

THE PHYSIOLOGIST



A Publication of the American Physiological Society

Volume 38, Number 5

October 1995

Physiology on the World-Wide Web

Daniel Gardner

Department of Physiology
Cornell University Medical College

The World-Wide Web, a part of the Internet, is the fastest-growing communication network in the history of humanity and potentially one of the most important advances ever in scientific communication. Software available at little or no cost permits an individual using any contemporary desktop computer to select and view text and images, including sound and video, created and provided by a remote computer.

Because the Web is machine independent, users with one type of computer, such as a Macintosh, can readily select and view documents created and provided by any computer, whether Mac, IBM PC, or UNIX. An intuitive point-and-click interface provides easy-to-use navigation of "links" (underlined in Fig. 1) from document to document. This graphical interface largely shields the user from having to know the actual site—the location on the Internet of the remote computer—or even whether related documents are stored on the same machine or on computers at different sites. Further navigation by button or menu permits retracing a series of links or revisiting any of a set of personally selected sites.

Posting documents ("pages") on the Web is technologically almost as simple as reading them. The resulting prolif-

eration of sites renders less gloomy A.J. Liebling's famous dictum that freedom of the press is restricted to those who own one.

However, it is this anarchic and explosive growth that makes it difficult to find the addresses (called Uniform Resource Locators or URLs) of pages of interest or even to know what sites exist. There is no official central registry or directory, and unlike the earlier Gopher protocols, there is no hierarchical tree structure. (There is an art to deducing URLs known to experienced Web users. It is based on a variety of formal or informal conventions, but the guess must be exact.)

One approach to keeping track of the continuing growth of this new medium is provided by on-line indexing and directory tools. A major indexing resource is the World-Wide Web Virtual Library (WWWVL), a set of distributed subject catalogs. One of these is the WWWVL: Physiology & Biophysics, maintained at the Department of Physiology at Cornell University Medical College. This Virtual Library serves as an index and guide to physiology sites on the Web and as a list of other sites that are likely to be of particular interest to physiologists. By combining the functions of a directory and index, the Virtual Library provides a contemporary and informal definition of physiology.

As the name implies, usage of this Virtual Library is indeed world wide. During one typical 24-hour period beginning noon on August 14th, the site was used by hundreds: academics at 40 US and Canadian universities; US government, commercial, and military organizations; and other users from 18 foreign countries as geographically diverse as Australia, Brazil, Estonia, India, and Malaysia.

Origins

As a developer of this new technology at Cornell, I began by constructing a local Web site that indexes and describes research, teaching, and people within my department. This

continued on page 193

INSIDE

The Training of Physiologists	189
On-line and Into the Future	192
First Summer Institute Held for Teacher Research Fellows	198
Experimental Biology '96 Preview	203
APS Conference: New Discoveries Within the Pancreatic Polypeptide Family: Molecules to Medicine	i

CONTENTS

FEATURE ARTICLES

- 187** Physiology on the World-Wide Web
D. Gardner
- 189** The Training of Physiologists for the 21st Century
J.A. Williams

A MATTER OF OPINION

- 192** On-line and Into the Future

APS NEWS

- 195** Letter to the Editor
- 195** Council Meets in Bethesda, MD
- 197** Council Thanks APS Staff

EDUCATION

- 198** First Summer Institute Held for Teacher Research Fellows
- 199** Education Staff to Promote APS Programs at Fall Teacher Conferences

APS CONFERENCES

- 200** Conference Report. Understanding the Biological Clock
- 201** 1996 Conference. Neural Control of Breathing: Molecular to Organismal Perspectives
- 202** 1996 Conference. pHysiology of Acid-Based Regulation: From Molecules to Humans
- 202** 1996 Intersociety Meeting. The Integrative Biology of Exercise

EXPERIMENTAL BIOLOGY '96

- 203** Symposia Preview
- 212** Bowditch Award, Cannon Award
- 212** Distinguished Lectureships

PUBLIC AFFAIRS

- 214** Legislative Alert: Oppose the "Animal Experimentation Right to Know Act"
- 215** APS Council Approves Resolution on "Class B" Dealers
- 216** Coronado Sentenced, Repudiates Own Activism

217 SUSTAINING ASSOCIATES

221 PEOPLE AND PLACES

223 SENIOR PHYSIOLOGISTS

224 POSITIONS AVAILABLE

225 BOOKS RECEIVED

225 BOOK REVIEWS

ANNOUNCEMENTS

- 228** XXXIII International Congress of Physiological Sciences
- 229** Director, Division of Research Grants, NIH Position Open
- 230** Scientific Meetings and Congresses

The Physiologist

Published bimonthly and distributed by
The American Physiological Society
9650 Rockville Pike
Bethesda, Maryland 20814-3991
ISSN 0031-9376

Martin Frank

Editor and Executive Director

Leonard S. Jefferson *President*

Brian R. Duling *Past President*

James A. Schafer *President-Elect*

Councillors

**Walter F. Boron, Gerald F. DiBona, D. Neil Granger,
Barbara A. Horwitz, Diana L. Kunze, Heinz Valtin**

Ex Officio

**Leonard R. Johnson, Franklyn G. Knox, Francis L. Belloni,
Ethan R. Nadel, Richard J. Traystman**

Publications Committee: *Chairman*, Leonard R. Johnson; *Members*, Dale Benos, Jerome A. Dempsey, Lorne Mendell, John A. Williams, and Loring R. Rowell (ex officio). *Publications Manager*, Brenda B. Rauner.

Subscriptions: Distributed to members as part of their membership. Nonmembers in the USA: individuals \$25.00; institutions \$37.00. Nonmembers elsewhere: individuals \$35.00; institutions \$48.00. Single copies and back issues when available, \$10.00 each; single copies and back issues of Abstracts issues when available, \$20.00. Subscribers to *The Physiologist* also receive abstracts of the Conferences of the American Physiological Society.

The American Physiological Society assumes no responsibility for the statements and opinions advanced by contributors to *The Physiologist*.

Deadline for submission of material for publication: Jan. 1, February issue; March 1, April issue; May 1, June issue; July 1, August issue; Sept. 1, October issue; Nov. 1, December issue.

Please notify the central office as soon as possible if you change your address or telephone number.

Headquarters phone: 301-530-7118. Fax: 301-571-8305.

Printed in the USA.

The Training of Physiologists for the 21st Century

John A. Williams
Department of Physiology
University of Michigan

In the last year I have been involved in a number of discussions and read articles about the oversupply—real, perceived, or potential—of PhD scientists in the US. The issue has become prominent enough that it was addressed last fall in a meeting of the Association of American Medical Colleges (AAMC) that considered for the first time PhD degree programs in medical schools and will be the subject again this year at a similar meeting.

The oversupply of PhDs is generally believed to result from an increased number of individuals being trained coupled with a decline in the number of positions available in both academia and industry. David Goodstein of the California Institute of Technology has pointed out that if the past exponential increase of individuals receiving PhDs continued until 2080, every man, woman, and child in the US will have a PhD in physics (1).

Until recently it was fashionable to speak of how many PhD students one had trained. The implicit assumption was that these students would all find jobs as science grew and that by training as many scientists as possible, the day would be hastened when the benefits of science would be brought to bear on an array of problems affecting mankind. Now we tend to talk of how many people are applying for each available job or how many people register at the placement office at the annual meeting.

With the growing realization that society may not be able to support all conceivable scientific research, that the costs of health care need to be brought under control, and that certain political groups are espousing large cuts in government spending at all levels, we are starting to hear that we should reduce graduate training.

Obviously, physiologists make up only a small portion of biological scientists. Even though this means we are not a large part of a manpower problem, it means we are at risk of getting swept along in any solution. Certainly at my institution some administrators would like to combine all biomedical graduate training into a common smaller program with less institutional costs. Thus, if for no other reason than self interest, it is important for physiologists to take stock of the self-renewing aspects of our discipline and to be able to make valid proposals regarding graduate training and have the data to back them up.

The purpose of this article is to present issues that, in my opinion, physiologists should be thinking about regarding graduate education, to present some examples from the perspective of one physiology department, and to develop my view that we probably should not significantly decrease our overall training effort but rather, in some cases, we need to change our curriculum to prepare our students for the wide range of careers open to physiologists.

We need to develop a better understanding of the physiology pipeline

An understanding of the physiology pipeline as it relates to the production of physiologists in North America is important both for our discipline as a whole and for individual institutions mounting a significant training effort. While there is no question of the importance and need for improvement in precollege and college science education, I am starting my consideration at the entrance to graduate school.

At this point students who have majored in a variety of areas, frequently biology or chemistry, and who typically have had significant research experience, enroll in a PhD program seeking a degree in physiology.

Nationwide figures from the AAMC suggest the number of enrolled physiology students has remained relatively constant at 1,200 to 1,400 while the number receiving degrees has declined somewhat from 1980 to the 1990s and is now about 200 per year (2).

At my school, the University of Michigan, the number of enrolled PhD students has declined gradually and is now lower than any time in the previous fifteen years.

In our case this recent decline reflects a reduction in the number of highly qualified American applicants, little growth in funds to support graduate training, and a significantly higher annual cost in stipend, tuition, and insurance per trainee, which now totals about \$30,000 for out-of-state students.

It will be important to understand whether the dwindling applicant pool reflects the general state of graduate education in the biomedical sciences or reflects the perception by fewer applicants of physiology as an attractive career. However, at the same time, there has been growth in interdisciplinary PhD programs such as cell and molecular biology, neuroscience, and bioengineering. Some of these students work with physiologists as mentors and will ultimately identify themselves as professional physiologists. Thus, although graduates of American physiology PhD programs make up the major source of new physiologists, other disciplines or programs are graduating individuals who may also become physiologists.

Most physiology graduates go on to do postdoctoral research. At this stage there is a great mixing of disciplines as some physiology degree recipients will do research with mentors who do not identify themselves as physiologists, whereas individuals from other disciplines such as biochemistry or pharmacology will come to work with physiologists. Working with a physiologist, of course, does not necessarily

make one a physiologist unless this training provides an appropriate integrative background.

The postdoctoral pool of physiologists is also enhanced by foreign medical or science graduates. Although many of these scientists return home after training, large numbers from certain countries, including China, UK, and the former USSR, apply for permanent resident status and remain in the US.

The postdoctoral period is also getting longer and many individuals take more than one postdoctoral position. My perception is that the average period of postdoctoral training for individuals identifying themselves as physiologists is now about five years. Moreover, there is the very gray area of individuals who have completed postdoctoral training (post-postdoctoral fellows), which is handled differently in different institutions. This large expansion of the postdoctoral and post-postdoctoral pool is probably the basis for government figures indicating low unemployment rates among scientists and the general perception, certainly among postdoctoral fellows, that it is difficult to find a permanent job.

After postdoctoral training, most physiologists look for a permanent position, i.e., one that pays enough to live on and provides some security of employment. In this area we frequently provide inadequate information to our students and postdoctoral fellows as to the breadth of career options open to physiologists.

Too often we focus on being an independent principal investigator, usually as a university faculty member in a basic science department, as the expected successful outcome. We need to be more aware of and publicize the breadth of opportunities for physiologists in research as well as teaching, hospitals, clinical research, public health, pharmaceutical and biotechnology industries, and government research and testing laboratories. Knowledge of this diversity of career options is important not only because it affects our students' abilities to find meaningful and rewarding positions but also for guiding the evolution of our educational structure.

Clearly not all these types of careers require the same intensity and length of research training. Exposing graduate students to a meaningful teaching experience is essential if that path is to be perceived as an option. There may also be a place for some research-intensive academic centers to offer a designed masters level program in place of a PhD.

We need to be aware of several special circumstances in considering the physiology pipeline, primarily the time lag in the system. When the average individual takes ten years from the time of entering a PhD program to obtain a permanent position, evaluating and correcting problems becomes difficult.

Due to the large demand for postdoctoral fellows, essentially all graduates of physiology PhD programs get a job, but most of us have little data about our graduates' success or personal satisfaction five to ten years after they receive their degree. Furthermore, this analysis is confounded by the fact,

or at least the feeling, that we are providing different training now than was the case ten years ago.

Thus, what is happening to our past graduates may not be relevant to our future graduates. This argument is probably overstated as scientists have always had to evolve with their discipline. However, in the face of discussions of oversupply and pressures to downsize, this type of information will become increasingly important.

Finally, understanding of the pipeline demographics requires an appreciation of the fact that certain students, including some women, individuals with disabilities, and those choosing physiology after an earlier work experience, may have careers that follow a different time line.

How do we provide education that ensures our graduates will get jobs?

It is vitally important that we design our graduate curriculum for individuals who will work in the next century and who will be able to evolve with the discipline of physiology. Although it is easy to tire of formulating mission statements, it is essential to identify and foster what we hold to be unique.

The two aspects that always seem to emerge from gatherings of physiologists who discuss their discipline are "function" and "integration." It is also clear that physiology can span the spectrum of life from the molecule to the organism. Thus, although we may focus our research on the cell or organ level, as physiologists we should always be considering how these structures are made up of their component parts and how they integrate to produce a functional organism.

Thus, a successful training program should introduce students to different levels of organization. It is this need, combined with the complexity of science, that makes it necessary for all but the most gifted students to receive their training in a center with a "critical mass" of faculty investigators and students.

We need to expose students to the most modern techniques of biomedical research. At present, this means having hands-on experience with cell and molecular techniques, particularly those utilizing recombinant nucleic acid to measure mRNA, express proteins, and produce structurally altered proteins both in cells and animals.

Students should be introduced to prominent cell physiological techniques, including patch-clamp electrophysiology and the use of fluorescent intracellular reporter probes, both of which give information from living cells at the molecular level. Immunological techniques that students should learn include the generation and use of specific monoclonal and polyclonal antibodies. Some of these techniques may be learned during a hands-on research experience and others through classes, seminars, and observing work going on in other laboratories.

The aim here is not to make new physiology PhDs

experts in all these techniques but to give them a basic understanding of the technique, an appreciation of its power and limitations, and the feeling that if it becomes essential to answer a particular question they know they can set up and use the technique with advice from others. This may be thought of as "molecular empowerment" and has gone a long way toward replacing the "molecular angst" of the previous generation of physiologists.

At the same time we are providing training in molecular techniques, fostering a deep understanding of integrative function is essential. The main difference between what I do and what some of my biochemical friends do is that while they are studying a molecule or process in yeast or COS cells, I am studying it in pancreatic acinar cells and relating what I learn to the tissue-specific function of this cell while keeping in mind the role of the acinar cell in digestion.

It is this sort of approach that makes physiology so relevant to medicine and is the basis for bridges between physiology and clinical departments. Seeing this sort of interaction being practiced may open our students' eyes to career options in clinical disciplines.

At Michigan we have married the molecular and the integrative approaches by creating a Cellular and Molecular Aspects of Systems and Integrative Biology training program. This program, which started out as a training grant application, has been so appealing to students that it now forms the predominant training path. Students in the program take courses in gene regulation and advanced biochemistry as well as cellular and integrative physiology. They are encouraged to have two mentors, one being cellular/molecular in emphasis and the other being integrative. This frequently involves one mentor being outside the department. Students can also carry out rotations within a broader group of faculty.

To reinforce understanding of integrative physiology, each student spends time teaching in an undergraduate human physiology course. Whenever possible, we encourage students to design a thesis project in which cellular/molecular techniques are used to answer a question of integrative importance. Even those students who choose a pure cellular/molecular or integrative study benefit from being in this milieu.

Ten years ago the challenge to physiologists was to introduce cellular and molecular techniques. The more difficult challenge for the future is to keep integrative biology alive.

As a departmental chair reviewing faculty applicants for a position specifying both integrative relevance and teaching, it has become obvious to me how few individuals address any sort of big picture in their research proposals. On the other hand, I have noted that there is a smaller group, distinguished by having received training in classical physiology, who may have trouble competing successfully for research grant support because of their lack of familiarity with modern molecular tools. Complaints from our colleagues in the pharmaceutical industry regarding their trouble recruiting scientists able

to carry out experiments in animals also indicates that keeping integrative biology alive will be a challenge in the future. While this usually relates to large animals, another new frontier in physiology may be to carry out integrative or system function studies in mice to understand the consequences of gene mutations or knockouts. For their own research, physiologists can now obtain mice expressing a particular protein in a tissue-specific manner by making use of core facilities available at most major research centers.

Does the enterprise need attention?

If we expect to continue training PhD-level physiologists, we need to pay more attention to how this training is done. We need to be able to justify the type of training we provide and to understand supply and demand as it affects our graduates. In the face of pressure to combine programs and down-size, we must also be able to articulate the unique mission of physiology.

However, we may also need to contend with a decreasing number of students simply due to finances or a dwindling applicant pool. In this case, medical schools might institute combined graduate student recruiting among the biomedical sciences, as well as a common first year curriculum. This would be followed by election of a program and discipline-specific training in the second year, which would then be followed by thesis research.

Are we training too many physiologists? I would answer a resounding no. Are we training the right people in the right way? I would have to answer, not always.

It is our responsibility when admitting students to be reasonably confident that each student's background and innate abilities, coupled with his/her training, will enable the student to obtain a position that is both personally satisfying and makes use of the training we provide. This may mean we need to be more rigorous in our entrance requirements and at the same time do a better job of recruiting interested highly qualified applicants.

In some cases there may be pressure to fill a class or to provide research and teaching assistants to meet other needs. A reduction in graduate students may require us to look elsewhere for people to fill these roles. However, if we are committed to providing the highest quality educational experience, our curriculum should, in any case, be designed with the student in mind and should prepare him/her for the position he/she will take five to ten years after entering our programs. Thus, it is certainly not hyperbole to assert that we need to think in terms of training physiologists for the 21st century.

References

1. Goodstein, D. Scientific PhD problems. *Am. Scholar* Spring: 99-104, 1993.
2. Matyas, M.L., and M. Frank. Physiologists at US medical schools: education, current status and trends in diversity. *Physiologist* 38:1-12, 1995.

On-line and Into the Future

August 1, 1995, marks the dawning of a new age for APS.

On that date the Society signed a contract with Online Computer Library Center, Inc. (OCLC) to publish the *Journal of Applied Physiology* on CD-ROM and on-line. In deciding to take this step, the Society acknowledged that, in the future, the distribution over the Internet of full-text scientific journals will be a vital means of information dissemination. Ultimately, on-line publication of APS journals should also speed the publication process and help to reduce the growing cost of serials for libraries.

APS has long been a leader in the distribution of information over the Internet. With the initiation of the APS Gopher Information Server in December 1992, the Society became one of the first scientific societies with a presence on Gopher.

In January 1994, APS created its first electronic journal, *APStracts*, an on-line publication of current research in the form of abstracts of accepted manuscripts scheduled to be published in the APS journals. Started as a pilot project with abstracts from the *American Journal of Physiology: Cell Physiology*, *APStracts* was expanded to include abstracts from all the journals in 1995. It was then that the Society also began the publication of *APStracts* on the World-Wide Web.

The Society has been exploring the electronic publication of full-text journals for some time. Initially, APS focused on the production of a monthly CD-ROM, but advances in technology rendered the concept obsolete before implementation.

With the development of Web browsers such as Mosaic and Netscape, on-line publication became a more promising platform for the monthly publication of the Society's journals. Consequently, the Society switched its focus and began investigating a combination of on-line publication and production of archival CD-ROMs.

APS selected OCLC based on its pioneering role in the publication of scholarly journals on-line. OCLC's electronic journal platform was introduced in July 1992. Today, OCLC is one of the world leaders in the distribution of journals on-line. Currently, OCLC Electronic Journals Online publishes *Immunology Today Online*, *Applied Physics Letters Online*, *Current Opinions in Biology*, *Current Opinions in Medicine*, *Electronics Letters Online*, *The Online Journal of Knowledge Synthesis for Nursing*, and *The Online Journal of Current Clinical Trials*. OCLC plans to load 13 other journals at the beginning of 1996. OCLC has also signed a memorandum of understanding with Elsevier Science to make all Elsevier titles available electronically under a joint marketing arrangement.

OCLC's Electronic Journals Online uses Guidon, a Windows and Macintosh graphical user interface, for the on-line delivery of the journals. Guidon offers typeset-quality presentation, complete with tables, math and scientific nota-

tion, and gray scale and color images. The user interface supports full-text searching using Boolean capabilities, wildcard, adjacency, and proximity indicators. Most importantly, the Guidon user interface will allow the Society to link the references in the *Journal of Applied Physiology* to relevant external databases such as Medline, other articles in *Journal of Applied Physiology*, and other OCLC electronic journals.

Electronic Journals Online can be accessed via the Internet or via dial access through Compuserve lines. Each user is supplied with an authorization number that allows one simultaneous user at a time. The software can also be loaded on a local area network to facilitate usage among a group of users. The Society will offer multiple-user subscriptions at a modest additional charge, making this an attractive option for institutions or others who want to offer access to a number of simultaneous users.

OCLC's Electronic Journals Online offers users technical support through toll-free telephone support and comprehensive documentation. OCLC's offices in Birmingham, UK, provide support for international subscribers. The Guidon interface's extensive on-line help system is complemented by a documentation package (including journal-specific reference cards) and startup information (including a separate section on connectivity).

As a publisher of multiple journals, the Society had to decide whether to mount all the journals simultaneously or to begin our electronic publication venture with only one journal. Because of the uncertainties associated with the on-line publication environment, APS decided to start with one title and evaluate how it is utilized and how to price it to ensure cost recovery.

The large member subscriber base contributed to the Society's decision to initiate the venture with the *Journal of Applied Physiology*, titling the new product the *Journal of Applied Physiology Online*. The journal will be published on-line and on paper simultaneously, but because of mailing delays it will appear on-line before it arrives in the library or subscribers' offices.

As a fully searchable file, *Journal of Applied Physiology Online* will provide the user with immediate access to the wealth of information appearing each month. In addition, subscribers can receive notification, via e-mail or fax, of new articles appearing that meet the search parameters of their particular fields of interest. Having identified articles of interest, subscribers can print the article locally, order a reprint from APS, or download articles or sections of articles for future use.

In order to make the *Journal of Applied Physiology Online* attractive to subscribers, it will be available independently or in combination with either the print or archival CD-ROM version of the journal. The *Journal of Applied Physiology Online*'s attractive introductory price for APS members will maximize utilization of this exciting new

resource. APS plans to invite member subscribers to evaluate the product and help the Society determine the utility of on-line publications. The success of the *Journal of Applied Physiology Online* will help APS decide whether to publish all its journals on-line.

In the coming months, APS will be distributing addi-

tional information about the Journal of Applied Physiology Online. The journal should be available to subscribers in May 1996, with access to all issues published since January 1996.

We look forward to having you join us in this adventure.

Martin Frank

Physiology on the World-Wide Web

continued from page 187

provided any Web user, whether at Cornell or far beyond its walls, with descriptions of our research, bibliographies of our recent works, and schedules of our courses.

This continually updated site serves not only its original purpose but now also acts as a directory to other servers at Cornell and allied institutions. One of its most popular components is a student handbook-derived guide to New York life and the neighborhood surrounding Cornell.

This departmental page served to keep the world informed about us and our work, but I saw the need for a compendium of sources of information elsewhere that physiologists would find useful. This naturally included physiology and biophysics departmental and program home pages at other institutions but would also include physiology journals, databases, techniques, and resources, as well as organizations such as APS, the Biophysical Society, and the Physiological Society.

I also saw the need to emphasize how physiology was continuing to evolve, to stress the range of contemporary physiology and the strength of its ties to such related sciences as molecular biology, neuroscience, structural biology, cell biology, and information science.

Therefore, I selected similar resources in these disciplines to be included in my evolving physiology Web site. The major criterion for inclusion in this growing list remained the information's utility to physiologists.

Once established, the page proved to be of more than local interest. Soon, maintainers of other subject areas of the WWWVL asked me to convert my physiology Web page to a virtual library. Now, I maintain the original Cornell physiology site as well as the WWWVL: Physiology & Biophysics page.

The new WWWVL: Physiology & Biophysics page grows as new links are continually added. Some links, however, are only temporary. For example, when matters related to research funding arise, such as Congressional action on bills affecting NIH or NSF, summaries and alerts are provided during critical periods.

Organization

Much like a journal editor, maintainers of Web sites help to define and codify the current extent of a field. If well done, Virtual Libraries make it unnecessary for every Web-

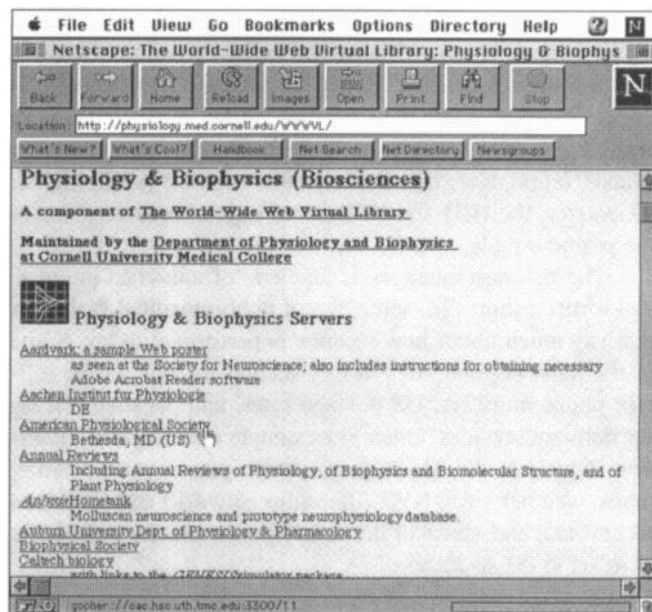


Fig. 1. The top of the WWWVL: Physiology & Biophysics page, as viewed on a user's computer equipped with a Web browser (here, Netscape Navigator). Visible under the category Physiology & Biophysics Servers is the start of an alphabetized list of links. Pointing to and clicking on any underlined text selects the corresponding page from a remote computer and displays it on the user's screen. On the right, the scroll bars are used to reveal other parts of a page too large for the window. Buttons permit further navigation and reading and printing pages. The Bookmarks menu allows generation and recall of individual lists of pages of interest. Pages present a similar appearance on other graphical browsers; nongraphical browsers such as Lynx provide a text-only equivalent.

The WWW Virtual Library:
Physiology & Biophysics
can be found at

<http://physiology.med.cornell.edu/WWWVL/>

The Department of Physiology & Biophysics
at Cornell University Medical College
home page can be found at

<http://physiology.med.cornell.edu/>

linked institution to do the research necessary to generate its own ad hoc list of links in a subject area.

With links maintained to about 200 resources, utility of the Virtual Library depends upon the efficiency of the classification and arrangement of listings. Currently, links are divided into three main categories and alphabetically listed within each category.

Physiology and biophysics sites form the first group, including approximately 60 departments, programs, databases, and organizations. The second category comprises about 100 resource pages for related or broader biomedical sciences. Examples of links in this more diverse category include chemistry, cognitive science, Digital Anatomist, the Japan Neural Network Society, the *Journal of Biological Chemistry*, the NIH and NSF home pages, three versions of the periodic table, and the Visible Human.

The broadest category is labeled "of universal interest" and forms a short (28) select list of nonbiomedical Web sites that say much about how science is performed today. Some of the most popular sites in this section include airline toll-free phone numbers, US postage rates, and package tracing for delivery services. Other sites sample contemporary interests: I include the Shakespeare home page, world subway maps, weather sites, NPR (the radio network) and CPR (the technique), and views of the solar system and the paleolithic cave art in the Ardèche.

Future APS Meetings

1995

APS Conference

New Discoveries within the Pancreatic Polypeptide
Family: Molecules to Medicine
Nov. 8-11, Newport Beach, CA

1996

Experimental Biology '96
April 14-17, Washington, DC

APS Conference

pHysiology of Acid-Base Regulation:
From Molecules to Humans
July 12-15, Snowmass, CO

APS Conference

Neural Control of Breathing:
Molecular to Organismal Perspectives
July 21-25, Madison, WI

APS Intersociety Meeting

The Integrative Biology of Exercise
October 16-19, Vancouver, British Columbia

1997

Experimental Biology '97
April 6-10, New Orleans, LA

Predictions

Estimates of the future growth rate of the Web vary so widely as to be unreliable. However, predictions of the future of physiology on the Web can be more focused. Most major departments, programs, and laboratories will post home pages, in part to stay competitive in the search for students, postdoctoral fellows, and clinical residents and fellows. Web pages can also provide preprints and virtual posters and list local on-line resources, including research descriptions, phone and e-mail lists, videoconference reflectors, and databases. Keeping track of this growth will enhance the utility and value of such guides as the WWW Virtual Libraries.

What You'll Need to Get Hooked Up to the Web

For those not yet using the Web, all that is needed are contemporary computer hardware and software and access to the Internet (usually provided by one's institution).

Useful hardware includes a Macintosh with 4 MB of memory and 68030, 68040, or PowerPC processor; an IBM PC clone with 4 MB of memory and 386, 486, or Pentium processor; or a 16-MB UNIX workstation, all with Ethernet (either card or built-in) and appropriate transceiver.

The most popular Web browsers, Netscape Navigator or NCSA Mosaic, are available by downloading over the Internet and from many academic institutions as well. These browsers require contemporary system and windowing software: for Macs, System 7.x and MacTCP; for PCs, Windows (3.1, NT, or 95) and Winsock TCP/IP, or LINUX; for UNIX, X Windows. Needed institutional support includes an Ethernet connection to lab or office, either via fiber optic cable (10-base-T), or coaxial cable (10-base-2 or 5), a link from the local net to the Internet, and support for Internet TCP/IP and addressing protocols.

There are alternatives. Older machines or those with slower processors can access text on the Web (without images) using other browsers, such as Lynx. Where institutional Ethernet-based connections are unavailable, dial-up access using a modem provides a less-convenient and slower option.

Letter to the Editor

Following is a letter written in response to Past President Brian Duling's open letter which appeared in the June 1995 issue of The Physiologist.

In your open letter to APS members, you relate the visits you made with Martin Frank and Alice Hellerstein to congressional offices. You explained the discussions you had and the positions you took as our representatives. In your discussions you agreed with the opinion that cuts have to be made in the financing of scientific research and suggested that it is time for scientists themselves to make the decisions about which existing programs should be dropped and which should be maintained. You were impressed by the fact that people in Congress are ready to hear where cuts can be made and that at least one congressman was offended at the reluctance of scientists to point fingers and name names.

We have seen, however, that all these congressmen who point their severe slashing fingers toward the budget of biological research, health care, and educational programs, as well as toward foreign aid and international collaboration, fight vigorously for the procurement of unneeded weapons and for the maintenance of unnecessary military installations, especially when the weapons are produced and the installations are located in their voting districts.

Following the levels set by the budget resolutions by both houses, the Senate Armed Services Committee approved a \$264.7 billion military budget bill for fiscal year 1996. They approved \$7 billion more than the Pentagon requested. Congress is also prepared to spend \$7 billion more than the Pentagon requested next year and \$11.14 billion more in 1997. The plans of both houses to spend over and above the very generous military budget of the administration are larded with the addition of different military fight-

er and bomber planes, two more Aegis destroyers, and a potpourri of other pork-barrel projects from amphibious assault ships and army trucks to barracks and day care centers.

The congressmen who voted for this very substantial increase in military spending want us to agree voluntarily to slash the health science budget, even though the total yearly NIH budget is only about \$11 billion!

Despite the fact that our science budget is very modest in relation to the large military expenses, all the results of the work are very important. They make it possible today to maintain a healthy life for our citizens to a degree never seen before. New successes are on the horizon. The prestige of American science is high. It is clear, on the other hand, that the enormous amount of money by which military spending is increasing is a waste of taxpayers' money.

You suggest that we should be prepared to point our fingers at those whose research should be eliminated and at those whose research should continue. You know that your work is excellent and your colleagues in the committees agree that it should continue. You will therefore, agree that their excellent work should also continue. The research of the scientists not represented in the committees of power would, therefore, have to be discontinued. Their knowledge, their skill, their talent, and their enthusiasm would be wasted. Finger pointing has nothing to do with the quality of science, rather it is necessarily determined only by the position of the individuals in the power structure.

As responsible citizens, the members of the APS cannot agree with decreases in funding for biological or any other type of research. We cannot collaborate in this process with finger pointing.

*Walter Ehrlich
The Johns Hopkins University*

Council Meets in Bethesda, MD

The summer Council meeting was held in Bethesda at APS headquarters June 23–25, 1995. One of the highlights of the summer meeting is Council's opportunity to meet with committee chairs, receive reports on their accomplishments during the past year, and listen to their plans for the coming year. (These committee reports were published in the August issue of *The Physiologist*.)

In addition, Council and committee chairs were briefed by Lawrence E. McCray, Executive Director of the Committee on Science, Engineering, and Public Policy at the National Academy of Sciences, on the recently published report on graduate education in the US.

With each year's committee reports, it becomes more apparent that while the committees continue to work as independent entities on their own projects, increasingly they are joining forces to implement specific plans in areas of common interest. The recent increase in APS education and pub-

lic affairs staff may account for this trend. With its increased manpower, the staff is better able to coordinate projects involving multiple committees or groups, as well as make suggestions for such cooperative efforts.

Recent examples include the joint efforts of the Long-Range Planning and Program Committees and sectional representatives, along with APS Council, to revamp the Experimental Biology meeting to increase its drawing power among scientists through better and more exciting programming. The Liaison With Industry and Careers in Physiology Committees joined to support a seminar on possible career opportunities, both traditional and nontraditional, in physiology. The Education, Women in Physiology, Careers in Physiology, and Animal Care and Experimentation Committees jointly sponsor programs to develop resource materials for the precollege classroom concerning contemporary issues in physiology. In light of the positive results of these efforts, Council encouraged the committees

to continue to share resources and ideas.

Council reviewed the recent Experimental Biology (EB) '95 meeting and the APS programs associated with it and previewed EB '96. Noting that in a period of just two years the Distinguished Lectureships had become an integral part of the EB, Council encouraged the sections to continue to bring in the very best world-renowned lecturers in their fields.

Following their retreat in the fall of 1994, Council generated many new programming ideas, some of which have been implemented already and a great many of which will be implemented at EB '96 in Washington, DC. The number of symposia was reduced in anticipation of having as many as three "hot topic" symposia and the new Physiology InFocus program, the subject of which will be "Ion Channels and the Mechanisms of Disease" in 1996. Council expects programs such as these to engage members' interest in attending future EB meetings.

The individuals chosen for the 1996 Bowditch and Cannon Lecturers and the sectional Distinguished Lecturers were announced at the meeting (see page 212). Council predicted that the outstanding quality of the individuals involved in the EB meeting will generate greater enthusiasm for it.

Council reviewed the APS policy on reimbursement of symposia speakers at the urging of the Program Committee. In the past, reimbursement was limited to non-APS members. Acknowledging the perception of discrimination toward the Society's own membership, Council approved the allocation of \$2,500 for each symposium, beginning in 1996. The organizer of the symposium will then have the capability to distribute the funds to the speakers on the basis of need

only. This should provide a more equitable distribution of funds than occurred previously.

During the meeting, Council discussed the awards program and its impact on the membership. As a result of this discussion, Council established a new Awards Committee and charged it with overseeing the entire APS awards pro-



APS Council. Back (l to r): Walter F. Boron, Diana L. Kunze, Barbara A. Horwitz. Front (l to r): Heinz Valtin, Leonard S. Jefferson, Brian R. Duling, Gerald F. DiBona.

gram to ensure uniformity and conformity with the goals of APS and selecting the recipients of the Research Career Enhancement Awards, the APS-Genentech Fellowship, and others. The Council gave its approval for a second APS-Genentech Postdoctoral Fellowship in Mammalian Organ System Physiology, renewing the Society's commitment to training physiologists in integrative physiology.

The Society's greater commitment to education at all levels was evident throughout the meeting, but particularly in the Education Committee's report. With the recent establishment of the APS Education Office, the Society has undertaken a variety of new educational programs.

The Education Committee updated Council on the grants underway for the development of specialized physiology curriculum for science teachers at the middle and high school levels. These include units on female role models in science (including 2 APS members), a curriculum development project titled "My Health, My World" for grades K-4 that is run in conjunction with Baylor College of Medicine, and the summer research training program for high school science teachers. In addition, the Education Committee plans to become involved in professional educational issues and to work with the Human Anatomy and Physiology Society in their attempts to develop a model curriculum for undergraduates. Council directed the Long-Range Planning Committee to work with the Education Committee to prepare white papers on the criticality of physiology in the medical school curriculum and on graduate student



APS Committee Chairs. Back (l to r): Mordecai P. Blaustein, Steven L. Bealer, and Franklyn G. Knox. Middle (l to r): Eric O. Feigl, Barry T. Peterson, and Richard J. Traystman. Front (l to r): Cheryl M. Heesch, Eleanor Ison-Franklin, and Hannah Carey.

training in physiology.

The Council also received an update from the APS staff concerning efforts to enter the world of electronic publishing. The first APS electronic journal, *APStracts*, went online with *AJP: Cell Physiology* abstracts beginning in 1994. In January 1995, abstracts from the remaining *AJP* journals, the *Journal of Applied Physiology*, the *Journal of Neurophysiology*, and *Physiological Reviews* also began appearing on the Internet.

At the recent summer meeting, Council approved the electronic publication of the *Journal of Applied Physiology*, beginning with the January 1996 issue, on the World-Wide Web and semi-annually on CD-ROM, in conjunction with the printed journal. APS signed a contract with Online Computer Library Center (OCLC) of Columbus, OH, to execute this new project (see page 192). OCLC is one of the few companies with actual on-line electronic publishing experience. By the beginning of 1996, OCLC expects to have over 14 journals online. The *Journal of Applied Physiology Online* will include Medline links to the reference lists of each article. OCLC's user interface has the ability to handle scientific notation and equations and allows the journal to be accessed through either PC- or Mac-based systems. Council approved a special introductory offer for the on-line version as a means to introduce current and potential subscribers to the service, with subscribers in turn helping APS to determine the value of the service and the feasibility of publishing the other APS journals on-line.

Council also decided to begin discussions of public

affairs issues during its future meetings. With the greater involvement of the Federation in public affairs and the need for increased communication among APS Council, APS staff, APS Public Affairs Committee and Chair, the Federation Public Affairs Executive and Advisory Committees, and the Federation Board, Council decided an ongoing discussion of current issues at its meetings would be worthwhile. With the recent reorganization of the FASEB Board and Public Affairs Executive Committee and the newly formed FASEB Public Affairs Advisory Committee, Council saw the need to be kept as informed as possible, as well as to keep Society representatives informed of the Council's views on specific issues in a timely manner.

The Council began planning for its fall retreat, scheduled for November 9–11, 1995, in conjunction with the APS conference on "New Discoveries Within the Pancreatic Polypeptide Family: Molecules to Medicine." As a result of the development of APS' Strategic Plan in 1992, many new programs have been started and many others have been changed in an effort to better meet the needs of APS members. As most strategic plans are evaluated at a five-year mark, Council, in anticipation of conducting such an evaluation, has decided to use the fall retreat to reexamine the Strategic Plan and receive updates on progress made toward reaching the goals set in 1992.

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

Council Thanks APS Staff

Council, in conjunction with its summer meeting at APS headquarters in Bethesda, MD, hosted a staff appreciation reception for APS' 58 employees. On behalf of Council, President **Leonard (Jim) Jefferson** thanked the staff for all their efforts over the past year. He noted that because of staff members' dedication, the Society's programs have continued to be very successful, allowing APS to move in new directions, such as electronic publishing.



APS Executive Director Martin Frank (left) receives a certificate for 10 years of service to the Society from President Jefferson (right).

An important part of the annual staff appreciation reception is the recognition of years of service to the Society. This year, Jefferson presented 10-year certificates to Martin Frank (Executive Director) and Karen Cannon (Art Department Manager). Jefferson expressed Council's appreciation for their many years of service.

In addition, Council expressed its appreciation for the efforts of all the staff and its hope that the staff would continue in their tradition of excellence for many more years.



President Jefferson (left) presents Art Department Manager Karen Cannon (right) with a certificate for her 10 years of service.

First Summer Institute Held for Teacher Research Fellows

The first Summer Institute, a component of the Frontiers in Physiology Science Teacher Summer Research Program, administered by the APS Education Office, was held at APS headquarters in Bethesda, MD, July 29–August 3, 1995. All 23 Summer Research Teacher (SRT) Fellows participated in the Institute, which was designed to complement the two months the teachers spent engaged in research at the laboratories of APS members.

SRT Fellows had a number of goals to accomplish during the week-long Institute, the foremost being to begin the development of a classroom laboratory activity or lesson based on their summer research experience. SRT Fellows also had opportunities to:

- network with their colleagues to discuss their research activities, science education content, and teaching methods;
- reflect on their teaching methods and practices to determine ways in which to improve their students' science achievement. This activity was facilitated by a newly developed video produced by APS, "Reflecting on Effective Teaching Practices"; and
- explore the Internet for teaching resources and develop a plan for accessing Internet in their classroom or home.

Brainstorming with Colleagues

SRT Fellow Edward Neubauer, a teacher at Northwestern High School in Hyattsville, MD, said the Institute provided him with the "most valuable experience a teacher can have—brainstorming with his colleagues for the improvement of education for students." Neubauer worked in the laboratory of Mordecai Blaustein at the University of Maryland School of Medicine.

In previous years, SRT Fellows did not have the opportunity to meet each other until the spring Experimental Biology meeting held nearly eight months after their summer research experience. For many of this year's Fellows, the Institute occurred just prior to their completion of their laboratory research activities. This enabled them to discuss with each other ideas for developing their classroom activities and for improving their teaching performance.

Laboratory activities developed by the SRT Fellows will be published as a manual and several will be posted on APS' Internet home page as well.



Fellows simulate bronchial asthma breathing by using snorkels and PVC pipes.

Internet home page as well.

Field Testing Activities

SRT Fellows were joined at the Institute by APS member physiologists, science educators, and science teachers who were part of the

Columbus, OH, and San Diego, CA, Frontiers Local Action Teams (LATs). During the previous year, each LAT devel-

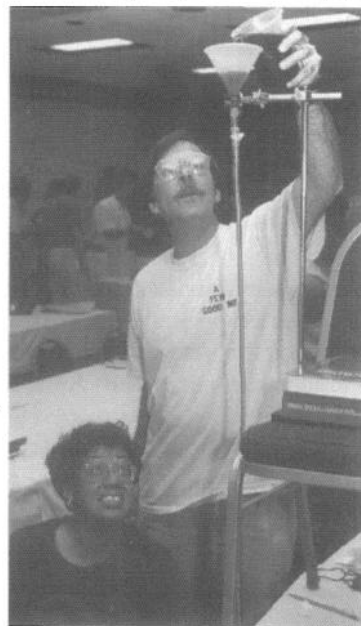


Institute participants prepare tubing for a blood flow and resistance experiment.

oped physiology laboratory activities for in-service teacher training workshops. These activities were field tested for the first time during the Institute.

The Columbus LAT presented neurophysiology activities appropriate for middle school classrooms while the San Diego team presented exercise physiology activities for high school classrooms. Over the next two years, these laboratory activities will be included in in-service training workshops for teachers in Columbus, San Diego, and seven other sites across the country.

For SRT Fellow Evelyn Bradshaw, a teacher at Cleveland Heights (OH) High School, who worked with Joseph LaManna at Case Western Reserve University School of Medicine, the LAT activities "really explained and showed me what inquiry activities are. They're not just hands-on; they ask students to come up with a problem and then determine how to approach it."



Fellows simulate blood viscosity and flow in an Institute experiment.

Field testing the activities "gave us an opportunity ... to work out some of the bugs before presenting it to other teachers," said APS member Frank Powell of the University of California, San Diego and chair of the San Diego LAT. It also made the San Diego LAT aware of "the importance of modeling innovative teaching methods," Powell added.

The Frontiers program is a three-year project supported by the APS, the NSF, and the National Institute of Diabetes, Digestive, and Kidney Diseases (NIDDK). Its aim is to improve science education by building connections between science teachers and the research community.

Education Staff to Promote APS Programs at Fall Teacher Conferences

This fall more than 26,000 science teachers from across the country will have the opportunity to learn about APS education programs at conferences to be held in Arizona, Maryland, and Texas.

At the annual meeting of the National Association of Biology Teachers (NABT) and two regional meetings of the National Science Teachers Association (NSTA), APS Education Officer Marsha Lakes Matyas will conduct a total of five workshops for middle and high school teachers at the meetings. The workshops engage participants in hands-on science activities developed as part of the APS' NSF-supported project on female role models in life sciences.

The project includes the development of 20 classroom activity modules, each focusing on a historical or contemporary female life science researcher. Modules include a biography of the role model and hands-on, inquiry, or problem-solving activities related to her area of research. The complete set of modules will be published later this year by APS

for use in middle and high school life sciences classrooms.

During the upcoming workshops, each participant will do activities from several of the modules. Project consultants Ann E. Haley-Oliphant, Miami University, Oxford, OH, and April L. Gardner, University of Northern Colorado, will act as coleaders for the workshops.

APS project coordinator Phyllis Edelman will hold workshops at both NSTA regional meetings on the Frontiers in Physiology program, with a particular focus on the summer research program for middle and high school teachers. The Frontiers in Physiology project, supported by the APS, the NSF, and the National Institute of Diabetes, Digestive, and Kidney Diseases, includes summer research fellowships for middle and high school science teachers and in-service programs led by physiologists for teachers in their communities.

Participants in the NSTA workshops this fall will hear from both Edelman and past recipients of the APS Summer Research Teacher fellowship about the influence of a summer research experience on science teachers' outlook, perceptions of science, and science teaching methods. Participants also will try some of the hands-on activities developed by past Summer Research Teacher Fellows.

In addition, the APS Marketing Office will have a booth in the exhibit hall at the NABT annual meeting, providing information on APS journals, membership, and other publications as well as educational resource materials.

The NABT meeting will be held in Phoenix, AZ, October 25–28. The NSTA meetings will be in Baltimore, MD, November 16–18, and San Antonio, TX, December 14–16.

APS members in these areas are invited to participate in these events. For more information on the upcoming workshops or the APS education activities noted above, contact Marsha Lakes Matyas at (301) 530-7132 or mmatyas@aps.faseb.org.

APS Mentoring Program for Women Keeps Growing

The APS Mentoring Program for Women in Physiology is growing at a steady pace. Sponsored by the APS Women in Physiology Committee, the program enables women physiologists to increase their networking and facilitates professional relationships between men and women scientists at all levels. Women who are graduate students, postdoctoral fellows, or faculty members in physiology are eligible to become mentees, and both male and female APS members act as volunteer mentors.

The program began in the summer of 1993. By October 1994, the program supported 64 mentors and 37 mentees. Of those individuals, 20 mentor/mentee matches were made. As of August 1995, however, the number of mentors had increased to 73 APS members. The number of mentees increased even more dramatically to 70 individuals, an increase of 89% in less than 10 months.

Matches between mentors and mentees have more than doubled, to 44 in all. The growth of the Mentoring Program is significant because such relationships can be instrumental to the success of women in science careers. Mentors play a vital part in steering women scientists through early career stages and providing essential support and guidance on such issues as scientific and academic development, career advancement, and family and gender concerns.

The APS would like to see the Mentoring Program continue to grow. All interested individuals are encouraged to contact the APS Education Office for more information. Contact Marsha Lakes Matyas, Education Officer, at (301) 530-7132, or by e-mail at mmatyas@aps.faseb.org.

Applications are now available for

Frontiers in Physiology

1996 Science Teacher Summer Research Program

Through the Frontiers program, middle and high school science teachers spend seven to nine weeks during the summer working in the research laboratory of an APS member who serves as a research host.

Applications are developed jointly by the science teacher and the APS member in whose laboratory the teacher will be working. All applications must be received at the APS Education Office by Friday, January 5, 1996. Applicants will be notified of their acceptance by March 8, 1996.

If you are interested in receiving an application to pass on to a science teacher, science supervisor, or principal, please contact:

Phyllis Edelman, Project Coordinator
APS Education Office, Frontiers in Physiology
9650 Rockville Pike Bethesda, MD 20814-3991
Tel. (301) 571-0692 Fax (301) 571-8305
e-mail: pedelman@aps.faseb.org

1995 APS Conference Report

Understanding the Biological Clock: From Genetics to Physiology

Dartmouth College, Hanover, New Hampshire, served as the venue for APS' first 1995 conference, "Understanding the Biological Clock: From Genetics to Physiology." The conference, held July 8–12, was organized by APS members **Jay C. Dunlap**, **Jennifer J. Loros**, and **Heinz Valtin**. The Conference was designed to take advantage of the fusion of two intellectually dominant but heretofore separate lines of clock research, vertebrate physiology and invertebrate and microbial genetics. As an outgrowth of this conference, the organizers hope to create a reference source of lasting value

APS Conference Registration

Category	Number
Member	15
Nonmember	97
Retired	3
Student	68
Guest	12
Invited Speaker	56
Total	251

that will provide a snapshot of the state of knowledge, both factual and contextual, concerning biological timing.

The conference started with an evening plenary lecture presented by **Michael Rosbash**, Brandeis University, and an opening reception. On each of the subsequent evenings, attendees were

able to enjoy plenary lectures presented by **Michael Menaker**, University of Virginia; **Robert Moore**, University of Pittsburgh; and **J. Woodland Hastings**, Harvard University. Each day featured a morning symposium and an afternoon poster session with ample time for discussion of research by the attendees.

Ninety-three abstracts were submitted and programmed as poster presentations for the conference; 34% or 32 of the abstracts listed women as the first author. Three abstracts (3.2%) were submitted by scientists working in government laboratories and one abstract was submitted from investigators in industry. The international nature of the field of biological clocks was reflected in the fact that twenty-seven

abstracts (29%) were submitted by scientists working in laboratories outside the Americas. The volunteered abstracts were submitted by scientists working in 23 different departments including 24 abstracts (25.8%) from biological sciences departments, 14 abstracts (15%) from psychology, and 7 abstracts (7.5%) from physiology.

The scientific abstracts submitted by students were judged for scientific excellence, and the four best abstracts were selected for awards consisting of a \$500 check, complimentary registration, and a certificate. Awards were presented by the organizers to **Brian Prendergast**, University of California, Berkeley; **James Comolli**, Harvard



Jay C. Dunlap and Jennifer J. Loros with the APS Student Award recipients at the APS Conference, Hanover, NH.

University; **Yi Liu**, Vanderbilt University; and **Namni Goel**, University of Michigan, during the concluding banquet of the conference.

The Society also continued its efforts to increase the participation of underrepresented minority students in APS meetings by providing support for two students to attend the conference. **Renee Markham**, Xavier University of Louisiana, and **Jose Paulo Castro**, St. John's University, received travel fellowships funded by the National Institute of Diabetes, Digestive, and Kidney Diseases, which enabled them to attend and participate in the meeting.

A total of 251 scientists, both invited and paid registrants, attended the conference. Government scientists accounted for 3.5% (9) of the registrants, industry-based scientists for 2.8% (7) of the registrants, and non-American scientists for 16.3% (41) of the registrants (see table for a breakdown of registrants by category).

The scientific success of the conference was clearly a result of the efforts of the organizers Dunlap and Loros. In addition, the invited speakers, abstract presenters, and attendees provided the opportunity for the fruitful discussions that make a meeting a success. The Society also gratefully acknowledges the contributions received in support of the conference from the National Aeronautics and Space Administration, the NSF, and Groupe de Recherche Servier, France.



APS Conference attendees discuss the work of a poster presenter.

1996 APS Conference
**Neural Control of Breathing:
 Molecular to Organismal Perspectives**
 July 21–25, 1996 • Madison, WI

The fundamental goal of this conference is to provide the opportunity for in-depth exchange of ideas concerning the central neural control of breathing in vertebrates. Fundamental components of this important homeostatic control system will be discussed, such as the central neural mechanisms of rhythm generation and burst pattern formation. These topics will be discussed on the molecular, cellular, synaptic, and network levels, providing the basis for mechanistic insights into system behavior expressed in intact, behaving organisms. Organismal perspectives will be derived by examining complex, integrated behaviors of the system, such as the ventilatory responses to exercise, hypoxia, hibernation, and sleep. The interplay between the respiratory control system and other physiological control systems (e.g., cardiovascular, locomotion) will also be considered. In each session, concepts will be explored using both a traditional mammalian bias and a comparative physiological perspective, exploring the advantages of unique experimental preparations for their technical and conceptual power.

Following is a preliminary program.

Organizing Committee

Gordon S. Mitchell, University of Wisconsin, Madison
 Gerald Bisgard, University of Wisconsin, Madison; Jerome Dempsey, University of Wisconsin, Madison; Jack Feldman, University of California, Los Angeles; Marc Kaufman, University of California, Davis; Donald McCrimmon, Northwestern University, William Milsom, University of British Columbia

Abstract Deadline: March 1

Advance Registration Deadline: May 31

Sunday, July 21

Registration

Reception

Meeting overview and geographic orientation

Gordon S. Mitchell, Madison, WI

Monday, July 22

The Central Neural Network—Mechanisms of Rhythm Generation

Eve E. Marder, Boston, MA

Michael S. Dekin, New Brunswick, NJ

Naweed I. Syed, Calgary, Canada; Jack L. Feldman, Los Angeles, CA; Jan-Marino Ramirez, Göttingen, Germany; Bruce G. Lindsey, Tampa, FL; John M. Orem, Lubbock, TX

Neurochemicals in Ventilatory Control

David E. Millhorn, Cincinnati, OH

Diethelm W. Richter, Göttingen, Germany; Albert J. Berger, Seattle, WA; Michael S. Dekin, New Brunswick, NJ; Maria Czyzyk-Krezeska, Cincinnati, OH; Gregory D. Funk, Auckland, New Zealand; Leszek K. Kubin, Philadelphia, PA

Tuesday, July 23

Central CO₂-Sensory Mechanisms

Peter Scheid, Bochum, Germany

Judith A. Neubauer, New Brunswick, NJ; Eugene E. Nattie, Hanover, NH; Joseph S. Erlichman, Dayton, OH; H. V. Forster, Milwaukee, WI; Steven A. Shea, Cambridge, MA

Integrated Ventilatory Responses: Sensory Mechanisms

Gerald E. Bisgard, Madison, WI

David F. Donnelly, New Haven, CT; Gabriel G. Haddad, New Haven, CT; Tony G. Waldrop, Urbana, IL; Steven W. Mifflin, San Antonio, TX; Frank L. Powell, San Diego, CA; Eugene N. Bruce, Lexington, KY

Wednesday, July 24

Phylogeny and Ontogeny in Ventilatory Control

Sandra J. England, New Brunswick, NJ

Neil J. Smatresk, Arlington, TX; E.W. Taylor, Birmingham, UK; Mark A. Hanson, London, UK; David M. Katz, Cleveland, OH; Douglas A. Bayliss, Charlottesville, VA; Monique Denavit-Saubié, Gif-Sur-Yvette, France

Modulation and Plasticity in Ventilatory Control

Gordon S. Mitchell, Madison, WI

James C. Houk, Chicago, IL; Donald R. McCrimmon, Chicago, IL; Duncan L. Turner, Leeds, UK; Liming Ling, Madison, WI; Kingman P. Strohl, Cleveland, OH; Gary C. Sieck, Rochester, MN

Thursday, July 25

Integrated Ventilatory Responses: Exercise and Sleep

Jerome A. Dempsey, Madison, WI

Dorothy M. Ainsworth, Ithaca, NY; Dona F. Boggs, Missoula, MT; Ralph F. Fregosi, Tucson, AZ; Marc P. Kaufman, Davis, CA; Lewis Adams, London, UK; Alan I. Pack, Philadelphia, PA; William K. Milsom, Vancouver, BC, Canada

1996 APS Conference
**pHysiology of Acid-Base Regulation:
From Molecules to Humans**
July 12-15, 1996 • Snowmass, CO

This conference will be unique in bringing together a range of biologists who normally do not attend pH meetings or symposia, especially together as a group. The meeting will bring a fresh and integrative perspective to the field of pH regulation.

Our understanding of the mechanisms and relevance of pH regulation is undergoing dramatic changes, brought about by improved techniques for measuring pH in vitro and in vivo, application of molecular biological techniques, and measurement of pH in nontraditional systems. In addition to including state-of-the-art advances in more traditional areas of research, also included will be two new areas of research:

in vivo measurements of pH using magnetic resonance spectroscopy and the involvement of endomembrane systems (e.g., endosomes) in pH regulation.

Organizers

Robert J. Gillies, University of Arizona Health Science Center

Walter F. Boron, Yale University School of Medicine

Abstract Deadline: March 1

Advance Registration Deadline: May 31

1996 Intersociety Meeting
The Integrative Biology of Exercise
October 16-19, 1996 • Vancouver, British Columbia

Muscular exercise in both health and disease is perhaps the most integrated of all biological functions, requiring often prolonged coordination among the central nervous, respiratory, cardiovascular, musculoskeletal, cutaneous, renal, and hormonal systems. Understanding the scientific basis of exercise therefore requires crossing interdisciplinary boundaries in ways few investigators normally achieve. To facilitate this, we propose an integrative, interdisciplinary scientific conference on muscular exercise.

In one meeting, symposia will offer integration on several fronts: from molecular to whole organism function, from health to disease, from biochemical to biophysical processes, across species, and between organs. Such depth and breadth in the scientific basis of exercise are not available through regular national or special meetings of either the APS or the American College of Sports Medicine. The need for such a meeting can be appreciated by the success of its predecessor in 1992 and the eagerness with which participants have agreed to be involved in 1996.

The backbone of the conference is a series of 12 research symposia and 3 tutorial lectures. Contributed poster presentations by attendees will be unopposed by symposia and prominently featured. Six awards will be made to graduate students presenting outstanding original research. With an aging population living longer with chronic disease as well as a national focus on wellness in part via exercise, it is ever more important to develop a sound scientific foundation for medical recommendations. This conference will contribute to this goal.

Organizing Committee

Peter D. Wagner, University of California, San Diego

Frank Booth, University of Texas Medical School; James H. Jones, University of California, Davis; Harold Laughlin, University of Missouri; Ethan R. Nadel, John B. Pierce Laboratory; Ronald Terjung, SUNY Health Sciences Center, Syracuse; Tony Waldrop, University of Illinois; David Wasserman, Vanderbilt University Medical Center

Experimental Biology '96
Deadlines

December 1

Abstracts

February 23

Advance Registration

March 14

Housing Reservations

Experimental Biology '96 Preview

April 14–17, 1996 • Washington, DC

Comparative Aspects of Membrane Transport: Functional Variation Within Common Paradigms

Comparative, Cell & General, and Renal Sections
and Epithelial Transport Group

Gregory Ahearn and Stephen H. Wright

*Etana Padan, Helmut Wieczorek, Barbara Giordana,
Gregory A. Ahearn, Stephen H. Wright, Bruce A.
Hirayama*

Recent years have seen dramatic advances in the understanding of the molecular basis of membrane transport. The past few years have also provided new information on the functional diversity of membrane transport processes that, on the surface, appear to have much in common with a few very well-studied families of transporters. Two examples of these functional variations on otherwise common themes are (i) the alkali ion/H exchangers and (ii) the alkali ion/nutrient cotransporters. The proposed symposium brings together workers whose studies have emphasized both the conceptual similarities that link together these families of processes and the adaptational differences that, nevertheless, have them playing very different roles for some animals and/or in some environments. With the family of mammalian Na/H exchangers ("NHEs") as a focal point for comparison, Gregory Ahearn will discuss the distribution and functional characterization of the electrogenic 2Na/H exchanger of many invertebrate tissues, Helmut Wieczorek will discuss the K/nH exchangers of some insect epithelia, and Etana Padan will discuss the electrogenic nNa/nH exchanger of bacteria. Comparisons to the nA/nutrient cotransporters of mammalian intestine will be the backdrop for Stephen Wright's description of the diversity of Na/amino acid cotransporters found ubiquitously in the external integument of marine invertebrates, Barbara Giordana's discussion of recent advances in the cellular physiology of K/amino acid cotransport in insect intestine, and Bruce Hirayama's presentation of evidence for H/glucose cotransport via the mammalian Na/glucose cotransporter, "SGLT1." The ensuing discussion and comparison of these transport processes with their well-studied "archetypes" will lead to a greater appreciation of the underlying plasticity of the transport model that arose from Crane's "Na-gradient hypothesis." The work presented here should also point the way for valuable future studies that may establish the molecular basis for a striking panorama of physiological function. We expect the material to be discussed in the symposium to be of substantial interest to a broad selection of scientists, including those from the comparative, cellular, epithelial transport, renal, and gastrointestinal fields.

Oxidants and Thiol Redox Control in the Gastrointestinal Tract

Gastrointestinal Section

Tak Yee Aw and Dean P. Jones

Christopher S. Potten, Tak Yee Aw, Dean P. Jones, Bruce Demple, and Thomas Kensler

This symposium will focus on new developments in oxidants and thiol redox balance that have considerable impact on gastrointestinal physiology. For many years, thiols have been known to have critical functions in the gastrointestinal tract, such as in maintenance of mucus fluidity, unfolding of protein for digestion, and reduction of iron for its absorption. There has been much interest in the role of thiols in protection against dietary oxidants and endogenously produced reactive oxygen species. Recent studies have provided considerable insights into the use of dietary thiols for disposition of oxidants in the gastrointestinal tract. Other studies have shown that oxidants and antioxidants can affect cell function independently of effects of cell injury by activation of transcription factors and control of gene expression. Oxidants have also been found to activate cell death by apoptosis, and thiols have been found to inhibit this mode of programmed cell death. These effects on both gene expression and cell turnover have far-reaching implications with regard to chronic disease processes affecting the gut and to gastrointestinal responses to diet and oral therapeutic agents. The symposium will address subjects key to these new developments, namely recent advances in the understanding of dietary peroxides and thiols, regulation of gene expression by oxidants and thiol compounds, control of detoxication enzymes by antioxidant response element, and modulation of apoptosis in the gastrointestinal tract by oxidants and thiol antioxidants.

The Single Smooth Muscle Cell: 25th Anniversary

MyoBio (muscle) Group

Roland M. Bagby and Frederic S. Fay

*Roland M. Bagby, J. Victor Small, David M. Warshaw,
Frederic S. Fay, Joshua J. Singer, and Mark T. Nelson*

The first successful enzymatic isolation of living, extended, contraction-competent, vertebrate smooth muscle cells from a tropical toad's stomach in 1971 began a new era of smooth muscle research. This symposium was organized to celebrate and document the research that has evolved during the first 25 years since that serendipitous discovery, as well as to point out future uses of isolated smooth muscle cells. Light

microscopical documentation of changes that occurred during contraction, immunofluorescence studies of the localization of contractile and cytoskeletal proteins in single cells, and studies of force developed by a single cell have led to an understanding of the smooth muscle contractile system that could not have been obtained without the single cell. Three main groups, led by Bagby, Fay, and Small did most of the work on the single cell contractile system, and each of those groups is represented in this symposium. The work was not without controversy since the models developed from single cells challenged existing paradigms. The availability of single smooth muscle cells also opened up a new era for understanding the ionic currents and channels that are responsible for changes in the membrane potential of the smooth muscle cell. A diversity of channels were shown to exist, and investigations into their susceptibility to pharmacological agents has led to the development of new agents directed at controlling smooth muscle function in diseases ranging from hypertension to asthma. Investigations into the mechanisms underlying excitation-contraction coupling in smooth muscle were carried out at the cellular level using new Ca^{2+} -sensitive fluorescent dyes in conjunction with the digital imaging microscope that, while having widespread application, was largely developed for work on single smooth muscle cells. These investigations have provided fundamental new insights into excitation-contraction coupling in smooth muscles and revealed a number of fundamental principles underlying Ca^{2+} signaling in cells in general. As we strive to learn so much from such tiny cells, existing technology will be pushed to its limits, and new technology developed specifically for single smooth muscle cells will continue to benefit the general scientific community.

From Receptor to Response: Brain Stem Cholinergic Mechanisms of Autonomic Control

**Central Nervous System, Neural Control & Autonomic
Regulation, and Cardiovascular Sections**

Helen A. Baghdoyan

*Helen A. Baghdoyan, Kazue Semba, Eugene E. Nattie, and
Jerry J. Buccafusco*

Brain stem cholinergic systems are known to play a key role in the central regulation of autonomic physiology. This symposium will provide state-of-the-art presentations of ongoing research and emerging concepts concerning cholinergic mechanisms of autonomic control. Kazue Semba will begin the symposium with an introduction to brain stem cholinergic anatomy, placing special emphasis on cholinergic projections important for cardiopulmonary control. Helen A. Baghdoyan will present data demonstrating that brain stem muscarinic receptors are critical for generating the state of rapid-eye-movement sleep. Eugene E. Nattie will show how brain stem muscarinic receptors influence the chemosensi-

tive drive to breathe. In the final presentation, Jerry J. Buccafusco will present data showing that brain stem and spinal cord cholinergic mechanisms are critically important contributors to the control of cardiovascular function. There will be time for discussion following each presentation. The symposium will conclude by pointing out important future opportunities for cellular and receptor level studies aiming to elucidate cholinergic mechanisms of autonomic control.

Molecular Targets of Vascular Disease

**Members in Industry Group
and Cardiovascular Section**

David L. Crandall

*Mark B. Taubman, Larry M. Wahl, William C. Sessa,
Patricia D'Amore, and Charles E. Hart*

The understanding of the pathophysiology of vascular disease remains one of the greatest challenges in today's society. While cardiovascular diseases such as hypertension are effectively managed, understanding the course of development of diseases of the vascular wall such as atherosclerosis and restenosis remains a challenge to both basic and clinical investigators. This symposium will focus upon molecules involved in various aspects of the pathophysiology of vascular diseases and the potential effect of targeting these molecules in development of therapeutic interventions. Crandall will provide an introduction of the topic. Taubman will discuss gene expression in the vessel wall. Wahl will focus upon the role of monocyte matrix metalloproteinases as contributors to atherosclerotic lesion development. Sessa will discuss the role of nitric oxide synthase in endothelial cell homeostasis. D'Amore will provide information concerning the effect of hypoxia on VEGF, a critical growth factor involved in angiogenesis. Hart will discuss the critical involvement of platelet-derived growth factor in vascular lesion development. Together, these presentations will provide an overview of a variety of molecules that can contribute integrally to the process of vascular disease development.

Lung Inflammation: Cells, Secretory Products, and Signaling Mechanisms

Respiration Section

James D. Crapo and Jonathan S. Stamler

*Stephan F. Van Eeden, C. Wayne Smith, Jonathan S.
Stamler, James D. Crapo, and Craig Gerard*

The lung is unique in that it has a great surface area (100 m^2) with a delicate air-blood barrier optimally designed for gas exchange and that is continuously exposed to a wide variety of toxins, antigens, and infectious agents from the ambient air. During an average human life span, approximately 300×10^6 liters of air and more than 3×10^{15} respirable particles are inhaled. Particles and infectious agents that reach the small

airways and/or lung parenchyma can potentially activate inflammatory responses. The lung is now being recognized to have unique anti-inflammatory pathways that enable it to maintain normal function under conditions that would otherwise lead to extensive inflammation and injury. The lung contains large numbers of inflammatory cells, including marginated neutrophils, whose traffic in the lung is just beginning to be understood. The role of specific signaling pathways in the molecular regulation of inflammation will be discussed. Unique aspects of the lung such as its high constitutive expression for leukocyte adhesion molecules, high constitutive expression of nitric oxide synthase, and high constitutive expression of extracellular antioxidants will be discussed. The possible roles of small molecular weight signals including oxygen based radicals in the molecular regulation of inflammation will be explored. The symposium will emphasise novel, new, and emerging concepts that address the pathogenesis and unique mechanisms for regulation of inflammation process in the lung.

Fatigue and Endurance Capacity of Respiratory Muscles: Emerging Concepts

Environmental & Exercise Section and Hypoxia Group

Ralph F. Fregosi and Gary C. Sieck

Roger M. Enoka, Robert H. Fitts, Gary C. Sieck, Thomas L. Clanton, Jerome A. Dempsey, and Ralph F. Fregosi

The purpose of this symposium is to present the ideas of scientists that study muscle fatigue at several levels of organization, from myofiber to the intact, exercising human. The symposium is expected to attract individuals with interests in muscle biology, respiratory physiology, and exercise physiology. Because the symposium will address fundamental issues in the study of muscle fatigue, we anticipate a lively exchange of ideas between scientists that study this problem with a variety of techniques and experimental preparations, ranging from single cells to whole muscles in intact exercising humans. It is the chairman's feeling that this broad approach to the study of physiology will also facilitate interactions between the reductionist and the clinical practitioner. Given the clinical significance of respiratory muscle fatigue, we also anticipate good participation from specialists in pulmonology, critical care medicine, pediatrics, and cardiopulmonary rehabilitation.

Role of Nitric Oxide in the Physiology and Pathophysiology of the Digestive System

Gastrointestinal Section

Matthew B. Grisham and Paul Kubes

David Wink, Daniela Salvemini, Timothy Billiar, Matthew B. Grisham, Paul Kubes, John Corbett, and John Wallace

Nitric oxide (NO) is a small, lipophilic gas that is produced by a variety of mammalian cells. Over the past seven years this free radical has become one of the most studied molecules in biomedicine. Much of the attention devoted to this molecule has come as a result of the growing recognition that NO is an important modulator of a variety of physiological processes. Nitric oxide has been implicated as a modulator of blood flow, motility, electrolyte and water transport, as well as a modulator of immune system function in the digestive system. Consequently, it is not surprising that an altered production of NO, whether it be increased or diminished production, may lead to impaired organ function and disease. An interesting development that has occurred in this field has been the realization that NO can exert both beneficial and deleterious effects in different tissues of the digestive system. These observations have led, in many cases, to controversy regarding whether NO is a "friend or foe". Although several national and international NO conferences have been held over the past 2 years, there has been no conference which has focused on NO and the digestive system. Therefore, the objective of this symposium is to present, using a multidisciplinary approach, some of the emerging concepts and controversies concerning the biochemistry, physiology and pathophysiology of nitric oxide in the digestive system. In order to accomplish this objective we have assembled a group of seven, internationally-recognized investigators who will address specific aspects of NO involvement in digestive system function and disease. We are particularly excited about the fact that the symposium will include three young investigators who have attracted national and international recognition for their important work on the physiology and pathophysiology of NO. In addition, we have received commitments from four established investigators who are considered leaders in the area of NO and the digestive system. Topics to be covered include the biochemical and physiological factors that regulate expression of NO synthase and NO reactivity in vivo, those physiologic or pathophysiologic situations in which NO may act to protect or exacerbate tissue injury, and the modulatory relationship between the NO and prostaglandin producing pathways. It is our hope and expectation that this symposium will provide the audience with a stimulating discussion of the latest concepts and controversies concerning the role of NO in the digestive system.

The Kidney as a Target Organ for Growth Hormone

**Renal, Endocrinology & Metabolism,
and Water & Electrolyte Homeostasis Sections**

Aviad Haramati and Tomas C. Welbourne

*Edward Chin, Marc R. Hammerman, Raimund Hirschberg,
Aviad Haramati, Tomas C. Welbourne, and Susan E.
Mulroney*

Growth hormone is known to have metabolic and somatogenic effects in various organ systems; however, studies in recent years have provided compelling evidence that the kidney may be a particularly important target organ for growth hormone. Growth hormone, either directly or indirectly via insulin-like growth factor I, affects renal hemodynamics, regulates specific renal transport systems, and may play a central role in limiting the urinary losses of electrolytes during growth. New information has also come to light regarding the cellular and molecular aspects of growth hormone action in the kidney. The purpose of this symposium is to highlight these new findings in the kidney to a broad audience of physiologists who will gain considerable insight into novel actions of this hormone. The intent is also to focus on some of the controversial or unknown aspects that, hopefully, will stimulate discussion regarding future directions for research. The presentations will be made by individuals active in the field (including at least two "young" investigators) and will encompass multiple levels of investigation (from genetic expression to somatic growth of the organism). Further, the forum's multidisciplinary approach should interest several APS sections (Renal, Endocrinology & Metabolism, and Water & Electrolyte Homeostasis), and it also fits well with one of the EB '96 themes, "Regulation of Growth and Development."

Potassium Channels and Blood Vessels

Cardiovascular Section

Donald D. Heistad and David Harder

*Joseph E. Brayden, Paul M. Vanhoutte, Richard A. Cohen,
Frank M. Faraci, Kevin Dellsperger, and Nancy Rusch*

Two major mechanisms that mediate vasodilator responses are activation of guanylate cyclase and adenylate cyclase. Recent evidence suggests that several types of potassium channels are present in blood vessels and that activation of these channels may be a third major mechanism of vascular relaxation. Activation of potassium channels produces hyperpolarization of vascular muscle, which closes voltage-dependent calcium channels and thereby produces relaxation. Several types of potassium channels have been described in vessels, including ATP-sensitive K⁺ channels, calcium-activated K⁺ channels, delayed rectifier, and inward rectifier K⁺ channels. An important question is whether phar-

macological inhibitors can be used to conclusively differentiate between the various types of K⁺ channels. Vasodilator responses to several endogenous substances appear to be mediated by activation of ATP-sensitive potassium channels. Activity of ATP-sensitive K⁺ channels is impaired in several disease states, including hypertension, diabetes and atherosclerosis. Calcium-activated K⁺ channels also may play an important role in regulation of vascular tone. Calcium-activated K⁺ channels appear to be activated during chronic hypertension. The symposium will review current concepts about activation and modulation of K⁺ channels in physiological and pathophysiological stress. The symposium will interest physiologists and vascular biologists who are interested in regulation of the circulation. Future directions and implications will be discussed during the symposium.

Epithelial Na⁺ Channels: Conclusions and Controversies

**Epithelial Transport Group, Respiration, Renal,
and Cell & General Sections**

Sandy I. Helman

*Pascal Barbry, Dale J. Benos, Bonnie Blazer-Yost, Douglas
C. Eaton, Thomas R. Kleyman, Lawrence G. Palmer,
Bernard C. Rossier, and Wade C. Sigurdson*

The expansion of biophysical and molecular biological approaches to study of transport in epithelial cells has brought not only new information but new controversies in discussion of mechanisms and regulation of transport by epithelial cells. The goals of the symposium are to: 1) foster open discussion, 2) focus attention on current problems, controversies, and discrepancies, 3) educate the scientific community at large, and 4) promote exchange of ideas in as diverse a group as possible with particular attention to epithelial Na⁺ channels. To maintain the spontaneity and timeliness of the symposium in the face of rapidly changing and accumulating evidence, the speakers will focus their presentations so as to permit the audience to leave the symposium knowing precisely and concisely the importance and relevance of the issues addressed as they pertain to their own initiatives, interpretations and integration of ideas and evidence.

Mechanisms of Angiogenesis

Cardiovascular Section

Kathryn G. Lamping

*M. Judah Folkman, Gary K. Owens, Michael A. Reidy,
Napoleone Ferrara, Robert J. Tomanek, M. Harold
Laughlin*

Angiogenesis or growth of new vasculature is important in a variety of diseases such as hypertension and hypertrophy, and in the development of collateral vessels in the heart with

chronic coronary stenosis. The mechanisms involved in the initiation of angiogenesis are unclear. Considerable interest has been stimulated in the role of growth factors and extracellular matrix in the development of new vessels. In addition to the role of growth factors in the development of angiogenesis, growth factors may also be involved in the proliferation of vascular smooth muscle following balloon angioplasty. Inhibition of this response may be important in the prevention of restenosis. This symposium will review mechanisms involved in the vascular response to physiological stimuli such as exercise and vascular growth during the development and will address potential second messenger systems involved in the response of the vasculature to a variety of growth factors. In addition, the role of extracellular matrix in the development of new vessel growth will be discussed. The symposium should be interesting to not only coronary physiologists but also pathologists and anatomists who are interested in angiogenesis.

Central Mechanisms of Long-Term Arterial Pressure Regulation: A New Perspective

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

John W. Osborn and Virginia L. Brooks

John W. Osborn, Alan F. Sved, Virginia L. Brooks, Gregory D. Fink, Alastair V. Ferguson, and Eileen M. Hassler

The role of the sympathetic nervous system in long-term control of arterial pressure has been continuously debated, and many issues remain unresolved. The symposium will begin with a historical perspective of this topic. Evidence that long-term alterations in sympathetic activity effect arterial pressure will be presented. This raises the question of what afferent signals control sympathetic activity chronically. Studies of the effect of chronic interruption of baroreceptor pathways will be reviewed. A theoretical framework, based on the concept that peptide hormones provide an afferent pathway for regulation of sympathetic activity, will be discussed. A review of integrative studies suggesting that long-term elevations of angiotensin II chronically effect sympathetic outflow by acting on circumventricular organs, will then be presented. Finally, the mechanisms by which peptide hormones interact with sympathetic neural networks will be presented. The symposium will conclude with new perspectives on neural control of arterial pressure as well as future directions.

Signaling Mechanisms and Genes Involved in the Development of Cell Hypertrophy

Renal, Cell & General, and Cardiovascular Sections

Patricia Preisig

Jay Hunter, Seigo Izumo, Gary Owens, Fuad Ziyadeh, and Patricia Preisig

Cardiac monocytes, vascular smooth muscle cells, and renal epithelial cells all hypertrophy in response to a wide variety of systemic disorders. Each form of hypertrophy is thought to be associated with detrimental long-term effects. Despite its importance, both the development and sequelae of cellular hypertrophy are poorly understood processes. The focus of the proposed symposium is the signal transduction pathways and genes involved in the development of hypertrophy in cardiac, smooth muscle, and renal cells. The symposium participants represent a diverse group of scientists, each studying a different model of cellular hypertrophy. Each participant will focus on the signaling pathways believed to initiate the growth/hypertrophic processes and discuss the transcriptional regulation of genes believed to mediate the growth/hypertrophic processes in their model.

The Juxtaglomerular Apparatus I: Structural and Functional Characteristics

Renal, Water & Electrolyte Homeostasis, and Endocrinology & Metabolism Sections, and Epithelial Transport Group

Jurgen B. Schniermann and Armin Kurtz

Jurgen Schniermann, Luciano Barajas, P. Darwin Bell, Michael S. Goligorsky, Armin Kurtz, Sadayoshi Ito, and Josie P. Briggs

This symposium will outline the structural and functional properties of the individual cells in the juxtaglomerular apparatus in the kidney, a cell complex located at the site of contact between the terminal end of the thick ascending limb of Henle's loop and the glomerulum of the same nephron that serves to regulate glomerular vascular tone and renin secretion. Identification of individual juxtaglomerular cells in various in vitro preparations has made it possible to apply a variety of techniques to studying the functional characteristics of these cells at the cellular level. These approaches have greatly enhanced our knowledge of membrane properties and of intra- and extra-cellular signaling pathways. It is expected that this progress in the understanding of juxtaglomerular cell function will be followed by an improved understanding of the integrated response pattern generated by the intact cell complex and that the interaction between participants will contribute to the final goal of identifying the

role of the juxtaglomerular apparatus in the control of electrolyte homeostasis and arterial blood pressure.

The Juxtaglomerular Apparatus II: Role of Nitric Oxide in Functional Regulation

Water & Electrolyte Homeostasis and Renal Sections

Ian A. Reid and Ronald H. Freeman

Jennifer S. Pollock, Christopher S. Wilcox, L. Gabriel

Navar, Ian A. Reid, Armin Kurtz, and Ronald H. Freeman

Research during recent years has established nitric oxide as a unique signaling molecule that plays important roles in the regulation of the cardiovascular, neural, and immune systems. Nitric oxide also contributes to the regulation of renal function, particularly to the functions of the juxtaglomerular apparatus. Isoforms of nitric oxide synthase have been identified in components of the juxtaglomerular apparatus including the macula densa and the granular juxtaglomerular cells. Evidence from several laboratories indicates nitric oxide participates in the tubuloglomerular feedback response and also serves to modulate angiotensin-induced vasoconstriction. In addition, nitric oxide contributes to the regulation of renin secretion, both under resting conditions and in the renin secretory responses to activation of the major mechanisms that control renin secretion.

The purpose of this symposium is to review current concepts concerning the role of nitric oxide in the functions of the juxtaglomerular apparatus, to identify areas where controversy or uncertainty exist, and to consider future directions for research. The symposium will be of interest not only to renal and cardiovascular physiologists but to all investigators involved in studies of the physiology of nitric oxide.

The Role of Ras in the Transmission of Growth and Developmental Signals

Endocrinology & Metabolism Section

Thomas Roberts

Frank McCormick, Larry Feig, Deborah Morrison, Natalie Ahn, Dennis Templeton, and Andy Golden

The Ras proteins play important roles in the regulation of cell growth and differentiation in all eukaryotic organisms. Mutation of these proteins has been implicated as a causal agent in the development of human tumors. Ras proteins function during growth and development as essential, plasma membrane-bound signaling proteins. For many years the precise role of Ras has been unclear. However, recent studies have identified a crucial signaling pathway in which Ras

serves as a central intermediate connecting upstream receptor tyrosine kinases to downstream serine/threonine kinases. This pathway transmits proliferative, developmental, and oncogenic signals from the cell surface to the nucleus and involves the activation of a cascade of kinases including the Raf family of serine/threonine kinases, the mitogen-activated protein kinases (MAPK, also known as ERK), the MAPK kinases (MKK or MEK), and the Jun or stress-activated kinases (JNK or SAP). Both biochemical and genetic studies have revealed that this pathway functions in a variety of cell types and developmental systems and in organisms as diverse as mammals, *Xenopus laevis*, *Drosophila melanogaster*, and *Caenorhabditis elegans*. The symposium will focus on the critical molecules involved in Ras-mediated signal transduction and mechanisms regulating their activity. The goal of this session will be to present a current understanding for how Ras relays growth and developmental signals from the plasma membrane to the nucleus. Since Ras signaling is fundamental to a variety of basic physiological processes, this symposium has broad relevance to all areas of physiology. In addition, it will appeal to other disciplines such as pathology, immunology, and pharmacology.

Cell-Matrix Interactions in Lung Development

Respiration Section

Robert M. Senior and Jesse Roman

Jesse Roman, Philip I. Sannes, Lucia Schuger, Peter Ekblom, Richard Pierce, Robert Pytela, and Michael D. Infeld

During human embryogenesis, the lung develops from a single avascular epithelial bud into a specialized structure with a complex airway system, two complete circulatory systems, and millions of functional gas-exchange units. The exact mechanisms responsible for this dramatic transformation remain undefined; however, multiple studies suggest cell-matrix interactions are critical. Lung development is associated with tightly regulated alterations in extracellular matrix (ECM) expression and composition. Although the consequences of these alterations are unknown, the ability of matrix components to affect the phenotype and function (i.e., differentiation, adhesion, migration, proliferation) of embryonic cells strongly suggests a role for ECMs and matrix-binding receptors in lung development. This idea is further supported by studies performed using various cell and organ culture models that have implicated ECMs and matrix-binding receptors in specific lung developmental processes such as airway branching morphogenesis, vasculogenesis and angiogenesis, gland formation, and alveolar differentiation. This session will explore the mechanisms by which ECMs and matrix receptors may affect distinct processes during lung development.

Methods for Evaluating Higher Order Learning

Teaching of Physiology Section and Education Committee

Roger Thies

Robert G. Carroll, Penelope A. Hansen, Laura Malloy, and Sheella Mierson

Methods used to measure student learning strongly influence the nature and extent of that learning. Techniques currently used for evaluating students, especially machine-scored multiple-choice examinations, may discourage the development of higher order reasoning skills. Such skills include understanding and application of concepts rather than memorization of facts. This symposium will demonstrate some innovative methods for student evaluation. Each speaker will give a brief description of their approach, and then participants will apply the information by developing practice student evaluations.

First, Robert Carroll will demonstrate how multiple-choice questions can be used for higher order learning. This information will be especially useful to participants who teach classes leading to licensing examinations. Second, Penny Hansen will describe the triple-jump exam that helps students to develop their problem-solving skills. After questions and a break, Laura Malloy will demonstrate the use of structured exercises to evaluate learning in small-group activities. Finally Sheella Mierson will describe the use of feedback in peer, tutor, and self-evaluations of student learning in group activities. The symposium will conclude with a discussion of any other evaluation methods by the attendees. The attendees at this symposium should be able to begin using appropriate techniques to evaluate higher order learning in their students.

Effects of Growth Hormone Excess in Transgenic Mice

Endocrinology & Metabolism Section

Thomas E. Wagner and Andrzej Bartke

Lucia Stefaneanu, Andrzej Bartke, Carol J. Phelps, C. David Rollo, James D. Murray, and John Kopchick

Transgenic technology provided means for creating life-long excess of growth hormone (GH). During the past few years transgenic animals overexpressing various GH genes have been used extensively to examine the mechanisms of GH actions, including the structure-function relationships, and to study the consequences of GH excess on the expression of genes for PRL and GH and their receptors and on plasma levels of adenohipophyseal, gonadal, and adrenal hormones, as well as on reproductive functions, pathological changes in various organs, tumor incidence, and aging. It is the purpose of this symposium to bring together and critically discuss

some of this information. The areas selected for presentation are those in which sufficient progress has been made to allow for going beyond the descriptive stage of the work (by making some significant conclusions or developing novel hypotheses) and those that are pertinent to interpretation of data obtained by other groups of investigators. The material presented will concern consequences of the expression of human (pituitary and placental), bovine, and ovine GH genes as well as experimentally generated GH mutants in transgenic mice, with particular emphasis on alterations in the neuroendocrine function. Analysis of the neuroendocrine function in transgenic mice expressing various GH genes will include data on hormone gene expression, CNS neurotransmitters, activity of specific neuronal groups within the hypothalamus, structure of hormone producing cells, and peripheral hormone levels. It is hoped that the symposium will be of interest to molecular biologists, cell biologists, pathologists, and physiologists interested in growth, endocrine, and reproductive function.

Refresher Course for Teaching of Gastrointestinal Physiology

Education Committee and Gastrointestinal Section

Norman Weisbrodt

Helen Cooke, Leonard Johnson, Joseph Szurszewski

The purpose of this course will be to promote the exchange of ideas, materials, and factual information that will facilitate the teaching of gastrointestinal physiology. The Education Committee was charged by APS Council to consider reinstituting refresher courses in physiology as a part of the yearly Experimental Biology meetings. The current proposal is the result of an initial assessment, which included a polling of all Chairs of Departments of Physiology affiliated with APS, on the need and desirability of such a course and of extensive discussions among members of the Education Committee with input from representatives of the Teaching and Gastrointestinal Sections of the APS. The course is designed to take place on Sunday morning and will be comprised of several components: poster presentations, demonstrations (e.g., computer simulations, videos), exhibits (e.g., books, lecture outlines, syllabi, problem-based learning cases), and didactic presentations. Ideas and materials to be presented as posters, demonstrations, and exhibits will be selected from abstracts that will be solicited from the general membership. In addition, materials for presentation will be solicited from publishing houses and from the American Gastroenterological Association. The didactic component will consist of three 20-minute presentations, each followed by 10 minutes for questions. These presentations will stress information that is considered important by experts in the field, that is likely to appear on national examinations, but has yet to make its way into textbooks.

Intracellular Calcium Communication

Epithelial Transport Group, and Renal and Cell & General Sections

Andrew Charles and Michael Woodruff

Michael J. Berridge, Eric C. Beyer, Andrew P. Thomas, Scott Boitano, Maiken Nedergaard, and Lawrence C. Katz

Stimulus-dependent intracellular Ca^{2+} concentration changes have been extensively studied over the last several years, but the importance of the communication of these Ca^{2+} signals from cell to cell via gap junctions is now just starting to be appreciated. The nature of this communication is that an increase in intracellular Ca^{2+} in one cell is correlated with increases in intracellular Ca^{2+} in neighboring cells. Synchronous Ca^{2+} increases may be used for coordination of development and maturation, as well as integration of cell and tissue responses to chemical or mechanical stimulation in the differentiated state. Despite its potential importance, the mechanism(s) by which increases in intracellular Ca^{2+} are synchronized is an enigma. Evidence in several systems suggests that Ca^{2+} itself does not permeate gap junctions to trigger Ca^{2+} increases in adjacent cells. The presentations in this symposium will examine intracellular Ca^{2+} increase mechanisms and intracellular movements of Ca^{2+} (Berridge), gap junction expression and permeability in various cell types (Beyer), intercellular communicated Ca^{2+} concentration increases in hepatocytes (Thomas), the possible role that inositol 1,4,5-triphosphate plays in Ca^{2+} communication in airway epithelial cells (Boitano), the occurrence of coordinated, stimulus-dependent Ca^{2+} increases in glial and nerve cells (Nedergaard), and the important role gap junctional communication may play in development of the nervous system (Katz).

Guest Societies

New Approaches to Membrane Potential Studies Using Voltage-Sensitive Dyes

Biomedical Engineering Society and APS Central Nervous System Section

James M. Beach

Lawrence B. Cohen, Leslie M. Loew, Brian M. Salzberg, Guy Salama, and James M. Beach

This symposium, sponsored by the Biomedical Engineering Society, will present a wide picture of optical membrane potential recording for scientists who are interested in incorporating optical techniques into their research or furthering the development of new methods. Recent developments in this maturing field have made optical recording an important and necessary tool for assessing the role of membrane poten-

tial in complex functions associated with the nervous and cardiovascular systems. Speakers will present instrumentation used in their research along with strategies for monitoring electrical activity in heart, neuron, and microvessels using a variety of techniques including photometry, imaging, and radiometric recording. Included will be discussions of appropriate voltage-sensitive dyes for different preparations, dye-staining technique, instrumental methods for improving signal-to-noise ratio and reducing optical motion artifact, calibration and quantitative measurements, multiple-site recordings, and imaging of membrane potential distributions.

Role of Natriuretic Peptides in Body Fluid Homeostasis

Society for Experimental Biology and Medicine

Samuel M. McCann and Thomas Maack

Michael Chinkers, Donald B. Jennings, Thomas Maack, Samuel M. McCann, M. Ian Phillips, and John C. Burnett

A number of natriuretic peptides have now been discovered, and they play an important role in control of fluid and electrolyte intake and excretion. This symposium will evaluate the role of atrial natriuretic peptide (ANP) in this physiological function and will review it particularly with regard to most recent events as shown in the detailed listing of speakers. In essence it will consider the localization of ANP and its receptors and their molecular genetics throughout the body and factors modifying the activation of the receptors. It will then turn to the role of ANP in various physiological systems such as direct control of release of the peptide from the atria by atrial stretch and actions on the vascular system and kidney and the mechanism of action of the peptide. It will then turn to the central nervous system control of body fluid homeostasis via ANP and other peptides. Since ANP and angiotensin II have antagonistic actions at most sites in the body in control of body fluid homeostasis, these will be discussed. Finally, the possible clinical application of ANPs will be considered. It is felt that this is an active area of research undergoing rapid expansion and cutting across many systems to bring about control of body fluid homeostasis, which is frequently deranged in disease states.

Gene Regulation by Mechanical Force in Mammalian Cells

North American Society for Biorheology

Larry V. McIntire and B. Rita Alevriadou

Scott A. Diamond, Nitzan Resnick, Shu Chien, Suzanne G. Eskin, Larry V. McIntire, and Rena Bizios

In the last five years, it has become clear that mechanical forces can play a major role in mammalian cell gene regula-

tion. Both fluid shear stress and mechanical strain have been shown to alter protein synthesis and secretion in several cell types, including endothelial cells, smooth muscle cells, and pulmonary alveolar cells. Since each of these cell types resides in a mechanically active environment in vivo, gene regulation by mechanical forces may play an important role in both normal physiology and pathophysiology. This symposium focuses on new research concerning stress and strain regulation of both secreted and membrane-associated protein expression. A second area of emphasis will be on the current state of understanding of the signal transduction pathways involved in the force/metabolism coupling. Several levels are involved, including membrane, cytosolic, and nuclear pathways. Studies are presented on cytosolic second messengers, DNA binding proteins, and stress-sensitive gene promoter elements.

Transport of Peptides and Proteins

Biomedical Engineering Society

Cynthia Sung

W. Mark Saltzman, Paul F. Morrison, Melody A. Swartz,

Michael F. Flessner, Cynthia Sung, and William C.

Eckelman

Advances in modern biology have made available a wide variety of peptides and proteins with potentially important therapeutic applications. Progress in transferring these compounds to the clinic has been hindered in part by problems related to poor delivery to the desired target tissue. This symposium will present quantitative methodologies and models that have been developed to further our understanding of the factors that affect peptide and protein transport. The talks will consider localized, regional, and systemic administration of peptides and proteins. Topics covered will include biodistributions and clearances, interstitial penetration, peptide and protein stability, polymeric implants, and the role of lymphatics and pressure gradients in protein transport. The purpose of this symposium is to stimulate discussion of strategies to improve the utility of peptides and proteins as pharmacological agents.

Adhesion Biomechanics: Molecular, Cellular, and Biomechanical Aspects of Cell Adhesion

Biomedical Engineering Society

K-L. Paul Sung and Shu Chien

Shu Chien, Thomas P. Stossel, K-L. Paul Sung, Larry Sklar,

Herbert Lipowsky, and Larry McIntire

The aim of this symposium is to summarize the recent advances in research on the signaling, molecular regulation, and cellular function of cell adhesion, so that the physiology and pathophysiology of cell adhesion can be understood at

the molecular and cellular levels. The papers to be presented in this symposium will integrate molecular biology and mechanical approaches to the study of cell adhesion.

The program will bring the audience up-to-date on the newest developments in the molecular mechanism of cell-cell interaction. The results of the symposium will stimulate new research on the molecular and micro-biophysical aspects of cell adhesion to achieve a better understanding of this important physiological phenomena.

APS Workshops

Physiology in a Changing Medical Curriculum: Crisis or Opportunity?

Education Committee

Aviad Haramati

Jordan Cohen, Aviad Haramati, Andrea Gwosdow, Carol Whitfield, and Herbert Chase

Animal Research News: The Guide, the Regulations, and the Congress

Public Affairs Committee

Jeffrey L. Osborn

Careers in Physiology Workshop

Stephen L. Bealer

Women in Physiology Mentoring Workshop and Reception

Cheryl M. Heesch

Past-President's Symposium

Intercellular Signaling in the Vascular Wall

Brian R. Duling

**The "Call for Abstracts" for EB '96 is
now available.**

Contact Linda Buckler, Meetings Manager

tel: 301-530-7172

fax: 301-571-8305

email: lbuckler@aps.faseb.org

Experimental Biology '96

April 14-17, 1996 • Washington, DC



1996 HENRY PICKERING
BOWDITCH AWARD

Kim E. Barrett
University of California,
San Diego

*Intra- and Intercellular
Regulation of Intestinal
Epithelial Transport*



1996 WALTER B. CANNON
MEMORIAL AWARD

Richard W. Tsien
Stanford University

*Calcium Channels as Versatile
and Efficient Signal Transducers*

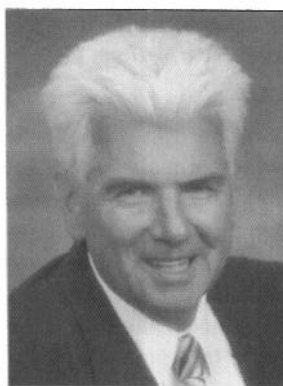
Distinguished Lectureships



ROBERT M. BERNE
DISTINGUISHED LECTURESHIP
OF THE CARDIOVASCULAR
SECTION

Richard J. Traystman
Johns Hopkins University

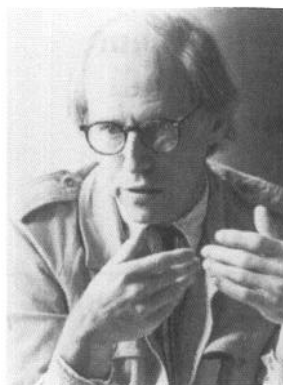
*Brain Protection: Lessons
From the Animal Farm*



HUGH DAVSON
DISTINGUISHED LECTURESHIP
OF THE CELL AND GENERAL
PHYSIOLOGY SECTION

Günter Blobel

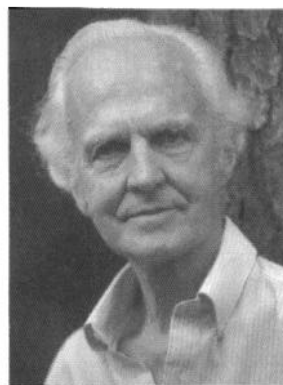
*Protein Translocation
Across Membranes*



JOSEPH ERLANGER
DISTINGUISHED LECTURESHIP
OF THE CENTRAL NERVOUS
SYSTEM SECTION

J. Allan Hobson
Harvard Medical School

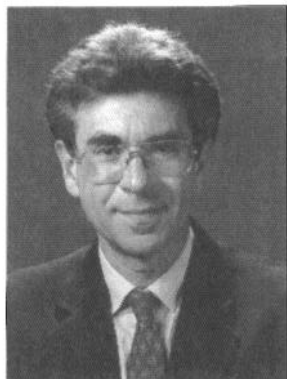
*Waking, Sleeping,
and Dreaming:
The Neurobiological
Control of Conscious States*



AUGUST KROGH
DISTINGUISHED LECTURESHIP
OF THE COMPARATIVE
PHYSIOLOGY SECTION

Knut Schmidt-Nielsen
Duke University

*Life at the Edge:
Survival in Hostile
Environments*



SOLOMON A. BERSON
DISTINGUISHED LECTURESHIP
OF THE ENDOCRINOLOGY AND
METABOLISM SECTION

Robert J. Lefkowitz
Duke University

*G Protein-Coupled Receptors
and Receptor Kinases: From
Molecular Biology to Potential
Therapeutic Applications*



EDWARD F. ADOLPH
DISTINGUISHED LECTURESHIP
OF THE ENVIRONMENTAL AND
EXERCISE PHYSIOLOGY SECTION

John T. Reeves
University of Colorado

*Pulmonary Circulation
During Exercise at Sea Level
and High Altitude*



HORACE DAVENPORT
DISTINGUISHED LECTURESHIP
OF THE GASTROINTESTINAL
SECTION

Alan F. Hofmann
University of California,
San Diego

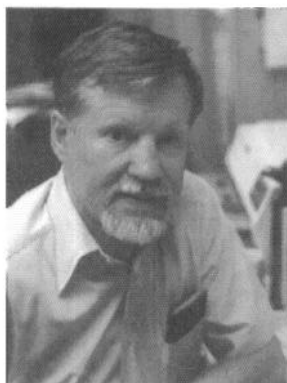
*The ABCDs of Bile Acids and
the Enterohepatic Circulation*



CARL LUDWIG
DISTINGUISHED LECTURESHIP
OF THE NEURAL CONTROL
AND AUTONOMIC REGULATION
SECTION

Diana L. Kunze
Rammelkamp Center

*Neural Integration
of Cardiovascular Reflexes:
A View From the Cell*



CARL W. GOTTSCHALK
DISTINGUISHED LECTURESHIP OF
THE RENAL PHYSIOLOGY SECTION

Mark A. Knepper
National Heart, Lung,
and Blood Institute

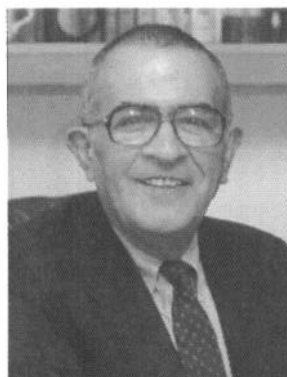
*Mechanisms of Vasopressin
Action in the Kidney*



JULIUS H. COMROE, JR.
DISTINGUISHED LECTURESHIP
OF THE RESPIRATION SECTION

Marlene Rabinovitch
Hospital for Sick Children,
Toronto

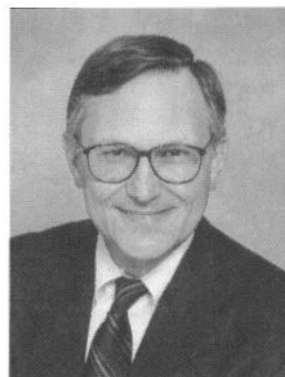
*Endogenous Vascular Elastase
and Beyond: Retro and
Pro-Spectroscopic Insights*



CLAUDE BERNARD
DISTINGUISHED LECTURESHIP
OF THE TEACHING OF
PHYSIOLOGY SECTION

Stanley G. Schultz
University of Texas, Houston

*Homeostasis, Humpty-Dumpty,
and Integrative Biology*



ERNEST H. STARLING
DISTINGUISHED LECTURESHIP
OF THE WATER AND ELECTROLYTE
HOMEOSTASIS SECTION

Allen W. Cowley, Jr.
Medical College of Wisconsin

*Role of Renal Medulla
in Volume and Arterial
Pressure Regulation*

Legislative Alert: Oppose the 'Animal Experimentation Right to Know Act'

Rep. Robert Torricelli (D-NJ) has again introduced the "Animal Experimentation Right to Know Act" (H.R. 1547). This bill would hamper medical research without improving animal welfare because it imposes unnecessary paperwork. APS urges all researchers to ask their Representatives to oppose this unsound measure.

Arguing that animal research in this country involves "many" painful and distressful procedures, H.R. 1547 discourages this research by requiring medical researchers and animal care professionals to devote additional time to recordkeeping and reporting. H.R. 1547 requires research facilities to track and report to USDA their use of all laboratory animals, including rats and mice. Facilities must report the source of their research animals; whether the animals were used for research, testing, or education; and the "severity of the pain or distress caused by such procedures." The bill requires USDA to publish this information annually.

The bill also mandates a new series of reports and procedures for Department of Defense (DOD). The bill requires DOD laboratories to report to Congress annually in detail on all its animal research, plans to "phase out and reduce the use of animals in research," procedures for preventing unintended duplication of research, and a cost comparison between biological research conducted with and without animals. The President must appoint an 11-member panel of biomedical and animal care experts to investigate the "ethics and regulation of the number and types of animal experiments" conducted by DOD. The bill also requires DOD to appoint an ombudsman for animal issues at each research facility.

H.R. 1547 has now been referred to the House Agriculture Committee's Subcommittee on Livestock, Dairy and Poultry and to the House National Security Committee's Subcommittee on Military Research and Development. The bill is a major focus of letter writing to Congress by animal

HOUSE AGRICULTURE COMMITTEE

Pat Roberts (R-KS), Chair

E. "Kika" de la Garza (D-TX), Ranking Member

Subcommittee on Livestock, Dairy, and Poultry

Republicans

Steve Gunderson (WI), Chair

John Boehner (OH)

Bob Goodlatte (VA)

Richard Pombo (CA)

Nick Smith (MI)

Frank Lucas (OK)

Wes Cooley (OR)

Democrats

Harold Volkmer (MO), Ranking Member

Collin Peterson (MN)

Calvin Dooley (CA)

Earl Hilliard (AL)

Tim Holden (PA)

HOUSE NATIONAL SECURITY COMMITTEE

Floyd Spence (R-SC), Chair

Ronald Dellums (D-CA), Ranking Member

Subcommittee on Military Research and Development

Republicans

Curt Weldon (PA), Chair

James Hansen (UT)

Todd Tiahrt (KS)

Richard "Doc" Hastings (WA)

John Kasich (OH)

Herbert Bateman (VA)

Robert Dornan (CA)

Joel Hefley (CO)

Randy Cunningham (CA)

John McHugh (NY)

John Hostettler (IN)

Van Hilleary (TN)

Joe Scarborough (FL)

Walter Jones, Jr. (NC)

Democrats

John Spratt (SC), Ranking Member

Patricia Schroeder (CO)

Solomon Ortiz (TX)

John Tanner (TN)

Gene Taylor (MS)

Marty Meehan (MA)

Robert Underwood (Guam Delegate)

Jane Harman (CA)

Paul McHale (PA)

Pete Geren (TX)

Patrick Kennedy (RI)

APS Council Approves Resolution on 'Class B' Dealers

At its June meeting Council adopted the following resolution concerning USDA-licensed random-source animal dealers who supply many of the dogs and cats used in medical research. This resolution discusses the cooperative efforts needed to ensure continuation of this program given the importance of research involving random-source animals and the fact that "Class B" dealers are the only legal source in many states for researchers to obtain these animals.

APS Policy on Random-Source Animals Dealers

The APS recognizes the importance of research that depends upon animals of large size, advanced age, and diverse genetic background. These are known as "random source animals," and, in many places, they are legally available at reasonable cost only from the Class B category of USDA-licensed dealers. Class B dealers are important due to many state and local laws that prohibit the transfer of abandoned and feral animals from pounds to research facilities. Until this regrettable situation can be changed, the APS will sup-

port all efforts to make the current USDA licensing system work as well as possible. We therefore support providing the USDA with appropriate funding to ensure adequate resources to conduct the necessary inspections and oversight.

The Animal Welfare Act is rooted in the desire to prevent pets from inadvertently becoming research subjects. The APS encourages researchers to actively promote policies to assure that their institutions utilize only dealers who comply fully with all Animal Welfare Act regulations. Researchers should be knowledgeable about where their institutions obtain random source animals and should be certain that incoming animals are screened for identifying marks or other signs that they might be lost pets.

In addition, researchers and research institutions should promote responsible pet ownership that can avert many situations in which pets get lost or come to harm. We encourage the public to have their pets neutered, identify pets with either tattoo or a chip implant as well as a collar, and keep pets protected in a home or yard.

Resolution approved by APS Council June 1995

activists, including the Humane Society of the United States which published several newsletter articles about H.R. 1547 and an earlier version of the bill.

Please write to the key committee members listed on the previous page and tell them that H.R. 1547 will hurt research without helping animals because it will force USDA and animal care providers to spend too much time on unneeded paperwork.

- H.R. 1547 imposes new burdens such as additional record-keeping and reports that would encumber research efforts while not offering any significant improvement to animal welfare. Animal research is subject to numerous laws, regulations, and standards, including the requirement that projects be supervised locally by the Institutional Animal Care and Use Committee. The IACUC verifies that research involving animals is appropriately designed and carried out, and scientific peer review assures that funding is provided only to research that addresses important medical and scientific questions.
- The legislation forces USDA to divert limited resources from inspections that protect animals into collecting statistics and issuing reports. H.R. 1547 would greatly expand recordkeeping and reporting requirements, which would be excessively costly and burdensome to both USDA and individual research facilities. USDA's Animal and Plant Health Inspection Service is overwhelmed with its current regulatory duties, and it may even face a budget reduction in FY 1996. USDA's most important contribution is to conduct inspections and oversight to verify that animals are humanely treated.

- Requiring expanded reports on "the severity of pain or distress" involved in research procedures will only give people false confidence that reliable data is available. USDA annual reports already require information on the painfulness of procedures and whether pain-relieving drugs were provided. Determining degrees of pain is a difficult problem, and there is some confusion about such reports due to differing interpretations of the categories. It would be a better use of scarce USDA resources to clarify the existing form rather than try to devise a pain classification system that would not provide more reliable data unless it was extraordinarily complex, which is an added burden we do not need.
- There is no need for the DOD to set up special programs promoting alternatives if its research is subjected to rigorous peer review. H.R. 1547 perpetuates the false premise that alternatives to animal research exist but are not being utilized. Scientists in a competitive research environment must find the best model if their work is to be funded. On-going peer review, not reports and special programs, is the most effective way to ensure researchers have chosen the most appropriate research approach, whether that be cellular and molecular studies, cell cultures, clinical or epidemiological work, computer models, or whole animal studies.

The address and salutation for all U.S. Representatives is: The Hon. [Name], U.S. House of Representatives, Washington, D.C. 20515, Dear Representative [Name]:

Coronado Sentenced, Repudiates Own Activism

Animal rights activist Rodney Coronado has been sentenced to 57 months in prison for his role in a 1992 firebomb attack at Michigan State University and for stealing an historical artifact from the site of Custer's last stand. Coronado, 29, was sentenced in federal court in Kalamazoo, Michigan, on August 11. He was also ordered to pay \$2.5 million in restitution to institutions and businesses he damaged in Animal Liberation Front (ALF) raids.

"My actions were illegal, radical and extreme and caused great pain to others," Coronado said at the time of his sentencing. "It took me years to realize the impact of my actions."

Coronado pleaded guilty in March 1995 to one count of aiding and abetting arson in connection with the firebombing of the offices of two researchers at Michigan State University. The ALF claimed responsibility for this raid, which caused \$1.2 million in damage, as part of a campaign it called "Operation Biteback." Coronado also pleaded guilty to one count of theft of government property for removing a cavalryman's journal from a historical display at the Little Big Horn Battlefield National Monument in Montana. Coronado admitted that he later burned the black leather notebook.

Federal Judge Richard Enslen sentenced Coronado to serve two concurrent 57-month prison terms for the two

offenses. The sentence exceeded the 41 to 55 months in prison prosecutors had requested.

"The intimidation and fear that these crimes were designed to inflict continues to this day," prosecutors wrote in their sentencing request. "Scientists, business owners, and farmers around the U.S. still live in fear that a bomb will be waiting for them the next time they go to their offices, farms, or laboratories."

In his courtroom statement, Coronado said that when he tried to separate himself from the so-called "animal rights" movement prior to his arrest, other activists turned on him. He said that he began to feel exploited and believed that they wanted him only as a front person to continue advocating their violent approach. He also said that he was concerned that his imprisonment would be treated as martyrdom for the cause.

US Attorney Timothy VerHey told the Lansing State Journal that despite Coronado's denials of any direct involvement in the attacks, prosecutors had assembled considerable evidence that he was part of the ALF inner circle. "We found out that every time there was an ALF action in town, he was in the neighborhood," VerHey told the newspaper.

Among the evidence were two packages sent to Bethesda by Federal Express before and after the MSU attack by a man who signed his name as Leonard Robideau. Federal Express employees intercepted the second package after a false account number was used to ship it. The Federal Express drop box in which the package was deposited was only 300 feet from a hotel where Coronado had stayed on the night of the arson. An analysis of the handwriting on the shipping label determined that it was penned by Coronado.

A man who identified himself as a member of the ALF called a television reporter to claim responsibility after a December 21, 1991, attack on the Malecky mink ranch in Yamhill, Oregon. Phone records suggest that Coronado made that call.

Investigators also seized a typewriter from a storage locker rented by Coronado in Talent, Oregon, and forensic experts were able to use the ribbon to reconstruct a letter which revealed that two Montana fur farms were being targeted for arson attacks.

As part of Coronado's plea bargain agreement, federal prosecutors in five other states agreed not to pursue charges against Coronado for his role in ALF raids there. However, the \$2.5 million in financial restitution ordered in Coronado's sentencing covered not only the MSU attack but also the damage done in ALF-claimed raids at Oregon State University, Washington State University, and Utah State University.

A federal grand jury indicted Coronado in July 1993 on five counts relating to the Michigan State University raid, but he was a fugitive from justice for 14 months before being arrested in September 1994 at the Pascua Yacqui Indian reservation outside Tucson, Arizona.

APS NetAlert Up and Running

An urgent appeal concerning the Congressional budget resolutions went out in mid-May to some 200 APS members who signed up for our rapid response network "NetAlert." NetAlert members were asked to write or call their Members of Congress about budget proposals that would have reduced NIH funding by 5 to 10 percent as part of overall plans to balance the federal budget by the year 2002.

Although we were unsuccessful in changing the House legislation, the Senate adopted a floor amendment sponsored by Sen. Mark Hatfield (R-OR), that restored virtually all of the planned 10 percent cut planned for the NIH. In order to find more money for NIH, Hatfield proposed reducing many other federal programs by about half a percent. The final vote on the Hatfield amendment was an overwhelming 85-14.

To join APS NetAlert and receive bulletins on funding, use of animals, and other research-related issues, please send an email to netaalert@aps.faseb.org or contact APS Public Affairs Officer Alice Hellerstein at 301/530-7105.

Know Your Sustaining Associates

Abbott Laboratories

Abbott Laboratories is a world-wide 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 Nembutal 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 spent on research and development in 1989 and an annual compound growth rate in R&D spending over the past five years of 20%.

Alliance Pharmaceutical Corporation

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

Oxygent is in clinical development in conjunction with Johnson & Johnson as an oxygen carrier ("blood substitute") to reduce the need for donor blood transfusions during surgery.

LiquiVent is an intrapulmonary agent for treatment of acute respiratory failure. LiquiVent has Subpart E ("fast track") FDA status and is in clinical trials with neonates, children, and adults.

Imagent US is in preclinical development for enhancement of ultrasound images of blood flow abnormalities related to myocardial infarctions, blood clots, or solid tumors.

American Medical Association

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

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 manufactures 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, 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: human insulin, alpha-interferon, human growth hormone, and recombinant tissue plasminogen activator.

Glaxo

Glaxo is a leading research-based pharmaceutical company. At its US research site in North Carolina, Glaxo has basic and applied research programs in cancer, inflammation, diabetes, osteoporosis, and obesity. Glaxo supports a wide range of related research in university and research institute departments, as well as in-house postdoctoral programs.

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.

Groupe de Recherche Servier

Of the 6,000 people working throughout the world at the Groupe de Recherche Servier, 25% carry out research involved in the development of new drugs.

Among these, various specialists including chemists, pharmacists, pharmacologists, toxicologists, and physicians work in our research laboratories located in Suresnes, Croissy, Orleans, Gidy, Fulmer, and Tokyo and on our development teams in Courbevoie, Fulmer, Brussels, Munich, Rome, Madrid, and Tokyo.

The main axes of research at the Groupe de Recherche Servier concern the following areas of pathology: cardiovascular disease (especially in hypertension and myocardial ischemia), heart failure (cardiovascular aging and venous diseases), oncology and immunology, respiratory disease (chronic obstructive pulmonary diseases and asthma), metabolic disease (diabetes, lipid disorders, obesity, and their consequences particularly in terms of cardiovascular damage), neurological disease (cerebral impairment in the elderly and Parkinson's disease), cerebrovascular disease (memory impairment and Alzheimer's disease), psychiatric disease (emotional disorders, anxiety, and depression), and rheumatology (inflammatory and painful joint diseases and joint and bone aging including osteoporosis).

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 Pharmaceuticals 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 pharmaceutical products. According to the Japan Drug Research studies, Janssen was responsible for more significant new drug discoveries during the period 1970-1983 than any pharmaceutical company in the world.

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

The R. W. Johnson Pharmaceutical Research Institute

The R. W. Johnson Pharmaceutical Research Institute is engaged in the discovery and development of new drugs and delivery systems that provide significant advances in the treatment or prevention of disease. The key areas for Discovery Research are complemented through outside alliances with numerous academic and commercial enterprises. The current areas of research include contraception, analgesia, immunosuppression, infectious diseases, thrombin receptor and cellular growth factors. The process involves integration of molecular biology, fermentation processes and molecular drug design with classical pharmacology, biochemistry, and medicinal chemistry in the pursuit of new and novel drugs.

Eli Lilly and Company

The Lilly Research Laboratories is dedicated to the advancement of basic scientific information upon which further targeted medical breakthroughs may be identified. Scientists in the Lilly Research Laboratories are committed to excellence

in research as evidenced by a steadily increasing investment in research and development over the years. Scientific research is being supported by the construction of new research facilities and with the use of a Cray II supercomputer. Scientists are focusing on basic research and targeted medical therapy for cardiovascular disease, central nervous system dysfunction, cancer, diabetes, and pulmonary disorders.

MacLab Division, ADInstruments, Inc.

ADInstruments is an innovator in the design of versatile yet easy-to-use computer-based physiological recording and analysis systems. The company's primary offering, the MacLab System, is an integrated data recording and analysis system consisting of a hardware interface and associated applications software. When combined with any of the Apple Macintosh series of personal computers, MacLab gives physiologists the power not only to acquire and display experimental data but also to analyze and manipulate data in ways not possible using traditional paper recorders.

Applications-specific amplifiers, transducers, and components offered by ADInstruments allow simple and straightforward system configuration for virtually any teaching or research application. The thousands of MacLab systems presently in use in both teaching and research laboratories worldwide bear testimony to its ease of use, versatility, and affordability.

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 carries out research in oncology, peptide hormones, cataract surgery, nutrition, and allergy diagnostics.

Oncology: the company offers products for the treatment of various forms of cancer, including breast cancer, leukemia and lymphoma, and prostatic cancer. New research areas in cancer therapy are immunology and gene therapy.

Peptide hormones: growth hormone is manufactured by recombinant DNA technology. Among other applications, these products give extremely short-statured children the possibility of normal growth. Growth hormone has also been approved for treating growth-hormone deficiency in adults.

Cataract surgery: Pharmacia's products include soft surgical aids and intraocular lenses. These products facilitate eye operations, restoring sight within 24 hours.

Nutrition: the company produces preparations for intravenous nutrient delivery.

Allergy diagnostics: supply high-technology systems for all allergy diagnostics and follow-up of asthma with the help of blood specimens.

Procter & Gamble Co.

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

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

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

Quaker Oats Company

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

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

G.D. Searle & Co.

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

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

SmithKline Beecham

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

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: cardiovascular disease, infectious disease, diagnostics, and 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 pharmaceuticals. Human health care is the heart of Upjohn's endeavors.

People and Places

Wayne W. Carley is presently employed by the National Association of Biology Teachers, Reston, VA. Previously, Carley was with the Department of Biology, Lamar University, Beaumont, TX.

Currently the Director of Clinical Services, University of Medicine & Dentistry, Newark, NJ, **Neil S. Cherniack** was formerly the Dean of Case Western Reserve University School of Medicine, Cleveland, OH.

Formerly with the Department of Physiology, University of Texas Health Center, Tyler, TX, **Jon C. Connelly** is now with the Abilene Heart & Vascular Institute, Abilene, TX.

Daniel P. Costa recently accepted a position with the Department of Biology, University of California, Santa Cruz, CA. Prior to his new position, Costa was associated with the Office of Naval Research, Arlington, VA.

Elizabeth LeBourgeois Crockett is now employed by the Department of Biological Sciences, Ohio University, Athens, OH. Previously, Crockett was associated with the Department of Zoology, Arizona State University, Tempe, AZ.

Formerly employed by the Department of Kinesiology, University of Maryland, College Park, MD, **Christopher A. DeSouza** has transferred to the Department of Kinesiology, University of Colorado at Boulder, CO.

Michael Paul Doyle has accepted the position of Scientist for Somatogen Incorporated, Bolder, CO. Doyle had been with the Department of Molecular Physiology, University of Virginia Health Science Center, Charlottesville, VA.

Andre Dray recently accepted a position with the Department of Pharmacology, Astra Pain Research Unit, Quebec, Canada. Prior to his new position, Dray was associated with Sandoz Institute for Medical Research, London, UK.

Having accepted an assignment with the Department of Pediatrics, Medical College of Wisconsin, Milwaukee, WI, **Stephen J. Elliott** has moved from the Department of Pediatrics, Baylor College of Medicine, Houston, TX.

Accepting a position with the Ashville Cardiovascular and Thoracic Surgeons, Ashville, NC, **Stephen W. Ely** has moved from the Department of Physiology, University of Virginia Health Science Center, Charlottesville, VA.

Previously with the Department of Anesthesiology, Mayo Clinic, Rochester, MN, **Keith A. Engelke** has accepted an assignment with the Division of Natural Science, Pepperdine University, Malibu, CA.

Raymond A. Frizzell is now employed with the Department of Cell Biology and Physiology, University of Pittsburgh School of Medicine, Pittsburgh, PA. Formerly, Frizzell was associated with the Department of Physiology/Biophysics, University of Alabama, Birmingham, AL.

Accepting a position with the Respiratory Research

Group, **Matthew James Gdovin** has relocated to the Department of Medical Physiology, University of Calgary Faculty of Medicine, Calgary, Alberta, Canada. Previously, Gdovin was with the Department of Physiology, Dartmouth, NH.

Having accepted a position with Anesthesia Research, Mayo Clinic, Rochester, MN, **John R. Halliwill** has left the Cardiovascular Physiology Department, Medical College of Virginia, Richmond, VA.

Formerly with the National Naval Medical Center, Bethesda, MD, **Louis D. Homer** has accepted a position with Emanuel Hospital, Portland, OR.

James B. Hoying recently moved from the Department of Physiology & Biophysics, University of Arizona, Tucson, AZ, to the Department of Molecular Genetics, Biochemistry and Microbiology, University of Cincinnati, Cincinnati, OH.

Sadayoshi Ito has accepted a position with the Second Department of Internal Medicine, Tohoku University School of Medicine, Sendai, Japan. Formerly, Ito was associated with the Hypertension & Vascular Research Department, Henry Ford Hospital, Detroit, MI.

Sarah N. Jerome has moved from the Department of Physiology, Louisiana State University Medical Center, Shreveport, LA. She has accepted a position with the Department of Health Sciences, University of Central Arkansas, Conway, AR.

Emily Carolyn Johnson has joined the Department of Kinesiology, Washington State University, Pullman, WA. Prior to her new position, Johnson was associated with the Department of Medicine, University of California, San Diego, La Jolla, CA.

Formerly with the Department of Physical Therapy, Boston University, Boston, MA, **Gary P. Kamen** is currently associated with the Department of Exercise Science, University of Massachusetts, Amherst, MA.

Lymperis Perry Koziris recently accepted a position with the College of Kinesiology, University of Illinois at Chicago, Chicago, IL. Previously, Koziris was affiliated with the Center for Sports Medicine, Pennsylvania State University, University Park, PA.

Peter R. Kvietys has moved from Louisiana State University's Department of Physiology & Biophysics to Victoria Hospital, Research Institute, London, Ontario, Canada. Kvietys' new position is Senior Scientist.

Accepting a position with the Rammelkamp Center, **Diana L. Kunze** is now associated with the Metrohealth Systems, Cleveland, OH. Formerly, Kunze was associated with the Department of Physiology and Molecular Biophysics, Baylor College of Medicine, Houston, TX.

Dave A. MacLean has accepted a position with The Copenhagen Muscle Research Center, Copenhagen, Denmark. Prior to his new assignment, MacLean was affiliated with the School of Human Biology, University of

Guelph, Guelph, Ontario, Canada.

Recently moving from the University of Tennessee, Knoxville, TN, **Margaret Maher** has joined the Department of Biology and Microbiology, University of Wisconsin, La Crosse, WI.

Peter Morsing is now with the Department of Physiology and Biophysics, University of Lund, Lund, Sweden. Prior to his move to Sweden, Morsing was associated with the University of North Carolina in Chapel Hill, NC.

Formerly, the Assistant Professor of Medicine and Physiology, University of Missouri, Columbia, MO, **Paul R. Myers** is now associated with the Department of Cardiology, Vanderbilt University Medical Center, Nashville, TN.

Myeong Jin Nam has recently accepted a position with the Department of Neurology, Kennedy Krieger Institute, Baltimore, MD. Nam had been with the Department of Physiology & Pharmacology, Bowman Gray School of Medicine, Wake Forest University, Winston-Salem, NC.

Takashi Nishino is now with the Department of Anesthesiology, School of Medicine, Chiba University, Chuoku, Chiba Japan. Nishino was formerly with the Department of Anesthesiology, National Cancer Center, Hospital E, Kashiwa, Chiba, Japan.

Lillian Novela has joined the Department of Pharmacology, University of Illinois, Chicago, IL. Prior to her new position, Novela was associated with Dalton Research Center, Columbia, MO.

Stuart Martin Phillips has left the Department of Kinesiology, University of Waterloo, Waterloo, Ontario, Canada, to join the Metabolism Unit of the University of

Texas Medical Branch, Shriners Burns Institute, Galveston, TX.

Jeffrey T. Potts has moved from the Department of Biomedical Engineering, Johns Hopkins University School of Medicine, Baltimore, MD, to the Department of Internal Medicine and Physiology, Harry S Moss Heart Center, Southwestern Medical Center, Dallas, TX.

Donald W. Rodd is currently with the Department of Biology, University of Evansville, Evansville, IN. Previously, Rodd was with the Department of Exercise & Health Science, Alma College, Alma, MI.

Moving from the Department of Pharmacology, United States Uniformed Health Services, **Vanessa Hope Routh** has accepted a position with the Department of Pharmacology, University of Medicine & Dentistry, Newark, NJ.

Colin G. Scanes has recently accepted a position with the Iowa State University College of Agriculture, Ames, IA. Scanes was formerly associated with the Department of Animal Science, Rutgers University, New Brunswick, NJ.

William P. Schilling has joined the Rammelkamp Center for Research, Cleveland, OH. Prior to accepting his new position, Schilling was associated with the Department of Molecular Physiology & Biophysics, Baylor College of Medicine, Houston, TX.

Xiaocai Shi has accepted a position with Gatorade Worldwide Division, The Quaker Oats Company, Barrington, IL. Shi was formerly associated with the Department of Exercise Science, University of Iowa, Iowa City, IA.

Barbara M. Richmond Smith has joined the Institute of Biotechnology, Vilnius, Lithuania. Prior to her new position, Smith was associated with the Department of Physiology, Cornell University Medical College, New York, NY.

Having accepted a position with the Department of Medicine, **Manoocher Soleimani** is now affiliated with the University of Cincinnati, Cincinnati, OH. Formerly, Soleimani was with the Department of Medicine, Indiana University School of Medicine, Indianapolis, IN.

Formerly with the Human Performance/Sport Study, University of Tennessee, **Hirofumi Tanaka** has recently accepted an appointment with the Department of Kinesiology, University of Colorado, Boulder, CO.

Having moved from the Department of Physiology, St. George's Hospital Medical Center, London, UK, **Susan A. Ward** is currently with the School of Applied Science, South Bank University, London, UK.

Ellis Eugene Williams, formerly associated with the Department of Zoology, Oregon State University, Corvallis, OR, is now employed at the Department of Biology, Indiana State University, Purdue, Indianapolis, IN.

Formerly a Professor at Munchen, University, Munchen, Germany, **Heinz G. Zimmer** is now the Director of Leipzig University, Leipzig, Germany.

APS Members Honored

APS member **Julianna E. Szilagyi** recently received several honors. She was elected as a Fellow of the Council for High Blood Pressure Research of the American Heart Association, received a faculty excellence proclamation from the City of Houston, and received the University of Houston College of Pharmacy Celebration of Excellence Award. Additionally, she was named the Director of Professional Studies for the Department of Pharmacological and Pharmaceutical Sciences in the University of Houston College of Pharmacy.

Jerod M. Loeb was a recipient of the 1994 Richard Simpson Memorial Award, given by the group incurably ill For Animal Research (iiFAR). In February, he was named to iiFAR's Board of Directors.

In naming Loeb, iiFAR noted that his commitment to the protection and support of the use of animals in research is longstanding, deep, and sincere and that his training as a physiologist has given him hands-on experience with animals.

Senior Physiologists

Basil I. Hirschowitz writes to **John Blinks**, "I have just retired from my academic position and am now emeritus professor of medicine and of physiology. I have discontinued active laboratory investigation although I am still actively pursuing clinical investigation regarding gastric secretion in ulcer and esophageal reflux disease. My particular interest is in Zollinger-Ellison syndrome and in NSAID injury to the GI tract. From my current perspective in clinical research, I have one regret and that is not having initiated long-term longitudinal follow-up for the many patients that I have seen through the years. In fact, we should have been doing outcome research all along in our every day practice. Finally, I envy those who are beginning a joint career of physiology and medicine now."

Domingo Aviado, whose research publications over the past four decades focused on physiological approaches to pharmacology and toxicology, continues to publish regularly on the relationship between environmental tobacco smoke exposure and heart disease. He also continues to write on para-physiological topics.

In spite of a series of major medical problems over the past ten years, he remains cheerful.

He recently wrote the following to **Robert Grover**, "I personally feel that before the end of this century and millennium, the accomplishments of physiologists/pharmacologists should be reviewed.

"I have four children and five grandchildren on the Atlantic and Pacific coasts, and visit the Philippines every year. I would like to communicate with either retired or current joint members of APS and ASPET."

APS members can contact Aviado at 225 Hartshorn Drive, Short Hills, NJ 07078.

Don MacCanon writes, "Following my retirement from NIH on July 1, 1989, I became a consultant on training programs, mainly minority programs, with occasional seminars on training opportunities. I also assist Martin Frank in identifying reviewers for new publications.

"I am now very much involved with church related activities. In December 1993, I finished chairing a group which during a three-year period established a homeless prevention task force that helps prevent needy families that have been identified by county welfare from becoming homeless.

"The same group established a 'table of sharing' in the church narthex and a liaison with Rockville Fish, Inc. to provide emergency food supplies for the hungry. Frankly, I don't know how I ever found time to work.

"In June 1994, we moved to Asbury Methodist Village in Gaithersburg, MD, where we have a lovely apartment and have gotten used to eating in the dining room every night. The big 70 is not as bad as once thought."

Herbert N. Hultgren writes, "I have been retired since 1988, but am still doing volunteer teaching of students and residents at the Palo Alto VA Hospital. I am completing a

book on high altitude medicine and still writing up a few research papers. As a member of the editorial staff of the *Journal of Wilderness and Environmental Medicine*, I enjoy reviewing many interesting papers.

"Barbara and I are enjoying life on the very active and stimulating Stanford campus."

Pierre Laurent writes on his 70th birthday, "I was very proud many years ago when I was elected as a corresponding member of APS. That was like being integrated into a famous family full of prestigious but friendly scientists.

"Although presently officially retired, I am still active in research. Two years ago, I went to Kenya as a member of a US/Canada expedition to study the very unusual physiology of a small fish living in an alkaline lake with pH 11. At present I have a grant from NSR Canada to work in Hamilton at McMaster University. I plan to go there next spring. In the meanwhile, it is a great pleasure for me to welcome American and non-American scientists and discuss their new research projects.

"Besides writing original and review papers, I read, read, and read everything, trying to get familiar with new fields of knowledge. For instance, I noticed a very interesting APS book, *Fractal Physiology*, edited by Bassingthwaite, Libovitch, and West. I would like to buy this book and learn more about the US laboratories working in that field."

APS Members at NIH Receive Awards

Paul Didisheim received the first C. William Hall Award from the Society for Biomaterials. The award honors Didisheim's outstanding contributions in advancing the field of biomaterials. Didisheim has been a leader in the development and evaluation of new biomaterials, particularly for use in vascular grafts and stents.

The Karl Spence Lashley Award of the American Philosophical Society was recently given to **Robert Wurtz**. The award recognizes Wurtz's "brilliant technical innovations in recording the activity of single visual neurons of alert behaviorally trained monkeys that made possible salient scientific discoveries relating individual nerve cells to visual perception and the generation of eye movement."

Positions Available

NATIONAL SCIENCE FOUNDATION-FUNDED POSITION is available, starting immediately, in the Department of Biological Sciences at Florida Atlantic University. The scope of work involves investigating the role of adenosine in initiating and coordinating downregulatory processes in the anoxic turtle brain and determining how tightly ATP failure and anoxic depolarization are coupled. Annual stipend is \$25,000 per year. Applications will be accepted until a candidate is found. For further information contact: Dr. Peter Lutz, Department of Biological Sciences, Florida Atlantic University, Boca Raton, FL 33431. Tel: 407-367-2886; fax: 407-367-2749; e-mail: lutz@acc.fau.edu. [EOAAE]

MOLECULAR "EXCITABLE CELL" PHYSIOLOGIST. A tenure-track assistant/associate professorship is available for a molecular physiologist whose research interests in nerve and muscle cells complement those of the neurobiology and cardiopulmonary faculty in the department. The successful candidate must have a PhD or equivalent degree, two years of postdoctoral research experience, and is expected to establish an extramurally funded research program as well as participate in teaching general physiology courses. Start-up funds are available. The deadline for applications is November 15, 1995, with a starting date between May 1 and September 1, 1996. An application letter, description of teaching experience and interests, curriculum vitae, and the names, addresses, and phone numbers of four individuals who were asked to provide reference letters should be sent to: Dr. Douglas N. Ishii, Search Committee Chair, Department of Physiology, Colorado State University, Fort Collins, CO 80523. Women and ethnic minorities are strongly urged to apply. [EOAAE]

WELLCOME VISITING PROFESSORSHIPS IN THE BASIC MEDICAL SCIENCES 1996-97

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

For application procedures and information, contact

Rose P. Grimm, Executive Office
FASEB

9650 Rockville Pike
Bethesda, MD 20814-3998
Tel. (301) 530-7090 Fax (301) 530-7049
E-mail rgrimm@excofc.faseb.org

Deadline for letters of application is March 1, 1996

SPONSORED BY THE BURROUGHS WELLCOME FUND

POSTDOCTORAL POSITION. A postdoctoral position is available at the John B. Pierce Laboratory to investigate the interaction of cardiovascular and thermal reflexes in the control of the cutaneous circulation in humans. Experiments will focus on the measurement of skin blood flow using laser doppler imaging techniques and various stimuli (i.e., thermal stress, exercise, and/or venous blood pooling) to examine the interaction of these two control systems. Applicants should have a background in systemic physiology with an emphasis in the area of cardiovascular control or temperature regulation. Experience with human microneurography techniques is desirable. Interested candidates should send their curriculum vitae and the names and addresses of three references to: Gary W. Mack, PhD, The John B. Pierce Laboratory, 290 Congress Avenue, New Haven, CT 06519. Minority and female applicants are encouraged to apply. [EOAAE]

POSITIONS AVAILABLE

There is a \$50 charge for each position listed. Positions will be listed in the next available issue of *The Physiologist* and immediately upon receipt on the APS Gopher Information Server. Listings will remain on the APS Information Server for three months.

A check or money order payable to "The American Physiological Society" must accompany the position listing. Purchase orders will not be accepted unless accompanied by payment. Ads not prepaid will not be printed. Copy must be typed double space 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 must reach the APS office before the 15th of the month, two months preceding the month of issue (e.g., before February 15th for the April issue).

Mail copy with payment to:

THE PHYSIOLOGIST
APS
9650 ROCKVILLE PIKE
BETHESDA, MD 20814-3991

Books Received

- Attention-Deficit Hyperactivity Disorder in Adults.* Paul H. Wender. New York, NY: Oxford University Press, 1995, 295 pp., index, \$25.00. ISBN: 0-19-509227-9.
- August & Marie Krogh: Lives in Science.* Bodil Schmidt-Nielsen. New York, NY: Oxford University Press, 1995, 295 pp., illus., index, \$49.95. ISBN: 0-19-509099-3.
- The Book of Genesis: Exploring Realistic Neural Models with the General Neural Simulation System.* James M. Bower and David Beeman. Santa Clara, CA: TELOS, 1995, 409 pp., illus., index, \$49.95. ISBN: 0-387-94019-7.
- Calculating the Secrets of Life.* Eric S. Lander and Michael S. Waterman (Editors). Washington, DC: National Academy Press, 1995, 285 pp., illus., index, \$39.95. ISBN: 0-309-04886-9.
- Essays in the History of the Physiological Sciences.* Claude Debru (Editor). The Wellcome Institute Series in the History of Medicine, Clio Medica 33. Atlanta, GA: Rodophi B.V., 1995, 256 pp., illus., \$68.00. ISBN: 90-5183-646-5.
- Fundamentals of Physiology: A Human Perspective.* Second Edition. Lauralee Sherwood (Editor). St. Paul, MN: West Publishing Corporation, 1995, 672 pp., illus., \$65.25. ISBN: 0-314-04272-5.
- Handbook of Physiology, Section 11: Aging.* Edward J. Masoro (Editor). New York, NY: Oxford University Press, 1995, 681 pp., illus., \$165.00. ISBN: 0-19-507722-9.
- High-Altitude Medicine and Pathology.* Fourth Edition. Donald Heath and David Reid Williams. New York, NY: Oxford University Press, 1995, 449 pp., illus., \$135.00. ISBN: 0-19-262504-7.
- Human Energetics in Biological Anthropology.* Stanley J. Ulijaszek. New York, NY: Cambridge University Press, 1995, 235 pp., illus., \$54.95. ISBN: 0-521-43295-2.
- Human Physiology: From Cells to Systems.* Second Edition. Lauralee Sherwood (Editor). St. Paul, MN: West Publishing Corporation, 1993, 853 pp., illus., \$69.75. ISBN: 0-314-01225-7.
- Physiology.* Ninth Edition. David G. Penny. Stamford, CT: Appleton & Lange, 1995, 257 pp., illus., \$16.55. ISBN: 0-8385-6222-1.
- Visceral Pain.* Gerald F. Gebhart (Editor). Progress in Pain Research and Management, Volume 5. Seattle, WA: IASP Press, 1995, 516 pp., illus., \$69.00. ISBN: 0-931092-10-8.

Book Reviews

Bioenergetics: Its Thermodynamic Foundations

Lars Garby and Poul S. Larsen
New York, NY: Cambridge University Press, 1995,
270 pp., illus., index, \$59.95
ISBN: 0-521-45143-4

Certain subjects develop a core of foundational material that orients the newcomer to the field and sets the domain of inquiry. Such material attracts authors who have a sense of mission to make the core material accessible and engaging and clear beyond previous expositions of it. To achieve that ambition the authors need not invoke new material, nor reports from the cutting edge of modern research in the area. The chief requirements are logical organization, sharp definitions, and thorough comprehension of the subject.

This book is solidly foundational in the above sense, and it meets the criteria of excellence for that genre. Topics lucidly covered include elements of thermodynamic theory, state properties, mass, energy, work, First Law, Second Law, equilibrium, local nonequilibrium, and energy balances.

Thermodynamics is a rather special subject in both its macro and micro forms, yet it is also synoptic, addressing, for example, classical steam engines, triple point of water, statistical mechanics, and Onsager relations. Many physi-

cists actively dislike the subject, because much or even most of physics rests on models of conservative fields in which Hamiltonians and the First Law of energy conservation with its associated summational invariants (and symmetry issues) dominate, and the Second Law (dissipations) does not appear and is not needed. The other two laws (Zeroth and Third) are regarded as being intuitively obvious and no big deal.

Ruling out perpetual motions of several kinds was a welcome achievement of the First and Second Laws of thermodynamics in the last century, and Boltzmann's microscopic rationalization of the entropy of a macroscopic field, admirably captured in his famous equation (which is displayed on his tombstone), was ultimately recognized as a great achievement (although not soon enough to prevent his suicide in despair over its neglect.) Shannon's brilliant work on signaling capacities of transmission channels in the 1940s led to an equation defining selective information that is identical in mathematical form to Boltzmann's entropy equation. Since then entropy and information have been confounded by the unwary, who do not know how to resolve the paradox that information seems somehow to reflect order and entropy disorder! (I'll not try to untangle that knot here, except to say that the world would be a better place if Shannon had never used the term entropy in his theorizing about information. Norbert Wiener put him up to it to "sell" information theory!)

In the popular press entropy lies alongside Heisenberg's Principle, not understood in detail but respected because they both offer impossibility arguments that are sometimes useful in conversation or even as guidelines for living, viz., "there's no free lunch; everything including the Universe eventually runs down; wear and tear is always there so we grow old and die; time is an arrow pointing ahead; you can't be sure of anything; everything you measure or touch changes...."

In the present book thermodynamic principles of equilibrium or near-equilibrium steady-state systems that can exchange matter and energy at their boundaries are carefully and clearly developed using algebraic notation to codify statements. Although some partial differentials are shown, no differentiations or integrations are explicitly performed. The text is lucid and the sequence logical. The book could have been written in the 1960s (but was not!) Macroscopic, steady systems, with linear approximations when necessary, are favored to support the examples offered for calculation and worked problems. Although the authors acknowledge and respect the complexity of biological systems, they offer a simplified view on purpose as a starting point. [Besides, the newer so-called sciences of complexity may be in deep trouble (1).] Garby and Larsen manage to convey highpoints of introductory physical chemistry in a biophysical context so the reader thinks about the varieties of work done by living things just to keep going, rather than phase diagrams of azeotropic mixtures and like topics of interest to chemical engineers.

The welcome precision of this presentation of bioenergetics makes it possible to calculate the work involved in such things as maintaining life in a human being at rest. The authors partition that work into convection of fluids, maintenance of ion distributions across membranes (keeping the battery charged), synthesis of proteins in steady-state turnover, etc. Assuming a resting metabolism of 74 watts, they conclude that the useful work of existence is about 15 watts, giving an "efficiency" of 20%. [Another way to view metabolism is to note that living systems typically invest about 85% of their lifetime energy turnover into maintenance of the living state and only 15% to growth (transiently the figure can be higher), reproduction, and external work on the environment. They do not lapse into "deferred maintenance" the way we so often do with our houses, cars, roads, bridges, etc.] This and other calculations illustrate the quantitative yields from the thermodynamic approach but also its limitations.

The limitations arise from the simplifying and linearizing assumptions that usually have to be made in applying physical or engineering modeling to living systems in order to obtain a mathematically tractable result. Feedback models, for instance, are often based on linear transfer functions with constant coefficients and single inputs and outputs for the components. Although modern control theory has long been extended far beyond such simplifications, when the extensions are focused on living systems serious problems

arise concerning identifiability, controllability, and observability because of the paucity of data and biological theory.

The authors close with the following paragraph:

"Structure-building processes involve typically non-linear couplings between diffusive transport and several chemical reactions, often autocatalytic reactions. Analysis of such processes leads to dynamic systems of non-linear differential equations, the solutions of which demonstrate that the process can maintain non-uniform heterogeneous stationary states far from equilibrium. This fact was first recognized by Turing (in 1952). Since then, the dynamics and structure of non-linear systems in biology have been the subject of intensive research. This subject is not treated in the present text...."

The reader has to go elsewhere to find out how to conceptualize, using physical and computational insights; the magnificent attributes of growth, development, and reproduction; and the loss of stability shown by most complex organisms in their senescence. The curious cooperation between information and dynamics that support the triad of autonomous morphogenesis, nearly invariant reproduction, and teleonomic behavior that Monod (3) claimed defined the living state requires an advanced treatment, without assumptions merely to make the problem mathematically congenial. Such modern treatments can be found, for example, in Thom (6), Kauffman (2), Prigogine (4), Weber et al. (7), Rosen (5), and in edited collections of articles by specialists (8).

The present book is a splendid starting point for biologists with sympathy for physically based quantitative modeling of primary operations involving energy transformations and mass fluxes. It provides the necessary foundation for understanding the more advanced treatments of harder problems. I am glad to have the book and wish it had been available sooner. It could have saved me much of the struggle of acquiring a quantitative view of the remarkable accomplishments of metabolic systems, from animal life to that masterpiece of power engineering—photosynthesis!

F. Eugene Yates

University of California, Los Angeles

References

1. Horgan, J. From complexity to perplexity. *Sci. Amer.* 272: 104-109, 1995.
2. Kauffman, S. A. *The Origins of Order*. New York: Oxford Univ. Press, 1993.
3. Monod, J. *Chance and Necessity*. New York: Knopf, 1971.
4. Prigogine, I. *From Being to Becoming: Time and Complexity in the Physical Sciences*. San Francisco, CA: Freeman Press, 1980.
5. Rosen, R. *Life Itself: A Comprehensive Inquiry into the Nature, Origin, and Fabrication of Life*. New York: Columbia Univ. Press, 1991.
6. Thom, R. *Mathematical Models of Morphogenesis*. New York: Halstead, 1983.
7. Weber, B.H., D.H. Depew, C. Dyke, S.N. Salthe, E.D.

Schneider, R.E. Ulanowicz, and J.S. Wicken. *Evolution in thermodynamic perspective: An ecological approach*. Biol. Philos. 4: 373-405, 1989.

8. Yates, F.E. (Editor). *Self-Organizing Systems: The Emergence of Order*. New York: Plenum, 1987.

Advanced Nutrition: Macronutrients

Carolyn D. Berdanier

Boca Raton, FL: CRC, 1995, 277 pp., illus., index, \$50.00

An attempt to provide graduate students and interested professionals with most of what they need to know about energy and macronutrients in 277 pages may seem ambitious at first glance. However, consider that the same topic expands to about twice as much text in the most recent edition of the classic nutrition textbook *Modern Nutrition in Health and Disease* (M.E. Shills, J.A. Olson, M. Shike, eds., Philadelphia, PA: Lea & Febiger, 1994), and it will be appreciated that Berdanier has completed a very challenging task.

The first chapter is an overview introducing concepts of nutritional requirements and the role of nutrition in disease prevention. Then there are separate chapters devoted to water, energy, protein, carbohydrate, and fat, each composed of a generous amount of nutritional biochemistry along with smatterings of nutritional epidemiology, physiology, and psychology. Some sections are perfectly fascinating as well as a mine of useful and educational material. For example, in the chapter on energy, you can read about the socioeconomic basis for insect consumption among the aborigines in Australia as well as oxidative phosphorylation and theories of body weight regulation.

Generally speaking, this book is strongest in the area of nutritional biochemistry. Almost inevitably for a book that attempted to be comprehensive in a modest space, there are some limitations in terms of providing detailed and current information. Future editions would benefit from revision of sections in which controversial issues are presented as though they are not controversial. In most of these cases I agreed with the author's interpretation of the evidence but would still have preferred to see a more clear distinction between facts and controversies. For example, quite a number of nutritional scientists working with human subjects would question an

assertion that brown adipose tissue plays an important role in energy regulation in humans (although this is most likely true in rodent models). Likewise, although it may ultimately prove to be true that genetic inheritance has a more dominant effect on body fatness than environmental factors, the weight of human studies to date does not support this view. Another edition of this book would also benefit from an update of some material, such as the use of inulin or mannitol to measure extracellular water, and an expansion of the index, which is currently rather sketchy.

Who will this book be suitable for? Certainly graduate students in the early part of their training will find things of interest to them in this book and will find it well written and easy to read. In addition, health professionals and non-nutritional scientists with an interest in nutritional biochemistry will find this book a useful addition to their library.

Susan B. Roberts

Tufts University

CALL FOR NOMINATIONS FASEB EXCELLENCE IN SCIENCE LECTURE AND AWARD 1997

Purpose

To recognize outstanding achievement by women in biological science.

Eligibility

1. All women who are members of one or more of the societies of FASEB will be eligible for nomination.
2. Nominations recognize a woman whose research has contributed significantly to further our understanding of a particular discipline by excellence in research.

Nominations

1. Nominations may be made only by members of the FASEB Societies.
2. A call for nomination of candidates for the Excellence in Science Award will be posted in the newsletters of the individual Societies as well as the FASEB Newsletter and The FASEB Journal.
3. The call for nominations will be made each year in November. **The nomination deadline is March 1 of each year.** The nomination will be transmitted to the FASEB Board before its May meeting.
4. Nominations must be made in the form of a letter, original and eleven (11) copies, setting forth in detail:
 - the contributions(s) to the field that represents the nominee's outstanding achievement in science
 - leadership and mentorship
 - evidence of national recognition
 - honors and awards
5. Twelve (12) copies of the curriculum vitae and brief selected bibliography of the nominee, as well as twelve (12) copies of no more than five (5) reprints, must accompany the nomination.
6. Additional letters of support (twelve (12) copies each) for the nominee are optional but are encouraged.
7. The nominations and supporting letters are to be sent to:

Ms. Leah C. Valadez
FASEB Excellence in Science Award
Federation of American Societies for Experimental Biology
9650 Rockville Pike, Bethesda, Maryland 20814-3998
Telephone (301) 530-7092

Selection

1. The Excellence in Science Award Committee, comprised of a member from each Society of the Federation, will receive the nominations and recommend an awardee based on an evaluation of scientific accomplishments.
2. The awardee must agree to present an Excellence in Science Lecture.
3. The name of the awardee and a summary of the candidate's qualifications will be sent to the FASEB Board for approval at the May meeting.

Award Presentation

The award will be presented before presentation of the Excellence in Science Lecture by the awardee. The award will be presented by the Chair of the Excellence in Science Award Committee or her representative in conjunction with a member of the FASEB Board. The award includes a \$10,000 unrestricted research grant, funded by Eli Lilly and Company, travel expenses, complimentary registration at the meeting, and a plaque in recognition of the award.

XXXIII International Congress of Physiological Sciences

In June, the IUPS Council met in St. Petersburg, where it received a report on the plans for the XXXIII International Congress of Physiological Sciences. The Congress will convene in St. Petersburg June 30–July 5, 1997.

During the meeting, plans for the scientific program were developed. They will be publicized elsewhere by Stanley G. Schultz, Vice Chairman of the Scientific Program Committee.

The venue for the Congress will be the Medical-Military Academy, which is located in a typical university campus setting. Surrounded by numerous other buildings, the Academy has ample meeting rooms of all sizes.

The Academy was founded in 1798 as the St. Petersburg Medical-Surgical School. Until the end of the 19th Century it was Russia's main institution for the training of medical and scientific personnel for public health services. The first chairs in Russia in gynecology, psychiatry, ophthalmology, operative surgery, otolaryngology, infectious diseases, and orthopedics were established at the Academy during the 19th Century.

Famous professors who have worked at the Academy include the founder of Russian physiology, I.M. Sechenov, and Nobel Laureate I.P. Pavlov.

Presently the Academy has 59 chairs, 28 specialty clinics, and 15 research laboratories. Seventeen members of the Russian Academy of Sciences work in the Academy. The clinics of the Academy provide care not only for members of the military but also civilians in the St. Petersburg region and other regions of Russia who are in need of the specialized services of the Academy.

Members of the IUPS Council who had previously visited St. Petersburg were impressed by the rapid progress in the development of a congenial atmosphere for an international meeting. Increasingly, hotels and restaurants cater to Western expectations, and the museums and other tourist attractions are outstanding. Transportation by subway and taxi is inexpensive and reliable. The Local Organizing Committee is working diligently to provide a very attractive and efficient venue for the last World Congress of the millennium.

ADHF Research Award Booklet Now Available

The 1995-96 American Digestive Health Foundation Research Awards booklet is now available. The ADHF and its partners, the American Gastroenterological Association and the American Society for Gastrointestinal Endoscopy, offer over 65 awards in 14 categories. More than \$2 million in research grants will be awarded this year.

Orders for the booklet can be faxed to ADHF at (301) 652-2099. For further information, contact Irene Kuo at (301) 654-2055.

Autonomic Neuroscience Society Founded

Recently, the International Society for Autonomic Neuroscience (ISAN) was established to facilitate communication between those working in autonomic neuroscience and to raise the profile of autonomic neuroscience.

The society will arrange meetings, lobby for improved representation of autonomic neuroscience in organizations such as IBRO, and aid communication between scientists who work on all aspects of the autonomic nervous system.

ISAN's First International Congress is planned for September 14-20, 1997, in Cairns, Australia.

Those interested in the society may contact Joel Bornstein, University of Melbourne, Parkville, Victoria, 3052 Australia. Tel. 61-3-9344-5850; fax 61-3-9344-5818.

Research Associate Awards in Space Biology

The current Space Shuttle Program has allowed the development of space biology science that offers exceptional opportunities for research.

NASA is offering Research Associate Awards at the postdoctoral level for scientists to conduct space biology research in a university laboratory or nongovernmental research institute of your choice that can provide the necessary facilities and research environment. Projects should be in the gravitational and space biology discipline.

The awards are \$20,000 for the first year and \$22,000 for the second year. Funding will begin July 1 to October 1, 1996. US citizens and permanent resident aliens with PhD, MD, DVM, DMD, or equivalent degrees are eligible to apply.

Proposals are due February 15, 1996

For information and application booklet, contact:

Dr. Gerald Sonnenfeld
Department of General Surgery Research
Carolinas Medical Center
P.O. Box 32861
Charlotte, NC 28232
Tel. (704) 355-2639
Fax (704) 355-7203

Director, Division of Research Grants, NIH Position Open

NIH has announced that applications are now being accepted for the Director of the Division of Research Grants (DRG) position. APS urges interested physiologists to apply.

The Director, DRG, serves as a principal advisor to the Director, NIH, and participates in discussions relative to the development of major policy decisions affecting the research grant and award programs of the Public Health Service; directs the search for qualified individuals to serve as members of initial review groups; participates in interagency discussions on the principal problems of federal granting agencies, and meets with private research agencies to address shared issues relating to review; assures that effective administrative procedures are established so that program operations and obligations of government funds and other resources are rendered consistent with statutory and regulatory requirements and within limitations imposed; works closely with peer review oversight groups to assess broad policy issues related to the scientific review of research grants; provides leadership in developing the scientific

and administrative skills for Senior Research Administrators; and ensures smooth interface between program goals of Institutes, and the Divisions review policies and procedures.

Applicants are required to submit a bibliography and either a curriculum vitae, Application for Federal Employment (SF-171), Optional Application for Federal Employment (OF-612), resume, or any other written format that addresses the requirements of the position.

Applications must be sent to National Institutes of Health, Division of Senior Systems, 6120 Executive Boulevard, Suite 100, Rockville, MD 20852, Attn: Janice Balin. E-mail applications may be sent to fcwalker@helix.nih.gov. Applications may be sent through the World-Wide Web via <http://www.nih.gov/news/>. Applicants may fax materials to (301) 402-6139 (limit of 10 pages).

The closing date for applications is **November 1, 1995**.

For further information about the position and more detailed requirements, contact Janice Balin at (301) 496-1443.

APS Sustaining Associate Members

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



Abbott Laboratories
Alliance Pharmaceutical Corporation
American Medical Association
Axon Instruments, Inc.
Berlex Biosciences
Boehringer Ingelheim Corporation*
Boeing Defense & Space Group
Burroughs Wellcome Company
Coulbourn Instruments, Inc.
Dagan Corporation
Du Pont Pharmaceuticals
Fisons Pharmaceuticals
Genentech, Inc.*
Glaxo, Inc.
Gould Instrument Systems, Inc.
Grass Foundation
Groupe de Recherche Servier, France
Harvard Apparatus
Hoechst-Roussel Pharmaceuticals, Inc.
Hoffman-La Roche, Inc.*
ICI Pharmaceuticals
Jandel Scientific
Janssen Research Foundation
The R. W. Johnson Pharmaceutical Research Institute
Kabi Pharmacia
Lederle Laboratories
Eli Lilly and Company

Lockheed Missiles & Space Company, Inc.
The Mack Printing Group
MacLab Division, ADInstruments, Inc.
Marion Merrell Dow, Inc.
McNeil Pharmaceuticals
Merck & Company, Inc.*
Miles Inc.
NARCO Bio-Systems
Norwich Eaton Pharmaceuticals, Inc.
Pfizer, Inc.
Pharmacia, Inc.
Procter & Gamble Company
Quaker Oats Company
Sandoz Pharmaceuticals Corporation*
W.B. Saunders Company
Schering-Plough Corporation*
G.D. Searle and Company
SmithKline Beecham
Squibb Corporation*
Sutter Instrument Company
The Upjohn Company*
Warner-Lambert/Parke Davis
Waverly Press, Inc.
Wyeth-Ayerst Laboratories
Zeneca, Inc.

**Second Century Corporate Founders*

Scientific Meetings and Congresses

- Specificity of Growth Factor Signaling**, October 13-16, 1995, Granlibakken, Lake Tahoe, CA. *Information:* American Society for Biochemistry and Molecular Biology, 9650 Rockville Pike, Bethesda, MD 20814. Tel: 301-530-7145; fax: 301-571-1824; e-mail: asbmb@asbmb.faseb.org.
- The Role of Lipid Messengers in Signal Transduction Pathways, Cellular Regulation, and Disease**, October 20-23, 1995, Keystone, CO. *Information:* American Society for Biochemistry and Molecular Biology, 9650 Rockville Pike, Bethesda, MD 20814. Tel: 301-530-7145; fax: 301-571-1824; e-mail: asbmb@asbmb.faseb.org.
- 11th Annual Meeting of the American Society for Gravitational and Space Biology**, October 25-29, 1995, Crystal City, VA. *Information:* Donald R. Beem, AIBS, Special Science Programs, 730 11th Street, NW, Washington, DC 20001. Tel: 202-628-1500.
- National Indonesian Physiological Society**, October 26-28, 1995, Semarang, Central Java, Indonesia. *Information:* Dr. Adrianta, Dinoyo 42, Surabaya, Indonesia. Fax: 31-511585 (country code 62).
- Tracer Methodology Course**, October 29-November 3, 1995, Galveston, TX. *Information:* University of Texas Medical Branch, PO Box 55176, Galveston, TX 77555-5176. Tel: 409-770-6605; fax: 409-770-6825.
- International Congress on Alternative Medicine**, November 19-25, 1995, LaPaz, Bolivia. *Information:* Mr. Darius Morgan, Crillon Enterprises, 1450 S. Bayshore Drive, Costa Bella Cond., Suite 815, Miami, FL 33131. Fax: 305-372-0054.
- Third International Glycobiology Symposium**, November 29-December 1, 1995, San Diego, CA. *Information:* Paddy Batchelder, California Separation Science Society, PO Box 370, Pleasanton, CA 94566. Tel: 510-426-9601; fax: 510-484-3024.
- 35th Annual Meeting of the American Society for Cell Biology**, December 9-13, 1995, Washington, DC. *Information:* The American Society for Cell Biology, 9650 Rockville Pike, Bethesda, MD 20814-3992. Tel: 301-530-7153; fax: 301-530-7139, e-mail: ascbinfo@ascb.faseb.org.
- Fourth National Symposium on Biosafety: Working Safely With Research Animals**, January 27-31, 1996, Atlanta, GA. *Information:* Fourth National Symposium on Biosafety, c/o Exposition and Meeting Concepts (EMC), PO Box 250381, Atlanta, GA 30325-0381. Tel: 404-355-4884; fax: 404-355-6765.
- Medical Imaging 1996**, February 10-15, 1996, Newport Beach, CA. *Information:* Society for Photo-Optical Instrumentation Engineers, P.O. Box 10, Bellingham, WA 98227-0010. Tel: 800-483-9034 or 360-676-3290; fax: 360-647-1445; e-mail: spie@spie.org.
- Obesity: Advances in Understanding and Treatment**, March 4-6, 1996, Washington, DC. *Information:* IBC USA Conferences, 225 Turnpike road, Southborough, MA 01772-1749. Tel: 508-481-6400; fax: 508-481-7911.
- Latest Therapeutic Applications of Cytokines: Control of Inflammation, Growth and Differentiation**, March 14-15, 1996, Philadelphia, PA. *Information:* IBC USA Conferences, 225 Turnpike road, Southborough, MA 01772-1749. Tel: 508-481-6400; fax: 508-481-7911.
- 17th Annual International Gravitational Physiology Meeting**, April 14-19, 1996, Warsaw, Poland. *Information:* Professor Hilding Bjurstedt, Environmental Physiology Laboratory, Karolinska Institute, 171 77 Stockholm, Sweden. Tel: 46-8334012; fax: 46-8339702.
- 12th International Symposium on Flavins and Flavoproteins**, June 30-July 6, 1996, Calgary, Canada. *Information:* Dr. Kenneth J. Stevenson, Department of Biological Sciences, University of Calgary, Calgary T2N 1N4, Alberta, Canada. Fax: 403-284-4184.
- 4th IUBMB Conference: The Life and Death of the Cell**, July 14-17, 1996, Edinburgh, Scotland. *Information:* The Conference Assistant IUBMB 1996, The Biochemical Society, 59 Portland Place, London W1N 3AJ. Tel: 0171 580 5530; fax: 0171 637 7626; e-mail: meetings@biochemsoc.org.uk.
- Bioartificial Organs: Science and Technology**, July 21-26, 1996, Nashville, TN. *Information:* Barbara Hickernell, Engineering Foundation Conferences, 345 E. 47th Street, New York, NY 10017. Tel: 212-705-7836; fax: 212-705-7441; e-mail: engfnd@aol.com.
- VI World Conference on Clinical Pharmacology and Therapeutics and VI Congress of the Interamerican Society for Clinical Pharmacology and Therapeutics**, August 4-10, 1996, Buenos Aires, Argentina. *Information:* CPI96 and ISCPT VI, Marcelo T. de Alvear 1980, 1122 Buenos Aires, Argentina. Tel: 54-1-81-6650; fax: 54-1-814-2733.
- Bernstein's Traditions in Motor Control**, August 23-25, 1996, University Park, Pennsylvania. *Information:* Dr. Mark Latash, Pennsylvania State University, Biomechanics Laboratory, University Park, PA 16802. Tel: 814-863-5374, fax: 814-865-2440, e-mail: mll11@psu.edu.
- First International Congress of the International Society for Autonomic Neuroscience**, September 14-20, 1997, Cairns, Australia. *Information:* Dr. Joel Bornstein, University of Melbourne, Parkville Vic 3052, Australia. Fax: 61-3-9344-5818; e-mail: joel@plexus.physiol.unimelb.edu.au.
- Second World Congress of High Altitude Medicine**, September 24-27, 1996, Cusco, Peru. *Information:* Dr. Fabiola León-Velarde, Universidad Peruana Cayetano Heredia, Dpto. de Fisiología, Apartado 4314, Lima 100, Peru. Fax: 51-14-482 34 35; e-mail: fabiolv@upch.edu.pe.
- Second World Congress on Alternatives and Animal Use in the Life Sciences**, October 20-24, 1996, Utrecht, The Netherlands. *Information:* World Congress Alternatives 1996, FBU Congress Bureau, PO Box 80.125, 3508 TC Utrecht, The Netherlands. Tel: 31-30-53-5344/2728; fax: 31-30-53-3667; e-mail: l.donkers@pobox.ruu.nl.