virginia L. Brooks (1994)
Andrea R. Gwosdow (1992)
John W. Manning (1993)
Jessica Schwartz (1992)
Barbara A. Vance (1993)
Susan A. Ward (1993)
Martin Frank, *ex officio* (indefinite)

Society Representatives to Other Organizations

American Association for Accreditation of Laboratory Animal Care

Virginia M. Miller (1992)

American Association for the Advancement of Science

Robert L. DeHaan (1992)
M. Ian Phillips (1992)

Council of Academic Societies of the Association of American Medical Colleges

Sarah D. Gray (1992)
George A. Hedge (1993)

Federation of American Societies for Experimental Biology

Board
Shu Chien (1993)
Stanley G. Schultz (1995)

Executive Officers Advisory Committee
Martin Frank (indefinite)

Finance Committee
Francis J. Haddy (1992)

Life Sciences Advisory Committee
Mordecai P. Blaustein (1994)

Public Affairs Committee
Gabor Kaley (1993)

Publications Committee
John A. Williams (1994)

Research Conference Advisory Committee
Frank Booth (1993)

3M Life Sciences Award Committee
Jerome A. Dempsey (1993)

National Association for Biomedial Research

Martin Frank (indefinite)

US National Committee for IUPS

William H. Dantzler (1995)
Stanley G. Schultz (1994)
Norman C. Staub (1993)

US National Committee on Biomechanics

Roger M. Glaser (1993)

Animal Care and Experimentation

From June 1991 to June 1992, the Animal Care and Experimentation Committee (ACE) of the American Physiological Society has fulfilled its charge from Council to

Virginia M. Miller

1. Write and submit to Council for their approval a draft for APS members' handbook regarding animal issues.

2. Write an article for *The Physiologist* seeking member referral regarding animal issues.

3. Review guidelines for euthanasia of laboratory animals. The ACE Committee responded to a questionnaire from the American Veterinary Association regarding revision of the AVMA Guide for Euthanasia. In addition, the ACE Committee sponsored a workshop on Euthanasia of Laboratory Animals with AVMA participation at the 1992 meeting of FASEB. Final recommendations are pending upon the new AVMA Guide.

In addition to fulfilling the charge from Council, the ACE Committee reviewed and prepared the Society's official comments of the American Veterinary Association's proposed guide for animal surgery. The ACE Committee also reviewed four manuscripts and related materials submitted to the *American Journal of Physiology* and referred to the Committee for questions regarding the appropriate use of animals.

Four workshops related to animal issues were organized and co-sponsored by the committee.

1. 1991 FASEB meeting, Atlanta, GA: "Why AAALAC?"; co-sponsor, ASPET. Average attendance: 20. Summary report: "The Value of Accreditation of Animal Laboratory Care" was published in the *FASEB Journal* 5: 3021–3022, 1991.

2. 1991 APS meeting, San Antonio, TX: "How to respond to attacks by animal activists"; co-sponsor for

University of Texas, San Antonio and Texas Society for Biomedical Research. Average attendance: 35.

3. 1992 FASEB meeting, Anaheim, CA: "Animals in Research: Communication the Need to the Public"; co-sponsor for ASPET. Average attendance: 150.

4. 1992 FASEB meeting, Anaheim, CA: "Symposium: AVMA Guidelines on Euthanasia"; co-sponsor for ASPET. Average attendance: 100. Summary report will be published in *The Physiologist.*

The ACE Committee was involved in proactive campaigns to inform television networks, book publishers, and airline executives about the importance of the use of animals in research and teaching. Write-in campaigns were initiated regarding anti-science/animal issues associated with the TV show "Quantum Leap," the Encyclopedia Britannica entry on dogs, and the suspending of the shipments of laboratory animals by Northwest Airlines. All activities were in cooperation with ASPET and the National Association for Biomedical Research. As a result of the letter-writing campaign, NBC revised the original script for the episode, Encyclopedia Britannica will revise the entry on dogs for the 1993 edition of the encyclopedia, and Northwest Airlines has resumed shipment of laboratory animals.

During the coming year, the ACE Committee hopes to work closely with the new Education Coordinator to develop materials related to the use of animals that could be of use in primary science classes.

The Ace Committee welcomes input from the members of APS regarding concerns and issues related to the use of animals.

Virginia M. Miller, Chair

Recently the APS has also moved down the educational "pipeline" with its High School Teacher Summer Research Program. Thirteen teachers have been selected for research experiences in APS member laboratories for 1992, the third year of the program. The 1991 fellows attended the spring meeting in Anaheim and contributed to an In-Service Training in Physiology Workshop attended by over 60 high school teachers from Southern California. The workshop ran all day and included very well received talks by APS scientists in the morning. Norman Staub is planning an even more comprehensive program for high school teachers and students in the New Orleans area as part of the Past-President's Symposium for Spring 1993.

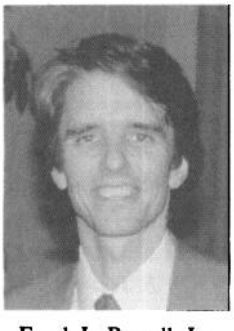
To adequately prepare both sides of K-12 teacher-scientist partnerships, we also coordinated a Pre-College Science Education Training Workshop organized by the NRC. About 30 FASEB members attended; see the report on page 84.

A small group of dedicated members also worked with Martin Frank on a proposal for a Science Education Partnership Award to finance expansion of some of these existing programs and initiation of some new ones. The proposal received a very respectable priority score, but unfortunately it was not one of the proposals funded. In addition the Education Committee worked to ensure better coordination with the Teaching Section and the Career Opportunities and Liaison With Industry Committees, assisted the Publications Committee with the selection of a new editor for *Advances in Physiology Education*, and represented the APS at the Coalition for Education in the Life Sciences second national conference.

Frank L. Powell, Jr., Chair

Education

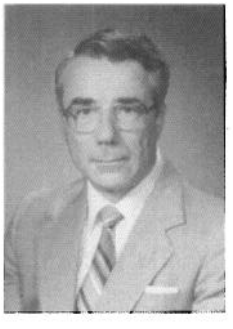
The past year has been very busy for the Education Committee, as APS has seized on the national ferment to improve science education and literacy. Traditionally, the Education Committee has focused on educating APS members. For several years we have sponsored a symposium on new experimental techniques on the first day of the spring meetings; this year it was on "Imaging Techniques for Assessing Cell Function" (see abstracts on p. XXX). The symposium was standing room only and has been scheduled for an encore in New Orleans in 1993.



Frank L. Powell, Jr.

Finance

It is the responsibility of the Finance Committee to review and modify the 1992 budget that was approved by Council in October 1991. With the executive director, business manager, and publications manager, the committee reviewed the Society's performance in 1991, revised the 1992 budget, and submitted it to Council for final approval. Based on the performance of the Society in 1991, the Finance Committee recommended an overall budget for 1992 of $9,712,000.



Franklyn G. Knox

During 1991, the Society's journal operations ended the year with income in excess of expenses of $168,669. This figure in-

cludes the allocation of $200,000 to a contingency fund. The Society's book operations ended the year with income in excess of expenses in the amount of $70,199. The Society's general fund derived from direct membership activities ended the year with a deficit of $183,284.

The Finance Committee is also responsible for reviewing the performance of four management groups managing our investment accounts through the consultative services of Shearson Lehman Hutton. As of December 31, 1991, the accounts had the following market value: Operating Reserve Investment Account=$4,910,200; Publications Contingency and Reserve Account=$4,021,894; Caroline tum Suden Account=$314,645; IUPS Account=$227,042; Perkins Memorial Fund=$179,230; Second Century Program Fund=$1,093,845.

In 1992, the Society continued its transition to a three-tiered subscription system, with the goal that nonmember individuals and members would ultimately pay two-thirds and one-third of the institutional rates, respectively. As a result of Council's decision, the 1992 institutional subscription rates were increased 15% for the consolidated *American Journal of Physiology* and 10% for all other journals. Member and nonmember individuals rates remained unchanged.

In proposing the 1993 subscription rates, the Finance Committee had extensive discussions with the Publications Committee and journal editors. Several options were considered for recovering the additional costs associated with an expanding journal program. These included increasing page charges, increasing subscription prices, initiating a manuscript handling fee, and limiting the number of pages published. As a result of the discussions, the Finance Committee recommended and the Council approved raising institutional subscription prices as a percentage of total costs associated with each journal. It was recommended that the

APS Balance Sheet
December 31, 1991

Assets

Cash, including savings accounts	$ 423,174
Certificates of deposit	4,825,575
	5,248,749
US government securities	5,266,145
Marketable securities, at cost, market value: 1991, $6,631,080	5,274,431
Accounts receivable, including $20,000 in 1991 due from FASEB	500,038
Accrued interest receivable	128,370
Advances to section editors	173,962
Inventories, net of allowance of $300,000 in both 1991 and 1990	751,292
Prepaid expenses	57,838
Furniture, fixtures, and equipment, net of accumulated depreciation of $171,902 in 1991	85,316
	17,486,141
Net assests restricted and allocated for unexpended grants and contracts:	
Cash	216,483
Certificates of deposit	48,654
US government securities	80,477
Marketable securities, at cost, market value: 1991, $640,251	602,330
Accounts receivable, net	9,910
	957,854
	$18,443,995

Liabilities

Accounts payable and accrued expenses, including $96,213 in 1991 due FASEB	$ 522,352
Unearned revenue	
Subscriptions	4,182,400
Dues	211,546
	4,393,946
	4,916,298
Unexpended grants and contracts	957,854
	5,874,152

Operating Fund Balances

Publications general fund	7,789,106
Publications special fund	31,779
Society general fund (deficit)	(47,792)
Publications contingency and reserve fund:	
Program Endowment Fund	0
Principal	3,148,043
Income	632,478
Second Century Program Fund:	
Principal	929,500
Income	86,729
	12,569,843
	$18,443,995

APS Finance Committee. Back row (l-r): M. Frank, N. C. Staub, J. Liakos, S. G. Schultz, and C. M. Tipton. Front row: M. I. Phillips, F. G. Knox (chair), and R. Gore.

journals be increased as follows: consolidated *American Journal of Physiology*, 10%; *Journal of Applied Physiology*, 7%; *Journal of Neurophysiology*, 8%; *Physiological Reviews*, 0%; *AJP: Cell Physiology*, 20%; *AJP: Lung Cellular and Molecular Physiology*, 20%; *AJP: Heart and Circulatory Physiology*, 15%; *AJP: Gastrointestinal and Liver Physiology*, 6%; *AJP: Regulatory, Integrative and Comparative Physiology*, 6%; *AJP: Endocrinology and Metabolism*, 0%; and *AJP: Renal, Fluid and Electrolyte Physiology*, 0%. The 1993 rates for members and nonmember individuals will remain unchanged.

For 1992, the Society General Fund is projected to show a deficit of $218,237 as a result of the Council's decision to support two APS Conferences, one in Colorado Spring, Colorado, and the other in Orlando, Florida, and to allocate funds for a high school science teachers summer research program. As part of the Finance Committee's and Council's strategic plan to utilize a portion of the Society's reserves to benefit the membership, $150,000 was transferred from the managed accounts to the Society General Fund. In addition, $25,000 was allocated for support of the minority programs administered by the Porter Physiology Development Committee.

To encourage prompt payment of dues and to encourage members to subscribe to the APS journals, it was recommended that dues and subscriptions be combined on the same note. This will help to make it easier for members to pay their dues and to subscribe to the journals at the same time.

As a result of the January Council Strategic Planning Retreat, the Finance Committee endorsed the establishment of a strategic planning fund that would contain income from the managed funds and would be utilized to fulfill the goals of the strategic plan. Council supported the proposal and asked the Finance Committee to identify the amount available and to define potential allocations against such a fund.

The Finance Committee also reviewed the allocations to the Society sections and noted that a number of the sections were not operating within budget. It was recommended to Council that a subcommittee be set up to review section budgets and to define a more equitable allocation of funds, with the understanding that the sections would be expected to function within budget. Council endorsed the Committee's recommendation and appointed a subcommittee of the Section Advisory Committee to review section budgets.

The Finance Committee is also responsible for receiving the annual audit performed by Coopers and Lybrand. The audit found the operations of the Society to be "in conformity with generally accepted accounting principles" and that the finance statements "present fairly, in all material respects, the financial position of the American Physiological Society." For the information of the membership, the Society's Balance Sheet for 1991 is provided for review.

Franklyn G. Knox, Chair

International Physiology

The reorganized International Physiology Committee of APS has been in place for some three years and has begun to establish a number of thrusts. These include the bringing together of various programs within the Society related to international affairs that previously did not have a particular home base as well as providing new initiatives and recommendations for questions arising from Council. Representatives of the APS to IUPS and the IUPS Commission on Teaching in Developing Countries and the APS Chair of the Perkins Committee are attached to the International Physiology Committee. We have established continuing communication with the American Association for the Advancement of Science, and their representatives have participated in our committee meetings.

Donald B. Jennings

The International Physiology Committee provides advice to Council on the distribution of free APS scientific journals to foreign institutions with particular needs. As an outcome of the IUPS Workshop on Teaching in Developing Countries at the Helsinki Congress, a "clearinghouse" was established by Martin Frank at the APS office in which the International Physiology Committee is involved. The purpose has been to arrange contacts between physiologists in developing countries and physiologists in North America. There have been difficulties in establishing this program, but the lessons learned will be useful for the future. The experience

has usefully served as an indicator of the resource requirements for introducing such a program from the central office.

In support of an initiative of APS member Craig Malbon and of the Chinese Physiological Society, we recommended the formation of an APS subcommittee for the Sino-American Initiative in Biomedical Sciences, which Council approved last fall. In his recent report to the International Physiology Committee, Malbon reported major strides in the development of the organization of this committee, and the International Physiology Committee will recommend to Council that this program receive strong support from the APS. Furthermore, Malbon has been invited to visit Beijing in the near future, so that this endeavor may eventually spread to include a wider interaction with mainland Chinese physiologists.

A major new direction of the International Physiology Committee in the past two years has been the introduction at the FASEB meetings of workshop sessions on internationally related topics. For Experimental Biology '93 a workshop entitled "Biomedical Research in Developing Countries: Current Problems in Nutrition" has been organized by Dan Richardson in conjunction with the Nutrition Society; this has been approved by the Program Committee. We also intend to continue holding a reception each year for foreign visitors and students and their APS hosts following the workshop. This will be an opportunity to increase communication and to acknowledge the importance of international cooperative exchanges.

This year's workshop at the spring APS/FASEB meeting entitled "Fostering Physiology with Latin America" arose from a concern, expressed early in my chairmanship, by members of the Society and the Executive Director. There has been a relative lack of communication between physiologists in North, Central, and South America. The aim of the workshop, therefore, was to explore ways of facilitating communication between individual physiologists in the Americas and to determine how the APS might be more helpful.

Key note addresses at the workshop were given by two eminent colleagues from Latin America. Eduardo Kreiger, Medicine and Heart Institute, Sao Paulo, Brazil, was a recent Past President of the Federation of Biological Societies of Brazil. Marcilino Cereijido is a professor of physiology and biophysics, Center for Research and Advanced Studies, Mexico City. Presentations were also provided by representatives of US organizations with a great deal of experience in working with foreign scientists and with Latin America. George Condouris represented the Educational Commission for Foreign Medical Graduates as a member of their panel for the Visiting Scholars Program; Gene Rosenberg represented the American Association for the Advancement of Science, where he is the Director of the Western Hemisphere Cooperation Program. Other participants included Fernando Vargas, formerly of Chile, who is currently with the Federal Drug Administration, Gerald Spurr, Department of Physiology, Medical College of Wisconsin, who has had many years involvement with cooperative physiological programs in Mexico and Columbia, and Clark Blatteis, Department of Physiology and Biophysics, University of Tennessee, who has been involved with exchange programs in Mexico and Peru.

As a result of the workshop, the International Physiology Committee formed a subcommittee composed of Blatteis and Spurr to put forward recommendations for a more permanent working committee to work with Latin Americans to promote communication and exchange programs. This action has been strongly supported by APS President Stanley Schultz. A number of ideas emerged from the workshop for improving interchange and for helping to make the resources of the APS more accessible to Latin Americans. These collective views will provide the basis for recommendations to Council from the International Physiology Committee for the support and development of new initiatives by the APS with our Latin American colleagues. Members of the APS who have particular interests in Latin America should contact Clark Blatteis for information about future plans of the subcommittee.

The International Physiology Committee has also been concerned about ensuring APS member representation at the First International Congress of the African Association of Physiological Sciences and the Society of Neuroscientists of Africa. This newly formed organization will hold its first Congress, sponsored by IUPS and hosted by the Kenya Physiological Society, in Nairobi, Kenya in September 1992. There are many APS scientists who are involved in collaborative projects in research and teaching of physiology in Africa. We would be interested to know if any of those involved in Africa feel that it would be useful to formalize a group who could explore problems and experiences for common benefit and act as a bridge of communication between the APS International Physiology Committee and our African colleagues. Anyone interested in such a group should contact Daniel R. Richardson, Department of Physiology and Biophysics, University of Kentucky Medical Center, Lexington. He is a member of the International Physiology Committee and has been involved with projects in Africa for several years; he has agreed to explore the feasibility of an African Committee for us. As evident from the increasing activities of the International Physiology Committee, you can expect to hear from us more frequently in the future. We look forward to the support of the members of the Society in our endeavors. If you, as a reader, have any interests in becoming involved in the Committee, please let us know. There will be much to do in the coming days and enthusiastic volunteers will be most welcome.

Donald B. Jennings, Chair

Liaison With Industry

The membership of the Liaison With Industry Committee (LWIC) for 1992–1993 is as follows: Stephen F. Flaim, Alliance Pharmaceutical Corp., chair; David P. Brooks, SmithKline Beecham; David L. Crandall, American Cyanamid; Michael J. Cronin, Genentech; Steven S. Segal, Penn State University; Andrea A. Seymour, Bristol-Myers Squibb; Heinz Valtin, Dartmouth, ex officio; Mary Anne Frey, Lockheed, ex officio; and Frank L. Powell, University of California at San Diego, ex officio.

Stephen F. Flaim

This past year has been a year of change for the LWIC. This committee was originally established to foster better interactions between the American Physiological Society and those industrial concerns that have interests in common with the Society. In the past, these interactions have been largely focused on obtaining financial support for the Society and its many activities. To meet this requirement, dialogue between the APS and industry necessarily occurred at the executive level of the organizations, and the LWIC facilitated this interaction. More recently, the focus of the interaction has shifted and expanded. The specific duties of the LWIC as assigned by Council are now as follows:

- Foster interactions and improve relations between the APS and industry by discussing problems of mutual concern.
- Develop new ways that the Society and related industry can interact in mutually beneficial ways.
- Develop a program to encourage high school and college students, especially minorities, to choose a career in physiology in cooperation with the Career Opportunities in Physiology Committee.

To fulfill these duties, the LWIC has realized that it must facilitate interaction on these issues between the APS and its own members who are employed in the industrial sector. As a result of this decision, a "special interest group" for APS members working in industry has been established, and a communication in the form of a questionnaire was sent out. The purpose of this questionnaire was to identify ways to improve communications between the APS and its members in industry, to solicit opinions and information relevant to specific APS goals and objectives from industrial sector members, and to solicit assistance in the organization and execution of APS-sponsored activities that are of relevance and of interest to the industry.

There was an enthusiastically positive response to the communication from APS members in industry. Based on this response, the LWIC has organized four subcommittees each chaired by a member of the LWIC. Each subcommittee has been asked to address a specific focus question relative to the general charge of the LWIC. The subcommittee focus questions and chairpersons as well as a brief synopsis of the information gathered by each subcommittee is as follows.

1. *What changes can the APS make to better serve its members in industry?* Chair: Michael J. Cronin

The APS has historically focused primarily on supporting its members working in academic institutions and has not shown comparable interest or support for its members and colleagues working in the industrial sector. The first step toward fostering better interaction between the Society and industry must certainly be a greater level of attention to the needs of the Society's members who work in industry. APS members employed in industry look to the Society for the same type of recognition and support as academic members. Membership on the Council and on the Society's standing committees, membership on the Society's journal editorial boards, and invitations to organize or participate in Society-sponsored symposia are ways the Society can recognize the contributions and foster an increased involvement from its industrial members. The APS could also sponsor collaborative scientific efforts between industry and academia through its membership communication and scientific meeting programs. In general, the leadership of the Society needs to recognize that applied research in the industry setting is an integral part of the overall scientific activities of the APS.

2. *How can the APS and industry work together to publicize the benefits of animal research?* Chair: Andrea A. Seymour

Many major pharmaceutical companies and industries involved with biomedical research have ongoing programs at the local level targeted at this issue. The approach being taken by most is to reach out to health care professionals and school teachers. There are numbers of ways that the APS can participate in and support these local activities at the national level. Suggestions include sponsoring advertisements, production of posters and literature that can be distributed to local schools and medical offices, sponsoring booths at grade school and high school teachers conventions, sponsorship of speaker programs aimed at civic organizations and schools, and sponsorship of instruction programs for physiologists focusing on rules and regulations of animal use and laboratory techniques as well as techniques for dealing with the general public.

3. *Is industry interested in working with the APS to support local high school teacher education in, and exposure to, the physiological sciences?* Chair: David P. Brooks

It is a very positive sign that the APS leadership is soliciting increased involvement from the Society's industrial members on the education issue. There is a clear and recognized need to aggressively advertise the long-range medical benefits as well as the career opportunities associated with

physiology research. A great many companies have already initiated local programs aimed at teachers and students in the K–12 environment. Such local efforts are far superior to national efforts such as sponsoring high school teachers at FASEB. The APS should consider supporting these local efforts by helping to provide materials such as videos and presentation packets with slides, text, and handouts that can be used by speakers.

4. *How can the APS best acknowledge, in a public fashion, contributions (intellectual, physical, financial) made from industry?* Chair: David L. Crandall

The APS generally ignores physiological research that occurs in industry despite the fact that much of this work is novel and is published in refereed journals. As a result of this long-standing position, most industrial scientists establishing their own careers and working in the area of physiology are more likely to join other national scientific societies and publish in scientific journals that show less apparent bias against the industrial sciences. The Society can reverse this trend by encouraging increased participation of its industrial scientific members in its meetings and in the various scientific committee activities including editorial boards and program planning. The APS Program Committee should consider encouraging an annual scientific symposium at the spring meeting that addresses an area that is of interest and of scientific relevance to industry.

In summary, it is quite clear that the APS has, in the past, viewed industry and its members working in industry as a resource. Unfortunately, this resource is considered to be primarily financial in nature rather that intellectual and scientific. The Society needs to look past the financial issue and recognize that industry has developed an extraordinary intellectual and scientific establishment that is moving ahead rapidly in many different applied research areas. The Society needs to readdress its views about physiological research in industry and the relevance that these efforts have to the overall goals of the Society. The LWIC is now in position to provide the needed route of communication between the Society and the biomedical research industry both at the executive level as well as at the level of the individual scientist.

Stephen F. Flaim, Chair

A special thanks to Ralph Kellogg for supplying photographs of the APS Spring Meeting, Anaheim, CA, April 1992.

Membership

During the current year (April 1991–April 1992) the Membership Committee received 159 applications for Regular membership, of which 149 were recommended for approval. One application was recommended for Corresponding membership on the basis of residence, while 9 were considered premature and recommended for Associate Membership. The committee also received 38 applications for Corresponding membership. Thirty-five plus the one transferred from Regular were recommended for approval. Three were recommended for Associate Corresponding membership.

Eugene M. Renkin

Because of difficulties committee members have encountered in evaluating the independence of young applicants and of evaluating the qualifications of older applicants formerly but not presently active in research, a recommendation was made to Council that 1) a single sponsor's letter be required for upgrading membership from Associate to Regular and that the instructions be modified to request information bearing on the applicant's independence, and 2) a list of publications extending back more than the present limit of five years be allowed.

The Membership Committee also discussed ways in which Society membership might be enlarged, particularly by modifying the requirements for membership to allow physiologists whose principal contribution is administration, teaching, or other scholarly activity to become Regular members. In consequence of these discussions and interaction with Council, the committee submitted the following recommendations to Council: 1) that the criteria for Regular membership be changed to a terminal degree (MS, MD, DVM, DSc, or PhD) in physiology, medicine, or a related field, plus at least two year's experience beyond the degree engaged in teaching and/or research in biological or biomedical science, plus a statement by the applicant of his or her commitment to a career of teaching and/or research; 2)that the present requirement for publications be eliminated (The requirement for nomination by two Regular members would be retained.); 3) that Associate membership be retained only as a transitional category, for persons in training, from their entry into a Master's or Doctoral program until they qualify for Regular membership (This subsumes the Student membership category, which could then be eliminated.).

At the request of Council, the Membership Committee formulated a revised By-law regarding revocation of membership for causes other than nonpayment of dues (the only basis covered by our current By-laws).

Eugene M. Renkin, Chair

Program

The Program Committee (PC) and the Program Advisory Committee (PAC) are separate entities that function in a coordinated fashion under a single chair. The PAC is a rather large body of 25–30 persons; it is composed of representatives from the various subspecialty sections and groups of the APS, of the 6 regular members of the PC, and a numbers of ex officio members. They meet once a year at the spring meeting, formerly known as FASEB, thenceforth to be called Experimental Biology '93, . . . '94, . . . '95, etc. Prior to their meeting, the members of the PAC review written proposals for symposia, workshops, and tutorials that have been submitted for the following spring meeting, as well as proposals for APS Conferences to be held two years hence. During a meeting that lasts three to four hours, the PAC discusses and ranks the proposals. This year, 35 proposals for the next spring meeting and 5 prospectuses for APS Conferences were considered. Members of the PAC also suggest topics and organizers for symposia and APS Conferences to be held in subsequent years.

Heinz Valtin

Usually two days after the meeting of the PAC, the PC meets to fine tune the scientific programming of the Society for the coming year. The session is an additional, important step that achieves overall balance among sections and groups, and therefore of topics; avoids duplication; and judges financial implications and feasibility. The selections by the PC are then recommended to the Council for approval. This year, the approved programs consisted of 22 symposia (including 5 proposed by guest societies), 1 workshop, and 2 tutorials for Experimental Biology '93, and 2 APS Conferences to be held between June and December of 1994. The specific titles and names of organizers and participants will be announced in *The Physiologist*.

The new format for the spring meetings will be initiated with Experimental Biology '93, which will be held in New Orleans March 29–April 1. The reasons for some reorganization were discussed by Martin Frank in "Reaching for New Frontiers," which appeared in the February 1992 issue of *The Physiologist*. First, it is to be emphasized that the successful parts of the old format will not be sacrificed and that members of the Society who look to the spring meetings for a cluster of programming centered about their particular scientific interest will continue to find such clusters. What is new is that the sessions that were selected by each of the participating societies through processes similar to those described earlier for the PAC and PC now have been programmed in a coordinated fashion in the hope of avoiding duplication and conflicts of scheduling. That coordinating process was accomplished at a meeting held in Bethesda on May 4, where representatives from the participating societies grouped the proposals into a single, integrated program.

It is the aim of the PC and the PAC to make our scientific meetings so current, relevant, and pleasant that the members of the Society will look upon APS-sponsored meetings as "musts" that cannot be missed. In this effort, we solicit the help of the membership: any member is welcome to bring ideas for topics and organizers to the attention of the PAC and PC, preferably through the subspecialty section or group to which they belong.

Heinz Valtin, Chair

Publications

On January 1, 1992, Diana L. Kunze (Baylor College of Medicine) joined James A. Schafer and Loring B. Rowell on the Committee. Melvin J. Fregly completed his term on December 31, 1991; we thank him for his dedication and his sage advice. John S. Cook, Chairman, resigned December 31, 1991 to assume new responsibilities at Oak Ridge. He served three years on the Publications Committee before his two and one-half years as Chairman. We owe him a special note of thanks for his dedicated leadership. Charles M. Tipton was appointed to complete his term.

Charles M. Tipton

Journals

In 1991, the Publications Department received 5,699 submitted manuscripts, rejected approximately 40% of them, and published over 27,000 pages in its research and review journals. These figures reflect increases of 3% in submissions and 3% in pages published, with little change in rejection rates. Two journals, *AJP: Cell Physiology* and *AJP: Lung Cellular and Molecular Physiology*, had a significant increase in submissions, 20% and 24%, respectively. Submissions have continued to increase overall for the first half of 1992. Published pages are up 2%.

A US-USSR joint symposium, "Cardiovascular and Pulmonary Biology and Medicine," was published as a supplement to the consolidated *AJP, AJP: Lung Cellular and Molecular Physiology,* and *AJP: Heart and Circulatory Physiology.* The 122-page symposium contained 21 articles. Production costs were paid by the National Institutes of Health (NHLBI), who sponsored the symposium.

In 1992 institutional subscription prices for the journals were increased by 15% for the consolidated *American*

Senior Physiologists

The members of the committee were saddened by the death of the Chair of the committee, David Green, in October 1991. Ralph Kellogg, University of California at San Francisco, has been appointed to fill the vacancy, and Helen Tepperman has agreed to serve as Chair.

The Senior Physiologists Committee has corresponded with APS members who are over 70 years old and encouraged them to report their activities and any "words of wisdom" they may have to share with younger colleagues. With their permission, their replies have been published in *The Physiologist*. Each member of the committee has been assigned a section of the list of members over 70 to get in touch with and greet near the dates of their 70th, 72nd, and 80th birthdays. Exchange of individual names could be arranged if personal friends are involved.

From January 1991 through the first quarter of 1992, 71 responses to such notes have been published in *The Physiologist* under the column, "News From Senior Physiologists." Various members of the committee reported that approximately 30%–50% of their letters and cards have been answered.

During the same period of time, committee members have reviewed two applications for awards from the G. Edgar Folk, Jr. Senior Physiologists Fund. Recommendations for approval or disapproval were sent to Martin Frank, Executive Director.

The work of the committee has been greatly facilitated by Martin Frank so that it is very rewarding and not at all burdensome.

Helen M. Tepperman, Chair

Women in Physiology

The Women in Physiology Committee met once by conference call in March and once during the spring meeting in Anaheim.

A total of 127 abstracts were submitted for the 1992 Caroline tum Suden Award. Six awards were presented at the Spring meeting in Anaheim. Two of the awards were made to graduate students and the other four were given to postdoctoral fellows. To increase the quality and competitiveness of the abstracts submitted for this Award, a description of the criteria that are used to review the abstracts will be published in an upcoming issue of *The Physiologist*. Guidelines for eligibility for the Award will also be provided.

The Committee is in the process of determining the value of a mentoring program for junior women in the Society and students who are considering physiology as a career choice. The program would consist of senior (e.g., tenured) physiologists who would serve as mentors for women students, postdoctoral fellows, and junior faculty. Because only 10% of the APS is made up of women physiologists, many younger women in their training periods or who hold junior faculty positions have no access to a senior women physiologist who could serve as a role model and source of information on issues unique to women scientists. In addition, many male physiologists are interested in furthering the recruitment and retention of women into our discipline and have expressed their willingness to serve as mentors in the program. Increased involvement of junior members in Society activities is also viewed as a benefit of the program. Society members will be receiving an informational letter describing the program, as well as a questionnaire directed to potential mentors and junior scientists who are interested in using the program. The questionnaire will allow the committee to design and implement a mentoring program that reflects the interests and needs of junior scientists. The committee encourages all Society members to convey their thoughts and suggestions about the program through completion of the questionnaire. Because many younger scientists who would benefit from the program may not yet be APS members, it will be important for Society members to distribute the letter and questionnaire to as many young female scientists as is possible.

Hannah V. Carey

The committee continues to encourage women members to participate in Society activities through membership on APS committees. Nomination forms are available through the APS office and are also published in *The Physiologist*.

The FASEB Excellence in Science Award Committee met in Anaheim at the spring meeting. Hannah Carey, Chair of the APS Women in Physiology Committee, will be chairing the Excellence in Science Award Committee for the next year. All APS members are encouraged to submit nominations for this prestigious Award. Nominations are due October 1 of each year, and guidelines for nominations are published in *The FASEB Journal* and *The Physiologist*. This award recognizes outstanding women scientists who have made significant contributions to their field of research and who have served as mentors/role models for younger female and male scientists. The Award is accompanied by an unrestricted research price of $10,000, which is generously provided by Eli Lilly and Company.

Hannah V. Carey, Chair

Sections and Reports

Society Sections

How To Become Affiliated

In compliance with the Society's Bylaws, a number of sections have been organized encompassing various physiological specialty interests. These sections advise the Society on matters of interest to the specialty represented by the section, assist the Society in organizing scientific meetings, and nominate individuals to membership on Society committees.

Membership in the sections is open to all members of the Society. The Statement of Organization and Procedures for each section established specific requirements for membership. APS members who wish to become affiliated with one or more of the listed sections should contact APS Membership Services, 9650 Rockville Pike, Bethesda, MD 20814-3991. Tel: (301) 530-7171.

Cardiovascular

James Covell, Chair and Section Advisory Committee (1993)
Harris J. Granger, Treasurer (1993)
Hermes A. Kontos, Secretary (1993)
Erik Ritman (1993) and Diana L. Kunze (1994), Program Advisory Committee
James Faber (1995), D. Neil Granger (1994), and Kim P. Gallagher (1993), Nominating Committee

Cell and General Physiology

Melvyn Lieberman, Chair and Section Advisory Committee (1995)
Caroline S. Pace, Secretary-Treasurer (1995)
Peter M. Cala, Program Advisory Committee (1993)
Antonio Scarpa (1993) and Lazaro J. Mandel (1993), Steering Committee

Central Nervous System

Richard Hawkins, Chair and Section Advisory Committee (1994)
Beverly Bishop (1993), Helen Cserr (1993), Lester Drewes (1993), James Krueger (1993), Ralph Lydic (1993), and Celia Sladek (1992), Steering Committee

Comparative Physiology

Eldon J. Braun, Chair and Section Advisory Committee (1994)
Marvin H. Bernstein, Secretary (1992)
Stan L. Lindstedt, Treasurer (1993)
Stephen H. Wright, Councillor (1994)

Endocrinology and Metabolism

Charles Blake, Chair and Section Advisory Committee (1995)
David Wasserman, Secretary-Treasurer (1995)
Jessica Schwartz, Program Advisory Committee (1995)
Richard N. Bergman (1994) and Kenneth L. Barker (1994), Councillors

Environmental and Exercise Physiology

Ethan R. Nadel, Chair and Section Advisory Committee (1994)
Barbara Horwitz, Secretary-Treasurer and Program Advisory Committee (1993)
Charles Tipton (1992), Kent B. Pandolf (1993), John E. Greenleaf (1994), Steering Committee
Reed W. Hoyt, Hypoxia Group Subsection (1996)

Gastrointestinal Physiology

Jack D. Wood, Chair and Section Advisory Committee (1994)
Joseph Fondacaro, Secretary-Treasurer (1994)
Gilbert Castro, Program Advisory Committee (1993)
Terry Machen, (1993), Patrick Tso, (1994), William A. Weems (1992, Steering Committee

Neural Control and Autonomic Regulation

Marc P. Kaufman, Chair, Program Advisory Committee, and Section Advisory Committee (1993)
Lawrence P. Schramm, Secretary (1994)
Cheryl M. Heesch, Treasurer (1994)

Renal Physiology

Walter F. Boron, Chair and Section Advisory Committee (1993)
P. Darwin Bell, Secretary (1992)
Pamela K. Carmines, Treasurer (1994)
Mark A. Knepper (1992) and Bruce M. Koeppen (1993), Program Advisory Committee

Respiratory Physiology

Joe R. Rodarte, Chair and Section Advisory Committee (1993)
Jimmie T. Sylvester, Secretary (1994)
D. Eugene Rannels, Treasurer (1993)
Edward D. Crandall, Councillor (1993)
Aron B. Fisher, Program Advisory Committee (1994)

Teaching of Physiology

Daniel Richardson, Chair and Section Advisory Committee (1993)
Richard Manalis, Secretary (1995)
Lois J. Heller, Treasurer (1995)
Philip A. McHale, Program Advisory Committee (1994)
Robert G. Carroll, Education Committee Liaison (1993)

Water and Electrolyte Homeostasis

John E. Hall, Chair and Section Advisory Committee (1994)
Ronald H. Freeman, Secretary-Treasurer (1993)
Ian Reid, Program Advisory Committee (1995)

Epithelial Transport Group

John Cuppoletti, Chair and Program Advisory Committee (1995)

History of Physiology Group

John B. West, Chair (1993)
Daniel Gilbert, Secretary-Treasurer (1994)
Giuseppe Sant'Ambrogio, Program Advisory Committee (1994)

Hypoxia Group

Judith A. Neubauer, Chair (1996)
Reed W. Hoyt, Secretary and Program Advisory Committee (1996)

Myo-Bio Group

Marion J. Siegman, Chair (1993)
Jack A. Rall, Program Advisory Committee (1993)
Robert S. Eisenberg (1992), Alexandre Fabiato (1993), Allan W. Jones (1993), Melvyn Lieberman (1993), Robert L. Moss (1993), and R. John Solaro (1993), Steering Committee

Comparative Physiology

The Scholander Award is presented annually at the spring FASEB meeting to the outstanding student paper in the area of Comparative Physiology in memory of Pers Scholander. The competition for the prize this year in Anaheim drew 13 diverse and excellent papers, making the task for the judges more difficult than usual.

Selected for honorable mention were papers by A. R. Villalobos and E. J. Braun, University of Arizona, "Tetraethylammonium (TEA) transport by avian renal brush border members," and E. E. Williams and J. R. Hazel, Arizona State University, "Rapid alterations in membrane during cold exposure in trout hepatocytes."

The winner of the 1992 Scholander Award was Stephen Comeau of Creighton University. He presented a paper with his major advisor, James Hicks, entitled, "Vagal regulation of central vascular blood flow in the turtle." This year Hewlett Packard honored the winner with a LX95 PalmTop computer in addition to the $100 cash prize from the Comparative Physiology Section. Congratulations to all three winners.

Eldon Braun (left), president of the Comparative Physiology Section, and Scholander Award winner Stephen Comeau.

Renal Physiology

The Renal Physiology Section presented the Award for Excellence in Renal Research at the spring FASEB meeting to six students. The awardees (left to right) are **Raymond Glahn** (postdoctoral category; advisor, F. Knox, Mayo Clinic), **Taisuke Isozaki** (postdoctoral category; advisor, J. Sands, Emory University), **Susan Mulroney** (postdoctoral category; advisor, A. Haramanti, Georgetown University), **Karyn Todd-Turla** (graduate student category; advisor, J. Schnermann, University of Michigan), **Xiaoming Zhou** (graduate student category; advisor, C. Wingo, University of Florida), and **Thomas Manger** (graduate student category; advisor, B. Koeppen, University of Conneticut).

The Renal Physiology Section has established an annual award in honor of Robert W. Berliner. This award will be presented at the annual Renal Dinner each year to a senior American scientist to recognize lifetime achievement in the field of renal physiology. **Gerherd Giebisch** (right) introduced Robert Berliner at this year's dinner.

Respiration

Respiration Dinner, APS/FASEB Spring Meeting, Anaheim, CA. Left-right: J. Butler, K. Wasserman, and S. Chambers.

Teaching of Physiology

Membership

	Primary		Secondary	Tertiary	Total
	Regular	Associate	All	All	
1991	74	52	216	326	668
1992	90	63	237	348	738

This past year the teaching section saw an approximate 20% growth in primary membership. Since the secondary and tertiary memberships also increased, the growth of the section's primary membership reflects an infusion of new members and not just a redistribution of the existing membership.

The steady growth in section membership experienced over the past few years (there were 68 primary regular members in 1990) is probably a reflection of an increasing trend of academic physiologists to identify teaching as their primary professional interest. This suggests that the teaching sec-

tion is meeting its objective of providing a home within the Society for those who consider teaching as their major professional role.

Although the section has grown this year, the number of primary regular members still falls short of the magic 100 suggested to be a minimum level for all sections. The argument made for the teaching section in this regard is that several of the primary associate members cannot meet regular membership criteria since they are engaged in teaching and not bench science. To determine if this might be the case, the 1990–1991 primary membership list was categorized in accordance to whether a person was employed in an undergraduate or nonresearch setting or whether they were employed in a research environment such as a medical school. Twenty-six (26) percent of the primary regular membership and 56% of the primary associate membership of the 1990–1991 teaching section were employed in undergraduate or nonresearch settings. Extrapolating these data to the 1991–1992 membership, an estimated 35 primary associate members of the teaching section may not be eligible for regular membership since their professional activities may not be slanted toward research. If this were the case for only one-third of these individuals, then the primary regular membership of the teaching section would be over the magic 100.

In summary, the growth of the teaching section suggests that it is meeting the need of providing a society home for those who are "primarily" teachers of physiology. However, we are still short of the magic 100 primary regular members, and this may in part be due to the fact that it is difficult to meet present APS regular membership criteria on the basis of teaching credentials alone. To address this situation, we recommend that either the magic number be based on the total primary membership of a section (regular + associate) or that the membership criteria be changed to include teaching excellence in lieu of research expertise as a basis for regular membership in APS. A proposal centered on the latter recommendation was submitted by the teaching section to the membership committee about a year ago. The status of this proposal has not been reported back to us.

Section Finances

(1) Section Operating Budget Fiscal 1991:

APS Allocation	$500.00
Membership Capitation	$148.00
Total Income	$648.00
Expenditures	$4,475.58
Balance	($3,809.58)

(2) Restricted Teaching Section Fund:

corporate sponsors	$963.18
1992 Section Banquet	0.00
	(cost = income)

(3) Future budgeting:

The section treasurer (Lois Heller) has been charged with drafting a realistic budget for section operating expenses. This will be taken by the chair to a future meeting of a SAC subcommittee (of which the chair is a members) charged with establishing new budgetary guidelines for all sections to follow.

Section Steering Committee

1991–1992

Office	Office Holder	Term ends
Chair	Daniel Richardson	1993
PAC Rep.	Philip McHale	1994
Secretary	Kathryn Taubert	1992
Treasurer	Nels Anderson	1992
Councillor	Robert Carroll	1993

1992-1993

Chair	Daniel Richardson	1993
PAC Member	Philip McHale	1994
Secretary	Richard Manalis	1995
Treasurer	Lois Jane Heller	1994
Councillor	Robert Carroll	1993

Program Activities

FASEB 1991

Section Banquet: Sunday evening, April 21, 1991

Poster Discussion Session: Enhancing the Traditional Pedagogical Skills and the Learning Process (Ronald Carlin, Chair)

Poster Discussion Session: Biomedical Research in Developing Countries (Daniel Richardson, Chair) (Co-sponsored with International Physiology Committee)

Poster Discussion Session: Computer Applications in Teaching Physiology (J. P. Meehan, Chair)

Computer Demonstration Area in the Exhibit Hall (Harold Modell, Organizer)

FASEB 1992

Section Banquet: Sunday evening, April 5, 1992

Poster Discussion Session: Wednesday April 8, 1992. Teaching Materials and Methods (Philip McHale, Chair)

Workshop: An Experience of Various Interactive Teaching Techniques (Roger Thies, Chair)

Computer Demonstration Area in the Exhibit Hall (Harold Modell, Organizer)

Other Activities

1) *Organization of a two-day workshop entitled "Promoting Active Learning in the Physiology Classroom"*

Last year a subcommittee of the teaching section consisting of Harold Modell (chair), Joel Michael, and Daniel Richardson organized a workshop on active learning and presented it to the APS program committee for consideration as a specialty conference. The program committee gave the proposal due consideration, but in the end turned it down. Following this action those involved with the proposal decided to carry on and seek support elsewhere. This has now been done, and we have been successful in obtaining support from the New York Academy of Sciences who will sponsor the workshop and provide assistance in its organization and promotion. The focus of the workshop will be on the development of techniques for teaching active learning and the venue will be Lexington, Kentucky, February 13 and 14, 1993. The workshop is being is being targeted for about 200 participants.

2) *Teacher of the Year Award*

Last year an ad hoc awards committee of the teaching section consisting of Roger Thies (chair), Allen Rovick, and David Bruce submitted a proposal to APS to the effect that an annual award be given at the Society business meeting at FASEB to the individual identified by the APS membership to be the best teacher of the year. The proposal was rejected by Council with the main reason being that in their opinion it would be impractical to evaluate candidates on a national basis.

The teaching award issue was discussed at the 1991 section business meeting, and their was a consensus that we press on with the idea and attempt to secure support elsewhere. After five months of searching and negotiating, the awards committee has been successful in obtaining financial support. The award is to be named the Arthur Guyton Physiology Teacher of the Year Award, and it will be financed by W. B. Sanders with a prize of $1,000 to the recipient plus an additional $1,000 for expenses. The expenses will consist of $100 for the award itself plus $900 for travel to FASEB.

The award will be Society wide in that the nominators and nominees need only be members of APS. Criteria for the award and procedures for nominating individuals have been drawn up and procedures for a schedule of announcements in *The Physiologist* and *Advances in Physiological Education* are being arranged with Martin Frank. The awards committee is planning to present the first award during the teaching section dinner at the 1993 FASEB meeting in New Orleans.

3) *Interactions with undergraduate physiology teaching societies.*

Interactions with undergraduate organizations such as HAPS (Human Anatomy and Physiology Society) has become an "official" activity of the teaching section in that the duties of the section councillor have been expanded to include serving as a liaison between these organizations and the teaching section of APS (see VII below, Amendments to the Section Operating Procedures).

During this past year Robert Carroll, teaching section councillor, and Allen Povick, past councillor, attended the annual meeting of HAPS in June. The main purpose of their attendance was to establish communication links between APS and HAPS. The meeting was very productive in this regard and several areas of mutual interest were identified. A full copy of their report of the Haps meeting was submitted to Martin Frank, APS Executive Director, and Norman Staub, APS President.

In regard to future interactions, Wayne Carley, Lamar University, will be serving a the liaison from HAPS to APS. Both Robert Carroll and Norman Staub are scheduled to attend the 1992 meeting of HAPS, and Dr. Carroll will be presenting a workshop on active learning at this meeting.

In other matters related to this area, the chairperson of the teaching section wrote an introductory letter to Rebecca Halyard, President of the Society for College Science Teachers, stating our willingness to establish ties with their organization. As yet we have not heard back from her.

Advances in Physiology Education

This journal has acquired a new editor, Penny Hansen, Assistant Dean of Undergraduate Medical Education at Memorial University of Newfoundland. She has expressed interest in working closely with the Teaching Section in the development of the journal, and in this regard she has been appointed as an ex officio member of the section steering committee (see VII below).

Amendments to the Section Operating Procedures

At the section business meeting the following amendments to our Section Operating Procedures were approved.

1) That the Councillor will serve as the section's liaison to physiology education organizations outside of the American Physiological Society in addition to serving as liaison to the APS Education Committee.

2) That the editor of Advances in Physiology Education will serve as an ex-officio member of the section steering committee.

Daniel Richardson, Chair

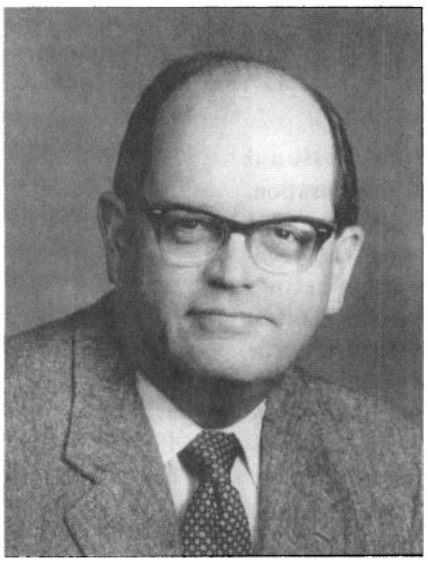
Awards

1992 Ray G. Daggs Award

Howard Edwin Morgan has made major contributions to teaching and research in physiology and moreover has been a leader in many of the functions of the American Physiological Society.

He was born in Bloomington, Illinois, and began college in that city at Illinois Wesleyan University. After one year Morgan transferred to Johns Hopkins University, where, in 1949, he received his MD degree. The next 10 years were spent at Vanderbilt University, where he served as a house officer in obstetrics and gynecology and also as an investigator in physiology—the latter in the Howard Hughes Institute at Vanderbilt. By 1966, Morgan rose to the rank of professor, and the following year, he became the first professor and the chairman of the Department of Physiology at the new Milton S. Hershey Medical School in Hershey, Pennsylvania.

Howard Morgan is a member of several national and international biochemical societies and heart associations. During the period of 1985–1986, he became chairman or president of three of these societies. He was elected to the Council of the American Physiological Society in 1983 and became its president in the following year.



Among the many contributions Morgan has made to our Society are his role in planning our centennial celebration and his active involvement in modifying the governance of our Society to ensure broader representation of the various sections.

Howard Morgan's major contributions have been in the area of publications. He was instrumental in making final arrangements for the joint publication of *News In Physiological Sciences (NIPS)* by the APS and the IUPS. Very importantly, he was editor of *Physiological Reviews* and has been editor or associate editor of sections and journals both in our Society and in related fields.

During the past 25 years the presidents of APS have often expressed concern about the apparent fragmentation of the science and the development of diverse and presumably independent interests by members of the Society. A countertendency is beautifully illustrated in the lecture Morgan gave when he received the Carl J. Wiggers Award in 1984. He described experiments that began with a problem in classic physiology, the response of the heart to increased load. However, he pursued the response, not only by use of traditional physiological measurements such as oxygen consumption, but on through analysis of pathways of protein, carbohydrate, and lipid metabolism, until he reached the measurement of rates of synthesis and degradation of the several forms of RNA. The experiments moved clearly and easily from the whole organ to the level of molecular biology. His lecture illustrates how what seem to be old-fashioned problems can be studied by using the most sophisticated of modern techniques to provide a clearer understanding of what really takes place in living organisms.

Ray G. Daggs Award Recipients

1974	John H. Brookhart	1981	Arthur C. Guyton	1987	Orr E. Reynolds
1975	Maurice B. Visscher	1982	Robert W. Berliner	1988	Horace W. Davenport
1976	James D. Hardy	1983	C. Ladd Prosser	1989	Bodil Schmidt-Nielsen
1977	Julius H. Comroe	1984	Edward F. Adolph	1990	Robert Berne
1978	Hermann Rahn	1985	A. Clifford Barger	1991	Hallowell Davis
1979	John R. Pappenheimer	1986	David B. Dill	1992	Howard E. Morgan
1980	John R. Brobeck				

APS and Section Awards

Society Awards

Caroline tum Suden Professional Opportunity Awards

The APS **Caroline tum Suden Professional Opportunity Awards** ($500, complimentary registration, and placement service fees) are granted to as many as six graduate students or postdoctoral fellows who present a contributed paper at the Experimental Biology meeting. Candidates must be the first author of an abstract submitted to APS. An accompanying letter, signed by the sponsor of the abstract, must contain 1) certification that the author is a student or postdoctoral fellow and 2) the approximate date the nominee will be available for employment. Awardees are notified by the Selection Committee prior to January 31 and presented with their awards during the APS Business Meeting.

NIDDK Travel Fellowships for Minority Physiologists

NIDDK Travel Fellowships for Minority Physiologists are open to advanced undergraduate, predoctoral, and postdoctoral scientists who have obtained their undergraduate education in Minority Biomedical Research Programs (MBRP) and MARC-eligible institutions, as well as students in the APS Porter Development Program. Applications may also be submitted by minority faculty members at the above institutions. Funds will provide transportation, meals, and lodging to attend the annual spring Experimental Biology meeting. The specific intent of this award is to increase participation of the pre- and postdoctoral minority students in physiological sciences. Applicants need not be members of the APS but should be US citizens or hold permanent resident visas. Applications should include 1) information on academic background and experience; 2) a written statement of interest in research in physiology; 3) a letter of recommendation from the applicant's mentor; 4) a list of publications, if available; 5) a statement indicating the underrepresented minority (Black, Hispanic, American Indian, etc.) with which the applicant identifies himself/herself; and 6) an estimate of required travel and per diem expenses. The deadline for receipt of completed applications is December 31.

John F. Perkins, Jr. Memorial Fellowship

The American Physiological Society invites applications for the **John F. Perkins, Jr. Memorial Fellowships**. The Perkins Fellowships are designed primarily to provide supplementary support to foreign physiologists who have already arranged for fellowships or sabbatical leave to carry on scientific work in the United States.

The supplementary support is intended to help foreign scientists bring their families to the United States and thus enable them to take fullest advantage of other cultural benefits inherent in international exchange. Preference will be given to physiologists working in the fields of respiratory physiology, neurophysiology, and temperature regulation. Applications from scientists in developing countries will also be given special attention.

Application should be made by both the visiting scientist and his/her host. To qualify, the host must be a member of the American Physiological Society. The application should contain an account of these arrangements with a brief description of the proposed scientific work and an account of how visitors and their families intend to make use of cultural opportunities during their stay. Deadlines for receipt of applications are May 1 and November 1. Applications may be obtained from the Executive Director, American Physiological Society, 9650 Rockville Pike, Bethesda, MD 20814, USA.

Orr E. Reynolds History Award

The Orr E. Reynolds Award is 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 annual spring Experimental Biology meeting. If the awardee wishes, and there is a suitable place on the program, an oral presentation will be made at the Experimental Biology meeting or a subsequent conference 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 chair of the History of Physiology Group. At least one member will be a professional historian.

Manuscripts should be typed and double spaced with wide margins on 8.5 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. Manuscripts should be sent to the Orr E. Reynolds Award, American Physiological Society, 9650 Rockville Pike, Bethesda, MD 20814, by December 1. The recipient of the award will be announced at the Experimental Biology meeting.

Section Awards

Procter & Gamble Professional Opportunity Awards

The Procter & Gamble Professional Opportunity Awards (providing $500 and complimentary registration for the spring Experimental Biology meeting) are granted to at leat 17 predoctoral students who present a contributed paper at the meeting. Candidates must be the first author of an abstract submitted to APS and within 12–18 months of completing his/her PhD degree. All recipients must be US citizens or hold a permanent resident visa. An accompanying letter, signed by the sponsor of the abstract, must contain 1) certification that the author is a predoctoral student and 2) the approximate date of degree completion. Awardees will be notified before February 15. Awardees are selected by the following sections of APS: Cardiovascular, Cell & General Physiology, Comparative Physiology, Endocrinology and Metabolism, Environmental and Exercise Physiology, Gastrointestinal Physiology, Nervous System, Neural Control & Autonomic Regulation, Renal Physiology, Respiratory Physiology, Teaching of Physiology, and Water & Electrolyte Homeostasis.

Cardiovascular

The Cardiovascular Section presents three annual awards—Fellowship, the Lamport Award, and the Carl J. Wiggers Award. Nominations for **Fellowship Awards** must be made by at least two existing fellows with supporting letters sent to the steering committee for vote. The total number of fellows cannot exceed 5% of the APS regular members who have published meritorious research in cardiovascular physiology. The **Lamport Award** is presented to a young investigator under the age of 36 showing outstanding promise in his/her field of cardiovascular research. The recipient, who receives a certificate and a $200 check, is selected by the Wiggers awardee of the previous year. The **Carl J. Wiggers Award** honors a founder of the section and is presented to a scientist who has made outstanding and lasting contributions to cardiovascular research.

Comparative Physiology

The Comparative Physiology Section **Scholander Award** is presented annually to recognize an outstanding young investigator presenting a papers as first author in a comparative physiology slide session at the spring Experimental Biology meeting. Candidates must be graduate students or postdoctoral fellows, not more than five years beyond their highest degrees. The recipient receives a cash award of $100 and a certificate from the APS.

Environmental and Exercise Physiology

The Environmental and Exercise Physiology Section presents two annual awards. The **Young Investigator Award** ($150) is for the recognition of excellence in research by a graduate student. The **Honor Award** ($200) is given to a member of the section who has had a lifetime of outstanding research. Candidates must be first author on a paper presented at a previous APS meeting. Honoring Harwood S. Beling, the awards are presented at the section dinner.

Gastrointestinal Physiology

The Gastrointestinal Physiology Section **Student Prize** is designed to challenge and reward students and postdoctoral fellows who are conducting their research efforts in gastrointestinal physiology. Two awards—one for work done while enrolled as a student for a doctoral degree and the other for work performed during the first through third postdoctoral years—are presented at the spring Experimental Biology meeting. Applicants must be first author on abstracts submitted for the Experimental Biology meeting, which are accompanied by a letter from the applicant's advisor indicating whether the applicant is a graduate student or postdoctoral

fellow. Each award consists of a certificate and $300. The Steering Committee chooses a senior physiologist as the recipients of the **Smith, Kline and French Prize** in Gastrointestinal Physiology. The awardee receives $500 and presents a lecture at the Section's annual meeting.

Renal Physiology

The Renal Physiology Section **Award for Excellence in Renal Research** is to promote and develop excellence in research related to molecular, cellular, and organ mechanisms expressed by the kidneys. Annual awards are presented to a graduate and a postdoctoral student, with judging based on abstract submission (25%) and meeting presentation (75%). Papers are evaluated by three judges in renal hemodynamics, epithelial transport, and metabolism. A certificate and prize of $200 are presented to the recipients at the annual renal dinner.

Teaching of Physiology

The Teaching of Physiology Section of the American Physiological Society sponsors the **Arthur C. Guyton Physiology Teacher of the Year Award.** The award is sponsored by the W. B. Saunders Company. Nominees must be full-time faculty members of accredited colleges or universities and members of the APS. They must be involved in classroom teaching and not exclusively teaching of graduate students in a research laboratory. Each nominee must be nominated by a member of APS. The nominator is responsible for completing application materials and forwarding three copies to the chairperson of the Award Selection Committe. The deadline for receipt of applications is November 30.

The person selected will receive the award at the banquet of the Teaching of Physiology Section at the spring Experimental Biology meeting. The Teacher of the Year will receive a certificate, an honorarium of $1,000, and expenses of up to $900 to attend the meeting.

1992 Award Recipients

Henry Pickering Bowditch Lecture

Roger Y. Tsien, University of California, San Diego

Walter B. Cannon Lecture

Karlman Wasserman, University of California, Los Angeles

Caroline tum Suden Professional Opportunity Awards

Kaarin Goncz, Lawrence Berkeley Laboratory, Berkeley, CA
Yue Lin, University of Virginia, Charlottesville
Harold I. Magazine, Albany Medical College, Albany, NY
Susan E. Mulroney, Georgetown University, Washington, DC
Peipei Ping, University of North Carolina, Chapel Hill
Karyn M. Todd-Turla, University of Michigan, Ann Arbor

1991 Caroline tum Suden Professional Opportunities Awardees with H. Carey (left), chair of the Women in Physiology Committee.

Ray G. Daggs Award

Howard E. Morgan, Geisinger Clinic, Danville, PA

John F. Perkins, Jr. Fellowship Awards

Visiting Scientists and Hosts

Cediminas Cepinskas, Institut of Biochemistry Lithuanian Academy of Science, Vilnius, Lithuiania. Host: Peter R. Kvietys, Louisiana State University, Shreveport, LA

Ahmad P. M. Yusof, Universiti Sains Malaysia, Penang, Malaysia. Host: Arthur D. Loewy, Washington University, St. Louis, MO

1992 NIDDK Travel Program

The APS, with support from the National Institute of Diabetes, Digestive and Kidney Diseases (NIDDK), awarded travel fellowships to 25 underrepresented minorities to attend the annual spring APS/FASEB meeting. The APS/NIDDK program, which has been in existence since 1987, provides awardees with reimbursement for transportation, meals, and lodging. Each Fellow is assigned to an individual mentor who guides the Fellow through the meeting and introduces him/her to leading scientists. The culmination of the Fellows' participation is a closing luncheon to review the week's scientific activities and to hear an APS member discuss his/her research.

For the April 1992 meeting in Anaheim, the Society received applications from 49 candidates. Table 1 provides a breakdown of the minority and academic status of the applicants and awardees. Twenty-seven of the applicants identified themselves as African American and 19 identified themselves as Hispanic. Of the 25 awardees, 11 identified themselves as Hispanic and 13 identified themselves as African American. The 1992 Spring Meeting Awardees were

John J. Andazola, New Mexico State University
Daniel G. Baldwin, University of Arizona
Barika Bettis, Clark Atlanta University
Francis N. Bosah, Clark Atlanta University
Renita D. Butler, Meharry Medical College
Virginia G. Corpus, New Mexico State University
Robert E. Espinoza, San Diego State University
Lillybeth Feliciano, Ponce School of Medicine
Eric A. Floyd, Meharry Medical College
Orlando Gonzalez, University of Puerto Rico
Vyvian J. Gorbea-Oppliger, Michigan State University
Alane T. Gresham, University of Hawaii
Timothy A. Hawkins, Wayne State University
Benjamin Hughes, Meharry Medical College
Mark E. Lee, Morehouse School of Medicine
Juan A. Melendez, SUNY, Albany
Ozuem P. Mgbonyebi, Meharry Medical College
Alexandro Ortiz-Acevedo, University of California, Davis
Linda C. Payne, University of Tennessee
Elizabeth S. Quintana, New Mexico State University
Cheryl Torrence-Campbell, Meharry Medical College
Oscar A. Torres, New Mexico State University
Oristyne E. Walker, University of Tennessee
Anita Williams, Tulane Univ. School of Medicine
Marcus T. Wynn, Norfolk State University

Table 1. NIDDK Applicants: Minority and Acdemic Status of NIDDK Applicants and Awardees

	Applicants		Awardees	
	Male	Female	Male	Female
Hispanic				
Undergraduate student	3	1	3	1
Graduate student	7	6	4	3
Postdoctoral	1	0	0	0
Faculty	0	1	0	0
African American				
Undergraduate student	4	3	1	1
Graduate student	9	8	6	4
Postdoctoral	0	0	0	0
Faculty	1	2	0	1
Pacific Islander				
Undergraduate student	0	0	0	0
Graduate student	0	2	0	1
Postdoctoral	0	0	0	0
Faculty	0	0	0	0
Asian Indian				
Faculty	1	0	0	0
Total	25	24	14	11

1992 NIDDK Fellows

1991 Procter & Gamble Professional Opportunities Awardees

G. Edgar Folk, Jr., Senior Physiologist Fund

The G. Edgar Folk, Jr., Senior Physiologist Fund has been set up through the generosity of family and former graduate students and postdocs to provide modest but helpful assistance to senior physiologists 70 years or older who no longer have grant funds available to them. The awards might be used for such purposes as attending an APS meeting to present a paper, engaging in a series of modest experiments, or completing a manuscript (paying for typists or perhaps page charges). Recipients will be selected with the assistance of the Senior Physiologists Committee throughout the year. Names of awardees will not be made public. Mary Folk writes that the purpose of the fund is for the Senior Physiologists Committee "to have *fun* assisting colleagues and for Emeritus APS members to keep in closer touch with APS."

Inquiries concerning the G. Edgar Folk, Jr., Senior Physiologist Fund should be made to Martin Frank, Executive Director, APS.

Procter & Gamble Awards

As a result of a generous contribution provided by the Procter & Gamble Company, the APS has been able to recognize the contributions of predoctoral students to the science of physiology. Awarded by the 12 sections of the Society, based on the number of abstracts submitted by predoctoral students, P&G Professional Opportunity Awardees receive a certificate, $500, and complimentary registration for the meeting. The 17 awardees for the 1992 meeting were

Cardiovascular Section
Nelson K. Asante, University of Alabama, Birmingham
Beth A. Bailey, Temple University
Christopher Gaposchkin, Boston University
Erin Wheatley, Albany Medical College
Jian-Nan Wu, University of Alabama, Birmingham

Cell & General Section
Hector M. Maldonado, University of California, Davis
Youngsuk Oh, University of Alabama, Birmingham

Comparative Physiology Section
Alice Villalobos, University of Arizona, Tucson

Endocrine & Metabolism Section
David Bradley, University of Southern California
Linda C. Payne, University of Tennessee

Environmental & Exercise Physiology Section
Craig Crandall, Texas College of Osteopathic Medicine

Gastrointestinal Physiology Section
Aldebaran Hofer, University of California, Berkeley

Nervous System Section
Jeannine Faber, University of North Dakota

Neural Control & Autonomic Regulation Section
Glenn Toney, University of Louisville

Renal Physiology Section
Thomas M. Manger, Univ. of Connecticut, Farmington

Respiratory Physiology Section
Bryan Eckert, University of California, Berkeley
Judith K. Murphy, University of Southern California

Water & Electrolyte Homeostasis Section
Robert A. Johnson, University of Missouri

Membership

News From Senior Physiologists

Letters to Helen M. Tepperman

George N. Bedell reports that he is working full-time in the Department of Internal Medicine at the University of Iowa. "I am not actively involved in research, but I am very interested in pulmonary physiology. I find that the teaching of physiology to medical students, internal medicine residents, and pulmonary disease fellows is very rewarding and exciting.

"In my spare time I enjoy traveling. I have a son who is a physician living in El Salvador. His work there is primarily in public health. In the last year we visited El Salvador and we also did Elderhostle in Ireland. For anyone with an active mind, Elderhostle offers outstanding opportunities in education and travel."

John Bateman writes from Frederick, MD, that after a career in physiology and biophysics, starting at the University of London where he worked with A. V. Hill, continuing in Germany, Canada, and the United States, he still is spending 40% of his time in science. He collaborates with E. H. Grant at King's College, University of London.

Bateman spends summers in Maryland, 40 percent of the time in chamber music, 20 percent in various activities in the countryside and city. He expressed concern about the response of some physiologists to fanatical animal rights activists, pointing out physiologists' responsibility to consider in their research goals not only technological feasibility but simple humanity as well.

Membership Status

March 1992	
Regular	4,917
Emeritus	800
Honorary	27
Corresponding	317
Associate	768
Student	447
Associate Corresponding	45
Total	7,321

Newly Elected Members

The following were elected to membership in the Society by Council at its 1992 Spring Meeting, Anaheim, CA.

Regular

Roger H. Adamson
University of California, Davis

Robert J. Applegate
Bowman Gray School of Medicine

Tong G. Bagg
Baylor College of Medicine

Brian M. Barnes
University of Alaska, Fairbanks

Christina G. Benishin
University of Alberta

Loren A. Bertocci
University of Texas Southwestern

Wendy C. Bevier
Sansum Medical Research Foundation

Nancy D. Binder
Oregon Health Science University

Joann D. Bradley
Alliance Pharmaceutical Corporation

Matthew D. Breyer
Vanderbilt University

Lou Ann S. Brown
Emory University

Sulie L. Chang
Louisiana State University

Michele M. Cripps
Louisiana State University

William A. Cupples
Jewish General Hospital, Montreal

Scott E. Curtis
Childrens Hospital, Alabama

John A. Dani
Baylor College of Medicine

Jang E. Digiacomo
University of Pennsylvania

David A. Fryburg
University of Virginia

Joseph A. Gascho
Hershey Medical Center

Alfred L. Gest
Baylor College of Medicine

Jeffrey M. Gidday
Washington University

Robin D. Gleed
Cornell University

Brian D. Hanna
Dalhousie University

Barbara Y. Hargrave
Old Dominion University

James R. Haselton
University of California, Davis

Bruce A. Holm
Children's Hospital, Buffalo

Ming-Ta Huang
Chang Gung Medical College

Shao Y. Huang
University of Colorado

Bret A. Hughes
University of Michigan

Edward W. Inscho
Tulane University

Ira Jacobs
Defense & Civil Institute of Environmental Medicine

Michael J. Joyner
Mayo Clinic and Foundation

Masataka Kawai
University of Iowa

Dean L. Kellogg, Jr.
University of Texas, San Antonio

Laurie J. Kelly
Massachusetts College of Pharmacy

Loren W. Kline
University of Alberta

Lih Kuo
Texas A&M University

Carol A. Lapp
Medical College of Georgia

Thomas J. Lauterio
Hampton V.A. Medical Center

David M. Lawson
Wayne State University

Felix W. Leung
Sepulveda V.A. Medical Center

Joseph V. Levy
University of The Pacific

Brian N. Ling
Emory University

Leslie A. Lobaugh
Duke University

Edward T. Mannix
Indianapolis V.A. Medical Center

Kenneth H. McKeever
Ohio State University

John R. Milley
University of Utah

James N. Moore
University of Georgia

Nazih L. Nakhoul
East Carolina University

Christopher P. O'Donnell
Johns Hopkins Asthma & Allergy

Joseph A. Ontko
Louisiana State University

Mark R. Opp
University of Tennessee

Joseph T. Peterson
Parke-Davis

Saroja K. Reddy
Palmer College

Michael B. Reid
Baylor College of Medicine

Bernard J. Rubal
Brooke Army Medical Center

Maythem Saeed
University of California, San Francisco

Deborah A. Scheuer
Rorer Pharmaceuticals

Mitchell L. Schubert
McGuire VA Medical Center

Allan W. Smits
University of Texas, Arlington

Manoocher Soleimani
Indianapolis, Indiana

Adam M. Sun
Harvard Medical School

David M. Systrom
Massachusetts General Hospital

Bela Szabo
Oklahoma University

Henrich Taegtmeyer
University of Texas, Houston

Walter F. Taylor
University of Texas, San Antonio

Carol A. Tozzi
UMDNJ

Kodetthoor B. Udupa
University of Arkansas

Robert S. Walsh
University of South Alabama

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

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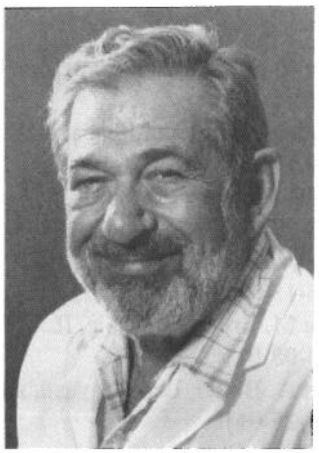
Sidney Solomon (1923–1992)



Sidney Solomon, who was one of the founders of the University of New Mexico School of Medicine, died May 16. He was 69.

Solomon moved to the New Mexico institution in 1963 from the Medical College of Virgina and was the school's first chairman of physiology, a position he held for 15 years. Solomon was a graduate of the University of Massachusetts and earned his doctorate at the University of Chicago.

His many honors include a Guggenheim Fellowship, being elected to Outstanding Educators of America, and serving as program director of the National Science Foundations' Metabolic Biology Section. He co-authored more that 100 scientific articles.

Solomon had been a member of APS for 31 years and served as a member of the Animal Care and Experimentation, Governmental Relations Initiative Programs, Membership, and Porter Physiology Development committees and secretary of the Renal Section.

Nominations for Honorary Membership

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

Deceased Members

Albert R. Behnke, San Francisco, CA (01-16-92)
Emmett N. Bergman, Ithaca, NY (10-11-89)
John W. Boylan, Guilford, CT (08-27-91)
Frank Brooks, Philadelphia, PA (03-18-91)
Austin M. Brues, Hinsdale, IL (03-08-91)*
Robert A. Butler, Lake Havasu, AZ (03-25-91)
Min Chueh Chang, Shrewsbury, MA (06-05-91)
Rudolf Clarenbury, Manhattan KS (07-29-91)
Alfred L. Copley, New York, NY (01-28-92)
Benjamin G. Covino, Boston, MA (05-30-91)*
Phoebe J. Crittenden, St. Petersburg, FL (05-13-91)
Kiertisin Dharmsathaphorn, San Diego, CA (10-09-90)
F. Curtis Dohan, Bala Cynwyd, PA (11-09-91)
R. Keith Dupre, Las Vegas, NV (11-18-91)*
Gerald T. Evans, Litchfield, MN (05-30-91)*
George H. Fried, Brooklyn NY (12-07-90)
D. Dale Gillette, Valdivia, Chile (10-03-91)
Vincent V. Glaviano, Glen Ellyn, IL (05-14-91)
Eric A. Glende, Jr., Cleveland, OH (12-02-91)
Philip D. Gollnick, Pullman, WA (06-26-91)
David Greene, Buffalo, NY (10-03-91)
M. Mason Guest, Galveston, TX (06-21-91)
Stanley C. Harris, Chicago, IL (07-23-91)
Frances A. Hellebrandt, Athens, OH (02-02-92)
Austin Henschel, Cincinnati, OH (07-01-91)
Jack W. Hudson, Birmingham, AL (09-01-90)
Robert S. Hutton, Seattle, WA (03-16-91)
Frank H. Johnson, Princeton, NJ (08-07-91)*
James R. King, Pullman, WA (04-07-91)
Milton A. Lessler, Columbus, OH (06-15-91)
Ulrich C. Luft, Albuquerque, NM (11-25-91)
Larissa Lukin, San Francisco, CA (11-18-91)
Horace W. Magoun, Santa Monica, CA (06-11-91)*
Richard C. Mason, Piscataway, NJ (11-12-91)*
Roland K. Meyer, Scottsdale, AZ (08-09-91)
Sol M. Michaelson, Rochester, MN (01-07-92)
Irvine H. Page, Hyannis Port, MA (06-10-91)
John F. Quay, Indianapolis, IN (03-17-91)
Orr E. Reynolds, Fort Lauderdale, FL (03-30-91)
Andre Robert, Kalamazoo, MI (05-20-91)
Sue S. Sanders, Fairfield, AL (09-17-91)*
Ray S. Snider, Houston, TX (09-18-91)*
David C. Willford, Poway, CA (02-05-92)*
Allan C. Young, Seattle, WA (09-20-91)*

**Indicates date notified of death*

Future Meetings

1992	
APS Conference Integrative Biology of Exercise	September 23–26 Colorado Springs, CO
APS Conference Cellular and Molecular Biology of Membrane Transport	November 4–7 Orlando, FL
1993	
Experimental Biology '93	March 28–April 1, New Orleans, LA
APS Conference Physiology and Pharmacology of Motor Control	October 3–6 San Diego, CA
APS Conference Signal Transduction and Gene Regulation	November 17–20 San Francisco, CA
1994	
Experimental Biology '94	April 24–29, Anaheim, CA
APS Intersociety Meeting Regulation, Integration, Adaptation: A Species Approach	To Be Announced
APS Conference Physiology of the Release and Activity of Cytokines	To Be Announced
APS Conference Mechanotransduction and the Regulation of Growth and Differentiation	To Be Announced

APS Urges Congress to Reaffirm Support for Biomedical Research

The American Physiological Society has urged the Congress to reaffirm its support of biomedical research by providing adequate funds for both investigator-initiated research and for the training of pre- and postdoctoral fellows.

APS President Stanley G. Schultz told the House Appropriations Subcommittee on Labor, Health and Human Services, Education, and Related Agencies that, "It can be said without fear of contradiction that the NIH [National Institutes of Health] is the best investment this nation has made, or any nation could have made, during the past half-century in the interest of mankind.

"Federally supported biomedical research during that period has placed the United States in the forefront, a position which is fragile and could easily be lost if the federal commitment to excellence in research is now lessened. Investigator-initiated research is the foundation of biomedical research."

Schultz said that adequate funding for the NIH requires an appropriation in Fiscal Year 1993 of $10.47 billion, which would support 6,233 new and competing grants and would

permit increasing the number of pre- and postdoctoral trainees by 7.5% and 2.5%, respectively.

He also urged the Congress to appropriate $1.332 billion for the Alcohol, Drug Abuse, and Mental Health Administration, which would include support for 857 new and competing research grants, an increase of 148 grants above the number awarded in FY 1992.

Maryland Poll Shows Strong Support for Medical Research

A poll in Maryland shows that four of every five voters support federally funded medical research and that two of every three voters would support increased funding for health care.

The poll, conducted for Research!America, sampled 832 registered Democrat, Republican, and independent voters by telephone. The results are considered to be accurate within four percentage points.

Two-thirds of those polled (67%) said they would support increased federal spending on health care, and 80% said they would support more government spending for medical research aimed at "preventing and treating disease." Less than half, 47%, said medical research is important enough that they would support higher taxes to fund it.

Three of every four (76%) said the government spends too little on health care, and 56% said that the government should be spending more on health care. Seventy-five percent said the cost of drugs were "unreasonably high."

Nine areas were listed as possible causes for increasing the cost of health care. Selected most by those polled was insurance (66%). Other areas of blame for high cost of health care were hospitals (60%), people with unhealthy habits (60%), pharmaceutical companies (57%), people seeking unnecessary health care (50%), and physicians (46%). Technology, government regulations, and research were seen as lesser factors in the costs of health care.

AVMA Panel Proposing to Classify Methods for Euthanasia

Euthanasia—a death free of pain and distress.

At the 1992 meeting of the Federation of American Societies for Experimental Biology, a symposium on issues related to the euthanasia of laboratory animals was conducted by the American Physiology Society's Committee on Animal Care and Experimentation.

David Ramsay of the University of California, San Francisco, and former chairman of the committee, cited the concerns of scientists in 1986 when the American Veterinary Medical Association (AVMA) last published the Panel Report on Euthanasia. The concerns, by and large, were focused on the Panel's recommendations regarding the euthanasia of small animals by physical methods.

That report recommended that decapitation of small rodents is acceptable only if the animals are lightly anesthetized or sedated prior to decapitation procedures, thus eliminating any drug-free method for blood or tissue collection. Because the recommendation was not based on confirmed scientific evidence that decapitation without anesthetic cause undue pain or distress to the animals, and because the recommendation could interfere with science, the scientific community was concerned about the use of the AVMA's report as the only source for recommendations regarding euthanasia.

The AVMA originally published a Panel Report on Euthanasia in 1963 with the particular goal of defining acceptable methods of euthanasia of animals held in pounds and shelters. At that time scientific studies of the physiological changes associated with methods of euthanasia were few. The scope of the issue regarding euthanasia of animals has increased over the years because of changing technologies and drug development, public awareness of issues, and the number of different species used as pets and in recreation, industry, research, and teaching.

The new report will reflect this broader scope to include recommendations for euthanasia of horses, wildlife, reptiles, and amphibians, and animals killed for fur. B. Taylor Bennett, director of the Biological Resources Laboratory at the University of Illinois at Chicago and a member of the panel revising the report, said the new report will classify methods of euthanasia as acceptable, conditionally acceptable, or unacceptable, relative to the potential to cause pain or distress in the animal.

Harry Rozmiarek, professor of Laboratory Animal Medicine and director of the University Laboratory Animal Resource program at the University of Pennsylvania, said there are a number of agencies that oversee and regulate the use of laboratory animals. Although the US Public Health Service "Guide for the Care and Use of Laboratory Animals," the AVMA Panel Report on Euthanasia, and other similar documents are intended to assist institutions in caring for and using laboratory animals in ways judged to be professionally and humanely appropriate, these statements are not legal documents, but they often are taken for law.

Only the US Department of Agriculture (USDA) has the power of law as it officially interprets and enforces the federal Animal Welfare Act. Field inspectors for the USDA have been criticized in the past for not using professional judgment in considering points of view of the animal user regarding unusual or controversial issues. Rozmiarek emphasized that it is an important responsibility of individual institutions to set standards for procedures of performance at their institution and to provide and communicate the rationale for their decisions.

These standards should be clearly communicated to the USDA, the Public Health Service, the Federal Drug Administration, and any other institution that reviews and assures appropriate animal care and use in their programs. Increased communication will go far toward providing the best animal welfare program in support of animal research with the least amount of disruption.

There is a public cost to animal euthanasia, said Ronald McLaughlin, director of Laboratory Animal Medicine at the University of Missouri-Columbia. This cost is measured in terms of emotional response of laboratory personnel performing the procedures. Emotional responses are influenced by an individual's previous exposure to life and death cycles, attachment to the animals, or fear of losing his/her job. "Training, training, training" will reduce the number of animals killed as well as refine the technical skills and increase the confidence of the laboratory personnel in performing euthanasia.

Virginia M. Miller, Chair
APS Animal Care and Experimentation Committee

Scientific Misconduct Office Reorganized

The US Public Health Service (PHS) is combining the Office of Scientific Integrity with the Office of Scientific Integrity Review in a reorganization of the administrative procedures for responding to allegation of scientific misconduct.

The new office is to be called the Office of Research Integrity, and J. Michael McGinnis has been named interim director. McGinnis, a physician, is Deputy Assistant Secretary for Health and director of the PHS Office of Disease Prevention and Health Promotion.

The new office, which will report directly to the US Department of Health and Human Services' Assistant Secretary for Health, James Mason, will have responsibility for dealing with allegations of research misconduct in all research supported or performed by PHS agencies, including the National Institutes of Health (NIH), Alcohol, Drug Abuse, and Mental Health Administration, Center for Disease Control, and the Agency for Health Care Policy and Research. The Food and Drug Administration is not included because of its regulatory responsibilities to conduct its own misconduct investigations.

The reorganization was developed in conjunction with the NIH and will continue to maintain the 11-member Advisory Committee on Research Integrity, a panel of nongovernment researchers, science and academic administrators, lawyers, and ethicists. The panel was appointed last year to provide advice on research integrity policy matters.

PETA Founders Called Before Grand Jury

The founders of PETA (People for the Ethical Treatment of Animals) have been called before a federal grand jury in Grand Rapids, MI, that is investigating the activities of the Animal Liberation Front (ALF), according to news reports.

The National Association for Biomedical Research (NABR) Update cites a Pullman (WA) Daily News report that both Alex Pacheco and Ingrid Newkirk have been called by the grand jury and, according to PETA spokesperson Amy Bertsch, Newkirk has been asked to submit her fingerprints and samples of her handwriting.

According to news reports, grand juries in Eugene, OR, and Spokane, WA, also are investigating ALF.

The US Bureau of Alcohol, Tobacco, and Firearms, the Federal Bureau of Investigation, and state and local law enforcement agencies have been investigating ALF for the past year during which ALF has claimed responsibility for break-ins and thefts at Oregon State University, Edmonds (WA) Northwest Farm Food Cooperative, Washington State University, and Michigan State University. Damage for the four raids was estimated at $650,000.

Although federal officials in Washington, Oregon, and Michigan refused to discuss the investigations, FBI agent Jeffery John was quoted as saying, "We consider these acts to be domestic terrorism in every sense of the word."

The Daily News also has reported that the FBI has identified Rodney Coronado as the person who distributed the ALF statement claiming responsibility for the Washington State University break-in. In an interview with the Daily News, Coronado was reported as saying that he was in Pullman visiting friends when "the press release just showed up on my doorstep. I had no previous knowledge of it."

Coronado said that he alone went to a copy shop the morning after the raid and faxed the release to the Associated Press in Spokane. He denied having been involved in the break-in and that he and two women composed the press release on a computer at a copy shop. Copy shop employees said a man and a woman paid for the fax transmission.

Coronado, who is a member of the Coalition Against Fur Farms, said he was arrested once in connection with an ALF demonstration in Vancouver, BC, and dropped out of that group since ALF activists are useless once they are known to law enforcement agencies.

According to the Daily News, no warrant has been issued for Coronado's arrest, and he has not been indicted in connection with any break-ins. Coronado said that the FBI search warrant affidavit said he "was responsible for the destruction of animal research facilities at Washington State University on August 12-13, 1991." He added that the affidavit was filed by the FBI in connection with its investigation of a Maryland woman who is believed to have been involved with an ALF break-in at Michigan State University in February.

The Daily News also reported that an FBI spokesman said Coronado is a "person of interest. If there really was a full-court press to arrest him, he'd probably be in custody."

NSF Sets Proposal Policy

The National Science Foundation has announced a policy that disallows the simultaneous submission of proposals to programs within the Directorate for Biological Sciences that are *duplicates* of proposals submitted for consideration to other federal agencies.

An exception to the policy are beginning investigators who need to explore all opportunities for getting support to start their careers in research. The policy does not affect the submission of distinctly different proposals by the same investigator to NSF and other federal agencies.

Primate Center Programs Available

The Wisconsin Regional Primate Research Center (WRPRC) at the University of Wisconsin-Madison now offers a variety of information programs on primatology, including a new electronic mail list service called PRIMATE-TALK. The Center also has developed a resource of audiovisual materials about primates and is in the process of developing an international directory of primatology.

PRIMATE-TALK is an open forum for the discussion of primatology and related subjects. Topics include but are not limited to news items, meeting announcements, research issues, information requests, veterinary/husbandry subjects, job notices, animal exchange information, and book reviews.

Individuals with Internet, BITNET, or UUCP addresses can communicate with PRIMATE-TALK. Users of other networks interested in joining PRIMATE-TALK should contact WRPRC, sending a message to PRIMATE-TALK-REQUEST@PRIMATE. WISC.EDU; state that you would like to sign on. Send message to list to PRIMATE-TALK@PRIMATE.-WISC.EDU.

The WRPRC Library has developed a resources of audiovisual materials that include 5,000 slides and 400 videos on primate species and activities, both in the wild and in captivity. These audiovisuals are available to teachers, scientists, researchers, and the general public for a borrower's fee.

A catalog of holdings entitled Audiovisual Resources in Primatology is available from WRPRC. A listing of recent audiovisual materials are listed in the "Primate Library Report: Audiovisual Acquisitions," which is published periodically.

The WRPRC also is compiling the first international directory of primatology, which will encompass a broad range of organizations that have an active role in primatology. The purpose of the directory is to improve communication and to foster cooperative research, training opportunities, and the sharing of resources.

Questions about access to the electronic network, borrowing audiovisual materials, or the directory should be directed to Larry Jacobsen, Head of Library Services, WRPRC Library, 1220 Capitol Court, Madison, WI 53715-1299. Telephone: (608)-263-3512. FAX: (608)-263-4031. Internet: library@primate.wisc.educ.

NIH Sponsors Animal Workshop in Idaho

The National Institutes of Health, Office of Protection from Research Risks, Division of Animal Welfare is cosponsoring with Idaho State University an animal welfare program entitled, "Special Considerations in Animal Research: Reduction, Refinement, and Replacement in the Field and Laboratory." The program is set for August 27–28 in Pocatello, ID.

The workshop is designed for institutional animal care and use committee members, institutional administrators, laboratory animal veterinarians, research investigators and their staffs, and other persons with responsibility for the management of institutional animal care and use programs. The workshop will focus on topics including research involving wildlife, resources regarding reduction, refinement, and replacement in field and laboratory studies, and the role of animal care and use committees.

For information concerning the program, contact Jim Peck, Laboratory Animal Supervisor, Campus Box 8007, Idaho State University, telephone (208) 236-34895, FAX (208) 236-4570. For information about future programs, contact Roberta Sonneborn at (301) 496-7163, FAX (301) 402-2803.

Two More States Enact Facility Protection Laws

South Carolina and Tennessee have enacted laws that protect research facilities and investigators from illegal activities of a animal rights extremists.

The laws prohibit acquiring animals or property from an animal facility without the owner's consent, entering or remaining concealed in a facility with the intent to commit an act prohibited by the law, remaining in a facility knowing entry was forbidden or after receiving notice to leave.

The actions by the two states brings to 30 the number of states that have enacted similar laws since 1988.

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Russian Thermophysiology Today

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The deep political, economical, and social reforms taking place in the former USSR, the collapse of the communist regime, and the sudden fall of the Russian Empire, occupying one-sixth of the surface of the Earth, are attracting the attention of people all over the world. In addition to general curiosity about current events in the new Commonwealth, the international scientific community has manifested a keen interest in specific information concerning Russian science and Russian scientists [see, for example, the recent publications in *Science* and *Nature* (1, 3, 4, 12, 15, 19, 23)]. There are several reasons for such a particular interest.

1. After they became no longer insulated from the rest of the world, Russian laboratories opened to cooperation. Their special features—scientific (recognized expertise of Russian scientists in some field, e.g., laser physics, nonlinear dynamic mathematics, and cosmic exploration; good experience in the study of some unique subjects, such as endemic diseases or rare species of animals; accumulated experimental data still unpublished for various reasons in the international scientific literature); geographic (location of the laboratories in different climatic zones, at different altitudes, etc.); economic (access to a wide spectrum of natural compound, cheap labor)—are attractive potentials for foreign investigators interested in working in Russian laboratories. However, to use these facilities, foreign scientists need to be informed about them.

2. The scientific community has already faced the fact of a rapid increase in the number of Russian researchers who are working or wishing to work in foreign laboratories. This kind of cooperation might result in significant contributions to the investigations carried out in these laboratories but also—what is even more important—helps to keep a large number of young Russian scientists in research during this critical period in their native country, thus preparing qualified people to conduct investigations in Russia in the future. Better knowledge of the real situation in this or that scientific field in Russia (list of top-rated laboratories, names of the experts, areas of expertise, etc.) could improve the efficiency of this form of cooperation to mutual advantage.

3. The disintegration of the former political, economical, and other institutions in the former USSR has led to critical situations in many fields of social life, including science. Russian science needs help now, and a lot of state and private foundations, scientific institutions, and individuals in Western countries are ready to help (see, e.g., refs. 3, 4, 8, 10, 11, 15, 19). But for this help to be totally effective, Western colleagues should possess much fuller information about Russian science.

The duty of the Soviet scientists now is to provide this information. The situation in neuroscience in the Republic of Georgia was described in a recent issue of *Trends in Neurosciences* (9). "Special Feature" of a recent *Trends in Pharmacological Science* is devoted to some of the contributions of Soviet scientists to pharmacology and toxicology (18). The aim of the present article is to give some ideas about the situation in one field of Soviet physiology, thermophysiology, which may appeal to foreign scientists thinking about helping or cooperating with Russian colleagues.

There are about three dozen laboratories in the Commonwealth in which thermophysiology is the only, or major, field of investigation (it is hardly possible to give a more precise figure because of the confused present political and administrative map of the country, as well as continual reorganizations of scientific institutions). The highest concentration of thermophysiological laboratories is within the European part of the country (St. Petersburg, Moscow, Minsk). Among Asian centers, the best known laboratories are those in Novosibirsk and in the capitals of the three Middle Asian Republics: Kazakhstan, Kirgizstan, and Turkmenistan. Most of the laboratories belong to so-called scientific research institutes included in a system of one or another Academy of Sciences (in former days, they were the academy of Sciences of the USSR, the Academy of Medical Sciences of the USSR, the Academies of Sciences of each Republic of the Soviet Union); the rest belong to universities and institutes (colleges) of various USSR or Republic Ministries. The scientists working in the latter are burdened by a tremendous teaching load of up to 30 hours per week, while in the former, the researchers are usually completely exempt from teaching. During the previous years, scientists working in both scientific research institutes and universities received financial support for their research predominantly (or, more often, exclusively) from the government. Now this centralized system of constant financing is being revised, and it is hardly possible to predict how it will develop in the future.

The scientific staff of Russian thermophysiological centers consists of approximately 300 physiologists, yet only a

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few names are included in the international Directory of Thermal Biologists (21). Among the better internationally known thermophysiologists are V. N. Gourine (Minsk), co-organizer of and active participant in the Regional Thermoregulatory Group (RTG); K. P. Ivanov (St. Petersburg), contributor to the second edition of Glossary of Terms for Thermal Physiology (2) and former member of the Commission for Thermal Physiology of the International Union of Physiological Sciences (IUPS Thermal Physiology Commission); V. S. Koshcheev (Moscow), Yu. V. Lupandin (Petrozavodsk), Yu. F. Pastukhov (St. Petersburg), and V. I. Sobolev (Donetsk). In the field of comparative and ecological thermophysiology, the studies of N. I. Kalabukhov (Astrakhan) and A. D. Slonim (deceased; Novoskibirsk) are familiar to Western colleagues. Slonim was also a member of the IUPS Thermal Physiology Commission and consultant for the first edition of Glossary of Terms for Thermal Physiology (6). A notable presentation of Russian thermophysiology in the international arena was made at the 5th Regular Meeting of the RTG (May 1990, Beichlingen, GDR), in which 18 scientists from the USSR participated. The reports presented at the meeting are summarized in the review (14). The recent national scientific meetings at which the problems of temperature regulation were discussed are reviewed in *Thermophysiology* (24, 25).

During the last four years, research projects carried out in thermophysiological laboratories of the USSR were united in the framework of the program Physiological Mechanisms of Thermoregulation, supervised by both the Academy of Sciences and the Academy of Medical Sciences of the USSR (24). Apart from the coordination of the investigations, the activities of the program included the organization of annual scientific meetings, publication of the bulletin *Thermophysiology*, and others. The head institution of the program Physiological Mechanisms of Thermoregulation is the Institute Physiology of the Byelorussian Academy of Sciences (Minsk), directed by V. N. Gourine. The main research areas of the institute are the role of the autonomic nervous system in temperature regulation and the mechanisms of fever and antipyresis. International connections of the institute include those with thermophysiological centers in Canada, Czechoslovakia, Germany, Hungary, and the United States. In 1988, the institute organized an international symposium on thermoregulation and published its proceedings (13). Three employees of the institute are working now in American and German laboratories.

The entrance of Russian researchers in the competition for positions in Western universities raises certain questions about their general and professional education and expertise. The scientific community of the former Soviet Union, a huge country comprising more than 100 ethnic groups—big and small, speaking different languages, having different cultural traditions, religious beliefs, economic levels, and living standards—is not homogenous. Many of the Soviet scientists who were educated and worked within the communist system have obvious shortcomings well-known to Western colleagues; some of these have already been mentioned (23). However, the image of Russian science is determined by its achievements and its best representatives rather than by its shortcomings and mediocre scientists. "There are some areas of science where the old Soviet Union was a world leader," said L. R. Graham, an expert on Russian science at the Massachusetts Institute of Technology. "There were centers of excellence. If those dry up and disappear, it is a loss not just for Russia and former Soviet republics, but for world civilization" (8). In this paper, we shall use thermophysiology as an example to describe the characteristic features of the best Russian scientists.

Traditionally, education in Russia gives students a good basic knowledge in a wide range of disciplines rather than a narrow specialization. Most thermophysiologists in the USSR have received a medical education that consists of five years of general medical courses (identical for all students), a final year of undergraduate specialization in one of the three primary branches of medicine (internal medicine, surgery, or obstetrics and gynecology), and, usually, three years of postgraduate training in a narrower professional subfield. Substantial parts of the physiological education of Russian researchers today are Pavlov's nervism, Anokhin's functional system theory, and the general adaptation syndrome theory of Selye (whose books have all been translated into Russian and are well known to Russian scientists).

As one of the results of such an education, Russian physiologists have paid much more attention to the whole "forest" rather than to a particular "tree": understanding of the biological and medical meanings of experimental phenomena is considered to be of great importance. It was in Russia that, for example, the ancient idea of the beneficial role of fever was reborn in the 1880s (7), during the time when the "fathers" of thermophysiology—German physicians and physiologists (Liebermeister, Meyer, Brandt)—were united in the opinion of the harmfulness of the febrile process. It is not surprising, therefore, that some of the roots of today's important thermophysiological concepts (e.g., the difference between fever and hyperthermia) may be found in the works of Russian investigators of the previous century (5). The modern Russian handbook on thermoregulation (17) convinces one that these traditions are alive; the basic categories (temperature homeostasis, temperature regulation, homeothermy) and fundamental questions, such as what is regulated and how, are presented at great length.

Another advantage of a "broad" versus "deep" education is the progress achieved by Russian scientists in the border areas between orthodoxically subdivided scientific disciplines. A recent example of such investigations connected with thermophysiology is the work by E. A. Korneva (St. Petersburg), who is internationally recognized as one of the pioneers in neuroimmunomodulation. The traditional thermophysiological studies of endogenous pyrogen in her department evolved into complex investigations of the roles of cy-

tokines in host-defense reactions and the analysis of neuronal and hormonal mechanisms of their regulation. The development of interdisciplinary sciences in the former Soviet Union is also demonstrated by the list of specialities in which PhDs are awarded in Russia but have not yet been identified by US markets (see ref. 16 for examples of these disciplines).

Aside from specialities of education and training, the expertise of Russian thermophysiologists is strongly influenced by the conditions under which scientific work was carried out in the former Soviet Union. Trying to produce reliable scientific results despite poor organization of the work, restricted access to information, and severe lack of supplies and equipment, many researchers had to become true "jacks-of-all-trades" in experimental routine. The 1981 Nobel laureate in chemistry, R. Hoffmann, introducing Soviet scientists immigrated to the United States, advised their potential employers, " . . . [A]sk them to suggest innovations, to invent" (16).

The absence of modern—sophisticated and expensive —tools often forces Russian researchers to look for important scientific questions that might be solved by relatively simple experiments. Such an approach, very similar to that of Selye, allows one (by taking daring steps) if not to obtain the exact answer, at lease to determine the prospective area for further study. The possibility of making a successful scientific analysis of the results obtained by simple methods is a characteristic trait of Russian scientists. It was enough for A. L. Polenov (St. Petersburg), having observed the presence in the organism of large stores of neurosecretory materials, to propose in the early 1960s the hypothesis of the participation of the neurosecretion of the posterior hypophysis in the regulation of a wide spectrum of physiological functions other than diuresis (20). The thermophysiological application of this hypothesis—the discovery of the antipyretic properties of arginine vasopressin—was made 20 years later by Canadian scientists.

Though working under unfavorable conditions, the best Soviet thermophysiologists were able to create highly productive research groups. One of them was P. N. Veselkin (deceased; Leningrad), the author of a fundamental monograph of fever (27). It was in his department that I. S. Repin and A. V. Sorokin (both deceased) worked. The latter is the author of one of the first Soviet books on pyrogens (26). The former is known for investigations on fever mechanisms that were carried out by his group in the 1960s. His article, which describes fever produced by intracentrally injected endogenous pyrogen (22), is one of the most cited, in the West, papers of Soviet thermophysiolgists. As a recognition of his successes, Repin was invited in 1970 to participate in the Ciba Foundation Symposium on Pyrogens and Fever in London. However, as often happened at that time, he was not able to leave the USSR.

Another specific feature of Russian laboratories is that, in the best of them, the traditions, ethical norms, and spirit of Russian intelligence of the 19th century managed to survive. Let me give on example. Preparing to retire, N. I. Kalabukhov, who had, for decades, collected literature on thermoregulation, distributed among Soviet thermophysiologists the catalog of his collection, asking them to mark items of their particular interest. He managed to prolong the active scientific life of his library by sending to dozens of active scientists rare and unique books of their choice.

To complete the portrait of Soviet thermophysiologists, it is, unfortunately, necessary to add that the activities of many of them reflected the shortcomings of the imperfect system of the organization of science under the communist regime rather than the high traditions of Russian researchers. However, the best Russian scientists working in different fields, whether before or after the October coup of 1917, possess the positive features described here. These features are made concrete by Mendeleev's periodic table and Lobachevsky's geometry; the discovery of phygocytosis by Mechnikov and Pavlov's theory of conditioned and unconditioned relaxes; the understanding by Russian physicians of the 1880s of the biological value of fever and the ideas of Russian mathematicians who, in the 1930s, anticipated the theory of chaos; the launching of the first Sputnik and the development of holography; the invention of the surgical staple; and the placing of a human into space for a year. These features give the hope that the "goose" of cooperation with Russian laboratories will some day lay the "golden egg." It is very important now to allow this "golden" hope to materialize.

Acknowledgments

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References

1. Anonymous. Can Soviet science be rescued? *Nature* 354: 339–340, 1991.
2. Anonymous. Glossary of terms for thermal physiology. *Pflugers Arch.* 410: 567–587, 1987.
3. Anonymous. Rechanneling Soviet scientific talent. *Science* 255: 1073, 1992.
4. Anonymous. What to do with the former Soviet Union. *Nature* 355: 377–378, 1992.
5. Bazhenov, N. N. *Basic Concepts of Fever.* Moscow, 1883 (in Russian).
6. Bligh, J., and K. G. Johnson. Glossary of terms for thermal physiology. *J. Appl. Physiol.* 35: 941–961, 1973.
7. Botkin, S. P. Second lecture (1884). In: *Course of Internal Diseases and Clinical Lectures.* Moscow: Medgiz, 1950 (in Russian).

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International Society for Pathophysiology

On May 28, 1991, I took my first trip to Russia and attended the first meeting of the newly organized International Society for Pathology, which was organized by Georgy Kryzhanovski, Valadimir Shinkarenki, Osmo Hanninen, and Yutaka Oomura and held in Moscow. This meeting also had many firsts: 1) this was the first meeting of the International Society of Pathophysiology; 2) this was the first meeting held in Russia in which the participants were allowed to send in abstracts and attend the meeting (with the changes that have occurred in Russia, it may also be the last meeting in which representatives from the former members of the Soviet Union were allowed to attend a free communication meeting); and 3) we were allowed to tour Moscow as we pleased without obligatory guides.

The meeting was very successful, with over 1,300 presentations that included plenary lectures, symposia, and poster presentations. We were fortunate to have several bright, young medical students from the medical schools at Moscow University and other universities to serve as our interpreters in the scientific sessions. This was one of the most stimulating meetings that I have ever attended, and the sessions went well into the night to properly discuss the presentations among scientists speaking so many different languages. The opening ceremony, held at the State Cinema-Concert Hall at the Rossiya Hotel on the 28th, was enchanting and very entertaining. On Wednesday, the Congress Dinner and Dance was held at the Restaurant Arbat. The food at this banquet was beautifully prepared and excellent cuisine compared with any standard. On Thursday night, we attended a performance of "Tosca" at the Bolshoi Theater and on Friday evening the closing ceremony was held at the Academy of Social Sciences. The scientific meeting was held at a modern convention facility of the Academy of Social Sciences. On the last day a meeting of the Congress participants was held to elect the councillors of the International Society of Pathophysiology. It was also decided that the next scientific meeting would be held in Osaka, Japan, and organized by Yutaka Oomura in 1994. In addition, T. Yoshikawa from Japan was chosen as the editor of the journal of this Society. Since that time, a meeting was held in Brno, CSFR, organized by M. Dostal, in which a Society constitution and plans for the Journal were finalized.

The following article was written by the founder of the International Society of Pathology. It is interesting to note that at the Moscow meeting, teaching, animal use, publications, and future meetings were discussed in a manner similar to that which occurs at our physiology society meetings. Obviously, many of us work in some area of pathophysiology to evaluate how basic physiological mechanisms are altered in the diseased state. I hope that all interested parties will contact Georgy N. Kryzhanovsky and participate in this exciting new organization.

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Modern Pathophysiology

G. N. Kryzhanovsky

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Pathophysiology, as a biomedical science of the mechanisms of development and elimination of pathological processes, began because of a necessity of experimental analysis of pathological processes. Its origins date back to the works of Magendie and Claude Bernard, who introduced the concept of "experimental pathology." The founder of cellular pathology, Rudolph Virchow, emphasized the crucial importance of regulation disturbance of physiological processes as an essential mechanism of disease and used the term "pathological physiology." In Russia this term was defined by V. V. Pashutin in his lectures on pathological physiology (1878). In the 1930s, pathophysiology acquired the significance of a medical discipline and was included in the medical education curricula. I. P. Pavlov, the prominent Russian physiologist who designated pathophysiology as experimental pathology, greatly contributed to this end. In 1819 Galliot published a manual in general pathology and pathological physiology, but the first textbook in pathophysiology seems to have been written 200 years ago, as early as 1790, by Professor A. F. Hecker from the Erfurt University, who read lectures in "physiologia pathologica." Thus pathophysiology originated independently in various countries, which testifies to the objective necessity for appearance of pathophysiology owing to medicine development.

However, contemporary pathophysiology appreciably differs from that at its earlier development stages and even from that of several decades ago. Modern pathophysiology ceased to be just experimental pathology; it has also acquired

a new quality, having become an integrative biomedical science. This feature is due to growing differentiation of medicine and to an ever increasing body of diverse information about various pathological processes. All this brought about a necessity for the birth of an integrative biomedical science. Pathophysiology became such a science.

At the same time modern pathophysiology is a fundamental biomedical science. It is erroneous to think that fundamental research is concerned only with profound molecular biochemical and biophysical processes. Identification of the mechanisms of the pathological processes at the various levels of the organism, in different conditions, and of their connections as well as determination of the specific and common characteristics of different pathological processes, which is the aim of pathophysiology, are very significant fundamental studies.

The final biological outcome of pathological processes is disturbance of certain functions. From this point of view, pathophysiology is a functional pathology of the various structures beginning from the intracellular ones to complex systemic relationships of the highest levels.

The pathogenesis of pathological process cannot be reduced only to the lesion of the morphological structures and physiological systems. Along with the destructive phenomena quite a different process takes place, viz., the formation of new relationships between the involved structures, emergence of the secondary endogenic (intrinsic to these structures) mechanisms of pathological process development. In their entirety, these mechanisms and involved structures make up new pathodynamic organizations, pathologic systems, that underlie the corresponding syndromes. Modern pathophysiology has the credit of elaborting the general concept of endogenization of pathological processes. Biochemistry and biophysics obtain an ever increasing body of data about the endogenic mechanisms of pathological process development at the molecular, membranous, and cellular levels.

Together with pathological alternations and pathological mechanisms as such (which constitute pathogenesis), modern pathophysiology also studies the opposing phenomena, viz., the mechanisms of prevention and elimination of pathological process, compensation, and recovery of disordered functions. By analogy with pathogenesis, but in opposition to it, the whole complex of these mechanisms constitutes sanogenesis. In terms of the object of modern pathophysiology, sanogenesis is as important as pathogenesis. Knowledge of both classes of mechanisms—pathogenetic and sanogenetic—is needed for the development of principles and means of pathogenetic therapy and pathogenetic prophylaxis.

Pathophysiology, as an integrative biomedical science, has no specific research methods of its own. Experimental pathophysiological studies are carried out using the methods of various other disciplines. At the same time, there are specific features that are, to a great extent, characteristic of pathophysiology. It applies, in the first place, to elaboration of the experimental models of pathological processes and syndromes relating to the diseases in humans. Up to recent times, the possibility of creating such models was not universally accepted. However, the principle common nature of biological processes (biochemical, biophysical, immunological, etc.) in human and animal organisms gives the key for solving this pathophysiological problem. Creation of a pathogenetically adequate model is the instrument of cognition of a pathological process under study. Using this model is extremely important for testing the new means and methods of treatment, for elaboration of pathogenetic therapy.

Modern pathophysiology is a bridge between the fundamental theoretical disciplines (biochemistry, biophysics, physiology, etc.) and clinical medicine. It lays down the foundation of the physician's biomedical mentality. Thanks to pathophysiology the physician can understand the inner logic of the precesses, their relationship, and their biological significance and is able, as a result, to build an individual model of a disease in a given patient.

The characteristic objects for pathophysiological investigations are the typical pathological processes in tissues: edema, inflammation, microcirculation disorders, hypoxia, energy deficit, degeneration, dystrophic changes, etc. Because of the successes attained by biochemistry, biophysics, and molecular biology, the typical processes realized at the membranes' level, in the intracellular signaling, secondary messengers, and genome systems, became known. The standard processes of ischemic and postischemic lesions and cellular death can be cited by way of illustration. Identification of the standard, typical of as well as specific to, every kind of pathology of intracellular processes, became the objective of a new branch of pathophysiology—cellular pathophysiology.

Present-day noninvasive methods of research that do not disturb the normal course of functions and allow a direct study of pathological processes in the patient's organism have promoted the development of clinical pathophysiology. Presently clinicians not only apply pathophysiological data, but they can also conduct pathophysiological studies. The boundary betwen experimental and clinical pathophysiology is becoming less distinct.

In some countries the tasks of clinical pathophysiology are carried out by clinical physiology. This branch of physiological science originated in the 1940s and 1950s and was greatly assisted by the efforts of the Swedish colleagues. Its appearance was connected with the organization at the clinics of the laboratories that were to study the processes in a diseased human organism to develop and use new diagnostics methods. Certainly clinical physiology cannot replace pathophysiology, which includes both experimental and clinical branches and is an integrative biomedical science.

In the strict sense, clinical physiology is physiology at the patient's bedside. The term "physiology of the disease," which is sometimes applied in clinical physiology for definition of its tasks, requires a certain correction. The physiological mechanisms ensure normal functioning, homeostasis, adaptation, recovery, rehabilitation, and health maintenance.

The pathophysiological mechanisms proper underlie the development of pathological processes, diseases, and functional disorders. However, the tasks of pathophysiology and clinical physiology intertwine. Therefore cooperation between pathophysiology and clinical physiology is quite natural, important and fruitful.

Presently an ever increasing number of pathophysiological studies are being carried out by specialists of different profiles in various field of biomedical sciences. This trend and an increase in the number of pathophysiological studies are understandable in view of the final goal of biomedical sciences, viz., maintenance and restoration of human health. In this case, all the scientists concerned—the biochemists, biophysicists, physiologists, and others—as well as the clinicians, while studying the disorders of normal processes and trying to correct them, do not suspect that they are becoming pathophysiologists, too.

Paradoxically, pathophysiology of the organs and systems, comprising all the fields of medicine and penetrating into the studies of various profile, seems to merge with and dissolve in them. But this peculiarity only underlines the growing importance of pathophysiology for medicine.

Another phenomenon, characteristic of the development of every science, is clearly seen in modern pathophysiology: differentiation and emergence of new fields and branches—space pathophysiology, ecology and environment pathophysiology, extreme-event pathophysiology, pathophysiology of work and sport, adaption pathophysiology, etc. The misfortunes afflicting the humanity pose before medicine new, ever more serious and urgent problems. Pathophysiology is to play an important role in solving these problems.

In these conditions, of paramount importance become consolidation and unification of the efforts of scientists of various profile throughout the world who are concerned with a wide range of pathophysiological problems.

Therefore, the past Constituent Congress of the International Society for Pathophysiology (ISP) (May 28–June 1, 1991 in Moscow) was of special importance. Discussed at its numerious sections (about 20) and symposia (about 60) were the problems of pathophysiology of cells, organs, and systems, united by one main characteristic of pathophysiology topic: "Dysregulation and Its Correction." The Congress constituted the ISP, which is a society not only of pathophysiologists; it is a society for pathophysiology. This means that it is open to specialists of any profile, experimentalists and clinicians, to all concerned with pathophysiological problems. The Society sections will interact with the corresponding international scientific associations. Such cooperative activities of the Society reflect the peculiaritites of modern pathophysiology as an integrative biomedical science. The International Union of Physiological Sciences (IUPS) has set up and approved in its framework a commission for pathophysiology; the ISP is expected to become an associate member of the IUPS. The ISP will publish the journal *Pathphysiology*. The next congresses will be held in Japan, Finland, and Hungary.

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8. Broad, W. J. Genius for hire: the Soviet's best, at bargain rates. *New York Times*, March 15, 1992.
9. Burchuladze, R. Neuroscience in the Republic of Georgia. *Trends Neurosci.* 14: 131–132, 1991.
10. Burdick, A. Coming in from the cold. *The Sciences* 132(2): 6–8, 1992.
11. Coyle, J. T., and W. M. Cowan. Appeal of behalf of "Soviet" neuroscientists. *Neurosci. Newsletter* 23(2): 1, 1992.
12. Dickman, S. Soviet science: a struggle for survival. *Science* 254: 1716–1719, 1991.
13. Gourine, V. N. (ed.) *Neuropeptides and Thermoregulation.* Minsk: Navuka i Tekhnika, 1990 (in Russian).
14. Gourine, V. N., M. Nichelmann, and A. A. Romanovsky. 5th Meeting of Regional Thermoregulatory Group "Physiological and Behavioral Mechanisms of Thermoregulation," Beichlingen (GDR), May, 1990. *Fiziol. Zh. SSSR I. M. Sechenova* 77: 153–154, 1991 (in Russian).
15. Hamilton, D. P. A plea for aid to ex-Soviet science. *Science* 255: 1503–1504, 1992.
16. Hoffman, R. Soviet emigre talent: a windfall for U.S. employers. *The Wall Street Journal*, June 24, 1991.
17. Ivanov, K. P., O. P. Minut-Sorokhtina, E. V. Maistrakh et al. (eds.) *Physiology of Thermoregulation.* Leningrad: Nauka, 1984 (in Russian).
18. Lipnik, R. L., and V. A. Filov. Nikolai Vasilyevich Lazarev, taxicologist and phyarmacologist, comes in from the cold. *Trends Pharmacol. Sci.* 13: 56–60, 1992.
19. Maddox, J. The Party's dead, but the party goes on. *Nature* 354: 499–600, 1991.
20. Polenov, A. L. On the question of functional meaning of hypothalamic neurosecretion. *Arkh. Anat. Gistol. Embriol.* 43: 3–16, 1962 (in Russian).
21. Refinetti, R. International directory of thermal biologists. *J. Therm. Biol.* 15: 183–192, 1991.
22. Repin, I. S., and I. L. Kratskin. An analysis of hypothalamic mechanism of fever. *Fiziol. Zh. SSSR I. M. Schenova* 53: 1206–1211, 1967 (in Russian).
23. Romanovsky, A. A. Light at the end of the tunnel? *Nature* 356: 100, 1992.
24. Romanovsky, A. A. (compiler) Thermophysiology: *Bulletin of the USSR Academy of Sciences Programme "Physiological Mechanisms of Thermoregulation".* Vol. 1. Minsk: Byelorussian State Univ. Press, 1990 (in Russian).
25. Romanovsky, A. A. (compiler) *Thermophysiology: Bulletin of the USSR Academy of Sciences Programme "Physiological Mechanisms of Thermoregulation".* Vol. 2. Minsk: Byelorussian State Univ. Press, 1991 (in Russian).
26. Sorokin, A. V. *Pyrogens.* Leningrad: Meditsina, 1965 (in Russian).
27. Veselkin, P. N. *Fever.* Moscow: Medgiz, 1963 (in Russian).

Adaptation and Development of Gastrointestinal Function

M. W. Smith and F. V. Sepulveda (Editors)
Manchester, UK: St. Martin's Press, 1989, 168 pp., illus., index, $60.00 hardcover, $19.95 paperback

This compact book is focused on development and adaptation of the epithelial cells lining the gastrointestinal (GI) tract; it does not cover the underlying tissues of the GI tract (e.g., muscle and neural). The editors suggest the book be used for either teaching purposes or as a "stimulus for interdisciplinary research." The 13 chapters, which are 10–15 pages each, are grouped into five general topics. The chapters serve as topical reviews of specific subjects and in most cases are largely based on the work of the contributing authors. The associated references at the end of each chapter are not exhaustive but provide students and investigators exploring new avenues of research with some "keystone" papers.

The first topic, maintenance of intracellular ionic concentration during electrogenic nutrient absorption, is described in one chapter by F. V. Sepulveda, F. Giraldez, and D. N. Sheppard. The authors begin with a brief review of electrogenic nutrient transport. They follow this by reviewing their electrophysiology studies of ionic movements across intestinal cells of Necturus exposed to amino acids and sugars. Though there is some mention of responses by mammalian cells, the discussion is focused on Necturus.

The second topic, in vivo adaptation of intestinal functions, includes five chapters. The first chapter, by S. J. Henning, examines the role of hormones in mediating GI development in the rat and is a scaled down version of her several previous reviews of the same subject. The first half of the chapter described ontogenetic changes in the digestion and absorption of carbohydrates, proteins, fats, and minerals. The second half then examines the role of endogenous hormones in regulating the changes. Unfortunately, there is no mention about the possible role of hormones present in milk. The subsequent chapter by L. R. Johnson reviews postnatal development of gastric secretion in the rat. He first presents an overview of morphological and functional changes in gastric secretory cells during postnatal development. Then he follows it with a section on the regulation of gastric development, including the influences of diet, hormones, sex, and genetic programming. The following chapter by E. Skadhauge examines MaCl transport in avain hindgut. The brief review of avian hindgut function provided will be useful to many readers and serves as a foundation for descriptions of responses to different levels of dietary salt, with an emphasis on aldosterone. The fourth and fifth chapters of this section are complimentary. After E. S. Debnam presents conditions that can alter enterocyte functions and describes specific responses, the subsequent chapter by Smith, G. Meyer, P. S. James, and D. Cremaschi reviews the cellular basis of changes in enterocyte functions, with an emphasis on the changes that occur as enterocytes migrate from the crypt to the villus tip.

The third topic, which includes three chapters, covers in vitro enterocyte differentiation. The first chapter by D. Menard examines the use of fetal tissues to study morphological and physiological development of different GI regions and the influences of different conditions. The chapter is based mainly on studies of human fetal tissue and highlights a point not emphasized enough: care must be made when extrapolating data from animal models to humans. K. Haffen, M. Kedinger, F. Bouziges and P. Simon-Assmann review results from their experiments of the interactions between the mesenchyme and endoderm during ontogenesis. They discuss several lines of work that show the mesenchyme to be an important determinant in development, differentiation, and adaptation of the intestinal epithelium. The chapter by A. Zweibaum and I. Chantret reviews the use of cancerous colon cell lines that express some of the characteristics typical of small intestinal cells as models for studies of intestinal cell differentiation. The description of methods and applications, through brief, will aid those wishing to pursue this topic in greater depth. Readers should be advised of the recent develop-

BOOKS RECEIVED

Hypoxia, Metabolic Acidosis, and the Circulation. Allen I. Arieff (Editor). New York: Oxford Univ. Press, 1992, 215 pp., illus., index, $55.00.

Self-Efficacy: Thought Control of Action. Ralf Schwarzer (Editor). Philadelphia, PA: Hemisphere, 1992, 410 pp., illus., index, $39.50.

The Biochemistry of Exercise and Metabolic Adaptation. Wayne C. Miller. Dubuque, IA: Brown & Benchmark, 1992, 134 pp., illus., index, $17.00.

Influence of Local Oxygen Deficiency: On Function and Integrity of Liver, Kidney and Heart. Jens Hoper. New York: Gustav Fischer Verlag, 1991, 86 pp., illus., index, $92.80.

Baroreceptor Reflexes: Integrative Functions and Clinical Aspects. P. B. Persson and H. R. Kirchheim (Editors). New York: Springer-Verlag, 1991, 322 pp., illus., index, $149.00.

Perspectives in Exercise Science and Sports Medicine. Energy Metabolism in Exercise and Sport. David R. Lamb and Carl V. Gisolfi (Editors). Carmel, IN: Brown & Benchmark, 1992, vol. 5, 475 pp., illus., index, $45.00.

Developments in Aging: 1991, Volume 1: A Report of the Special Committee on Aging. United States Senate. Washington, DC: US Govt. Printing Office, 1992, 469 pp., illus., table of contents, $13.00.

Developments in Aging: 1991, Volume 2: Appendixes. A Report of the Special Committee on Aging. United States Senate. Washington, DC: US Govt. Printing Office, 1992, 414 pp., illus., table of contents, $14.00

Audition. Pierre Buser and Michel Imbert. Trans. by R. H. Kay. Cambridge, MA: MIT Press, 1992, 394 pp., illus., index, $34.95.

The Computational Brain. Patricia S. Churchland and Terrence J. Sejnowski. Cambridge, MA: MIT Press, 1992, 544 pp., illus., index, $39.95.

ment of stable polarized intestinal cell lines (Aponte et al., *Proc. Natl. Acad. Sci. USA* 88: 5282–5286, 1991).

The fourth topic, biochemical aspects of enterocyte development, consists of three chapters. The first chapter, by E. Rodriguez-Boulan, D. Vega-Saleas, Y. Sambuy, and P. J. I. Salas, describes the use of enveloped viruses to study targeting of specific proteins to different membrane domains. The authors introduce their topic by posing five of the most frequently asked questions in this field, and then they review the experimental approaches used to provide some of the answers. The chapter by H. P. Hauri, U. Eilers, T. Jascur, and K. Matter examines biosynthesis and transport of brush border proteins and might have been a better lead chapter for this topic. The authors restrict their discussion to brush-border hydrolases, mainly because of the limited information available for other brush-border proteins. The third chapter is meant to introduce readers to concepts of gene cloning. Although this was adequately addressed by D. E. M. Lawson, I found this chapter to be disappointing. Arguably, molecular biology is the most rapidly developing area of GI physiology. Those of us studying intestinal adaptation and development find ourselves asking and answering more questions about the regulation of gene expression. Thus, students and new investigators might have benefitted more from a review of pre- and posttranslational regulation of specific intestinal genes.

Whereas the other topics (and chapters) examine changes in GI functions that occur rapidly or over the life history, the final chapter (and topic) by W. H. Karasov examines the relationship between nutrient transport and the evolutionary diet of a species. He reviews the matching of transport characteristics to qualitative and quantitative characteristics of a species' evolutionary diet by drawing on information for species with different feeding habits and metabolic rates. The "take home message" is that characteristics of GI epithelial development and adaptation are closely related to each species' ontogeny and phylogeny.

Since the time of publication, there have been numerous advances in the field, notably those in molecular and structural biology of GI membrane proteins, development of differentiated small intestinal cell lines, and understanding the interactions of membrane proteins and membrane lipids. After reading this book, students and investigators from other fields should be able to interpret the new developments in the context of adaptation and development of GI tract epitheliz.

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Imaging, Measurements, and Analysis of the Heart

Samuel Sideman and Rafael Beyar (Editors).
Bristol, PA: Taylor & Francis Group, 1991, 445 pp., illus., index, $85.00

Since 1984 the Technion in Israel has conducted a yearly international workshop on topics related to Cardiovascular Physiology, with an emphasis on bioengineering. The 6th Henry Goldbergh workshop was held in December 1989, and from the workshop, this proceeding was produced.

The contributors to the workshop represent a broad spectrum of expertise in cardiovascular bioengineering, cardiovascular medicine, image processing, and mathematics. The book was dedicated to the memory of Professor Melvin Marcus of the University of Iowa, who died recently.

The work contains 31 chapters on a variety of topics related to cardiovascular function and is broken into several subunits including ventricular function, myocardial perfusion, myocardial metabolism, and electrophysiology. In each of the subunits, there are chapters on imaging, quantifying function, and other aspects of measurement and analysis.

The first section on ventricular function consists of nine chapters, which include analysis of cardiac function by fact CT and echocardiography as well as a section on image analysis and display. Mathematical analysis of stress-strain relationships in systole and diastole are presented in several chapters, and mathematical models of various aspects of myocardial function are analyzed. The concept of a constant heart volume throughout the heart cycle is presented by Hoffman in Chapter 1. A hypothesis by Janicki on echo shape and size is presented in Chapter 2, but results are inconclusive. A chapter on image analysis and display is a descriptive and economic chapter that provides some insights into methods for analyzing large three-dimensional images but provides no new information.

Several papers on diastolic function and myocardial stiffness are presented in the section on left ventricular function. These model experiments confirm already known information and often make simplifying assumptions that limit the application of the concepts to the intact functioning heart.

The section of perfusion contains seven chapters that are a mixture of theoretical model analysis and experimental studies. Beyar examines the circulatory flow in a global heart model, including proximal and distal coronary circulation, and provides insight into relationships between capacitance and resistance in the coronary circulation and the influence of coronary stenoses. On the other hand, the cine CT study of myocardial perfusion by Weiss indicated that there are limitations in the measurement of perfusion with this technique. An analysis of coronary vein physiology provides some insight into this poorly studied area of the coronary circulation, and Mates provided a thorough review of pressure at zero flow and critical closing theories in the myocardium. Several pure model analyses serve to confirm concepts already understood in the cyocardium. In the section on circulation and perfusion, there are studies on use of contract densitometry to determine myocardial blood flow. These densitometric techniques have been studies for many years and have had considerable limitations that have not been surmounted by the newer approaches.

Myocardial perfusion using positron emission tomography (PET) is also provided in several chapters. In the perfusion section there is a study presented by Bergman providing insight into the resolution capabilities and the limitations of PET. In this section, high speed MRI of the heart is also discussed, and some suggestions for coronary imaging are provided. However, it is clear that high speed MRI is in need of significant advances to have value for coronary imaging.

The section on myocardial metabolism provides experimental and purely theoretical studies. The chapters provide reviews of the metabolic aspects of the myocardium related to myocardial work and ischemia. The chapter by Weiss on blood supply and hypertrophy is a well-done experimental study outlining the relationships between flow and structure in the hypertrophied myocardium.

Six chapters on electrical aspects of the heart provide final topic of the symposium. Several of these are techniques for estab-

lishing myocardial electrical activation maps without well-organized clinical studies to show the efficacy of these techniques. However, this approach to electrical modeling of the heart provides some insight into the newest theories of electrical activation and propagation and shows some promise for better understanding of myocardial electrical propagation.

The final chapter is a discussion by all participants on all aspects of the symposium and brought out some of the limitations and areas of interest that should be pursued in the future.

The symposium brought together a wide spectrium of expertise in imaging, bioengineering, cardiovascular physiology, and pathophysiology. Several of the chapters describe purely theoretical models without experimental data to confirm the models. In some cases the models required simplifications that raised questions about applicability to the normally functioning heart. On the other hand, insights obtained by the experimenters and the mathematical models provide an excellent overview of ongoing research in cardiovascular function in health and disease from an engineering point of view and of the advances that are being made in areas of imaging of function, blood flow, metabolism, and electrical activity of the myocardium.

The work is therefore an interim window into ongoing research in these areas and as such represents a well-organized progress report on research in the heart. This book does not provide a basis of stable knowledge that can be used for many years but rather is a transient in our knowledge base on cardiovascular function, imaging, and modeling. For those involved in these areas of research, it is an excellent reference to examine ongoing work in a variety of areas, particularly in the areas of mathematical modeling and imaging of the performance, metabolism, blood flow, and electrical activity of the heart.

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Temple University Medical School

Computational Models of Visual Processing

Michael S. Landy and J. Anthony Movshon (Editors)
Cambridge, MA: MIT Press, 1991, 384 pp., illus., index, $55.00

Anatomists and physiologists study the nervous system with a view to understanding how it forms a basis for animal behavior. At the beginning of this century, there was every expectation that this program would show success. And it did in the hands of a selected few physiologists such as Sherrington. Enormous strides have been made in methodology during the last 75 years, yet most of mammalian behavior cannot be accounted for directly by the known properties of the nervous system. Is there anything wrong?

Not really. It turns out that success in this enterprise rewarded the shrewd selection of a subset of problems that would yield a partial answer. Thus Sherrington knew that the motor behavior of the whole cat was well beyond a satisfactory analysis but that using the spinal preparation one could obtain a convincing scientific description. The story was repeated often in the recent history of visual physiology, Hartline's use of limulus and the analysis of the retina of Necturus being good examples.

Naturally the drive to account for mammalian, specifically primate, behavior persists. With elegant methods and hard work and determination, a large body of knowledge of the structure and function of neural tissue of the primate is being generated, nowhere more so than in the visual system, which is both prominent and accessible in the primate. Yet the expectation of predicting a primate's visual behavior from the properties, connectivity, and layout of its neurons remains essentially unfulfilled. The reason is not hard to fathom. We are dealing with a problem of astronomical proportions, and the unraveling of the details of neuronal couplings and communication of hundreds millions of cells is a daunting undertaking. Enter computational neurobiology. After all, if physicists were able to develop and utilize concepts in terms of mathematical formulas, why not neurobiologists?

Regardless of philosophical arguments, computational methods are forced on the neurobiologist by the nature of the subject, like it or not. The book under consideration is a compilation of serious attempts to apply computational methods to the primate visual system. This means in practice selecting some neurophysiological or neuroanatomical results and some behavioral data and trying out models of how to get from one to the other. This approach, as might be expected, is most successful when the distance separating the two is shortest, as when dealing with visual acuity and the retinal cone mosaic, and least so when the attempt is to account for higher perceptual phenomena in terms of a few classes of single neurons in the first stage of processing in the visual cortex.

The book's chapters range over the whole gamut of the subject and represent the best that current workers have to offer in computational neurobiology of the mammalian visual system. There is a lot of mathematics here, but when it is rigorous it is usually linear and hence only a faint reflection of what must actually be going on.

Generating computational models of visual processing is a necessary step in the subject and, short of the back-breaking efforts of detailed tracing of all connections, is an inescapable state of progress. The contributors and editors of the volume deserve credit for making their efforts available in such a handsome form to the interested reader.

Gerald Westheimer
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ACDP Annual Questionnaire Results

Annual questionnaires were sent out to chairpersons of departments of physiology from 157 departments. Eighty-eight responses were received and tabulated by Lela Montgomery Aldrich, Douglas G. Stuart, and Theresa A. Hanley, Department of Physiology, Arizona College of Medicine, Tucson.

Information on salaries, faculty and positions, support, departmental budgets, and space were published in the June issue of *The Physiologist* 35 (3): 58–67, 1992. The following information concerns ranking according to research dollars, trainees and their disciplines, and training support.

Complete Primary Ranking According to Outside Research Dollars

Rank Total Dollars	Total Dollars	Rank Research Dollars	Grant Income	Rank Research Dollars per Faculty	Research Dollars per Faculty	Rank Total Research Space	Research Space (sq. ft.)	Rank Research Dollars per sq. ft.	Research Dollars per sq. ft.	No. Faculty
1	*$15,052,313*	1	$13,656,475	1	$505,795	20	23,556	2	$592	27
2	10,594,000	3	5,879,000	2	489,917	9	26,020	7	226	12
3	7,584,356	4	5,818,695	8	207,811	16	22,542	4	240	28
4	7,076,516	2	7,193,312	3	312,753	7	13,482	3	241	23
5	6,914,000	6	4,311,000	4	253,588	2	37,862	26	136	17
6	6,258,839	5	4,874,284	10	187,472	23	21,130	6	231	26
7	5,005,352	8	3,767,469	29	121,531	13	20,032	19	158	31
8	4,893,287	11	3,444,078	7	215,255	35	17,608	10	196	16
9	4,778,480	14	3,368,558	22	134,742	18	23,000	21	146	25
10	4,739,873	10	3,447,769	44	90,731	4	32,957	42	105	38
11	4,718,355	23	2,511,494	64	51,255	26	19,962	31	126	49
12	4,667,270	9	3,673,957	6	229,622	39	15,858	5	232	16
13	4,624,533	16	3,320,133	35	103,754	1	54,161	62	61	32
14	4,624,461	7	3,779,258	27	125,975	14	23,593	16	160	30
15	4,490,327	19	2,791,556	17	155,086	8	29,635	45	94	18
16	4,301,184	18	2,848,054	9	189,870	34	17,678	14	161	15
17	4,279,325	13	3,411,325	11	179,543	83	13,163	1	1,066	19
18	4,230,362	15	3,338,542	5	238,467	43	14,850	8	225	14
19	4,223,056	20	2,675,720	26	127,415	27	19,728	27	136	21
20	4,146,180	31	2,091,985	15	160,922	52	13,069	17	160	13
21	4,094,668	17	3,095,604	18	154,780	30	18,548	13	162	20
22	4,075,393	24	2,506,686	34	108,986	36	17,534	24	143	23
23	4,006,906	34	1,918,602	25	127,907	10	25,182	53	76	15
24	3,990,046	21	2,588,327	24	129,416	38	13,680	15	161	20
25	3,896,258	26	2,426,451	41	93,325	22	21,521	37	113	26
26	3,875,293	12	3,430,699	16	155,941	19	17,879	20	154	22
27	3,790,388	33	1,941,526	63	53,931	6	30,375	61	64	36
28	3,720,278	28	2,206,792	62	55,170	17	15,678	44	96	40
29	3,664,574	35	1,900,000	61	57,576	24	21,307	49	90	33
30	3,563,375	22	2,529,875	49	87,237	21	21,813	34	116	29
31	3,339,454	40	1,728,729	38	96,041	33	18,415	46	94	18
32	3,185,618	29	2,107,929	37	100,378	55	8,529	69	53	21
33	3,100,736	30	2,106,627	42	91,592	40	15,665	28	134	23
34	3,089,167	41	1,717,981	33	114,532	51	13,135	29	131	15
35	3,070,718	55	1,172,906	59	58,645	65	10,122	36	116	20
36	3,062,702	72	526,070	58	65,759	69	9,639	67	55	8
37	3,044,957	36	1,886,727	28	125,782	42	15,044	33	125	15

Complete Primary Ranking According to Outside Research Dollars (continued)

Rank Total Dollars	Total Dollars	Rank Research Dollars	Grant Income	Rank Research Dollars per Faculty	Research Dollars per Faculty	Rank Total Research Space	Research Space (sq. ft.)	Rank Research Dollars per sq. ft.	Research Dollars per sq. ft.	No. Faculty
38	2,991,597	39	1,788,561	12	178,856	87	0	87	NA	10
39	2,879,747	37	1,867,361	13	169,769	53	12,948	23	144	11
40	2,180,186	60	916,645	72	36,666	49	13,295	74	30	25
41	2,794,385	51	1,320,413	65	50,785	15	23,250	66	57	26
42	2,739,000	48	1,382,000	52	76,778	45	14,199	43	97	18
43	2,679,672	52	1,315,022	40	93,930	29	19,225	55	68	14
44	2,567,163	38	1,833,477	48	87,308	54	10,050	22	146	21
45	2,533,533	25	2,467,533	23	129,870	28	18,971	30	128	19
46	2,462,722	56	1,157,803	71	37,348	59	10,025	41	106	31
47	2,420,647	46	1,460,946	50	81,164	48	13,316	40	110	18
48	2,412,341	54	1,259,714	46	89,980	32	18,700	57	67	14
49	2,403,876	42	1,697,749	19	154,341	70	9,370	11	181	11
50	2,384,800	27	2,256,315	21	150,421	11	24,640	48	92	15
51	2,242,655	50	1,344,114	36	103,393	74	8,400	18	160	13
52	2,214,944	57	1,073,496	69	41,288	25	20,316	68	53	26
53	2,190,029	43	1,668,358	14	166,836	73	8,450	9	197	10
54	2,185,110	49	1,356,950	20	150,772	37	16,788	52	81	9
55	1,970,310	67	597,950	70	39,863	67	9,809	63	61	15
56	1,958,298	59	993,294	45	90,299	44	16,300	79	2	11
57	1,893,940	44	1,557,316	56	67,709	46	14,000	38	111	23
58	1,887,595	47	1,411,192	31	117,599	5	31,564	71	45	12
59	1,836,940	63	709,000	75	29,542	57	12,084	64	59	24
60	1,794,415	65	644,000	60	58,545	76	6,993	47	92	11
61	1,734,808	32	2,000,952	55	74,109	47	13,915	12	172	27
62	1,725,151	69	575,151	76	27,388	56	12,147	70	47	21
63	1,653,748	62	756,000	67	47,250	50	13,271	65	57	16
64	1,499,203	45	1,499,203	32	115,323	60	10,920	25	137	13
65	1,469,115	66	602,575	57	66,953	78	5,200	35	116	9
66	1,317,302	53	1,283,552	54	75,503	31	19,035	56	67	17
67	1,307,213	73	468,784	51	78,131	72	5,542	54	74	6
68	1,252,834	78	197,440	80	14,103	58	11,100	78	18	14
69	1,229,229	71	567,284	74	29,857	77	6,919	51	82	19
70	1,224,940	64	707,520	30	117,920	75	8,035	50	88	6
71	1,190,000	61	765,000	53	76,500	12	24,000	73	32	10
72	1,083,631	79	183,171	81	12,211	66	10,000	76	18	15
73	1,046,189	76	285,997	77	26,000	61	10,545	75	27	11
74	993,591	70	567,411	39	94,569	79	6,060	39	110	6
75	973,336	75	331,516	68	41,440	62	10,533	72	33	8
76	859,937	82	78,145	82	9,768	68	9,654	77	18	8
77	760,364	74	443,564	47	88,713	81	3,534	32	126	5
78	679,303	83	78,000	83	9,750	85	3,072	80	25	8
79	657,027	68	589,570	66	49,131	71	9,131	60	65	12
80	610,000	77	210,000	73	35,000	84	3,180	58	66	6
81	454,817	81	94,617	79	18,923	82	3,217	80	28	5
82	377,984	80	155,180	78	25,863	86	2,400	59	65	6
83	304,000	58	1,002,500	43	91,136	80	4,300	80	223	11
84	163,937	84	24,342	84	8,114	63	10,495	80	2	3
85	0	85	0	85	0	3	30,304	80	0	18
85	0	85	0	85	0	41	15,250	80	0	6
85	0	85	0	85	0	64	9,713	80	0	10

Completed Trainees and Their Subdisciplines

Approach (many may be applicable)

	Predoctoral	Postdoctoral	Female, Pre and Post	Behavioral/Aging	Biophysical	Cellular	Comparative	Developmental	Environmental	Exercise	Metabolic	Molecular/Biochemical	Neural	Pathophysiological	Reproductive	Structural/Anatomical	Systems	Theorectical	Toxicological	Transport	Other
Organ Systems																					
Cardiovascular	68	50	22	0	31	40	1	7	0	8	17	35	16	15	5	5	35	8	3	8	4
Endocrine	40	25	20	0	12	34	4	7	0	1	9	31	8	10	15	4	4	0	3	4	2
Gastrointestinal	11	15	8	0	4	12	1	2	0	0	2	11	0	4	1	1	1	0	0	12	1
General (Multi-Organ)	14	17	12	3	6	26	3	0	2	1	7	19	1	3	1	0	1	0	1	16	0
Immunological	6	2	0	0	1	6	1	0	1	1	2	3	2	0	0	1	0	1	0	0	0
Muscular	17	16	4	0	13	16	1	0	1	6	9	21	9	0	0	2	0	0	0	1	0
Neural	66	32	22	18	34	38	4	8	1	1	4	24	52	5	2	5	17	7	1	7	0
Renal	13	12	8	0	3	7	1	0	1	1	4	4	1	5	1	0	7	2	0	4	1
Respiratory	9	6	2	0	1	3	1	0	1	1	0	1	5	1	0	2	7	1	0	4	0
Other	17	19	13	3	6	20	2	3	1	0	0	12	0	2	11	2	3	2	0	5	5

Primary Faculty Subdisciplines

Approach (many may be applicable)

	Total	Extramural Funding	Behavioral/Aging	Biophysical	Cellular	Comparative	Developmental	Environmental	Exercise	Metabolic	Molecular/Biochemical	Neural	Pathophysiological	Reproductive	Structural/Anatomical	Systems	Theoretical	Toxicological	Transport	Other
Organ Systems																				
Cardiovascular	324	140	14	101	137	22	20	13	50	62	82	46	51	8	28	123	37	10	59	0
Endocrine	171	67	7	19	77	17	24	8	1	43	72	29	15	67	3	30	1	2	6	3
Gastrointestinal	81	31	1	20	49	9	17	2	1	24	22	13	9	3	4	12	9	0	28	0
General (Multi-Organ)	214	84	11	90	93	19	18	6	8	27	74	12	16	24	9	20	21	8	43	0
Immunological	28	12	0	4	17	3	1	3	2	8	11	1	4	0	1	1	2	3	2	0
Muscular	77	36	3	40	40	5	2	2	11	10	31	14	2	3	0	12	5	0	14	0
Neural	338	139	43	99	128	20	36	6	3	13	70	186	26	15	21	87	30	4	27	0
Renal	110	54	2	29	49	13	5	5	1	19	27	14	20	1	7	33	7	4	43	4
Respiratory	79	32	1	18	20	6	7	12	10	8	9	16	10	1	6	36	8	5	10	0
Other	45	16	2	4	18	2	3	0	3	7	13	2	5	1	3	2	7	1	6	0

Training Support

	% Total per Year						
	1991	1990	1989	1988	1987	1986	1985
Predoctoral							
Training grants	14	12	11	12	13	12	12
Individual federally funded awards	4	2	3	3	3	4	3
Research grants	29	31	30	29	30	26	24
State funds	21	22	22	24	26	31	30
Private foundations	3	3	3	2	4	4	4
Institutional awards	18	20	17	20	15	14	19
Medical scientist training program	2	2	6	2	2	2	2
Home (foreign) government	2	2					
Other	8	6	8	7	7	7	5
Postdoctoral							
Training grants	14	12	13	14	18	18	18
Individual federally funded awards	8	9	10	11	10	19	15
Research grants	56	55	56	51	55	41	45
State funds	2	3	2	2	3	4	5
Private foundations	7	10	11	12	7	10	8
Institutional awards	7	5	3	3	2	4	6
Medical sceintist training program	<1	0	0	0	1	1	1
Home (foreign) governments	4	5					
Other	3	1	5	7	5	3	3

Know Your Sustaining Associates

Abbott Laboratories

Abbott Laboratories is a worldwide company devoted to the discovery, development, manufacture, and sale of a broad and diversified line of human health care products and services. Abbott innovations include Membutal and Pentothal anesthetics, the Erythrocin line of antibiotics, and Ausria and Auszyme diagnostic kits for hepatitis B, the first US licensed AIDS virus antibody detection kit, Similac and Isomil infant formula, the TDx drug detection system, and the ADD-Vantage drug delivery system. Abbott's commitment to the future is evident in its $500 million dollars spent on research and development in 1989 and an annual compound growth rate in R&D spending over past 5 years of 20%.

American Medical Association

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

Axon Instruments, Inc.

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

Berlex Laboratories, Inc.

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

Coulbourn Instruments, Inc.

Coulbourn Instruments, Inc. manufactures electronic instruments for in vivo life science applications. Products include the LabLinc Modular Instrument System for physiological signal conditioning, experiment control, and data acquisition, featuring over 100 modules, including computer interface ports, signal conditioning and processing, and counting and timing modules for chart and computer-based polygraphs.

The company also produces transducers, biotelemetry, signal processors, stimulators, and auditory and animal behavior test equipment. Major markets include pharmaceutical, chemical, and biotechnological firms, universities, research hospitals, and government laboratories.

Dagan Corporation

Dagan Corporation manufacturers electronic instruments used in electrophysiology. Dagan offers a full line of analog and digital products, including preamplifiers for use in intracellular and extracellular recording, single and two electrode voltage/current clamps, patch clamps, signal averagers, programmable multichannel stimulators, and iontophoresis generators.

Du Pont Pharmaceuticals

Du Pont Pharmaceuticals is a part of The Du Pont Company, a diversified international corporation. Located in Wilmington, Du Pont Pharmaceuticals is a research-intensive firm whose major products are used to combat cardiovascular diseases, pain, and viral diseases. It is also a leading manufacturer of radiopharmaceuticals.

Major products include Coumadin, Sinemet, Percodan, Percocet, and thallium.

Primary areas of research are medicines for cardiovascular illnesses, inflammatory diseases, central nervous system disorders, central nervous system diseases, and viral illnesses.

Fisons Pharmaceuticals

The Pharmaceutical Division of Fisons is an international research-based pharmaceutical company committed to provide excellent health care products for prescription and consumer use. Fisons develops and manufactures a wide variety of pharmaceutical products, with markets in more than 100 countries. Fisons is recognized as a world leader in the treatment of respiratory problems and allergies and also markets products for cardiovascular disorders, neurological diseases and dermatological problems. Fisons has a major commitment to research and development to generate superior future medicines for these and other therapeutic areas including immunological and metabolic diseases.

Genentech, Inc.

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

Glaxo, Inc.

Glaxo, Inc. a leading research-based pharmaceutical company headquartered in Research Triangle Park, North Carolina, manufactures and markets prescription medicines including treatment for respiratory ailments, ulcers, hypertension, infectious diseases, and diseases of the skin. Glaxo is a wholly owned subsidiary of Glaxo Holdings p.1.c.

Grass Foundation

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

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

Harvard Apparatus

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

ICI Pharmaceuticals Group

The ICI Pharaceuticals Group R&D facility is based in Wilmington, Delaware. It consists of about 700 staff, of whom about 170 are in drug discovery. Within ICI, the US drug discovery function has sole responsibility for discovering new drugs in the pulmonary and CNS therapeutic areas. Current CNS targets are nondyskinetic antipsychotic drugs, disease-modifying drugs for Alzheimer's disease, and drugs for cerebral stroke and ischemia. The entire gamut of experimental approaches is available, including biochemical, neurochemical, electrophysiological, histochemical, and behavioral. Subserving the discovery efforts are a Molecular Pharmacology Unit at Wilmington and a Biotechnology Department in ICI-UK.

Jandel Scientific

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

Janssen Research Foundation

Janssen Pharmaceutica was founded in Belgium in 1953 by Paul Janssen. It is now an international company built on the foundation of research and a bedrock of innovation. The company remains under the direction of Janssen and has an unparalleled record in the successful development and marketing of new pharmeceutical products. According to the Japan Drug Research

studies, Janssen was responsible for more significant new drug discoveries during the period 1970–1983 than any pharmaceutical company in the world.

The company currently has approximately 6,000 employees worldwide. It is a world leader in medication used in the treatment of allergies, mental disorders, digestive and intestinal problems, cardiovascular conditions, and worm and fungal infections. Janssen's compounds have also enabled major advances in anesthesia and immunology. In addition, Janssen has also discovered many chemical compounds to identify and characterize receptors in the brain and the periphery that have played a prominent role in advancing our knowledge about neurotransmitters.

The R. W. Johnson Pharmaceutical Research Institute

Established in 1988, the R. W. Johnson Pharmaceutical Research Institute (PRI) pools the research and development resources of five successful Johnson & Johnson companies into a single worldwide, world-class R & D organization.

PRI integrates the considerable research achievements and potential of groups that were previously associated with McNeil Pharmaceutical, Ortho Pharmaceutical Corporation, Ortho Biotech, Johnson & Johnson Biotechnology Center, and Cilag International Research Center. Already one of the strongest pharmaceutical R&D companies in the world, PRI has forged alliances with other research organizations worldwide to accelerate drug discovery efforts.

Research and development at PRI focuses on reproductive medicine, dermatology, hematology/oncology, immunological disorders, central nervous system disorders, and infectious diseases, among other therapeutic areas. The world's best and brightest in science and medicine are working at PRI to discover and develop pharmeceutical and biotechnological products that will enhance health and life.

Narco Bio-Systems

Narco Bio-Systems designs, manufactures, and distributes the Physiograph physiological recording systems for use in clinical, research, and teaching applications. A selection of multichannel chart recorders are available with a complete line of modular input preamplifiers, signal conditioners, transducers, and accessories. This allows maximum flexibility for designing systems for recording physiological functions.

Pharmacia Incorporated

Pharmacia is the world's leading supplier of separation and purification products for the biotechnology industry, as well as a research-intensive international manufacturer of products for use in areas of medicine, including gastroenterology, rheumatology, oncology, ophthalmology, blood volume replacement, allergy, and dermatology.

Procter & Gamble Co.

Procter & Gamble is a multinational, technically based consumer products corporation with operations in 28 states and 36 foreign countries. It has four technical centers, and its world headquarters are in Cincinnati, Ohio. Technical centers are also located in Egham and Newcastle, England; Brussels, Belgium; Schwalbach, Germany; and Osaka, Japan.

The worldwide PhD population of Procter & Gamble is 850, divided equally between chemists and life scientists, and total employees number 75,000.

Sales in the paper, soap and detergent, health care, personal care, pharmaceutical, beverage, and food categories make Procter & Gamble one of the largest US corporations. Fortune magazine has named Procter & Gamble as one of the most admired corporations in the United States.

Quaker Oats Company

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

Schering-Plough

Born out of a 1971 consolidation of two companies—Plough, Inc. and the Schering Corporation—Schering-Plough is dedicated to the discovery, development, and marketing of novel therapeutic entities. The company focused its research in the fields of anti-inflammatory, antiallergic, cardiovas-

cular, and anti-infective disorders. The company has also attained a leading position in immunology and recombinant DNA technology.

SmithKline Beecham Pharmaceuticals

A division of Smith Kline Beckman Corporation, Smith Kline & French Laboratoties is a technology-intensive, worldwide health care company. Smith Kline & French is a leading supplier of pharmaceuticals to treat infectious, gastrointestinal, cardiovascular, and arthritic diseases and a leader in research, development, and marketing of innovative medicines.

Squibb Corporation

Squibb Corporation, a leading worldwide developer, manufacturer, and marketer of pharmaceutical and allied health care products, is organized into the Squibb Operating Group and the Science and Technology Group.

The Squibb Operating Group is responsible for the manufacturing, marketing, and distribution of products and services. Squibb's pharmaceutical products are marketed by Squibb International and Squibb United States. The Medical Products segment consists of ConvaTec and the companies of Edward Weck Incorporated.

The Squibb Science and Technology Group is composed of The Squibb Institute for Medical Research, Worldwide Regulatory Affairs and Licensing. Celebrating its 50th anniversary in 1988, The Squibb Institute is among the nation's first industry-sponsored research centers. In recent years, it has focused on four main areas: 1) cardiovascular disease, 2) infectious disease, 3) diagnostics, and 4) inflammatory disease. It has recently broadened into molecular biology, the neurosciences, and metabolic disorders.

The Upjohn Company

The Upjohn Company, a multinational corporation headquartered in Kalamazoo, Michigan, has celebrated its centennial year as a maker of fine pharmaceuticals. It is one of the 15 largest research-based pharmaceutical manufacturers in the world. It has research, production, and warehousing facilities in more than 45 countries and its products are sold in more than 150 countries.

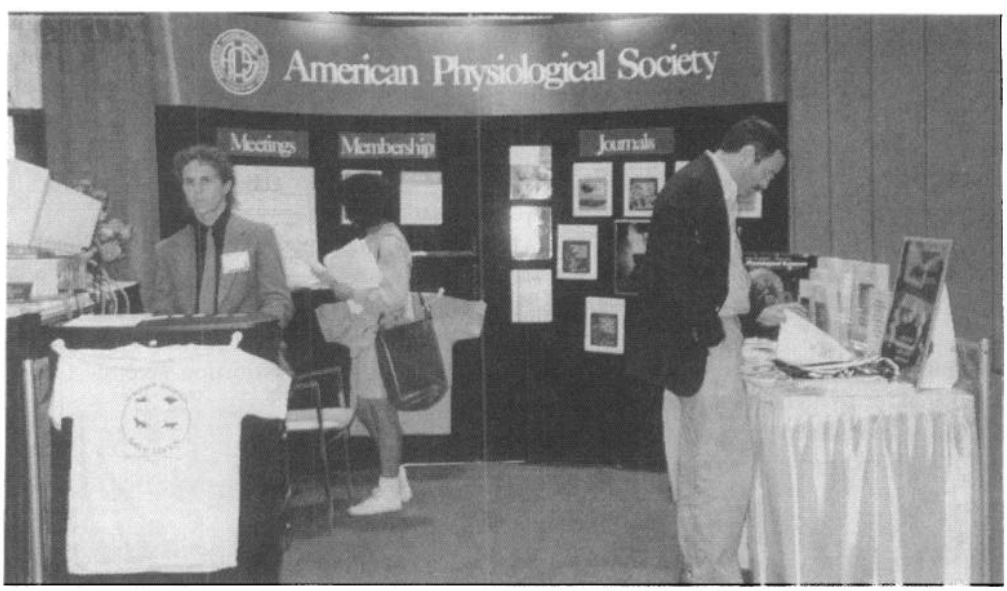
Upjohn has long been committed to the research, development, manufacture, and marketing of pharaceuticals. Human health care is the heart of Upjonn's endeavors.

Waverly Press

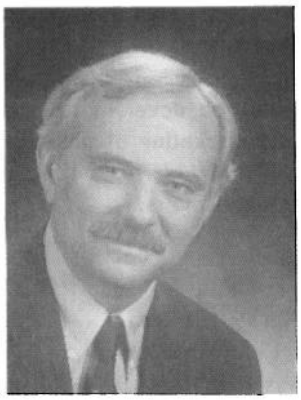
Waverly Press is a full-service publication printer specializing in journals and other periodicals. Committed to servicing its customers through sharing knowledge, providing the best of modern technology, and establishing mutual respect, Waverly Press offers a full range of publishing services including design, editing, composition, printing, binding, mailing and distribution, warehousing, subscription fulfillment, and ad sales.

Waverly practices team concept management. Both client and staff are part of the team. Through this management concept, each publication receives close personal attention.

Striving for excellence in the graphic arts industry is a tradition at Waverly Press—one that continues. Waverly believes in quality products and service through quality people.



APS exhibit, 1992 APS/FASEB Spring Meeting, Anaheim, California.



Willis K. Samson, University of Missouri, has been named chairman of the Department of Physiology at the University of North Dakota School of Medicine, Grand Forks, North Dakota. Samson was elected to APS membership in 1983.

Formerly at the University of Virginia, **Roberto Refinetti** has moved to the the Department of Psychology, College of William and Mary, Williamsburg, VA. Refinetti has been a member since 1989.

Michael C. Andresen, University of Texas Medical Branch, Galveston, has accepted an appointment in the Department of Physiology, Oregon Health Sciences University, Portland. Andresen was elected to APS membership in 1979.

Steven Segal, Pennsylvania State University, has accepted a position as associate professor at the John B. Pierce Laboratory, Yale University, New Haven, CT. A member since 1986, Segal is a member of the APS Liaison with Industry Committee.

William C. Stanley, who has been at the University of Wisconsin, is now with the Syntex Research in Palo Alto, California. Stanley has been a member of the Society since 1988.

Formerly at the University of Florida, Department of Physiology, **Orit Shechtman** has joined the Laboratory of Behavioral Science, National Institutes on Aging, Baltimore, Maryland. Shechtman was elected to membership in 1990.

George B. Zavoico is now with UDEC Pharmaceuticals, Inc. in New Haven, Connecticut. A member since 1985, he was formerly at Bristol-Myers Squibb Company, Princeton, New Jersey.

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

Travel Grant Applications Available for IUPS Congress in Glasgow

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

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

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

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

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

Deadline for submission of application for travel award is December 15, 1992. The application is on p. 155. All applicants must submit six copies of the application to USNC/IUPS, National Academy of Sciences, Attn: Robin Schoen, 2101 Constitution Avenue NW, Washington, DC 20418.

SURNAME_____

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

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

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

SURNAME_____

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

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

ANNOUNCEMENTS

New AAAS Database

The American Association for the Advancement of Science (AAAS), in collaboration with the Carnegie Commission on Science, Technology, and Government, is assembling a database of individuals in the field of science, technology, and public policy in the United States.

The database will be used by AAAS and the Carnegie Commission to publicize and distribute reports and publications, to develop invitation lists for conferences and workshops, and for similar purposes. Our target audience includes individuals in government, universities, the private sector, media, nonprofits, and other organizations interested in general science and technology policy issues or in related policy areas, such as energy, space, science and math education, and health/biomedicine.

Individuals who would like to be considered for inclusion in the database may request a brief questionnaire from Elizabeth Broughman, Directorate for Science and Policy Programs, AAAS, 1333 H Street NW, Washington, DC 20005. Tel: (202) 326-6600; Fax: (202) 289-4950.

Pierre Rijlant Academic Award

The Award of the Professor Pierre Rijlant Academic Foundation of Cardiac Electrophysiology has been awarded to D. Noble, professor of cardiovascular physiology at Oxford University, and E. Carmeliet, professor of physiology at Leuven University.

The award is designed to recompense a scientist who has made a major contribution to the field of cardiac electrophysiology, in particular as regards the following subjects: hybrid computers in electrocardiography, application to computers to electrocardiography, and vectography and analog simulation.

The next award is scheduled for 1994, and the amount of the prize will reach 500.000 B.F. Applications are due before December 31, 1993. For further information, write to Marc Renard, Secretary of the Foundation, Palais des Academies, Rue Ducale 1, B-1000 Bruxelles (Belgium).

Assistant or Associate Professor in Endocrinology. The Department of Physiological Science at UCLA is seeking applicants for a tenure-track position, beginning fall of 1993. Areas of interest include but are not limited to molecular aspects of hormone action, neuroendocrinology, and organismal or systemic endocrinology. Applicants must be able to establish an active research program and to teach endocrinology to undergraduates and graduate students. Submit curriculum vitae, statement of present and future research interests, and three letters of evaluation by November 1, 1992 to Gordon L. Fain, Chair, Endocrinology Search Committee, Department of Physiological Sciences, Jules Stein Eye Institute, University of California Los Angeles, Los Angeles, CA 90024-7008. [EOEAA]

Director, Noll Laboratory for Human Performance Research, College of Health and Human Development—Penn State. The Noll Laboratory is a multidisciplinary laboratory that conducts research in applied physiology from the cellular level to the intact organism. The Director is responsible to the Associate Dean for Research and Graduate Studies of the College of Health and Human Development. The new Director must possess a doctoral degree in physiology, medicine, or related disciplines, have an active record of research and extramural support, and have experience in administrative roles. Candidates should be qualified for appointment to a tenured, full professor position at Penn State. Salary is negotiable and commensurate with experience. Penn State offers a full and comprehensive benefits program. Applications and nominations should be sent to Peter A. Farrell, Chair, Search Committee for the director of Noll Laboratory for Human Performance Research, 119 Noll Laboratory, Dept. PHY, Penn State University, University Park, PA 16802. Screening of applications will begin immediately and continue until a suitable candidate is located. To receive full consideration, applications must be received no later than October 1, 1992. [EOEAA]

Positions Available

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

14th Annual Meeting
IUPS Commission on Gravitational Physiology

Berlin, Germany
September 29–October 3, 1992

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
Alliance Pharmaceutical Corporation
American Medical Association
Axon Instruments, Inc.
Berlex Laboratories, Inc.
* Boehringer Ingelheim
Burroughs Wellcome Company
CIBA-GEIGY Corporation
Coulbourn Instruments, Inc.
Dagan Corporation
Du Pont Pharmaceuticals
Fisons Pharmaceuticals
Genentech, Inc.
Glaxo, Inc.
Gould, Inc.
Grass Foundation
Harvard Apparatus
Hoechst-Roussel Pharmaceuticals, Inc.
* Hoffman-La Roche, Inc.
ICI Pharmaceuticals Group
Jandel Scientific
Janssen Research Foundation
R. W. Johnson Pharmaceutical Research Institute
Kabi Pharmacia
Lederle Laboratories
Eli Lilly & Company
Lockheed Missles & Space Company, Inc.
Marion Merrell Dow Inc.
McNeil Pharmaceutical
* Merck & Co., Inc.
Miles Institute for Preclinical Pharmacology
NARCO Bio-Systems
Pfizer, Inc.
Pharmacia, Inc.
Procter & Gamble Company
Quaker Oats Company
* Sandoz Pharmaceuticals Corp.
* Schering-Plough Corporation
G. D. Searle and Company
SmithKline Beecham Pharmaceuticals
* Squibb Corporation
Sterling Drug, Inc.
Sutter Instruments Company
* The Upjohn Company
* Warner-Lambert/Parke Davis
Waverly Press
Wyeth-Ayerst Laboratories

* Second Century Corporate Founders

Scientific Meetings and Congresses

8th Annual Meeting of the American Society for Gravitational and Space Biology (ASGSB), Tuscon, AZ, October 21–24, 1992. *Information*: Donald R. Beems, AIBS, Special Science Programs, 730 11th Street NW, Washington, DC 20001. Tel: 202-628-1500.

38th Annual National Conference of the Association of Physiologists and Pharmacologists of India, New Delhi, December 27–29, 1992. *Information*: B. N. Mallick, Organizing Secretary, Jawaharlal Nehru University, New Delhi 110 067. Tel: 667676/ext. 246; 650016; Fax: 011-686-5886.

Slow Infections of the Central Nervous System: The Legacy of Dr. Bjorn Sigurdsson, Reykjavik, Iceland, June 2–5, 1993. *Information*: Conference Department, New York Academy of Sciences, 2 East 63rd Street, New York, NY 10021. Tel: 212-838-0230; Fax: 212-888-2894.

Third International Meeting on Platelets and Vascular Occlusion, Santa Fe, NM, June 6–9, 1993 (formerly July 1992). *Information*: Conference Department, New York Academy of Sciences, 2 East 63rd Street, New York, NY 10021. Tel: 212-838-0230; Fax: 212-888-2894.

Human Gene Therapy, Washington, DC, June 26–30, 1993. *Information*: Conference Department, New York Academy of Sciences, 2 East 63rd Street, New York, NY 10021. Tel: 212-838-0230; Fax: 212-888-2894.

7th World Congress on Pain, Paris, France, August 22–27, 1993. *Information*: International Association for the Study of Pain, 909 NE 34rd St., Suite 306, Seattle, WA 98105. Tel: 206-547-6409; Fax: 206-547-1703.

XXXII IUPS Congress

Glasgow, Scotland
August 1–6, 1993

Deadline for submission of abstracts
January 31, 1993

Symposium on Resistance Arteries

The Fourth International Symposium on Resistance Arteries is scheduled for January 12–16, 1994, at the Sugarbush Inn in Warren VT. The overall theme is "Integration of Regulatory Pathways in Resistance Arteries." The American Physiological Society is sponsoring the symposium.

National Student Research Forum

The University of Texas Medical Branch announces the 34th National Student Research Forum, to be held April 15–17, 1993, at the UTMB campus in Galveston, TX.

The Forum is intended for the competitive presentation of clinical and basic science research by medical students, graduate students, interns, and residents.

Abstracts must be postmarked by no later than November 15, 1992. *Information*: National Student Research Forum, Room G-210 Ashbel Smith Building, Route M-17, UTMB, Galveston, TX 77550. Tel: 409-772-3762.

Proposed Committee _____

Nominee's Last Name _____

Date _____

NOMINATION FORM

FOR

APS COMMITTEE APPOINTMENTS

(Use this form for yourself or another individual)

Name of Nominee _____
First Middle Last

Position/Title _____

Mailing _____

Address _____

Telephone No: _____ Fax No: _____

Is the nominee an APS member who actively participates in APS meetings?

Have you personally verified that the nominee is willing to devote the time and effort to carry out the committee's charge?

What special expertise qualifies the nominee for the committee specified above?

With which section is the nominee affiliated?

Nominator (please print) _____ ☐ self

Nominator's Institution _____

Address _____

_____

_____

Mail Completed Form To:
American Physiological Society
9650 Rockville Pike, Rm 4402
Bethesda, MD 20814
Telephone: 1-301-530-7165
Fax: 1-301-571-1814

_____
Signature

0605-90

INSTRUCTIONS FOR APPLYING FOR APS MEMBERSHIP

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

GENERAL INSTRUCTIONS

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

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

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

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

DEADLINE DATES

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

QUALIFICATIONS (Except Students)

The following categories are used when evaluating an application:

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

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

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

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

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

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

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

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

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

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

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

SPONSORS

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

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

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

CHECK LIST

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

RIGHTS AND PRIVILEGES OF EACH MEMBERSHIP CATEGORY

REGULAR MEMBERSHIP

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

CORRESPONDING MEMBERSHIP

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

ASSOCIATE MEMBERSHIP

Same as for Regular members with the following exclusions:

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

ASSOCIATE CORRESPONDING MEMBERSHIP

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

STUDENT MEMBERSHIP

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

THE AMERICAN PHYSIOLOGICAL SOCIETY

THE AMERICAN PHYSIOLOGICAL SOCIETY

9650 Rockville Pike, Bethesda, MD 20814

Date _____ LAST NAME _____

MEMBERSHIP APPLICATION

Submit original and 7 copies of application and supporting documents

REGULAR	☐	ASSOCIATE	☐
CORRESPONDING	☐	ASSOCIATE CORRESPONDING	☐
		STUDENT	☐

Current Membership and year elected _____

Refer to Instructions Before Continuing

Name of Applicant: _____

First Middle Last

Mailing _____ Birth Date: _____

Address _____ Citizenship: _____

_____ *Country of Permanent Residence:

_____ _____

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

1. EDUCATIONAL HISTORY

Dates	Degree	Institution	Major Field	Advisor

Doctoral Dissertation Title (if any): _____

_____

Postdoctoral Research Topic: _____

_____

SPONSORS

#1. Name: _____

Mailing Address: _____

_____

_____

_____

Telephone No.

#2. Name: _____

Mailing Address: _____

_____

_____

_____

Telephone No.

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

#1 Signature _____ #2 Signature _____

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

NAME _____

2. OCCUPATIONAL HISTORY

Present Position: _____

_____

Prior Positions:

Dates	Title	Institution	Department	Supervisor

3. INTEREST IN THE SOCIETY

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

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

4. TEACHING

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

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

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

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

5. RESEARCH

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

b. If your research is funded state source: _____

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

6. BIBLIOGRAPHY

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

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

MEMBERSHIP RECORDS QUESTIONNAIRE

PLEASE MARK ALL ENTRIES IN RED.

CURRENT MAILING LABEL OR
PRINT NAME & ADDRESS

DATE _____

DATE OF BIRTH
Month Day Year

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

OPTIONAL PERSONAL DATA
SEX
☐ Female ☐ Male
A ☐ American Indian or Alaskan Native
B ☐ Asian or Pacific Islander
C ☐ Black
D ☐ White E ☐ Hispanic

POSITION TITLE CODE (SEE REVERSE) ☐☐

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

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

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

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

Keyline: _____ (from mailing label)

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

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

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

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

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

☐☐ MAJOR AREA ☐ SPECIFIC INTEREST

SECONDARY INTEREST AREA (If appropriate)

☐☐ MAJOR AREA ☐ SPECIFIC INTEREST

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

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

APS Sections

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

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

APS Groups

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

F ___Epithelial Transport Group
H ___History of Physiology
I ___Muscle Group

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

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

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

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

POSITION TITLE CODES (use most closely related description)

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

EARNED DEGREE CODES

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

INTEREST AREA CODES

01. Anesthesia

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

03. Anthropology

04. Biochemistry
A. General
B. Clinical

05. Biophysics

06. Biomedical Engineering

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

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

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

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

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

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

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

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

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

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

17. General Physiology

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

19. Immunology

20. Liver and Bile

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

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

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

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

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

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

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

27. Pathology

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

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

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

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

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

99. Other
Z. Other

APS T-Shirt Order Form

All shirts are $10.00 postage paid and can be purchased from the American Physiological Society. Place your order below and send with payment to APS. Orders will be shipped approximately three weeks after receipt of the order.

I would like to order (circle size and color)

"Research Animals Save Lives" #_____ @ $10.00 = _____

Size: M L XL
Color: White with blue lettering

"Physiologists Know the Inside Story" #_____ @ $10.00 = _____

Size: M L XL
Color: Yellow Lt. Blue

"APS Founders" #_____ @ $10.00 = _____

Size: M L XL
Color: Gray Lt. Blue

Please charge my VISA MasterCard (circle one)

Card # _____ Exp. Date _____

Daytime phone _____ Signature _____

Name _____

Address _____

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Send this form to
American Physiological Society
9650 Rockville Pike
Bethesda, MD 20814 USA

____ Please send information on APS membership ____ Please send information on APS journals and books

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THE AMERICAN PHYSIOLOGICAL SOCIETY