



A Publication of  
The American  
Physiological Society

# The Physiologist

Volume 39 Number 3

June 1996

## Inside

**ACDP Survey 83**

**IUPS Congress  
Travel Award  
Information 104**

**Joint APS-  
Spanish  
Physiological  
Society  
Meeting 107**

**Class B Dealers  
in Peril 115**

**Melvin J. Fregly  
1926-1996 122**

## Research Interactions Between Industry and Academia: A Corporate Perspective

Paul Citron  
Medtronic, Inc.

*This article is based on a talk presented at the Association of Chairmen of Departments of Physiology, Cancun, Mexico, December 1995.*

The nature of relationships and interactions between industry and academia have experienced a fast-paced evolution, especially in the life sciences.

I would like to begin by setting a historical operating context. The predominant paradigm in the 1980s had been one of separateness and perhaps insularity. There certainly were industry-university interactions, but they tended to be episodic or event driven. Examples are "technology days," student project fairs, annual alumni dinners, fund raisers, etc.

Faculty were most often used as consultants and injected their expertise on scheduled visits to companies or as needed to resolve critical issues within their area of expertise. They were often asked to produce a quick fix.

In academia, principal investigators with the ability to secure grant funding largely set the research projects. By and large, the value of university research projects was determined by the federal government agencies' perceptions of what was important through their grant mechanisms. Perhaps by design this system promoted a separation from industry. As long as funding levels were adequate, there was no great pressure to seek support or direction from industrial sources.

In those instances where academic-industrial collaborations were proposed as part of govern-

ment grant applications, the work was typically judged to be too advanced (that is, too applied) to be eligible for government funding, particularly by the NIH. Consequently, university research was performed in relative isolation from the strategic needs of industry or market considerations or with little consideration for how to efficiently achieve technology transfer. Academia and industry infrequently worked simultaneously and collegially on common research projects.

The university researcher was relatively self-sufficient and independent. Feasibility of theories, new ideas, and new concepts could be demonstrated more or less in self-contained labs. Many medical breakthroughs were procedure driven rather than technology based so here, too, progress could be made in relative isolation.

Most often, the general flow of new knowledge and know-how was unidirectional, from the campus outward. If one analyzed where the center of gravity for the leading edge in a new technical discipline was, it would figuratively be located somewhere on the campus quadrangle.

When technology transfer took place, it likely occurred in one of four forms: consulting, hiring of graduate students for their newly acquired knowledge and expertise, creating start-up firms, and licensing of specific technology from the researcher by an established company. In the latter instance, the technology usually had to be adapted for its intended industrial application

*(continued on page 90)*

# The Physiologist

Volume 39 Number 3

June 1996

## Contents

### Research Interactions Between Industry and Academia 81

*Paul Citron*

### ACDP 1995 Survey Results 83

*Gayle Wernberg, Janice M. Gentry, and R. John Solaro*

### APS News

#### RCEA Awards 93

#### Bowditch Lecture Award Announcement 93

#### Walter B. Cannon Award Announcement 93

#### 1996 Officers and Standing Committees 94

### Meetings and Conferences

#### Upcoming Conferences 97

#### The Integrative Biology of Exercise 98

#### XXXIII IUPS Congress 99

#### Travel Grant Applications for XXXIII IUPS Congress 104

#### APS/Spanish Physiological Society Meeting 107

### Membership

#### 1995 Statistics 108

#### Introducing...Francis L. Belloni 110

#### Introducing...Edward H. Blaine 111

#### Introducing...Kim E. Barrett 112

#### Web News 113

### Education

#### Local Outreach Teams Approved By Council 114

#### Columbus Teachers Attend Activities Workshop 114

#### APS Education Office Continues My Health, My World Project for Grades K-4 115

### Public Affairs

#### Fox and Lantos Introduce Misnamed "Family Pet Protection Act" 115

#### USDA Wants to Abolish Class B Dealers 116

#### NASA Convenes Panel to Review Rhesus Research 117

#### GAO Unable to Measure Regulatory Costs 118

#### FASEB Honors Hatfield and Porter 118

#### FY 1996 Budget Approved; Battles Loom Ahead 119

#### Positions Available 120

#### Senior Physiologists 121

#### Melvin J. Fregly 1926-1996 122

#### People and Places 123

#### Books Received 124

#### Book Reviews 124

#### Announcements 126

#### Scientific Meetings and Congresses 130

Published bimonthly  
and distributed by  
The American  
Physiological Society

9650 Rockville Pike  
Bethesda, Maryland 20814-3991  
ISSN 0031-9376

**James A. Schafer**  
*President*

**Leonard S. Jefferson**  
*Past President*

**Allen W. Cowley, Jr.**  
*President-Elect*

**Martin Frank**  
*Editor and Executive Director*

*Councillors*

**Walter F. Boron, Gerald F. DiBona,  
Diana L. Kunze, Celia D. Sladek,  
John A. Williams  
Heinz Valtin**

*Ex Officio*

**Leonard R. Johnson, Edward H.  
Blaine, Francis L. Belloni, Ethan R.  
Nadel, Richard J. Traystman**

**Publications Committee:** *Chairman:*  
Leonard R. Johnson; *Members:* Dale  
J. Benos, Jerome A. Dempsey, Donald  
S. Faber, Virginia M. Miller.  
*Publications Manager:* Brenda B.  
Rauner.

**Subscriptions:** Distributed to mem-  
bers 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 avail-  
able, \$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**

# ACDP 1995 Survey Results

## Association of Chairmen of Departments of Physiology 1995 Survey Results

Gayle Wernberg, Janice M. Gentry, and R. John Solaro, PhD  
Department of Physiology and Biophysics, University of Illinois at Chicago

The Association of Chairmen of Departments of Physiology annual survey was mailed to 158 physiology departments throughout the US, Canada, and Puerto Rico. A total of 94 surveys was received, for a response rate of 60%. This rate is slightly lower than for the 1994 survey (62%).

Although results based on 94 responses may not be statistically valid, they will provide the reader with general trends of faculty salary, overall depart-

mental budgets, and space available for research. Faculty salary information (Tables 1-3) is derived from the total compensation column, which includes any supplementary income but not fringe benefits.

Most of the statistics are based on 94 responses (5 from Canada and 2 from Puerto Rico), but salary results are calculated on the number of respondents providing this information. For the most part, inconsistent data were eliminated

in an attempt to achieve accurate statistics within each category. In addition to salary information, further data are provided on tenure, gender, ethnicity, and salary by number of years in rank. Table 4 reflects salaries by rank and region.

Student/trainee information is provided by ethnicity for predoctoral and postdoctoral categories as well as predoctoral trainee completions, stipends provided, and type of support.

Departmental budget information is

**Table 1. Faculty Salaries for Fiscal Year 1995**

	Mean	% Change From Previous Survey	Minimum	Maximum	No. of Faculty
Chairmen					
All schools	\$126,621	10.4	\$4,249	\$227,000	94
Medical public	119,749	9.3	4,249	192,000	65
Medical private	141,484	3.4	55,048	227,000	23
Nonmedical	144,098	42.5	77,562	200,000	6
Female	85,865	0.7	4,249	168,000	6
Professors					
All schools	90,215	9.5	3,605	246,681	597
Medical public	86,551	5.7	3,605	230,700	430
Medical private	101,937	16.9	20,000	196,938	118
Nonmedical	94,138	26.9	47,556	246,681	49
Female	84,135	6.5	34,128	124,740	63
Associate Professors					
All schools	66,482	10.8	3,128	124,000	349
Medical public	64,659	7.9	3,128	114,400	237
Medical private	71,611	17.6	36,273	124,000	87
Nonmedical	65,920	13.5	42,000	95,000	25
Female	67,544	9.3	3,128	102,060	65
Assistant Professors					
All schools	53,473	16.3	29,463	102,780	288
Medical public	51,987	15.4	33,270	102,780	176
Medical private	55,178	15.2	29,463	87,570	84
Nonmedical	57,702	20.6	36,630	69,500	28
Female	51,824	11.9	32,760	73,950	74
Instructors					
All schools	39,363	31.5	19,380	72,836	49
Medical public	34,333	17.6	20,529	57,000	26
Medical private	49,945	52.6	32,000	72,836	17
Nonmedical	31,176	-1.0	19,380	42,572	6
Female	36,426	38.0	19,380	69,327	19

# ACDP 1995 Survey Results

provided by type of support, faculty salaries derived from grants, negotiated indirect cost rates, and percent of returned indirect costs. Space averages are presented by research, administration, teaching, and other.

Table 5 ranks responding institutions according to grant income and research space.

We are grateful for the development of software by Charlene Smith, formerly of the University of Oklahoma.

**Table 2. Average Salary by Number of Years in Rank**

Years	Salary	No. of Faculty
<i>Chairpersons</i>		
0-5	\$116,343	33
6-10	128,700	30
11-15	136,262	14
16-20	143,778	11
21-25	118,808	6
26+	0	0
<i>Professors</i>		
0-5	\$ 81,439	203
6-10	91,693	140
11-15	91,793	101
16-20	99,227	83
21-25	99,178	48
26+	—	22
<i>Associate Professors</i>		
0-5	\$ 64,828	186
6-10	66,851	76
11-15	67,893	36
16-20	72,971	27
21-25	71,154	15
26+	64,673	9
<i>Assistant Professors</i>		
0-5	\$ 53,405	246
6-10	54,163	34
11-15	54,364	5
16-20	0	0
21-25	43,420	2
26+	62,400	1
<i>Instructors</i>		
0-5	\$ 38,297	36
6-10	40,060	9
11-15	57,794	2
16-20	0	0
21-25	32,960	1
26+	41,000	1

## Type of Institution (n = 94)

<i>Support</i>		<i>Teaching Interactions</i>	
Public	68	MD/DO	85
Private	26	DDS	25
		DVM	11
		Allied Health	48
		Pharmacy	21
		Other Biomedical	50
		Life Science	42
		Bioengineering	22

## Student/Trainee Summary

Total number of pre- and postdoctoral students/trainees			
Predoctoral male	923	Postdoctoral male	638
Predoctoral female	669	Postdoctoral female	315

Total number of foreign pre- and postdoctoral students/trainees.			
Predoctoral male	367	Postdoctoral male	381
Predoctoral female	237	Postdoctoral female	148

## Faculty Summary (n = 1,335)

	Male	Female
American Indian/Alaskan native	2	1
Asian/Pacific Islander	69	19
Black, not Hispanic origin	12	6
Hispanic	67	13
White, not of Hispanic origin	917	177
Foreign national	45	7

## Ethnicity of each pre- and postdoctoral student/trainee

	<i>Predoctoral</i>		<i>Postdoctoral</i>	
	Male	Female	Male	Female
American Indian/Alaskan native	5	3	1	3
Asian/Pacific Islander	59	30	51	29
Black, not Hispanic origin	21	34	6	5
Hispanic	14	20	16	10
White, not of Hispanic origin	457	345	183	120

## Tenure status in each department by degree (n = 1,369)

	<i>Tenured</i>	<i>Not Tenured</i>	<i>Not Eligible</i>	<i>Total</i>
MD	64	5	9	78
PhD	840	233	124	1,197
Both	45	16	2	63
Other	18	3	10	31

## Number of foreign pre- and postdoctoral students/trainees

	<i>Predoctoral</i>		<i>Postdoctoral</i>	
	Male	Female	Male	Female
African	7	5	25	10
Asian/Pacific Islander	183	92	168	52
Central and South American	12	6	25	9
European, Canadian, Australian	78	67	92	58
Middle Eastern	22	7	26	8
Other	65	60	45	11

# ACDP 1995 Survey Results

**Table 3. Budgets by Institutions**

	<b>All Institutions</b>	<b>No.</b>
Institutional	\$1,299,848	92
Outside research grants (direct costs only)	1,905,520	92
Training grants (direct costs only)	299,001	38
Endowments	322,532	38
Indirect recovery costs (amount to department)	89,381	52
Other budget support	251,847	49
Average	3,567,702	94
Standard deviation	2,141,017	
	<b>Public Medical</b>	<b>No.</b>
Institutional	\$1,331,409	63
Outside research grants (direct costs only)	1,776,929	63
Training grants (direct costs only)	258,148	24
Endowments	166,259	28
Indirect recovery costs (amount to department)	89,244	47
Other budget support	214,680	36
Average	3,413,479	64
Standard deviation	2,098,643	
	<b>Private Medical</b>	<b>No.</b>
Institutional	\$1,162,850	23
Outside research grants (direct costs only)	1,841,381	23
Training grants (direct costs only)	328,429	11
Endowments	932,064	8
Indirect recovery costs (amount to department)	68,218	3
Other budget support	259,779	12
Average	3,478,689	24
Standard deviation	2,070,665	
	<b>Nonmedical</b>	<b>No.</b>
Institutional	\$1,493,615	6
Outside research grants (direct costs only)	3,501,594	6
Training grants (direct costs only)	517,932	3
Endowments	72,213	2
Indirect recovery costs (amount to department)	124,342	2
Other budget support	1,494,646	1
Average	5,568,802	6
Standard deviation	1,842,734	

## US citizen/resident alien predoctoral trainee completions

	Male	Female
American Indian/Alaskan native	0	0
Asian or Pacific Islander	14	14
Black, not of Hispanic origin	3	1
Hispanic	3	6
White, not of Hispanic origin	42	47

## Foreign national predoctoral trainee completions

African	2	1
Asian or Pacific Islander	16	14
Central or South American	0	0
European, Canadian, Australian	11	7
Middle Eastern	4	0
Other	16	11

## Average annual starting stipend (in US dollars) for trainees

Predoctoral ( <i>n</i> = 89)	Postdoctoral ( <i>n</i> = 82)
\$12,767.37	\$24,599.88

## Number of foreign pre- or postdoctoral trainees whose primary source of support is:

	<i>Predoctoral</i>	<i>Postdoctoral</i>
Institutional	219	123
Research grants	376	203
Private foundations	50	28
Home (foreign) governments	40	18
Other	40	19

## Predoctoral trainee completions

Number of trainees who have completed doctoral work during the year ended June 30, 1995 (*n* = 58)

Predoctoral male	111
Predoctoral female	101

## Space controlled by department (*n* = 93)

Research	15,778
Administration	2,378
Teaching	2,376
Other	1,799
Total space	22,331

# ACDP 1995 Survey Results

**Table 4. Salaries by Region**

	Mean	Minimum	Maximum	No.	
Chairmen					
Northeast	\$136,536	\$ 34,354	\$197,421	20	Northeast: ME NH VT NY
Midwest	134,139	79,500	200,000	23	MA RI CT NJ
South	132,183	61,528	227,000	31	PA MD DE DC
West	131,978	90,800	190,400	13	
Canada/Puerto Rico	39,016	4,249	77,562	7	
Professors					
Northeast	100,071	62,604	178,000	121	Midwest: MI OH IN IL
Midwest	87,675	13,805	159,984	138	WI IA MO KS
South	88,732	20,000	196,938	200	NE ND SD MN
West	95,150	33,648	246,681	99	
Canada/Puerto Rico	63,690	3,605	105,382	39	
Associate Professors					
Northeast	73,672	36,273	124,000	78	South: VA WV KY TN
Midwest	64,684	31,694	102,850	111	NC SC GA FL
South	65,416	42,000	116,250	109	AL MS AR
West	67,734	33,700	114,400	39	LA OK TX
Canada/Puerto Rico	42,010	3,128	58,287	12	
Assistant Professors					
Northeast	56,617	42,000	77,910	47	West: AK HI MT WY
Midwest	52,909	29,463	83,990	90	CO NM AZ
South	52,331	29,600	102,780	91	ID NM WA
West	56,086	34,000	102,400	47	OR CA UT
Canada/Puerto Rico	44,563	36,120	56,000	13	
Instructors					
Northeast	40,395	29,000	57,000	6	
Midwest	33,451	25,000	45,148	11	
South	42,039	19,380	72,836	28	
West	40,282	32,418	52,042	3	
Canada/Puerto Rico	20,529	20,529	20,529	1	

## Financial Information

Percentage of total faculty salaries derived from research grants (not including fringe benefit amounts)	29.0%	(n = 78)
Current fringe benefit rate most frequently used for primary faculty	25.2%	(n = 92)
Percentage of allocated salary dollars for faculty salaries raised from grants, etc. directly returned to department:	76.5%	(n = 51)
Federally negotiated indirect cost rate for FY 95-96		
On campus	50.6%	(n = 88)
Off campus	25.7%	(n = 58)
Percentage of indirect costs returned to department	15.6%	(n = 45)

## APStracts: an online abstract publication

Available at gopher gopher.uth.tmc.edu 3300 or on the Web at <http://www.uth.tmc.edu/apstracts>.  
If you do not have access to a gopher and would like to receive free information, send e-mail to:  
[aps\\_server@oac.hsc.uth.tmc.edu](mailto:aps_server@oac.hsc.uth.tmc.edu).

# ACDP 1995 Survey Results

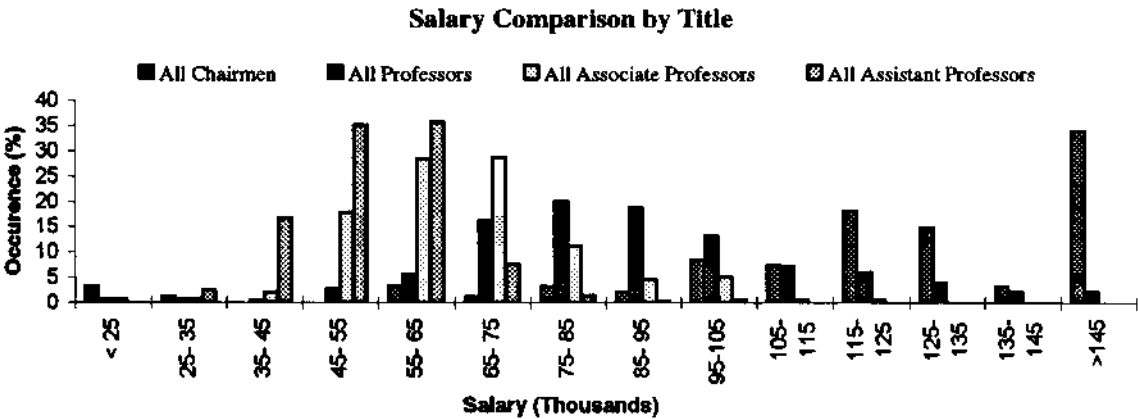
**Table 5. Complete Ranking According to Total Dollars**

Rank Total Dollars	Total Dollars	Rank Research Grant Dollars	Research Grant Dollars	Rank Research Dollars/ Faculty	Research Dollars/ Faculty	Rank Total Research Space	Research Space (sq. ft.)	Rank Research Dollars per sq. ft.	Research Dollars per sq. ft.	No. of Faculty
--------------------------	------------------	--------------------------------------	------------------------------	---	---------------------------------	------------------------------------	--------------------------------	--	------------------------------------	-------------------

# ACDP 1995 Survey Results

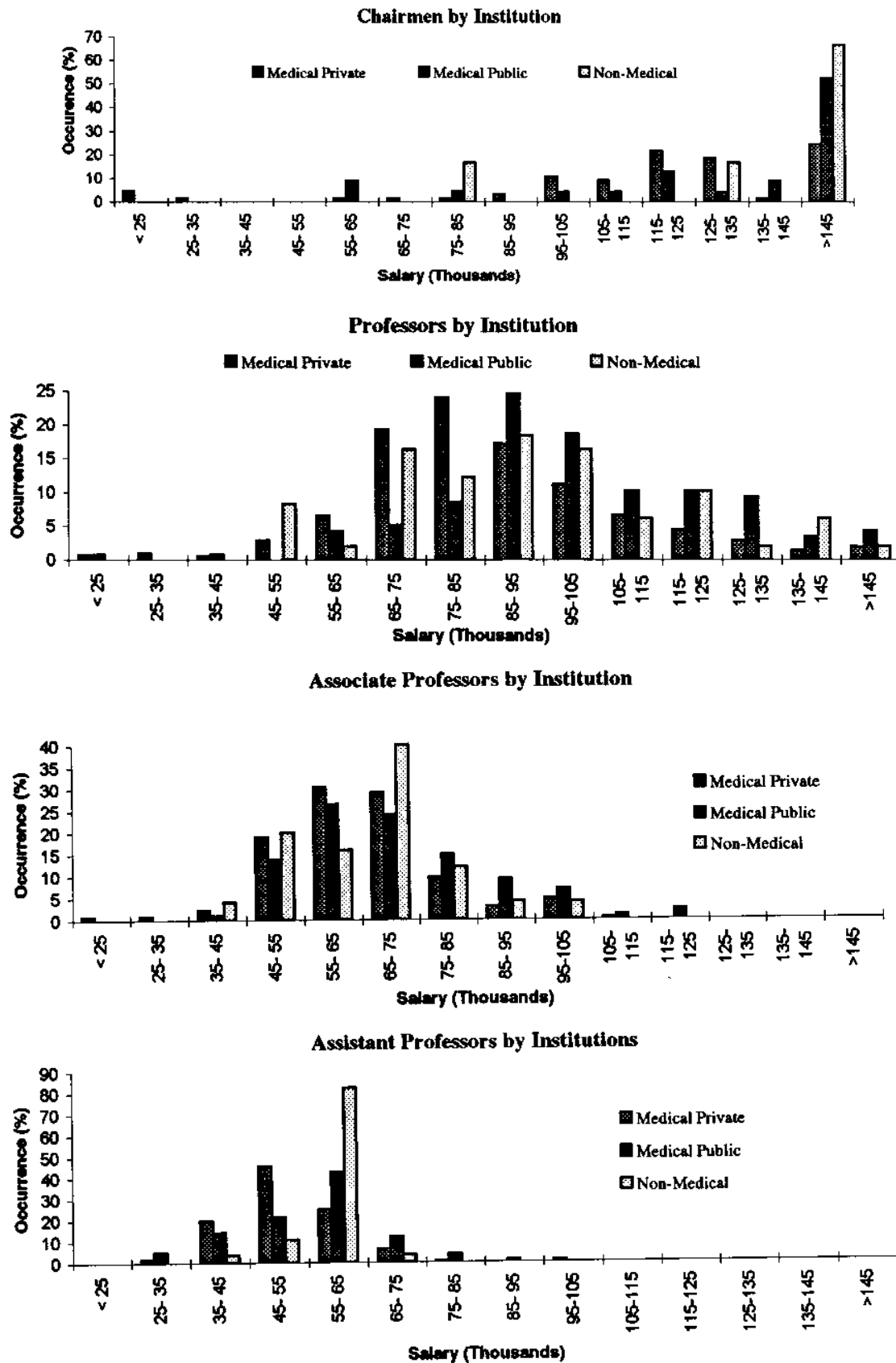
Table 5. Complete Ranking According to Total Dollars

Rank Total Dollars	Total Dollars	Rank Research Grant Dollars	Research Grant Dollars	Rank Research Dollars/ Faculty	Research Dollars/ Faculty	Rank Total Research Space	Research Space (sq. ft.)	Rank Research Dollars per sq. ft.	Research Dollars per sq. ft.	No. of Faculty
--------------------------	------------------	--------------------------------------	------------------------------	---	---------------------------------	------------------------------------	--------------------------------	--	------------------------------------	-------------------





# ACDP 1995 Survey Results



# Research Interactions Between Industry and Academia

*(continued from page 81)*

because it was developed independently by the investigator without regard to how it would be implemented.

The above observations are not meant as an indictment of the system. It worked well. In many instances this approach may still be appropriate today. What is important to note, however, is that many of the underlying circumstances that made an insular approach to research suitable for so long may no longer be relevant. The traditional structure and practice may not permit breakthrough work to take place.

Research initiatives have become more complex. Their realization increasingly can require a multi-disciplinary and multi-institutional approach. Even though an individual may define the problem and lay the conceptual groundwork, he or she often lacks other enabling capabilities or technologies to move the concept beyond the hypothetical. For example, if we consider research that employs an implanted medical device, a medical researcher or scientist can experience difficulty in evolving a new implanted treatment regimen with the limited hardware capabilities available on campus. It often is simply unrealistic for the academic center to develop the ancillary but necessary capabilities that are needed for the device aspects. Progress in such cases requires an interaction with industry.

Having said this, I wish to make it clear that we in industry are also becoming less self-sufficient. We simply cannot, by ourselves, build the necessary infrastructure in new disciplines such as molecular biology and cellular biology needed to develop biologically active medical technologies. Alliances with other companies and academic centers are increasingly necessary to get things done. We will need to develop research interactions that cross institutional boundaries to bring the required enabling intellectual and technological capabilities together. It is not only a

matter of expediency. Progress on a growing number of ideas will not be possible without collaboration, because none of the participants holds all of the puzzle pieces.

As further breakthroughs are made in cellular biology, tissue engineering, and genetic engineering, collaborative networks will be increasingly necessary to move ideas from concept to reality. Even the names given to these emerging disciplines, "tissue engineering, genetic engineering," convey the notion that nontraditionally linked areas of science and technology must be integrated.

I would like now to explore some practical aspects of forming relation-

ships between academia and industry.

First, however, I would like to offer a general observation. It is my experience that mutual respect between scientists, whether they are in industry or university laboratories, forms quickly. High-quality work is not confined to any one sector. When relationship barriers do arise, they typically are from administrative matters, speed to market, reputation, and so forth are used to set terms. Often the process is made somewhat more rational by the inventor's ability to secure terms from more than one firm and compare them. The inventor can thereby choose the package, not just royalties or payments, that best satisfies his or her objectives. Careful consideration must be given to intangibles that can markedly affect the actual value of the arrangement. Not the least of these is the intellectual capacity of the company and its ability to implement. In any event, the transaction from industry's perspective is based on tangible property since the patents already exist.

Most often in the field of medical devices, a patent is incremental. That is, it and other patents must be combined to create the clinical product. In many instances, the base product may already be in the public domain. For example, if the inventor from academia has a novel biologically active anti-thrombogenic coating that can be applied to the surface of an oxygenator or other blood-contacting device, determination of its value is complicated. Unquestionably, thrombosis is a concern during open

---

***collaborative networks will be increasingly necessary to move ideas from concept to reality***

---

ships between academia and industry. First, however, I would like to offer a general observation. It is my experience that mutual respect between scientists, whether they are in industry or university laboratories, forms quickly. High-quality work is not confined to any one sector. When relationship barriers do arise, they typically are from administrative

My remarks in the following section will touch on three primary areas: patents, publications, and conflicts of interest. I will conclude with a brief discussion of cultural differences between academia and industry.

## Intellectual Property and Patents

Patents provide crucial, but limited, property rights to those who innovate and teach a new standard that others can improve upon. In granting patent rights to inventors, governments have recognized the importance of placing incentives for those who take the risks to advance the state-of-the-art in novel ways. In the absence of such conferred rights, the pace of innovation would be

# Research Interactions Between Industry and Academia

heart surgery and especially for longer durations of circulatory support. An effective method to reduce its incidence and also reduce the levels of systemic anticoagulation would be desirable. However, how is its market potential valued?

An analysis of the value of the intellectual property in this instance would take into consideration the aspects cited earlier for a seminal patent, but also must factor-in other crucial elements. Among these is the value prescribing physicians place on the technology particularly if it were to cost more than other similar uncoated products that are perceived to perform adequately. The overall economic value of the invention would also likely be diminished because of other royalty-bearing patents that are integral to the device. The ability of competitors to employ a substitute treatment relatively quickly once favorable physician response is detected in the marketplace is also an influence.

Such considerations are often not fully appreciated by the inventor. This value mismatch is often difficult to reconcile, and there typically a considerable gap exists between the inventor's perception of value and the industry's. This, by the way, is in sharp distinction to traditional pharmaceuticals. There, the innovation and the final drug usually are one and the same, so the relationship between the innovation and its value is more closely aligned. However, even in pharmaceuticals there are shifts in the determination of value as drugs increasingly rely on more sophisticated methods of delivery and targeting.

More difficult still is assigning value at the beginning of a collaboration for inventions still not made. Clearly, it is appropriate to contemplate inventions in the course of a collaboration. Predicting and stipulating value a priori is an altogether different thing. Furthermore, from industry's perspective, other arrangements that support the collaboration including financial support, interaction of the respective

scientists, and articulation by industrial collaborators of the technological issues that need to be resolved reframe somewhat the obligations regarding intellectual property. Clearly, if the collaborating parties commingle ideas on how to approach solutions, ownership and resulting rewards should be different than if the work was derived independently. In other words, if the collaboration reduced the risks, it stands to reason the financial rewards should be viewed differently.

One method to deal with intellectual property that results from a collaboration funded by industry is as follows. If the invention is made by individuals from industry and academia jointly, the sponsor retains a fully paid-up exclusive license to the invention. This emanates from the research support of the sponsor and from the active collaboration with employees of the industrial sponsor that were contributory to the invention. As an aside, criteria defining who are inventors and coinventors are relatively well established in patent conventions. In practice, it has been our experience that this determination is relatively straightforward.

For those inventions related to the collaboration solely invented by the academic researcher, a nonexclusive paid-up license with an option to convert to an exclusive at a later time represents an equitable and elegant resolution. If the invention is only of incremental importance to the sponsor, the sponsor gets to use it and the inventor can sign up other licensees. If the sponsor elects to retain an exclusive license because the invention offers more substantial competitive advantage, provisions in the contract defining the relationship will contain mutually agreed upon parameters to value the invention if an exclusive license is sought. This approach provides flexibility to the involved parties. Most of all, it is an equitable way to deal with the value of as yet unknown inventions.

I would like to discuss briefly the

expectation of royalties for unpatented or unpatentable ideas and know-how. There is a perception by some that the mere association of an academic institution in a collaboration merits on-going royalties for products that may result. This is a misplaced notion. Unless there is a presumably enforceable patent in place, royalty payments from industry to the researcher or institution simply place the sponsor at a distinct financial disadvantage to others who may not have taken the risks but who can be fast followers. In the absence of enforceable patents they can do this with impunity. Consequently, royalties are most often linked to enforceable patents.

## Publications

Academia's mission, at least in part, is to expand society's knowledge base through its research activities. Implicit in this is the timely reporting and publication of important findings. Industry generally recognizes this obligation. Furthermore, companies engaged in on-campus research collaborations can accommodate the drive to publish and still preserve rights to the intellectual property that may be disclosed.

One approach that generally works well is to submit abstracts, journal manuscripts, or presentation materials to the industry sponsor for review in advance of submission to the journal or meeting. An understanding should exist between the university researcher and industry sponsor that the purpose of the review is two-fold. First, it is to help assure accuracy of the contents, especially as it relates to technological aspects emanating from the sponsor. Second, any patentable ideas contained in the publication or presentation should be identified and a prompt decision made whether to file for protection. Because of the time required to prepare and submit a patent filing, sponsors typically request at least 30 days and preferably 60 days to accomplish this prior to submission or public presentation. Failure

# Research Interactions Between Industry and Academia

to file for patent protection prior to public disclosure immediately bars patenting in most foreign countries and starts a one-year clock in the US.

Given the inevitable last minute rush to meet fixed deadlines, the requirement to submit materials to the sponsor a month or more in advance may seem to be an imposition. However, it should be kept in mind that inadvertent public disclosure of patentable material can considerably reduce the future value of the technology to those funding its development. This is not merely a hypothetical concern. There are many examples where a careful literature search uncovers a paper by the inventor whose public disclosure date automatically bars patenting. Industry is not alone in trying to preserve patentability. As universities increasingly recognize the potential value of patentable ideas as an important source of income for the researcher and the institution, they are setting up intellectual property offices to keep valuable ideas from inadvertently being placed into the public domain before proper filings are made. They are doing this to protect the interests of the researcher and university.

Similar considerations apply to PhD and Masters theses prepared by graduate students. They can be accommodated in the same way as described for other publications. I mention them because the public disclosure aspect may not be as apparent in these cases.

## Conflicts of Interest

Whenever academicians work on projects having commercial prospects, conflict of interest concerns can arise. Although generally left unstated, the underlying presumption is that the prospect of financial gain taints objectivity and perhaps causes misrepresentation of findings. There is no question that this has occurred occasionally. To guard against improprieties a number of institutions have created oversight panels to critically review investigator and

institutional relationships with industrial sponsors to anticipate and avoid improper actions. Where such review panels exist, one can conclude that there is at least a tacit agreement that collaborations having commercial intent are within the scope and mission of the university. Nevertheless, there are some dissenting views. Some believe a financial stake could result in a poor or biased study design or would introduce bias into the data collection, analysis, reporting, or interpretation. This position, then, would likely exclude the inventor or his/her institution if they had a “stake” in the study. Paradoxically, the innovator may really be the individual best suited to advance the technology legitimately as part of a broader study. Consider for a moment a new heart valve or similar technology that requires the innovator’s accumulated knowledge and even passion to properly deploy it. Excluding the innovator or founding institution may actually adversely affect outcomes.

In many ways, conflict of interest concerns are a red herring if they are focused on financial interests only. An argument can be made that all innovators are in “conflict” situations if they are pursuing their vision. First of all, bias results from their fundamental belief in the idea. If they did not believe their idea would work, innovators likely would not be placing personal energy into it. Bias could also be introduced from professional pride, pursuit of professional standing, aspirations of grant renewal, recognition, and so forth.

The point is that bias is virtually unavoidable in the innovation process. Conflicts of interest can be implicit or explicit. Consequently, there needs to be a sensitivity that conflicts of interest can color results of any study. Whether industry is involved or not, objective review and critical oversight are critical to assure balance and objectivity. Of course, full disclosure of sponsorships and other sources of potential conflicts must be identified at the outset so they

can be taken into consideration by reviewers. In any event, those who are inclined to cheat will find a way. I believe, however, that the peer-review system along with confirmatory studies have proven to be effective mechanisms to catch research science fiction and ultimately disgrace its authors.

## In Conclusion

Additional factors affect university-industry collaborations. Being aware of them and, when necessary, mutually accommodating to these differences, can make the interaction work well.

Industry has a greater sense of urgency and results orientation. It prefers to identify measurable project milestones. Some of these will be go/no-go decision points that may come into play earlier than university collaborators would prefer. Invariably projects must have a defined purpose that ties into a product. These should not be misinterpreted to mean that industry does no basic research. It does, but it is purposeful and targeted.

Industry usually places a stronger reliance on teams, teamwork, and shared decision making than may be customary on campus. Consequently, the individuals in industry may come across as indecisive when they seek consensus or approval from their organization.

Finally, it should be kept in mind that industry is not a replacement for the NIH, NSF, or any other granting agency. It can play a role in offsetting certain research cost but maintaining and adequately funding the federal grant process is crucial to sustaining academic leadership. You and your colleagues must get this message across to policy makers. ♦

### 1996 Research Career Enhancement Awards

The Research Career Enhancement Awards are designed to enhance the research careers of APS members in good standing, strengthening their research programs and making them more competitive scientists. The awards are given competitively twice a year with deadlines on February 15 and August 15.

In 1996 the spring round of applications resulted in three of eight applications being accepted, those of Joseph T. Brozinick, Jr., J. Michael Overton, and Gregory L. Stahl.

**Joseph T. Brozinick, Jr.**, NIDDK/NIH, will use the award to attend two molecular biology classes at the GIBCO-BRL training center: the first on the polymerase chain reaction techniques and the second on how to prepare and screen cDNA libraries. Brozinick's current research focuses on how insulin and muscle contraction activate glucose transport and how this process may be abnormal in the insulin-resistant state.

The award to **J. Michael Overton**, Florida State University, will enable

him to spend 3 weeks in the laboratory of Stephen DiCarlo, Northeastern Ohio Universities College of Medicine, to learn the techniques of direct recording of sympathetic nerve activity in the conscious rat. This expertise will enable Overton to focus on the relationship between sympathetic nerve activity and energy balance in hypertensive rats.

**Gregory L. Stahl**, Brigham & Women's Hospital, Harvard University, will use the award to attend a New England Biolabs Molecular Biology Summer Workshop to learn molecular biological techniques, and in particular polymerase chain reaction and mRNA sequencing techniques. At present, Stahl's research centers on the role of complement in ischemia/reperfusion injury with a special interest in the role of the endothelium during complement activation.

APS members in good standing are invited to apply for Research Career Enhancement Awards. The deadlines for applications are February 15 and August 15. Contact the Executive Office for applications. ♦

### Physiology in Perspective Walter B. Cannon Memorial Lecture Award

The Cannon Memorial Lecture honors Walter B. Cannon, President of the Society from 1913-1916 and one of the century's most distinguished physiologists. The plenary lecture is presented annually by a distinguished physiological scientist, domestic or foreign, at the spring meeting on a subject that addresses some aspect of the concept of homeostasis as enunciated in Cannon's classic work, *The Wisdom of the Body*. The lecture, sponsored by the Grass Foundation, is selected by the APS President-elect with the consent of Council.

The recipient receives an honorarium of

\$4,000 plus travel and per diem expenses and is invited to submit a manuscript for consideration of publication in one of the Society's journals.

Nominations for the Cannon Lecture Award should be adequately documented to demonstrate the candidate's contributions to physiology. A curriculum vitae should accompany the letter of support describing the nominee's achievements.

Submit nominations by October 1 to: The APS Cannon Lecture Award, 9650 Rockville Pike, Bethesda, MD 20814-3991. ♦

### Bowditch Lecture Award

The annual Bowditch Lecture honoring the first elected President of the American Physiological Society, Henry Pickering Bowditch, has been given at the annual meeting since 1956.

The Lecturer is selected by the President with the consent of Council from among the regular members who have achieved outstanding work and are under 40 years of age at the time of presentation. The award is for original and outstanding accomplishments in the field of physiology. Originality of approach, clarity of data presentation, and the general significance of the results are important criteria. The award conveys an honorarium of \$2,500 plus travel and per diem expenses to attend the spring meeting, and the recipient is invited to submit a manuscript for publication in one of the Society's journals.

Nominations should be accompanied by letters from two nominators describing the importance of the candidate's work, a brief sketch of the nominee's professional history, papers or manuscripts that substantiate the excellence of the candidate, and a curriculum vitae. The nominators should clearly state the contributions of candidates to any jointly authored manuscripts and papers, documenting the independence of the nominee's work.

Nominations should be submitted by October 1 to: The APS Bowditch Lecture Award, 9650 Rockville Pike, Bethesda, MD 20814-3991. ♦

#### Moving?

If you have moved or changed your phone, fax, or e-mail address, please notify the APS Membership Office at 301-530-7174 or fax the information to 301-571-8305.



## 1996 Officers and Standing Committees

### APS Council

#### Officers

James A. Schafer, President (1997)  
Allen W. Cowley, Jr., President-Elect (1997)  
Leonard S. Jefferson, Past President (1997)

#### Councillors

Walter F. Boron (1998)  
Gerald F. DiBona (1998)  
Diana L. Kunze (1997)  
Celia D. Sladek (1999)  
Heinz Valtin (1997)  
John A. Williams (1999)

#### *ex officio members*

Francis L. Belloni, Education (1997)  
Edward H. Blaine, Finance (1998)  
Ethan R. Nadel, Program (1997)  
Leonard R. Johnson, Publications (1998)  
Richard J. Traystman, Section Advisory (1996)

### Society Standing Committees

#### Animal Care and Experimentation

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

C. Terrance Hawk, Chair (1997)  
Ronald J. Korthuis (1998)  
Gordon J. Leitch (1996)  
David C. Randall (1996)  
Ingrid H. Sarelus (1998)  
Jackie D. Wood (1997)  
Andrea A. Seymour, *ex officio* (1998)  
Eric O. Feigl, *ex officio* (1997)

### Awards Committee

Oversees the award programs of the Society to ensure uniformity and conformity with the goals of APS, investigates new means of funding for the APS awards program, and selects Research Career Enhancement Awardees and APS-Genentech Awardee.

D. Neil Granger, Chair (1997)  
Helen J. Cooke (1996)  
Michael J. Cronin (1997)  
Robert W. Gore (1996)  
Martha E. O'Donnell (1998)  
James B. Wade (1998)  
Eleanor Ison-Franklin, *ex officio* (1996)  
Celia D. Sladek, *ex officio* (1997)

### Career Opportunities in Physiology

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

Steven L. Bealer, Chair (1997)  
Michael A. Castellini (1996)  
Andrew S. Greene (1998)  
Polly A. Hofmann (1997)  
Ulla C. Kopp (1996)  
Lori L. Woods (1998)  
Edward J. Zambraski (1997)

### Committee on Committees

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

Barbara A. Horwitz, Chair (1996)  
Gerald F. DiBona (1998)  
Peter M. Cala (1998)  
Robert G. Carroll (1998)  
Suzanne M. Fortney (1997)

Joey P. Granger (1998)  
Pamela J. Gunter-Smith (1997)  
David R. Harder (1997)  
Eileen M. Hasser (1996)  
Jeffrey R. Hazel (1997)  
Bruce G. Lindsey (1999)  
David W. Ploth (1996)  
Gerald I. Shulman (1996)  
Erik R. Swenson (1998)

### Ray G. Daggs Award

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

Robert E. Forster II, Chair (1996)  
Elsworth R. Buskirk (1998)  
William F. Ganong (1997)

### Education

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

Francis L. Belloni, Chair (1997)  
Beverly P. Bishop (1996)  
Virginia L. Brooks (1998)  
Herbert S. Chase (1997)  
Stephen E. DiCarlo (1997)  
Barbara E. Goodman (1998)  
Andrea R. Gwosdow (1996)  
Barry T. Peterson (1996)  
Roger E. Thies, *ex officio* (1996)  
Penny Hansen, *ex officio* (1998)

### Finance

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

## APS News: Committees

Edward H. Blaine, Chair (1998)  
Mordecai P. Blaustein (1998)  
Jack L. Feldman (1998)  
Harvey V. Sparks, Jr. (1997)  
Leonard S. Jefferson (1997)  
James A. Schafer, *ex officio* (1997)  
Allen W. Cowley, Jr., *ex officio* (1997)  
Leonard R. Johnson, *ex officio* (1998)

### Honorary Membership

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

John B. West, Chair (1996)  
William H. Dantzler (1998)  
Stanley G. Schultz (1997)

### International Physiology

Facilitates interchange between APS, other physiological societies, and their individual members; handles all matters pertaining to international physiological affairs, with an emphasis on developing countries; and maintains a clearinghouse for linkages with developing countries.

Ernst Knobil, Chair (1998)  
Marie Cassidy (1996)  
Kenneth J. Dormer (1996)  
Claes E. G. Lundgren (1996)  
Hector Rasgado-Flores (1998)  
Ian A. Reid (1997)  
Aubrey E. Taylor, *ex officio* (1997)  
Harvey V. Sparks, Jr., *ex officio* (1997)

### Liaison With Industry

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

Andrea A. Seymour, Chair (1998)  
James E. Foley (1997)  
Joseph D. Fondacaro (1997)  
Nancy J. Hutson (1996)

Terry J. Opgenorth (1997)  
Bruce A. Stanton (1996)  
Steven L. Bealer, *ex officio* (1997)  
Francis L. Belloni, *ex officio* (1997)  
Ethan R. Nadel, *ex officio* (1997)

### Long-Range Planning

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

Shu Chien, Chair (1996)  
Allan D. Cherrington (1996)  
John S. Cook (1997)  
Hershel Raff (1998)  
Andrea J. Yool (1998)  
David B. Young (1997)

### Membership

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

Hannah V. Carey, Chair (1996)  
Kirk W. Barron (1998)  
Russell C. Scaduto, Jr. (1997)  
Lawrence P. Schramm (1996)  
Sue Amy Shapses (1997)  
Lou Ann Stephenson (1998)  
Thomas C. Vary (1996)

### Perkins Memorial Fellowship

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

Aubrey E. Taylor, Chair (1997)  
Donald G. Davies (1997)  
Aviad Haramati (1998)  
George D. Leikauf (1998)  
Molly P. Hauck, *ex officio* (indefinite)

### Porter Physiology Development

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

Eleanor L. Ison-Franklin, CoChair (1996)  
H. Maurice Goodman, CoChair (1998)  
Reinier Beeuwkes (1997)  
Margaret Colden-Stanfield (1998)  
Sarah D. Gray (1996)  
Michael J. Overton (1997)  
Phillip L. Rayford (1998)  
Guido E. Santacana (1996)  
R. Clinton Webb (1997)

### Program

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

Ethan R. Nadel, Chair (1997)  
Thomas E. Lohmeier (1998)  
Richard L. Moss (1997)  
Judith A. Neubauer (1998)  
Hiroko Nishimura (1996)  
D. Eugene Rannels (1997)  
Allen W. Cowley, Jr., *ex officio* (1997)

### Program Advisory

Recommends to the Program Committee scientific programs for the APS meetings and conferences, organ-

## APS News: Committees

nizes contributed abstracts into sessions, and selects sessions chairs and introductory speakers.

Chair—Ethan R. Nadel (1997)  
 Cardiovascular—Gary K. Owens (1997) & Kathryn Lamping (1998)  
 Cell and General Physiology—Jack H. Kaplan (1996)  
 Central Nervous System—Helen Baghdoyan (1997)  
 Comparative Physiology—Michael A. Castellini (1997)  
 Endocrinology and Metabolism—Susan K. Fried (1998)  
 Environmental and Exercise Physiology—Charles M. Tipton (1996)  
 Gastrointestinal Physiology—Patrick Tso (1997)  
 Neural Control and Autonomic Regulation—Michael C. Andresen (1997)  
 Renal Physiology—Leon C. Moore (1996) & Jeff M. Sands (1997)  
 Respiration—Richard D. Bland (1996)  
 Teaching of Physiology—Nels C. Anderson (1997)  
 Water and Electrolyte Homeostasis—Ronald Freeman (1997)  
 Clinical Physiology Books—Richard J. Traystman (1996)  
 Epithelial Transport Group—John Cuppoletti (1998)  
 History of Physiology Group—Giuseppe Sant'Ambrogio (1996)  
 Hypoxia Group—Reed W. Hoyt (1996)  
 Myobio Group—Thomas M. Nosek (1996)  
 Members in Industry Group—Andrea A. Seymour (1998)  
 Education Committee—Francis L. Belloni (1997) & Andrea R. Gwosdow (1996)

### Public Affairs

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

Eric O. Feigl, Chair (1997)  
 Allen W. Cowley, Jr. (1998)

Florence N. Hutchison (1997)  
 Virendra B. Mahesh (1996)  
 R. John Solaro (1998)  
 Terry N. Thrasher (1997)  
 Phyllis M. Wise (1996)  
 C. Terrance Hawk, *ex officio* (1997)  
 Andrea A. Seymour, *ex officio* (1998)

### Publications

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

Leonard R. Johnson, Chair (1998)  
 Dale J. Benos (1997)  
 Jerome A. Dempsey (1997)  
 Donald S. Faber (1998)  
 Virginia M. Miller (1998)  
 James A. Schafer, *ex officio* (1997)

### Section Advisory

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

Chair—Richard J. Traystman (1996)  
 Cardiovascular—Allyn L. Mark (1997)  
 Cell and General Physiology—Paul J. De Weer (1998)  
 Central Nervous System—Celia D. Sladek (1997)  
 Comparative Physiology—Larry I. Crawshaw (1997)  
 Endocrinology and Metabolism—Marian R. Walters (1997)  
 Environmental and Exercise Physiology—Carl V. Gisolfi (1997)  
 Gastrointestinal Physiology—Gilbert A. Castro (1997)  
 Neural Control and Autonomic Regulation—Cheryl M. Heesch (1996)  
 Renal Physiology—Roger G. O'Neil (1996)

Respiration—Edward D. Crandall (1996)  
 Teaching of Physiology—David S. Bruce (1996)  
 Water and Electrolyte Homeostasis—Ian A. Reid (1997)

### Senior Physiologists

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

Suk Ki Hong, Chair (1996)  
 Robert M. Berne (1998)  
 John R. Blinks (1996)  
 Richard L. Malvin (1997)  
 Eugene M. Renkin (1998)  
 William J. Stekiel (1998)  
 Harold S. Weiss (1997)

### Women in Physiology

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

Celia D. Sladek, Chair (1997)  
 Kim E. Barrett (1996)  
 Gregory L. Florant (1996)  
 Cynthia A. Jackson (1996)  
 Jane F. Reckelhoff (1998)  
 Mary I. Townsley (1998)  
 Alice R. Villalobos (1996)

### Society Representatives to Other Organizations

**American Association for Accreditation of Laboratory Animal Care**

C. Terrance Hawk (1997)



## APS News: Committees

### **American Association for the Advancement of Science**

Lynne E. Olson (1998)  
Frank L. Powell (1998)

### **Council of Academic Societies of the Association of American Medical Colleges**

Vernon S. Bishop (1998)  
George A. Hedge (1997)

### **Federation of American Societies for Experimental Biology Board**

Brian R. Duling (1997)  
James A. Schafer (1999)

### **Executive Officers Advisory Committee**

Martin Frank (indefinite)

### **Finance Committee**

Franklyn G. Knox (1998)

### **Excellence in Science Award**

Celia D. Sladek (1997)

### **Life Sciences Advisory Committee**

Margaret C. Neville (1997)

### **Public Affairs Executive Committee**

Brian R. Duling (1997)

### **Public Affairs Advisory Committee**

Eric O. Feigl (1997)

### **Publications Committee**

Catherine S. Chew (1997)

### **Research Conference Advisory Committee**

Allen W. Cowley, Jr. (1996)

### **Wellcome Visiting Professorship**

Mrinacini Rao (1996)

### **National Association for Biomedical Research**

Martin Frank (indefinite)

### **US National Committee for IUPS**

Leonard S. Jefferson (1997)  
James A. Schafer (1998)  
Allen W. Cowley, Jr. (1999)

### **US National Committee on Biomechanics**

Peter Abbrecht (1996)

## 1997 APS Conference

*Physiology and Functional Diversity of Amiloride-Sensitive Na<sup>+</sup> Channels: A New Gene Superfamily*

**Organizers:** Dale J. Benos, University of Alabama, Birmingham, and Bernard C. Rossier, Universit de Lausanne

**Steering Committee:** Douglas C. Eaton, Emory University School of Medicine; Lawrence G. Palmer, Cornell University Medical Center; Bruce Stanton, Dartmouth Medical School; and David G. Warnock, University of Alabama, Birmingham

**Date:** Fall 1997

**Location:** To Be Announced

## 1998 APS Conference

*Paraventricular Nucleus of the Hypothalamus: A Crossroads of Integrative Physiology*

**Organizer:** Joseph R. Haywood, University of Texas Health Science Center

**Steering Committee:** Alan K. Johnson, University of Iowa; Arthur D. Loewy, Washington University; Leo P. Renaud, University of Ottawa; Catherine Rivier, Salk Institute; and A. J. W. Scheurink, University of Groningen

**Date:** Fall 1998

**Location:** To Be Announced

# APS Conference

## 1996 Intersociety Meeting Integrative Biology of Exercise October 16–19 • Vancouver, British Columbia

### Wednesday, October 16

2:00–8:00 PM

#### Registration Opens

6:00–8:00 PM

#### Opening Reception

*hors d'oeuvres and cash bar*

### Thursday, October 17

8:00–11:00 AM

#### Comparative Exercise Physiology: Insights on Human Performance From Animals

Chair: D.R. Jones

Speakers: D.R. Jones, R.J. Full, W.K. Milsom, P.J. Butler, J.H. Jones, S.L. Lindstedt

8:00–11:00 AM

#### Central Neural Control of the Cardiorespiratory System During Exercise

Chair: T.G. Waldrop

Speakers: T.G. Waldrop, M.P. Kaufman, L.B. Wilson, G.A. Iwamoto, L. Adams, E. Garcia-Rill

11:00 AM–2:30 PM

#### Poster Sessions

2:30–5:30 PM

#### Plasticity of Muscle

Chair: S. Kandarian

Speakers: B. Russell, D.B. Thomason, K. Esser, J.A. Carson, R.W. Tsika

2:30–5:30 PM

#### Regulation of Glucose Utilization by Working Muscle

Chair: J.L. Ivy

Speakers: J.L. Ivy, L.J. Goodyear, A. Bonen, D.H. Wasserman, A.D. Baron

7:00–8:00 PM

#### Lecture: Hyperventilatory Response to Heavy Exercise: Causes and Consequences

Speaker: J.L. Dempsey

8:00–9:00 PM

#### Lecture: Magnetic Resonance Approaches in Exercise Physiology

Speaker: B. Balaban

### Friday, October 18

8:00–11:00 AM

#### Linking Muscle Mechanics and Energetics: From Cross-Bridge to Locomotion

Chair: K.E. Conley and S.L. Lindstedt

Speakers: K.E. Conley, E. Homsher, T.L. Daniel, M.J. Kushmerick, L.C. Rome, S.L. Lindstedt

8:00–11:00 AM

#### Cardiovascular Plasticity/Exercise

Chair: M.H. Laughlin

Speakers: R.L. Moore, C.A. Tate, L. Leinwand, J.M. Lash, T.H. Hintze

11:00 AM–2:30 PM

#### Poster Sessions

2:30–5:30 PM

#### Force Modulation in Skeletal Muscle: Molecules to Motor Units

Chair: B.R. MacIntosh and J-M. Renaud

Speakers: D.G. Allen, H.L. Sweeney, B.R. MacIntosh, J-M. Renaud, C.J. de Luca, P.F. Gardiner

2:30–5:30 PM

#### Adaptations in Body Fluid Regulation to Physical Activity

Chair: E. Nadel

Speakers: S. Weinbaum, P. Watson, H. Nose, E. Nadel, G. Mack, P. Wagner

7:00–8:00 PM

#### Lecture: Molecular Approaches in Exercise Physiology

Speaker: F. Booth

8:00–9:00 PM

#### Graduate Student Poster Competition

### Saturday, October 19

8:00–11:00 AM

#### Interaction of Physical Activity, Growth, and Growth Factors in Children: A Developmental App- roach

Chair: D.M. Cooper

Speakers: D.M. Cooper, C. Roberts, Jr., G. Haddad, G. Sieck, R. Bailey, D. Rowe

8:00–11:00 AM

#### Fatigue

Chair: R. Fitts

Speakers: R. Enoka, J.K. Barclay, A. Wagenmaker, R. Fitts, R. Godt

11:00 AM–2:30 PM

#### Poster Sessions

2:30–5:30 PM

#### Vascular Remodeling: Angiogenic Growth Factors, Ischemia, and Exercise

Chair: R. Terjung

Speakers: O. Hudlicka, J. Abraham, E.F. Unger, J.F. Symes, R. Terjung

2:30–5:30 PM

#### Muscle Use and Overuse

Chair: B. Russell

Speakers: R. Lieber, R. Fielding, M. Jackson, R. Armstrong, S. Kandarian

7:00–9:00 PM

#### Banquet and Awards Ceremony

# XXXIII IUPS Congress

## Second Announcement

### St. Petersburg, Russia

#### Background

The International Union of Physiological Sciences (IUPS) will hold its General Assembly and the XXXIII International Congress of Physiological Sciences in St. Petersburg, Russia, from June 30 to July 5, 1997. The Congress site will be the Medical-Military Academy (formerly the emperor's Medical Surgical Academy), which, having been founded in 1798 by Paul I, the son of Catherine the Great, is one of the oldest and most attractive institutions of higher education and biomedical research in Russia.

The Congress will be held during the first week in July, which is the most fascinating time of the year in St. Petersburg. This is when the city is under the spell of the "white nights" and the sun sets for only two hours. There are magnificent palaces, Neva embankments, gardens, and parks, as well as about fifty museums in St. Petersburg and its suburbs (including the famous Hermitage and Russian Museum). Special tours for Congress participants and accompanying guests will be organized.

#### Program

The scientific program for the Congress was developed by an International Program Committee cochaired by Pavel Simonov (Moscow, Russia) and Stanley G. Schultz (Houston, TX). The theme of the scientific program will be "Integrative Physiology: From Molecules to Humans," a logical extension of the "date with the future of physiology" theme of the 1993 IUPS Congress in Glasgow. Each morning and afternoon session will open with a Plenary Lecture delivered by a scientist of international renown; the ten lectures will cover the spectrum of integrative physiology from intracellular signaling through emotions and cognition.

Complementing the symposia will be approximately thirty workshops dealing, more informally, with timely subjects. As at past Congresses, there will be poster sessions organized by topics and coordinated with the symposia and workshops. A call for posters will be published in the final announcement. A workshop on teaching physiology will be organized the week following the Congress.

Following is a preliminary program for the XXXIII IUPS Congress.

#### Plenary Lectures

On the Human Brain - Opening Ceremony (N.P. Bechtereva, Russia)  
Receptors (P. Chambon, France)  
Molecular Mechanisms Underlying Mammalian Development (P. Gruss, Germany)

Sensory (J. Hudspeth, USA)  
Central Nervous System (E. Kandel, USA)  
Reproduction (E. Knobil, USA)  
Design and Use of Muscles for Maximal Performance (R.M. Alexander, UK)  
Neuroreceptor to Brain Function (S. Nakanishi, Japan)  
The Epithelial Sodium Channel: From Physiology to Physiopathology (B.C. Rossier, Switzerland)  
Exocytosis (J. E. Rothman, USA)  
Conditional Reflex and Psychophysics in the Framework of Neurophysiology (E.N. Sokolov, Russia)

#### Cell and Molecular Physiology

##### Symposia

- 001** *Intracellular Messengers* O.H. Peterson (UK) and A.N. Malviya (France)
- 002** *Molecular Mechanisms of Ion Channel Control* P.G. Kostyuk (Ukraine) and W. Stuhmer (Germany)
- 003** *Membrane Traffic and Protein Sorting* M. Cerejido (Mexico) and E.J. Rodriguez-Boulan (USA)
- 004** *Nitric Oxide: Regulator of Renal Vascular and Tubular Function* T.F. Luscher (Switzerland) and L. G. Navar (USA)
- 005** *Steroid Receptors* E.V. Jensen (Germany) and M. Muramatsu (Japan)
- 006** *Epithelial Transporters* S.C. Hebert (USA) and H. Murer (Switzerland)
- 007** *Non-genomic, Rapid Actions of Steroid Hormone* Y-Z. Chen (China) and R.L. Moss (USA)
- 008** *Apoptosis* P. Davies (USA)
- 009** *Gastric Acid Secretion and Cytoprotection* S.J. Konturek (Poland) and G. Sachs (USA)
- 009a** *Calcium Homeostasis* J. Potts (USA) and I. MacIntyre (UK)

##### Workshops

- 010** *Functional Neurochemistry of Excitatory Amino Acid Receptors* S.A. Dambinova (Russia) and R.J. Winthold (USA)
- 011** *Cross-Talk Between Apical and Basal Membranes in Epithelia* B.J. Harvey (Ireland)
- 012** *Local Calcium Signaling and Calcium Channels* I. Schulz (Germany)
- 013** *Epithelia of the Eye* M.M. Civan (USA)
- 014** *Control of Internal Ion Concentration* C.O. Lee (Korea)
- 015** *Ion Co- and Countertransporters* R. DiPolo (Venezuela)
- 016** *Cellular Compartmentation* J. Hoffman (USA)

# XXXIII IUPS Congress

- 017** *Cell Modeling* H.J. Jongsma (The Netherlands)  
**018** *Gap Junctions: From Molecular Biology to Tissue Function* P.R. Brink (USA)  
**019** *Oxidant Regulation of Cellular Functions* S.J. Elliott (USA)  
**020** *Structure, Function and Regulation of ATPases in Epithelia* K. Geering (Switzerland)  
**021** *Developmental Aspects of Ion Transport* L.N. Ivanova (Russia)  
**022** *Nuclear Pores* H. Oberleithner (Germany)  
**023** *Cellular Calcium Signaling* W.J. Lederer (USA)

## Ion-Water Balance and Renal Physiology

### Symposia

- 024** *Aquaporins and Water Transport* P. Agre (USA) and S Sasaki (Japan)  
**025** *Cell Volume Regulation* M. Burg (USA) and F. Lang (Germany)  
**026** *Regulation of Salt and Water Metabolism* M. P. Blaustein (USA) and P.B. Persson (Germany)  
**027** *Renin-Angiotensin System* D. Ganten (Germany) and M.I. Phillips (USA)

### Workshop

- 028** *Renal Transport of Organic Anions and Cations* K. J. Ullrich (Germany)

## Respiration

### Symposia

- 029** *Respiratory Mechanics* P.T. Macklem (Canada) and G. Miserocchi (Italy)  
**30** *Control of Respiration* S. Lahiri (USA) and P. Scheid (Germany)  
**031** *Gas Exchange and Pulmonary Circulation* J.P. Dvoretzky (Russia) and J.B. West (USA)  
**032** *Respiration in Extreme Environments* P. Cerretelli (Switzerland) and V.S. Novikov (Russia)

### Workshop

- 033** *Respiratory Tract Electrolyte Transport in Health and Disease* H.E. Larsen (Denmark)

## Muscle Physiology

### Symposia

- 034** *Excitation Contraction Coupling and Molecular Mechanisms of Contraction* C. Franzini-Armstrong (USA) and H. Sugi (Japan)  
**035** *Molecular Motors* R.S. Orlov (Russia) and J.A. Spudis (USA)

- 036** *Pacemaker Activities in Cells* A. Noma (Japan) and K.M. Sanders (USA)

### Workshops

- 037** *Membrane and Intracellular Mechanisms of Contraction Activation in Smooth Muscles* M.F. Shuba (Ukraine)  
**038** *Muscle Fibers Composition: Effects on Performance* F.Booth (USA)  
**039** *Mathematical Modeling of Muscle Energetics* R.H. Morton (New Zealand)

## Environmental Physiology

### Symposia

- 040** *Cellular Mechanisms in Thermal Regulation* J.A. Boulant (USA) and E. Simon (Germany)  
**041** *Adaptation to the Environment* M. Horowitz (Israel) and V.I. Medvedev (Russia)  
**042** *Maximal Performance in Locomotion* G.A. Cavagna (Italy) and B. Saltin (Sweden)  
**043** *Physiological Adaptation of Muscle to Use S. Schiaffino (Italy) and R.J. Schwartz (USA)*  
**044** *Oxygen, Antioxidants and Exercise* S.P. Chatterjee (India) and O. Hanninen (Finland)  
**045** *Space Physiology* A.I. Grigoriev (Russia) and J. Vernikos (USA)

### Workshops

- 046** *Comparative Aspects of Temperature Regulation in Homeotherms* L. Folkow (Norway)  
**047** *Physiological Aspects of Exposure to Electromagnetic Fields* E.B. Lyskov (Russia) and K.H. Mild (Sweden)

## Endocrinology

### Symposia

- 048** *Neuroendocrine Effects of Cytokines* K. Fuxe (Sweden) and C.B. Saper (USA)  
**049** *Pancreatic B Cell Regulation* S. Misler (USA)  
**049a** *Neuroendocrine Control of Thirst* M. McKinley (Australia) and A.K. Johnson (USA)

## GI and Nutrition

### Symposia

- 050** *Motility and Enteric Nervous System* J.B. Furness (Australia) and M.A. Medvedev (Russia)  
**051** *Gut Endocrine Mechanisms* J.J. Holst (Denmark) and R.A. Liddle (USA)  
**052** *Control of Food Intake* Y. Oomura (Japan) and G.P. Smith (USA)

# XXXIII IUPS Congress

- 053** *Epithelial Secretion* P.Y.D. Wong (Hong Kong) and J.A. Young (Australia)  
**054** *Gut Growth and Differentiation* L.R. Johnson (USA) and E. Rozengurt (UK)  
**054a** *Genetic and Learned Mechanisms in Ingestive Behavior* D. Denton (Australia) and J. Fitzsimons (UK)

## Cardiovascular

### Symposia

- 055** *Regulation of Endothelial and Vascular Smooth Muscle Ion Channels* J. Daut (Germany) and F. Fay (USA)  
**056** *Local Control of Blood Flow* H.J. Granger (USA) and R.S. Reneman (The Netherlands)  
**057** *Cardiac Factors and Vascular Development - Transcription to Function* K.R. Chien (USA) and Y. Shevchenko (Russia)  
**058** *Regulation of Arterial Pressure, Cardiac Output and Body Fluid Volumes* J.E. Hall (USA) and O.S. Medvedev (Russia)  
**059** *Genetic Models of Human Vascular Diseases* V.J. Dzau (USA) and E.J. Mullins (UK)  
**060** *Electromechanical Aspects of Cardiac Function* M.R. Rosen (USA) and L.V. Rosenschtraukh (Russia)  
**061** *Neural Regulation of Blood Vessels* F. Abboud (USA) and V.M. Khayutin (Russia)

### Workshops

- 062** *Nitric Oxide and Microcirculation* G. Kaley (USA)  
**063** *Coronary Physiology and Cardiac Metabolism* E. Feigl (USA)  
**064** *Myocardial Calcium* B. Lewartowski (Poland)

## Fetal Physiology

### Symposia

- 065** *Fetal - Maternal Interactions* J.R.G. Challis (Canada) and P.D. Gluckman (New Zealand)  
**066** *Prenatal Development of Organ Functions* E.R. Lumbers (Australia) and F.A. Van Assche (Belgium)  
**067** *Functional Organization of the Brain in Human Ontogenesis* D.A. Farber (Russia) and A. Diamond (France)

## Autonomic Nervous System

### Symposia

- 068** *Transmission in Autonomic Ganglia* E.M. McLachlan (Australia) and V.I. Skok (Ukraine)

- 069** *Visceral Afferent Mechanisms* D. Grundy (UK) and V.G. Kassil (Russia)  
**070** *Neural Mechanisms of Somatic and Autonomic Interactions* A.D. Nozdrachev (Russia) and A. Sato (Japan)

## Ecological and Comparative Physiology

### Symposia

- 071** *The Evolution of Visual Systems* J.K. Bowmaker (UK)  
**072** *Evolution of Physiological Systems* F. Huber (Germany) and V.L. Svidersky (Russia)  
**073** *Integrative Physiology and Evolutionary Design* J. Diamond (USA) and E. Weibel (Switzerland)

## Synaptic Functions and Plasticity

### Symposia

- 074** *Dynamics and Plasticity in the Visual System* U. Eysel (Germany) and C. Gilbert (USA)  
**075** *Mechanisms of Synaptic Transmitter Change* P. Anderson (Norway) and L.L. Voronin (Russia)

### Workshop

- 076** *Control of Synaptic Release* S. Tucek (Czech Republic)

## Motor Functions

### Symposia

- 077** *Motor Maps and Population Coding in the Central Nervous System* A. Georgopoulos (USA) and U. Windhorst (Canada)  
**078** *Posture and Locomotion* A. Berthoz (France) and V. Gurfinkel (Russia)

## Sensory Systems

### Symposia

- 079** *Mechanotransduction* R. Busse (Germany) and O.H. Hamill (USA)  
**080** *Central Visual Processing* I.A. Shevelev (Russia) and W. Singer (Germany)  
**081** *Auditory Processing* J.A. Altman (Russia) and M. Konishi (USA)  
**082** *Cellular and Molecular Mechanisms of Sensory Transduction* J.F. Ashmore (UK) and D.A. Baylor (USA)  
**083** *Somatosensory System* Y. Iwamura (Japan) and M.J. Rowe (Australia)  
**084** *Pain: From Molecules to Perception* H.O. Handwerker (Germany) and W. Willis (USA)



# XXXIII IUPS Congress

## Workshop

- 085** *Mechanisms of Electro- and Echolocation* N. Suga (USA) and A.Y. Supin (Russia)

## Higher Nervous Activity and the CNS

### Symposia

- 086** *Conscious Vision (IBRO-IUPS)* S. Zeki (UK)  
**087** *Non-Invasive Study of Higher Brain Function* R. Hari (Finland) and M.E. Raichle (USA)  
**088** *Emotions: Interdisciplinary Approach* R.J. Davidson (USA) and T. Ono (Japan)  
**089** *Neural System for Learning and Memory* Y. Miyashita (Japan) and L.R. Squire (USA)  
**090** *Consciousness and Attention* Y. Kropotov (Russia) and R. Naatanen (Finland)  
**091** *Brain Systems Underlying Cognition* A.M. Ivanitsky (Russia) and M. Posner (USA)  
**091a** *The Neurobiology of Sleep* M. Jouvet (France) and M. Mukhametov (Russia)

## Workshop

- 092** *Memory Processes and Their Cellular Mechanisms* K.V. Anokhin (Russia) and S. Rose (UK)

## Clinical Physiology

### Symposium

- 093** *Ischemia: From Channel to Organ* D.J. Hearse (UK) and G.N. Kryzhanovsky (Russia)

## Workshop

- 094** *Physiological Problems of Transplantation and Artificial Organs* V.I. Shumakov (Russia)

## Immunology

### Workshops

- 095** *Neuroimmunology* I.D. Stolyarov (Russia) and M. Rosental (USA)  
**096** *Blood-Brain Barrier* W. Kuschinsky (Germany)

## General

### Symposium

- 097** *Physiology and the Limits of Man: The Ethical Issues* A.M. Genin (Russia), K. Hartiala (Finland) and J-D. Vincent (France)

## Workshop

- 098** *History of Physiology* M.M. Khananashvily (Russia) and T. Tansey (UK)

## Accommodations

Hotel prices (Table 1) include accommodation in a chosen room type, breakfast, and tax. Payment conditions require a \$500 (US) deposit to be paid six months before the Congress. Should currency rates, taxes, or other fees by authorities increase substantially, the Secretariat reserves the right to adjust the prices as well as to make corresponding changes to the accommodation reservations should conditions change substantially.

## Travel

St. Petersburg's International Airport, which is located 40 minutes from the City Center, can be reached from anywhere. There are direct flights from North America and a growing number of flights from European and Asian countries.

The official carrier to the Congress is Finnair, who will provide fare discounts and assistance to those attending the Congress. The most direct route to St. Petersburg is through Helsinki with either a connecting flight, train or boat from Finland or Sweden.

All participants will receive a warm welcome on arrival and will be provided with a guide and transport to take them to their reserved accommodation. Shuttle buses will be available to participants to take them from their hotels to the Congress site during their stay in the city.

## Deadlines

**August 31, 1996:** Deadline for returning Preliminary Registration Form. Only those people completing a Preliminary Registration Form will receive the Final Announcements.

**September 1996:** Distribution of Final Announcement and Abstract and Registration Forms

**February 28, 1997:** Date of receipt of abstracts. Abstracts must be postmarked on or before this date and must be accompanied by a completed Registration form and deposit.

Table 1. Hotel and accommodation prices

Hotel	Price Level per Night	
	Single	Double
Deluxe Class	\$300-475	\$350-525
Hotel Category II (Nevskij Palace or Astoria)	\$165-215	\$210-245
Hotel Category III (Pribaltiskaja, St.Petersburg, Pulkovskaja)	\$105-125	\$105-155
Hotel Category IV or V (Ohtinskaja, Hostels, Dormitories)	\$75 and less	

## XXXIII IUPS Congress

# XXXIII IUPS Congress

## Travel Grant Program

The US National Committee for the International Union of Physiological Sciences is seeking applications for travel awards for the XXXIII IUPS Congress in St. Petersburg June 30-July 5, 1997.

The Committee will screen the applications, and the awards will be made by APS, which is raising funds for the travel. The travel awards will be approximately \$800 to help cover the majority of the airfare to St. Petersburg.

The awards are intended for individuals who have no other source of funds to



attend the Congress. Federal employees are eligible. It is anticipated that more applications will be received than can be funded. To achieve as high a rank as possible, the following factors should be considered:

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

professional visits or work.

The deadline for submissions of applications for travel awards is November 1, 1996. The application is on the following page. All applicants must submit **six** copies of the application to USNC/IUPS, National Academy of Sciences, Attn: Robin Schoen, 2101 Constitution Avenue NW, Washington, DC 20418.

### Traveling to the IUPS Congress

GET Travel has been selected as the official travel agency for the 1997 IUPS Congress in St. Petersburg, Russia. GET Travel will provide discounted airfares to St. Petersburg to all participants in the Congress on either Delta Airlines or Finnair. In addition, GET Travel will be offering a pre-Congress tour of the Russian countryside and a post-Congress tour of Scandinavia. Both tours will last approximately one week. For additional information, contact **Jenonne Schafer, Mitchell/Fitzgerald & Associates, Inc. Travel Management Firm, 1730 K Street, NW, Suite 910, Washington, DC 20006. Tel: 1-800-228-0861 or 1-202-331-3322.**

Jenonne Schafer  
Mitchell/Fitzgerald & Associates, Inc.  
Travel Management Firm  
1730 K Street, NW, Suite 910  
Washington, DC 20006

Yes, I want additional information about travel to the IUPS Congress and the pre- and post-Congress tours. Please contact me at:

Name: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

Tel: \_\_\_\_\_ Fax: \_\_\_\_\_



Surname \_\_\_\_\_

XXXIII IUPS Congress Travel Grant Program  
St.Petersburg, Russia  
June 30-July 5, 1997

1. Name and Degree: \_\_\_\_\_ Year of highest degree: \_\_\_\_\_
2. Faculty position or employment title: \_\_\_\_\_ Year of Birth: \_\_\_\_\_
3. Address: \_\_\_\_\_  
\_\_\_\_\_
4. Phone Number: \_\_\_\_\_ Fax Number: \_\_\_\_\_
5. Email Address: \_\_\_\_\_
6. Country of citizenship: \_\_\_\_\_ Visa status if not US citizen: \_\_\_\_\_
7. Underrepresented Minority Applicants: Please circle ethnic group to which you belong:  
African American      Hispanic      Native American      Pacific Islander
- 8a. Gender: Male \_\_\_\_\_ Female \_\_\_\_\_ 8b. Do you need special assistance or accommodations? \_\_\_\_\_
9. Attending entire Congress? Yes \_\_\_\_\_ No \_\_\_\_\_ If not, which days will you attend? \_\_\_\_\_  
Will you present an invited paper or poster at the Congress? Yes \_\_\_\_\_ No \_\_\_\_\_  
If so, please indicate the sessions you will address. If invited, attach letter of invitation.  
Invited to give public lecture (give title): \_\_\_\_\_  
\_\_\_\_\_  
Invited to Congress symposium (give title; indicate chairman): \_\_\_\_\_  
\_\_\_\_\_
10. Do you intend to submit a poster? (If yes, please give title): \_\_\_\_\_  
\_\_\_\_\_
11. Please describe your area of specialty (e.g. cell physiology, cardiovascular physiology, neurophysiology, etc.):  
\_\_\_\_\_
12. Member of: APS \_\_\_\_\_ SGP \_\_\_\_\_ Div .Comp. Physiol. & Biochem., ASZ \_\_\_\_\_ Soc. Neurosci. \_\_\_\_\_  
BMES \_\_\_\_\_ Microcirc. Soc. \_\_\_\_\_ Other \_\_\_\_\_
13. Are you employed by the federal government more than half-time? Yes \_\_\_\_\_ No \_\_\_\_\_
14. Travel: a. City of departure \_\_\_\_\_ b. Support requested \_\_\_\_\_  
c. Amount of other support available (excluding personal) \_\_\_\_\_
15. Recent publications (not more than 5 titles, giving full refs). If listing abstracts or manuscripts in press, please indicate.

**Deadline for postmark of applications: November 1, 1996**

**Submit six (6) copies to USNC/IUPS, National Academy of Sciences, 2101 Constitution Avenue NW, Washington, DC 20418.  
Attn: Robin Schoen.**

**Surname** \_\_\_\_\_

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

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

# International Joint Meeting of Physiology

Sociedad Española de Ciencias Fisiológicas

(XXVIII Congreso Nacional)

and The American Physiological Society

The International Joint Meeting of the Sociedad Española de Ciencias Fisiológicas (SECF) and The American Physiological Society (APS) will be held from February 4 to 7, 1997 in Malaga, Spain. This meeting will contribute to a closer relationship between Spanish and American physiologists and facilitate future collaboration between them. The joint meeting coincides with the 28th National Congress of the SECF.

## Preliminary Scientific Program

The scientific program will include three plenary lectures, eleven symposia, poster sessions, and oral communications. The official language of the meeting is English.

### Topics to be considered are:

- Epithelial and Membrane Transport
- Autonomic Function
- Cardiovascular Control
- Respiratory Integration
- Endocrine Function
- Hormonal Receptors
- Renal Function
- Metabolism and Nutrition
- Aging Physiology
- Exercise Physiology
- Thermogenesis and Thermoregulation
- Plasticity and Regeneration in the Nervous System
- Brain Imaging and Mapping
- Comparative Physiology
- Mathematical Modeling of Physiological Systems
- Teaching in Physiology

### Plenary Lectures:

J.A. Schafer, University of Alabama, US  
K. Schmidt-Nielsen, Duke University, US  
P. Roland, Karolinska Institutet, Sweden

## Location

The meeting will be held in Benalmadena, a picturesque coastal village in the Costa del Sol. Benalmadena is very close to Malaga City and is easily accessible by air, road, and train. There are many comfortable hotels and the weather is warm and sunny (70-80°F). Benalmadena's attractions include beautiful Andalusian architecture, panoramic mountain and coastal scenery, cultural and sports centers, golf courses, casinos, and nightclubs. Social programs and tourist trips will be in operation during the meeting.

-----  
Dr \_\_\_\_\_ Mr./Mrs. \_\_\_\_\_ Name \_\_\_\_\_  
Institution \_\_\_\_\_  
Mailing Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ Postal Code \_\_\_\_\_  
Phone \_\_\_\_\_ Fax \_\_\_\_\_ E-mail \_\_\_\_\_  
Number of Accompanying Persons \_\_\_\_\_

\_\_\_\_\_ I wish to receive further information  
\_\_\_\_\_ I intend to attend the meeting  
\_\_\_\_\_ I intend to make a presentation:  
\_\_\_\_\_ Oral \_\_\_\_\_ Poster

Departamento de Fisiología, Facultad de Medicina  
29080 Malaga, Spain  
Tel: 34-5-213-1577; fax: 34-5-213-1650  
E-mail: bueno@ccuma.uma.es

# Membership Statistics

**Total Membership** 7,722

## Distribution by Employment

(7468 respondents)

	<i>No.</i>	<i>%</i>
Physiology depts.	2,441	32.6
Other preclinical depts.	591	7.9
Clinical	1,749	23.4
Administration	51	0.6
Hospitals and clinics	299	4.0
Veterinary schools	162	2.1
Dental schools	42	0.5
Public health and graduate schools	129	1.7
College or university	1,093	14.6
Commercial companies	206	2.7
Government	392	5.2
Institutes and foundations	211	2.8
Private practice	42	0.5
Other, emeritus or inactive	60	0.8

## Distribution by Racial Background and Heritage (optional personal data)

	<i>Total respondents</i>
American Indian or Alaskan	17
Asian or Pacific Islander	668
Black	85
White	5,638
Hispanic	137

## Distribution by Earned Degree

(6,951 respondents—includes 1,080 individuals with multiple doctorate degrees)

PhD	4,813
MD	2,806
DVM	193
ScD	102
DDS	34
EDD	10
Cand. Med.	25

## Distribution by Sex

(optional personal data)

	<i>Total respondents</i>
Female	1,093
Male	6,071

## Distribution by Age

(optional personal data)

	<i>Total respondents</i>
70+	1,036
60-69	1,249
50-59	1,888
40-49	2,203
30-39	1,095
20-29	289

## Principal Type of Work

(7,538 respondents)

	<i>%</i>
Research	75.3
Teaching	11.4
Clinical	7.0
Administration	5.4
Other	1.2

## Distribution Primary by Section

Affiliation (6,568 respondents)

	<i>%</i>
Cardiovascular	24.1
Respiration	13.4
Cell & General	11.0
Endocrinology and Metabolism	10.1
Environmental and Exercise	7.8
Renal	7.6
Central Nervous System	7.2
Gastrointestinal	9.7
Comparative	4.2
Neural Control and Autonomic Regulation	4.0
Teaching of Physiology	2.5
Water and Electrolyte Homeostasis	2.4

## Distribution by Group Affiliation

	<i>%</i>
MyoBio-Muscle Group	16.7
Epithelial Transport Group	15.4
History of Physiology Group	8.4
Hypoxia Group	7.5
Members in Industry Group	4.2

## Distribution by Primary Specialty

(7,391 respondents)

	<i>%</i>
Anesthesia	0.6
Anatomy and embryology	0.2

Biochemistry	0.7
Biophysics	0.6
Biomedical engineering	0.5
Blood	1.6
Cardiovascular	24.0
Cellular and tissue	3.9
Comparative physiology	2.5
Electrolytes and water balance	5.0
Endocrines	6.6
Energy metabolism and temperature	2.4
Environment	2.4
Gastrointestinal	5.0
General physiology	0.6
Gerontology	0.3
Immunology	0.2
Liver and bile	0.4
Lipids and steroids	0.6
Minerals, bone, and teeth	0.5
Muscle and exercise	6.8
Neurosciences	10.7
Nutrition and food	0.9
Pharmacology	1.6
Radiology	0.2
Renal	5.9
Reproduction	1.4
Respiration	11.3
Other	0.6

## APS Membership in the Americas

US	7,111
Canada	383
Brazil	23
Mexico	13
Argentina	8
Chile	6
Venezuela	4
Grenada	3
Jamaica/West Indies	3
British West Indies	2
Peru	2
Costa Rica	1
Panama	1

## US States With More Than 100 Members

(50 states plus District of Columbia, Puerto Rico, Guam, and the Virgin Islands)

California	777
New York	591

## Membership Statistics

Texas	492	<b>APS Membership Outside the</b>		Hungary	7
Pennsylvania	404	<b>Americas</b>		Republic of South Africa	5
Maryland	368	(countries with 5 or more members)			
Massachusetts	333			<i>Other Countries Represented:</i> Belarus,	
Illinois	322	Japan	145	Cameroon, Czech Republic, Finland,	
Ohio	285	Germany	85	Iceland, Indonesia, Ireland,	
Michigan	229	United Kingdom	70	Luxembourg, Philippines, Poland,	
North Carolina	201	France	57	Portugal, Russia, SW Africa, Saudi	
Florida	184	South Korea	54	Arabia, Serbia, Thailand, Turkey,	
New Jersey	182	Australia	47	Ukraine, United Arab Emirates.	
Missouri	180	Italy	38		
Virginia	150	Switzerland	36	<b>Canadian Provinces With 5 or More</b>	
Connecticut	147	Denmark	29	<b>Members</b>	
Wisconsin	144	Netherlands	28		
Louisiana	139	Sweden	25	Ontario	151
Minnesota	134	Spain	24	Quebec	91
Georgia	131	Belgium	21	British Columbia	47
Tennessee	129	Taiwan	19	Alberta	41
Indiana	125	Israel	18	Manitoba	25
Alabama	117	Norway	13	Saskatchewan	13
Colorado	114	China	12	Nova Scotia	10
Washington	109	Austria	10		
Arizona	104	Hong Kong	10	<i>Other Provinces Represented:</i> New	
Iowa	104	Greece	7	Brunswick, Newfoundland, Prince	
		India	7	Edward Island.	
		New Zealand	7		

### Introducing... Francis L. Belloni



On January 1, 1995, Frank Belloni succeeded Frank Powell as Chair of the APS Education Committee. At one time, APS' education activities were concerned primarily with attracting undergraduate or new graduate students into physiology. More recently, however, APS has become concerned with broader issues of science education and society, and, as a consequence, education has become a multi-faceted activity within APS. Belloni's goal is to continue and build upon the recent expansion of these educational activities that are coordinated by the Education Committee, with the invaluable professional assistance and collaboration of the APS Education Officer, Marsha Lakes Matyas, and her capable professional staff.

The Society now reaches out to elementary and secondary school life sci-

ence students to help nurture these student's natural interest in science in general, and physiology in particular, by producing posters, brochures, and pamphlets geared to these age levels. These materials expose the children to physiological concepts and also to physiologist role models. APS will soon make available to its members an outreach packet that includes a collection of such instructional materials, as well as source lists, and tips on how to make a successful visit to an elementary or secondary school classroom or how to host a successful visit of such classes to the member's laboratory. The APS' Frontiers in Physiology program, which is funded by the NSF with cost sharing by APS, invited middle and high school science teachers into research laboratories for an intensive, hands-on summer research experience. The Frontiers program has also led to the development of in-service workshops on physiological topics for middle and high school teachers. The Education Committee has continued its interest in undergraduate, graduate, and professional education. It is currently considering the value of items such as model course curricula and career-track information that could be made available to students. At the recent Experimental Biology '96 meeting, the Committee sponsored a panel discussion on how to incorporate physiology into various types of medical school curricula. Finally, the Education Committee has reinvigorated its efforts at providing continuing education programs to APS members through its recent sponsorship of various techniques workshops and through the reinstitution of refresher courses in different areas of physiology at each year's

spring meeting. This year, the refresher course on gastrointestinal physiology represented the first refresher course since the mid-1970s. Next year, for Experimental Biology '97, a refresher course on respiratory physiology is being planned.

Belloni is professor of physiology at New York Medical College in Valhalla, NY. Since 1993, he has been acting dean of the Graduate School of Basic Medical Sciences at NYMC, with oversight of six PhD and nine MS programs. He has recently been appointed as Vice Provost for Scientific Affairs at NYMC. Belloni is a graduate of Providence College and the University of Michigan, where he received his PhD under the mentorship of Harvey V. Sparks, Jr. He pursued postdoctoral training at the University of Michigan and also at the University of Virginia under Robert M. Berne. His research, which has enjoyed funding from the NIH and various affiliates of the American Heart Association, has focused on the local regulation of blood flow in heart and striated muscle and on the effect of local metabolites, particularly adenosine, on cardiac function. He has been an active member of APS since 1973. He has previously served on the Education Committee (1990-1993) and is currently serving on the Program and as ex officio member of the Liaison With Industry Committee, as well as being Chair of the Education Committee.

Belloni invites all APS members to participate in the various educational and outreach activities sponsored by the Education Committee and other committees of the Society. ♦

## Become a *Volunteer* for APS Education Outreach Programs

Please contact the APS Education Office, 9650 Rockville Pike, Bethesda, MD 20814-3991.  
Tel.: 301-530-7132; fax: 301-571-8305; e-mail: [mmatyas@aps.faseb.org](mailto:mmatyas@aps.faseb.org).



## Introducing... Edward H. Blaine



On January 1, 1996, Edward H. Blaine succeeded Franklyn Knox as Chair of the APS Finance Committee. The APS has prospered financially under the guidance of Frank Knox and Martin Frank, Executive Director, and Blaine will continue the sound fiscal policy of the Society. Because of the favorable economic climate and our careful investment policy, the Society is now in position to use a portion of our invested funds to provide added value to membership in the Society. The Society's fiscal policy will continue to support significant growth of reserves to ensure a financially healthy APS for the future. Blaine will encourage active fiscal management of APS programs to ensure that all are providing appropriate return on funds invested.

Blaine is Director of the John M. Dalton Cardiovascular Center at the University of Missouri, Columbia and a professor of physiology and of pharmacology at the University of Missouri School of Medicine. He is a graduate of the University of Missouri and received his PhD in 1970 under the tutelage of James O. Davis. Blaine's research has focused on salt and water homeostasis and blood pressure control. Early in his

career he developed the "nonfiltering kidney" model to study control of renin release. At the Howard Florey Institute for Experimental Physiology and Medicine his work was extended to behavioral and neurohumoral control of salt and water intake. After a brief period at the Department of Physiology at the University of Pittsburgh, Blaine joined the Merck Institute for Therapeutic Research where he led programs in developing diuretics, prostaglandin analogues, and inhibitors of the renin-angiotensin system.

Blaine's laboratory played a key role in the discovery of potent and specific renin inhibitors and was involved with the early development of angiotensin-converting enzyme inhibitors. While at Merck, he led a major effort to develop atrial natriuretic peptide as a therapeutic agent.

In 1986, Blaine moved to St. Louis to participate in a novel program to align industrial and academic research through the Washington University-Monsanto Biomedical Agreement. During his period at Washington University School of Medicine, he continued work on atrial natriuretic peptide and inhibitors of the renin-angiotensin system. In 1992, Blaine returned to the University of Missouri where his present research interests are focused on neurohumoral control of the circulation, especially the role of angiotensin in the central nervous system.

In addition to his scientific career, Blaine earned All America honors in football at the University of Missouri, playing on the only officially undefeated, untied team in the school's history. Professionally, he played with the Green Bay Packers' 1962 World Championship Team and finished his sports career with the Philadelphia Eagles in 1966. Blaine was selected to the Sporting News All Pro Team in 1964 and the Philadelphia Eagles 50-Year Team.

Blaine has published over 100 scientific papers and holds four patents. He

has been an active member of APS since 1974 and was founding Chair of the Liaison With Industry Committee. He also served on the Long-Term Financial Planning Committee, the Program Advisory Committee, Committee on Committees, and the Finance Committee. He has served as Secretary and Program Committee Representative for the Water and Electrolyte Homeostasis Section and on the editorial board of the *American Journal of Physiology: Regulatory, Integrative and Comparative Physiology*. He has been an ad hoc and guest member of the NIMH Board of Scientific Councilors, Cardiovascular Diseases Study Section and Study Section B of the NIH/LBD, and a member of the Ad Hoc Study Section of NIH/LBD.

Blaine is also active in the American Heart Association and the Council for High Blood Pressure Research and has served on American Heart Association peer review committees and local boards of directors.

Blaine has been recognized by the University of Missouri with an honorary DSc, selected as an Arts and Science Distinguished Alumnus, and received the Faculty/ Alumni Award from the university. ♦

### APS Conferences

*pHysiology of Acid-Base Regulation:  
From Molecules to Humans*

**July 12-15**

**Snowmass Resort  
Snowmass, Colorado**

*Neural Control of Breathing:  
Molecular to Organismal Perspectives*

**July 21-25**

**Madison Concourse Hotel  
Madison, Wisconsin**

### APS Intersociety Meeting

**July 21-25**

*The Integrative Biology of Exercise*  
**Vancouver Convention Center  
Vancouver, British Columbia,  
Canada**



### Introducing... Kim E. Barrett



Kim E. Barrett, Associate Professor of Medicine at the University of California, San Diego, School of Medicine, will assume the Editorship of the *American Journal of Physiology: Cell Physiology* effective July 1, 1996. She has served on the Editorial Board of the journal since 1993.

Barrett was born in London, UK, and received her BSc degree in medicinal chemistry from University College London in 1979. She remained at the same institution for her graduate studies under the supervision of Fred L. Pearce, and obtained her PhD degree in biological chemistry in 1982 with a thesis on the functional heterogeneity of mast cells. She came to the United States in 1982 for postdoctoral training with Dean D. Metcalfe at the NIH and then moved westward to join the research faculty at the University of California, San Diego, School of Medicine in 1985. She was transferred to the Professorial Series as an Assistant Professor of

Medicine in 1988 and promoted to Associate Professor in 1992.

In addition to her editorial activities on behalf of *AJP: Cell Physiology*, she also currently serves on the editorial boards of *Gastroenterology and Inflammation Research*. She serves on several national committees, including being a current member of the General Medicine A2 study section of the NIH. She is also a frequent ad hoc reviewer for proposals submitted to the Medical Research Council of Canada, the Alberta Heritage Foundation, and the Wellcome Foundation (UK), among others.

Barrett's research activities have focused on mast cells, epithelial cells, and the interactions between these two cell types in health and disease. She was an early contributor to the now well-recognized concept that the intestinal immune system is an important regulator of epithelial secretory function. Her findings in this area have implications for a number of diseases, including the inflammatory bowel diseases and peptic ulcer disease. Her work has also focused heavily on the intracellular signal transduction mechanisms that underlie epithelial chloride secretion, with a particular focus in recent years on novel negative second messengers intrinsic to the epithelium that regulate this process at several levels. Research in Barrett's lab has been funded by research grants from the NIH and the Crohn's and Colitis Foundation of America. She has also been the recipient of several honors in recognition for her work; most recently she was selected as the 1996 Bowditch Lecturer of the APS.

Barrett has a number of goals for the journal. In conjunction with her team of associate editors (Dennis Ausiello, Tim Bigby, Kevin Foskett, Mark Ginsberg,

Paul Insel, and Kathy Morgan) she intends to maintain and hopefully improve upon the excellent standards for editorial efficiency and timeliness set by the previous editor, Dale Benos. She would also like to increase the number of submissions to the journal, while maintaining its high scientific standards, and will encourage submissions from the international as well as the US cell physiology community. To help accomplish this, she will make a special effort to ensure geographic, as well as gender and ethnic, diversity among the members of the Editorial Board. She is particularly eager to involve younger scientists in the editorial process. She envisages several scientific areas that are ripe for growth in submissions, including cell-cell interactions, inflammatory cell biology, and signal transduction in general. The journal's ability to attract such studies will likely be greatly facilitated by the recent decision of the APS to subsidize the cost of color printing in its journals.

Finally, Barrett sees *AJP: Cell Physiology* as having a unique place among the APS journals given its interdisciplinary character and likewise considers it to have a special educational mandate for the society's membership. She plans to solicit a number of reviews that will describe cutting edge technologies and how they can be incorporated into more classical physiological studies.

By fulfilling these goals, Barrett and her editorial team hope to attract the best manuscripts from research scientists working in the area of cell physiology, broadly defined. Her hope is to make *AJP: Cell Physiology* the foremost vehicle for publication of such studies and able to compete with other premier interdisciplinary journals both in scope and content. ♦

Are you interested in being on an APS Committee?  
See page 131 for the nomination form.



### Looking for Science Information on the World Wide Web

The World Wide Web is still very young. Developed in 1990 at the European Laboratory for Particle Physics (CERN) near Geneva, Switzerland, it was largely ignored until the November 1993 release of NCSA Mosaic, a freeware browser from the National Center for Supercomputing Applications at the University of Illinois at Urbana-Champaign. With parents like that, it should not be surprising that the Web is a rich source of information on all kinds of science.

The first and best place to start looking for science information is the World Wide Web Virtual Library. Developed by the World Wide Web Consortium (W3C), it offers a comprehensive listing of Web pages for most major topics. The Virtual Library is logically organized and easy to use. It is also diverse in style and design—topic lists are maintained at sites around the world. The World Wide Web Virtual Library for Biosciences (<http://golgi.harvard.edu/biopages.html>), is sorted by subject area and offers a searchable index. The range of topics covered is broad, from agriculture to whale watching.

One useful link in that list is the Virtual Library for Physiology and Biophysics (<http://physiology.med.cornell.edu/WWWVL/PhysioWeb.html>), maintained by the Department of Physiology and Biophysics at Cornell University Medical College (see

“Physiology on the World Wide Web, *The Physiologist*, October 1995). The list of physiology and biophysics sites is exhaustive. One can find links to many departmental home pages, the Nobel Foundation, NIH grant application forms, and the home page of the International Lung Sounds Association, among others. One caveat: many of the sites here require special software (most commonly Netscape 2.0 and Adobe Acrobat) and contain graphics that can take a long time to download.

Another great site is the BIOSCI Home Page, at <http://www.bio.net>. BIOSCI provides the Bionet Usenet newsgroups and the corresponding mailing lists for professional scientists. This site provides an excellent Web interface for the newsgroups along with a post archive, a searchable user database, and a variety of links about Usenet.

Finally, just for fun, check out Hot AIR (<http://www.improb.com>), the “excitingly graphical and trendoid” home page of the *Annals of Improbable Research* (AIR). They are not kidding when they call this research improbable.

Please send URLs of interest, comments and suggestions to [kthompso@aps.faseb.org](mailto:kthompso@aps.faseb.org). Your submissions will appear in future issues of *The Physiologist*, as well as on the APS Home Page. ♦

#### Point your browsers at:

<http://www.luc.ac.be/research/groups/physiology> for the Department of Physiology at the Limburgs Universitair Centrum in Diepenbeek, Belgium, submitted by Emmy Van Kerkhove

<http://wings.buffalo.edu/medicine/phys> for the home page of the Department of Physiology at the State University of New York at Buffalo, submitted by Pam Garvey

<http://www.med.usf.edu/PHYSIO/physio1.html> for the home page of the Department of Physiology and Biophysics at the University of South Florida, College of Medicine, in Tampa, Florida, submitted by John R. Dietz

[http://www.uop.edu/pharmacy/HOME\\_PP/HOME\\_PP.HTM](http://www.uop.edu/pharmacy/HOME_PP/HOME_PP.HTM) will take you to the home page for the Department of Physiology and Pharmacology at the School of Pharmacy, University of the Pacific, submitted by Denis Meerdink

<http://showme.missouri.edu/~asrcwww/animalsciences.html> is the home page of the University of Missouri Animal Science Department, submitted by Donald E. Spiers

<http://www.uchsc.edu/sm/physiol> for the Department of Physiology at the University of Colorado Medical School, submitted by Bill Betz

<http://som1.ab.umd.edu/MuscleBiology/home.html> is the new home page for the Interdepartmental Muscle Training program at the University of Maryland at Baltimore and the University of Maryland, Baltimore County, submitted by Yu-Hua Jiang

### Don't Forget!

The APS Home Page is located at  
<http://www.faseb.org/aps/>

Stop by often to check on our progress and give us feedback via e-mail at: [kthompso@aps.faseb.org](mailto:kthompso@aps.faseb.org)

### Local Outreach Teams Approved by Council

The APS Council, at their April meeting, approved the selection of nine Local Outreach Teams (LOTs) to disseminate inservice physiology activities developed by APS for middle and high school teachers. The activities, "Neural Networks," for middle school teachers, and "The Physiology of Fitness," for high school teachers, were developed last year by two Local Action Teams (LATs): one in Columbus, OH, chaired by Jackie D. Wood (Ohio State University) and the other in San Diego, CA chaired by Frank Powell (University of California). Other LAT members included APS member Jean-Pierre Dujardin (Ohio State University), local science teachers, and science educators active in state and local science education reform organizations.

The nine sites were selected from among 14 proposals received from APS members and their institutions. Marsha Lakes Matyas, APS Education Officer, said "We were delighted by the enthusiastic response of members who are interested in taking an active role in enriching science education in their communities."

Members of the LOTs include APS members, coordinators from each of their institutions, local science teachers, and science educators from the local and state science education reform groups. Each site will receive reimbursement for local teachers to help plan and facilitate the workshop and develop workshop materials, stipends for teachers attending the training work-

shop, and travel costs for two LOT members to receive training in the use of these modules. Funding for this program is provided by the Frontiers in Physiology grant from NSF. Training for using these modules will be held in June at APS headquarters in Bethesda, MD.

The sites of the LOTs and their team leaders are:

- University of California, Davis—Barbara A. Horwitz
- Massachusetts General Hospital, Boston—Andrea R. Gwosdow
- East Carolina University, Greenville—Robert G. Carroll
- New York Medical College, Valhalla—Francis L. Belloni
- University of South Dakota, Vermillion—Barbara E. Goodman
- University of Texas Southwestern Medical Center, Dallas—George A. Ordway
- University of Texas Health Science Center, Houston—Norman W. Weisbrodt
- University of Texas Health Science Center, San Antonio—Jeremiah T. Herlihy
- Medical College of Wisconsin, Milwaukee—Jeffrey L. Osborn

For more information on how to participate in the LOT or LAT programs, contact APS Education Officer Marsha Lakes Matyas, tel: 301 530-7132; e-mail [mmatyas@aps.faseb.org](mailto:mmatyas@aps.faseb.org). ♦

### Columbus Teachers Attend Activities Workshop

Teachers from Columbus, Ohio, measured their reaction time and heart rate to an external stimulus as they participated in a physiology workshop "Neural Networks" on April 27 at The Ohio State University. The Inservice Workshop for Middle School Teachers was sponsored by APS under the Frontiers in Physiology program. It was organized by the Ohio Local Action Team (LAT), a team of physiologists, Columbus-area middle school teachers, and representatives from Project Discovery, the Ohio science education reform group.

The LAT, which is chaired by APS member Jackie D. Wood (Ohio State University), developed the training module last year. APS member Jean-Pierre Dujardin (Ohio State University) is also a member of this team. These activities were initially field tested by the 1995 Summer Research Teachers at the Summer Institute held at APS headquarters last July (*The Physiologist*, October 1995).

Nearly 25 teachers participated in the all day workshop in Columbus. The workshop marks the final field test of the activities.

Following any changes as a result of this field test, the "Neural Networks" activities will be published for distribution to the nine Local Outreach Teams (LOTs) recently named by the APS Council (see accompanying article). LOT members will receive training in the use of these activities at the LOT Institute, June 22-25, at APS headquarters in Bethesda, MD. ♦

### Mark Your Calendars for Experimental Biology '97!

**April 6-10, 1997**

**New Orleans, Louisiana**

## Education

### APS Education Office Continues *My Health, My World* Project for Grades K-4

The APS Education Office is in the second year of collaboration with the Baylor College of Medicine and the Texas Medical Association on *My Health, My World*, a project sponsored by the National Institute of Environmental Health Sciences. APS activities are supported by a subcontract from Baylor College of Medicine. The focus of the project is to develop, field test, and disseminate three science curricular units with materials for children in grades K-4. Each of the three units deals with the effects of the environment on human health and physiology. The field testing is taking place over the course of three years, on a one-unit-per-year basis, in classrooms in Houston, TX, Austin, TX, and Washington, DC.

Last year, the APS Education Office,

which coordinates the Washington, DC area field test, recruited 25 preschool and elementary school teachers in Washington, DC and Maryland. Most of the same group, plus some newcomers, attended the teacher's workshop at the APS conference center in Bethesda, MD on March 9, 1996. In a full-day session the teachers were trained to use the materials in the Year II unit, *Water and My World*. Education Office staff began the workshop by introducing printed materials for the unit and then the staff demonstrated the activities and provided guidance while the teachers did each of the hands-on science activities in the teacher guide. Activities included discovering the physical properties of water, measuring water in the human body, and learning environmental

health basics. Teachers were then provided with printed materials and activity supplies, as well as teacher and student evaluation forms.

Workshop attendees will return to the APS offices in June 1996 for a follow-up feedback session to discuss their evaluations of the unit activities and materials, as well as the reactions of their students. In early 1997, the Education Office will continue the project, bringing back the same group of teachers to repeat the field testing and evaluation process with the third *My Health, My World* unit.

For more information about this project contact Marsha Lakes Matyas, APS Education Officer, at (301) 530-7132 or by e-mail at [mmatyas@aps.faseb.org](mailto:mmatyas@aps.faseb.org). ♦

## Public Affairs

### Fox and Lantos Introduce Misnamed "Family Pet Protection Act"

On May 7, Reps. Jon Fox (R-PA) and Tom Lantos (D-CA) introduced a bill that would all but curtail the use of random-source dogs and cats in medical research and education. APS members should write to their Representatives urging them to oppose this legislation that would harm research without helping pets.

The misnamed "Family Pet Protection Act" (H.R. 3393) will do virtually nothing to reunite lost or stolen pets with their owners because it wrongly directs its focus on what its sponsors call "the crime of pet theft."

According to animal activist propaganda, as many as 2 million family pets are stolen each year. In a "dear colleague" letter soliciting cosponsors for their bill, Fox and Lantos cite a figure of 1 million stolen pets annually and claim that "many" of these animals end up in medical research. Claims that huge numbers of stolen pets are being sold to research labs are so outrageous that Merritt Clifton, the editor of the animal protectionist newspaper *Animal People*, has written that "the frequency of pet theft has been severely overestimated."

The use of dogs and cats in medical research, education, and testing is regulated by the USDA, and research facilities are required to report annually on the numbers of each regulated species they have used. According to the latest available statistics, in FY 1994, about 101,000 dogs and 33,000 cats were used for research, testing and education. The best estimates are that about half of those animals were specifically bred for research. If only 50,000 dogs and 16,000 cats were used for research, and the USDA is regulating the operation

*(continued on page 116)*

### Pet Protection Act

*(continued from page 115)*

tions of the dealers selling them, the allegation that hundreds of thousands of pets annually are stolen for research is truly ludicrous.

But people's concerns for their pets are real. The unfortunate part is that H.R. 3393 will do nothing to help the many thousands of pets who end up as strays because their owners did not house them properly housed in a fenced yard or provide them with an identifying tattoo, microchip, or collar.

What H.R. 3393 will do is eliminate directly or indirectly every source of non-purpose bred dogs and cats for medical research and education.

H.R. 3393 would do away with USDA-licensed Class B dealers, the individuals who purchase animals from breeders, private individuals, pounds and shelters, and other dealers, and then sell them for a variety of purposes, including research. There are about 1,000 licensed Class B dealers in this country, of whom about 50 are the principle suppliers of dogs and cats for

research. The USDA has raised concerns about its ability to police these dealers, and has announced its intention to seek a 2-year phase-out of Class B dealers. (See accompanying article.) But H.R. 3393 would eliminate Class B dealers outright plus place severe restrictions on the other potential sources of non-purpose bred animals.

H.R. 3393 would strongly discourage private donations of animals for research and would make it excessively difficult for local pounds to sell to research laboratories some of the estimated 10-16 million unwanted dogs and cats that are destroyed each year. H.R. 3393 would allow an individual to donate only 1 dog or cat per year for research. In order to sell dogs and cats for research, pounds and shelters which are currently regulated under local rather than federal laws, would have to conform to a whole host of requirements. Some, such as requiring employees to be trained in animal care and to sign a pledge that they have not been convicted of a crime related to animal theft or cruelty, may be good ideas, but they are not issues with which the federal government ought to be con-

cerned. Other requirements are extraordinarily burdensome. Pounds and shelters would not be permitted release an animal for research unless the person who relinquished it provided a rabies certificate or veterinary record for the animal as well as personal identification that matched the owner's name on the animal's medical records. Before being released for research, an animal would have to be held not just for 5 days (as provided under current law) but for 10 days, which is a very expensive proposition for a municipally-run or non-profit agency. The holding requirements and other restrictions would not apply to animals that will simply be euthanized. Under those circumstances, no rational pound or shelter manager would ever opt to provide animals for research.

**Write to your US Representative at the US House of Representatives, Washington, DC 20515 and send a copy to the APS Public Affairs Office at 9650 Rockville Pike, Bethesda, MD 20814. ♦**

## USDA Wants to Abolish Class B Dealers

USDA officials have announced that the agency intends to seek an end to Class B dealers as a source of random source dogs and cats for research. USDA Regulatory Enforcement and Animal Care (REAC) Administrator Dale Schwindaman discussed the proposal at an APS-sponsored symposium ("Animal Welfare Update") held at Experimental Biology '96.

Class B animal dealers are persons licensed under the Animal Welfare Act (AWA) to buy and sell animals they did not raise themselves. Class B dealers buy a variety of animals (i.e., dogs, cats, farm animals, and wild and exotic animals) from breeders, farmers, trappers,

individuals, other dealers, and from pounds and shelters. They then sell the animals for farming, hunting, exhibition, the retail pet trade, as well as for research. Some 50 of the 1,000 licensed Class B dealers account for the vast majority of dogs and cats sold to research institutions, and it is that function that is to be phased out over a two-year period.

According to Schwindaman, the rationale for ending Class B dealers as a source of dogs and cats for research is that USDA cannot adequately enforce the relevant Animal Welfare Act provisions. Of particular concern are the requirements that Class B dealers main-

tain individual identification and health records for every animal, making it possible to trace the animal's original owner. USDA conducted a detailed investigation of the records of the 50 largest Class B dealers and found that as many as half of some dealers' records were erroneous and possibly fraudulent. Effective USDA enforcement has been hindered further because funding for Animal Welfare Act enforcement has not even kept up with inflation over the last several years, and USDA's REAC has found that it lacks the authority to intervene quickly when problems occur.

*(continued on page 117)*

### USDA Throws in Towel

*(continued from page 116)*

These issues, combined with the entrenched public perception — wholly at odds with the facts — that stolen animals are being sold for research, has led USDA to propose the elimination of this category of animal dealers.

USDA's announcement that it is throwing in the towel on enforcing Animal Welfare Act provisions for Class B dealers has caused considerable consternation among some researchers and laboratory animal veterinarians. Many lab animal veterinarians were already taking considerable pains to assure themselves that the Class B dealers used by their institutions were taking good care of the animals, and they are disappointed that USDA's enforcement efforts have been so ineffective.

USDA has not yet offered up its legislation. However, it is very important in the meantime to assess the true costs of this plan. USDA estimates that switching from Class B-supplied animals to animals from Class A dealers would add only \$12 million per year to the cost of research in this country. However, the cost would undoubtedly fall disproportionately on certain kinds of research and on medical education.

APS members with information about how the loss of Class B dealer-supplied dogs and cats would affect specific research projects and/or medical education at their institutions are encouraged to contact Public Affairs Officer Alice Hellerstein (301/530-7105 or ahellers@aps.faseb.org). ♦

### NASA Convenes Blue-Ribbon Panel to Review Rhesus Research

In the face of an animal activist campaign against NASA participation in an upcoming Russian biostatellite mission, NASA Administrator Daniel Goldin has appointed a blue-ribbon panel to evaluate the use of rhesus monkeys in the study of how space flight affects bone, muscle, balance, and performance.

The review panel is being headed by Ronald Merrell, MD, Chairman of the Department of Surgery at Yale University. According to a NASA press release, the panel has been asked to determine whether the planned research "meet[s] NASA's requirements that the highest of ethical standards be met during all phases of these missions, and that the Bion science is of the highest integrity."

For the past year, Congress and NASA have been under pressure by animal activist groups to cancel the Bion 11 and 12 missions that are scheduled to fly on crewless Russian satellites in 1996 and 1997. The identical flights, each with a payload of two specially trained and instrumented rhesus monkeys will carry out US, French, and Russian experiments. The experiments are intended to take measurements and make observations that may elucidate how and why astronauts suffer space sickness, deterioration in the ability to perform certain tasks involving balance and coordination, and a loss in bone and muscle mass during space flight. Animal activists claim that research is unnecessary because human astronauts have successfully survived spaceflight.

APS President James Schafer wrote in April to members of the House and Senate subcommittees with jurisdiction over NASA funding in support of the need for controlled animal studies with an upright primate, such as the rhesus monkey, to provide more information about how weightlessness affects the body. Such information will be needed for the development of more effective countermeasures to the effects of weightlessness that can protect future astronauts on longer space flights. The activists who object to the use of rhesus monkeys as a research model have their priorities wrong, Schafer noted. "It would be ethically and scientifically unacceptable to knowingly deprive human astronauts of the benefits of known countermeasures to space sickness and bone and muscle loss for the purpose of learning how better to counter these effects. The use of rhesus monkeys is completely appropriate," Schafer wrote.

Schafer also pointed out that the specific research being proposed has already been reviewed for the merit of the science, the appropriateness of the procedures, and the humaneness of the animal care. He expressed concern that these reviews not be disregarded because of animal activists' "concerted efforts to cast false aspersions on the Bion project."

For more information, contact APS Public Affairs Officer Alice Hellerstein at 301/530-7105 or ahellers@aps.faseb.org. ♦

### The APS Public Affairs Web Page has grown...

Point your Browsers at <http://www.faseb.org/aps/pahome.htm> and check out the latest improvements. We look forward to your feedback and questions! Just send an e-mail to [paffair@aps.faseb.org](mailto:paffair@aps.faseb.org) or contact Public Affairs Assistant Dominika Trudgett at 301-571-0601.



### GAO Unable to Measure Regulatory Costs

After an investigation lasting 10 months, the congressional General Accounting Office (GAO) has told Representatives Dan Miller (R-FL) and John Porter (R-IL) that it is unable to determine the price tag for federal regulation of NIH-sponsored research.

Last June, Porter, the chairman of the House Appropriations Subcommittee on Labor-HHS-Education, and Miller, a member of the subcommittee, expressed concern to GAO that "less and less money is actually being spent on basic biomedical research and instead is funding excess paperwork and additional staff due to excessive regulation."

The Representatives asked GAO to identify the various costs associated with biomedical research to determine "how much of the federal dollar actually gets spent on the actual research." They also asked for a "list of the primary regulations and their accompanying costs."

In a March 25, 1996 response letter, the GAO confirmed that regulatory compliance is an increasingly burdensome problem but reported that "members of the research community were unable to provide cost data directly attributable to compliance activities."

Furthermore, according to the GAO, "even if such data could be obtained, they may not be very useful because they may be unreliable and may not be representative." One reason for that is the fact that institutions face specific challenges that "raise questions about the ability to generalize from the experiences of individual institutions."

After meeting with a number of organizations, including the APS, the GAO assembled a list of the areas of regulation cited most often as costly or burdensome, including handling and disposal of hazardous wastes, workplace safety and worker protection, human subject protection, humane care and use

of animals, cost accounting procedures, conflict-of-interest disclosure forms, permits for transporting biological samples, and compliance with the Americans with Disabilities Act.

However, the GAO pointed out that some state or local regulations are more stringent than federal regulations so that "the elimination of federal regulations would not reduce the burden or costs." Also, because operational costs vary widely, the implementation of regulations "may result in disparate costs in different locations." The GAO further found that although those interviewed were concerned about the growing and cumulative regulatory burden on research activities, they supported the goals of the regulations.

The APS believe excessive regulation is a serious problem and wants to identify how this burden might be reduced. The NIH is trying to be responsive to scientists' concerns through its Reinvention of Government (REIGO) activities, but other agencies have been much less receptive.

The APS Public Affairs Office continues to look for pertinent examples of regulations that should be changed. For example there are hazardous waste disposal regulations that were written for industries handling large quantities and strong concentrations of toxic materials, which probably could be adapted to produce simpler procedures for research laboratories handling small quantities and weak concentrations of these substances.

If you can suggest specific regulations affecting research that ought to be revised or adapted, please contact APS Public Affairs Officer Alice Hellerstein at 301/530-7105 or [ahellers@aps.faseb.org](mailto:ahellers@aps.faseb.org). ♦

### FASEB Honors Hatfield and Porter

FASEB has bestowed its 1996 Public Service Awards to Senator Mark Hatfield (R-OR) and Rep. John Porter (R-IL). Both men were recognized for their outstanding support of biomedical research and the NIH. The awards were presented at a Washington reception on May 2.

"These two individuals deserve the acknowledgement and special gratitude of the scientific community for succeeding in the Capitol Hill battle to support basic biomedical research," said FASEB President Ralph Bradshaw, who announced the awards.

Hatfield, who will retire from the Senate at the end of this year, has proposed a trust fund to supplement NIH appropriations. Last year Hatfield led the fight to amend the Senate budget resolution, which had called for a 10% cut in NIH funding as a source of funds to balance the budget.

Porter, who is chairman of the House Appropriations subcommittee with jurisdiction over NIH funding, has emerged as NIH's champion in the House. Earlier this year, Porter managed to secure a 5.7% increase for NIH in FY 1996 and stable full-year funding. Furthermore, Porter managed to do so at a time when many other government agencies were still operating on an ad hoc basis because of the ongoing dispute between the President and Congress over how to achieve a balanced budget.

### FY 1996 Budget Approved; Battles Loom Ahead

Action on the federal budget for fiscal year 1996 was finally completed in April, some seven months into the fiscal year, and President Clinton released the details of his FY 1997 budget proposals that include a 4% increase for NIH. Meanwhile, NIH advocates in the House and Senate have warned that it will be much more difficult to secure a generous increase this year, and concerns are also being raised that plans to balance the budget by 2002 will require sharp decreases in total federal spending after next year.

Final passage of FY 1996 funding was a milestone of relatively little importance to the NIH, since its dramatic 5.7% increase had been known since early January. But for other agencies, final passage of FY 1996 appropriations ended a long period of uncertainty.

The final conference agreement did settle a few issues for the NIH. The conferees told the agency to follow the instructions provided by both the House and Senate committee reports, and gave some additional guidance to help reconcile the differences. One such difference was the question of whether AIDS funding would be disbursed directly by the institutes (as the House wanted) or channeled through the Office of AIDS Research (the Senate's preference).

The conference report told NIH to follow the House view but stated explicitly that this is not to be considered "a precedent" for FY 1997 funding.

The details of President Clinton's \$1.64 trillion budget proposal for fiscal year 1997 were released on March 19. A brief outline of the plan had been released February 5 to meet a statutory deadline, but the full budget was not submitted until six weeks later.

The president's budget seeks \$12.4 billion for NIH, an increase of \$467 million or 3.9% over the FY 1996 funding level of \$11.9 billion. Budget plans for FY 1997 include setting aside \$310 million to build a new 250-bed Clinical Research Center with adjoining laboratories to replace the existing 40-year-old complex. NIH was required to make a one-time request for the entire amount because of Office of Management and Budget rules requiring that the full cost of federal construction projects be budgeted up front.

Even though two-thirds of NIH's increase is dedicated to the clinical center, the agency still proposes to increase RPGs by 2.6% by reducing other activities. The request calls for NIH to fund 6,827 new and competing RPGs, or 207 more new grants than in FY 1996. The total number of grants will reach an historic high of 25,400.

One major source of funding for new grants is a 50% reduction in the increase that was to be provided for continuing grants under NIH's Cost Management Plan. Instead of 4%, the increase available for continuing grants will be 2%. This will yield an estimated \$120 million.

The administration proposes to increase training by \$10 million (2.4%) in FY 1997, and to increase trainee stipends by 2.2%. Research and support activities will remain slightly above FY 1996 levels, but those were already 7.5 percent below the FY 1995 levels.

Intramural research will decline slightly (0.2%) from the FY 1996 levels.

One area that is getting a big boost is the small business research setaside, which will be increased by \$43 million to \$229 million, as mandated by law. APS has asked Congress to relieve NIH of the obligation to fund a fixed number of small business grants unless the quality of the research is comparable to that of R01 grants.

APS supports a 6.5% increase overall for NIH in FY 1997. But some NIH advocates on Capitol Hill are warning that this kind of increase will not be easy to achieve. At a FASEB reception honoring their efforts on behalf of the NIH, Sen. Mark Hatfield (R-OR) and Rep. John Porter (R-IL) urged scientists to redouble their efforts to convince Members of Congress that NIH deserves the 6.5% funding increase recommended by the FASEB consensus conference and the Ad Hoc Group for Medical Research Funding.

Porter, who chairs the House Appropriations Subcommittee with jurisdiction over NIH funding, urged scientists to meet with their Representatives and Senators in their district offices. He also recommended that they write letters and editorials for local newspapers explaining how NIH-funded research benefits the community and why NIH deserves a major increase.

Meanwhile, the American Association for the Advancement of Science is warning that despite increases this year, the administration's projections for achieving a balanced budget by the year 2002 will require significant belt-tightening for all federal programs over the next few years. The AAAS calculates that while total federal spending on civilian research and development will increase about 3.3% above inflation in

#### Communicating With Congress

For help in arranging visits with your Members of Congress and topics to discuss with them, visit the Public Affairs Page on the World Wide Web by pointing your browser to <http://www.faseb.org/aps/> and then clicking on public affairs.

You can also call the APS Public Affairs Office at 301/530-7105 to request a resource packet on communicating with Congress.

*(continued on page 120)*

## Public Affairs

(continued from page 119)

FY 1997, it will decline by 5-6% after inflation in FYs 1998, 1999, and 2000.

Although future budget projections are certainly subject to change, it seems likely that the administration has constructed a balanced budget plan that holds off the most painful cuts until after the 1996 election. This means that no matter who wins, there will be much less federal discretionary funding to go around.

With competition over scarce resources expected to be much harsher, it is more important than ever to make the case for biomedical research in our communities and with our elected representatives. ♦

### FY 1997 Funding Requests

The President requested \$3.3 billion for the National Science Foundation in FY 1997, a 4.6% increase over FY 1996. Research and related activities overall is slated for an 8.7% increase to \$2.5 billion, and the BIO directorate is to be increased 8.6% from \$300 million to \$326 million. No funding is being requested for the Academic Research Infrastructure Program.

The President requested \$257 million for VA medical research to fund 1,600 projects. This is the same funding level as in FY 1996.

Level funding is also expected for USDA Animal Welfare Act (AWA) enforcement in FY 1997. However, that level is still 1% lower than FY 1995 funding for AWA enforcement. AWA enforcement has been stagnant for a number of years, and USDA is again proposing to levy user fees on research institutions to help defray the costs of its inspections.

## Positions Available

**Lecturer (Assistant Professor level).** One-year appointment, non-tenure track position, commencing September 1, 1996, in the Department of Exercise Science and Sport Studies at Rutgers, The State University of New Jersey, specializing in Exercise Science/Physiology. Applicants must have documented teaching experience in areas of anatomy and kinesiology. Responsibilities also include undergraduate academic advising. PhD required in exercise science, physical education, or related areas. Salary competitive and contingent on qualifications. Submit letter of application, curriculum vita, and three letters of recommendation to: David A. Feigley, Chair, Department of Exercise Science and Sport Studies, Loree Gymnasium, PO Box 270, New Brunswick, NJ 08903-0270. [EOAAE]

**Molecular Biologist.** A tenure-track assistant/associate professorship is available for a molecular biologist

whose research interests in nerve and/or muscle cells complement those of the neurobiology or cardiopulmonary faculty in the department. The successful candidate must have a PhD or equivalent degree and is expected to establish an extramurally funded research program as well as participate in teaching general physiology, developmental biology, or related courses to graduate and undergraduate students. The deadline for applications is July 15, with a starting date between December 1, 1996 and August 1, 1997. An application letter, description of current and long-term research interests, description of teaching experience and interests, curriculum vita, and four letters of reference should be sent to: Douglas N. Ishii, Search Committee, Department of Physiology, Colorado State University, Fort Collins, CO 80523. Colorado State University is an EO/AA Employer. Women and ethnic minorities are strongly urged to apply.

### 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.

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. Copy must reach the APS office before the 15th of the month, two months preceding the month of issue. Mail copy with payment to:

*The Physiologist*  
APS  
9650 Rockville Pike  
Bethesda, MD 20814-39911



## Senior Physiologists

### Letter to John R. Blinks

**Harold G. Hempling** writes, "I became Professor Emeritus in February 1995. I am still doing research with a modest grant from the Biomedical Research Support Fund. My current interest is computer modeling of the regulation of cell volume and pH. A recent description of a teaching computer laboratory will appear in the next issue of *Advances in Physiology Education*."

"You asked in your letter whether I had any comments or even "words of wisdom" for my colleagues. What may I say? Our department once had 15 teaching laboratories in medical physiology. We now have two. Faculty once had individual grants with their one or two graduate students doing innovative, new research. Now those faculty who have not lost their grants are bonded together in a super grant with technicians, postdoctoral fellows, and graduate students who have been assigned a small piece of the action. At thesis exams, it is difficult to tell what the graduate students did and what the technicians contributed. Seminars end with the usual last slide listing a dozen or more individuals who participated in the research."

"The generation gap is widening."

### Letter to Robert M. Berne

**James O. Davis** writes, "I will be an octogenarian in July 1996. For years I felt no need for a personal computer but the dramatic changes in telecommunication which occurred in 1995 convinced me that the PC and the Internet are becoming increasingly important. I purchased a PC in February and joined the University of Missouri, Columbia online service. Now I am enjoying browsing the Internet. My e-mail address is [physjod@showme.missouri.edu](mailto:physjod@showme.missouri.edu)."

"I continue to have an office in the

Department of Physiology of the School of Medicine. Mrs. Davis and I attend the annual meeting of the National Academy of Sciences each year and visit with long-time friends in Bethesda, MD. My major research interest continues to be the renin-angiotensin-aldosterone system, which has been very interesting to follow as its frontiers develop in molecular biology. I enjoy keeping up with the changes in the business world and I invest in common stocks, mutual funds, and municipal bonds. My comments would not be complete if I do not tell you that I fly fish for rainbow trout in the Missouri Ozarks."

### Letter to Richard L. Malvin

**Panayotis G. Iatridis** writes, "Presently, I do not plan to retire since the new law which abolished mandatory retirement allows me to remain a tenure faculty beyond the age of 70. Biologically, I feel young and active and continue my activities uninterrupted."

### Letter to Eugene M. Renkin

**Julian Marsh** writes "I am really a biochemist, but my ties to physiology have always been strong. I started my research in the laboratory of David L. Drabkin, who had a very physiologic view of biochemistry and indeed was really a physiological chemist."

Marsh is now actively engaged in studies of lipoprotein metabolism as part of an NIH Program Project of which he was the original Principal Investigator (in 1978), at the Medical College of Pennsylvania and Hahnemann University.

Marsh and colleagues have been using stable isotopes and mass spectrometry for measuring apolipoprotein turnover

in human subjects, and well as Apo B metabolism in relation to omega-3 fatty acids in cultured cells. He is also interested in lipoprotein secretion, especially in the nephrotic syndrome. His latest work on this topic involves transgenic human A-I rats.

### Letters to Harold S. Weiss

**Burton E. Vaughan** writes, "I am seventy, in reasonably good health, and now enjoying teaching at Washington State University-Tricities. Teaching is something I had planned as a career change after my retirement from Pacific Northwest National Laboratory (Battelle). Having devoted 20 years to managing the Environmental Sciences Division at Battelle, I felt it was time to recharge my own batteries, and I had several specific ideas in mind."

"A compelling concern that has bugged me for many years was the narrow disciplinary outlook of many of my research colleagues. Just as any environmental issue cuts across a dozen disciplines in the biological sciences, earth sciences, and chemistry, so some breadth of knowledge in each discipline is essential for either a scientist or teacher to contribute anything useful. Teaching environmental science has allowed me the time to synthesize a great deal of both personal experience and new information and to pass it on to the next generation of students."

"I was fortunate to have both trained as a physiologist and taught physiology. As a discipline, the systems approach and holistic viewpoint of physiology gave me a helpful outlook that prepared me to move into other interesting areas and learn enough to be productive. Consequently, my several career changes have been rather evolutionary, and they have progressively strengthened my knowledge of biology. I owe a particular debt also to my mentor, Nello

*(continued on page 122)*

## Senior Physiologists

(continued from page 121)

Pace (deceased), a physiologist who had the foresight to insist on basic science training far beyond the graduate physiology curriculum as it existed at Berkeley in 1950.

“Membrane physiology continues to fascinate me, although my personal research in this area is far in the past.”

**Madison S. Spach** writes, “I am a full time faculty member of the Duke University School of Medicine with a joint appointment in the Department of

Pediatrics and the Department of Cell Biology. I will become emeritus professor as of 7/1/96, but I have made arrangements to continue full time in my research (I have two more years on my R01 grant and the Medical Center will let me keep my research space).

“I am still working on papers to submit for peer review concerning the research we are doing.

“I have no words of wisdom for my younger colleagues. All of the junior scientists I know are doing exciting and important work. It is most distressing, however, to see that some are having to

leave their academic positions when their grants are not funded. I still am convinced that integrative physiology will be the way of the future when the major wave of genetic and molecular biology moves much further. My hope is that academic leaders will have the wisdom to invest a part of their institutional resources in integrative biological scientists. They will be greatly needed when the time comes to meet the ultimate challenge of putting together the genetic and molecular information at different size scales to build a total healthy body.” ♦

## Obituary

### Melvin J. Fregly 1926-1996

Melvin J. Fregly, Graduate Research Professor of Physiology at the University of Florida, Gainesville, died on January 13 at the North Florida Medical Center. He was 70 years of age.

Born in Patton, PA, Fregly graduated valedictorian from Patton High School in 1941 and shortly afterward served in the US Army in the Southeastern Pacific Theater during World War II. He was with the 304th Signal Operation Battalion of the 8th Army in New Guinea, the Philippine Islands, and Japan. After three years in the service, he returned to school and received bachelors and masters degrees in biology from Bucknell University in Lewisburg, PA, and a PhD in physiology in 1952 from the University of Rochester, NY, in the laboratory of E. F. Adolph.

One of the first faculty members of University of Florida's College of Medicine, Fregly began his career as a

physiology instructor at Harvard Medical School in Boston. In 1956, when the first medical class entered the University of Florida College of Medicine, he became an assistant professor in physiology. He was promoted to associate professor in 1960 and to professor in 1965.

From 1964 to 1965, Fregly was acting chairman of the physiology department and served as assistant dean for graduate education at the College of Medicine from 1967 to 1972. In 1979, he was appointed graduate research professor.

Fregly authored more than 500 papers and four books and contributed to approximately 50 books during his career. He also served on the editorial board of many publications, including *Proceedings of the Society for Experimental Biology and Medicine*, the *American Journal of Physiology*, and the *Journal of Applied Physiology*. Most recently, he edited the new edition of the *Handbook of Physiology. Environmental Physiology* along with Clark M. Blatteis. Fregly mentored well

over 100 students and postdoctoral fellows.

He served as a consultant for over 40 years, most recently to the Space Station Science and Advisory Subcommittee to NASA.

In addition to being a member of APS, Fregly was also active in many other US and Canadian professional societies, including the Canadian Physiological Society, The Endocrine Society, the American Thyroid Association, the American Heart Association, the Society for Experimental Biology and Medicine, the American Society of Zoologists, and the Aerospace Medical Association.

He is survived by his wife, Marilyn Southwick Fregly of Gainesville and two brothers: Henry Fregly of Tallahassee, FL and Deacon Gilbert Fregly of Johnstown, PA.

Expressions of sympathy may be made as donations to the Melvin Fregly Travel Fund, American Physiological Society, 9650 Rockville Pike, Bethesda, MD 20814-3991. ♦

## People and Places

Moving from the Department of Biological Sciences, California State University, Long Beach, California, **Rajen S. Anand**, has joined the Center of Nutrition, Policy, and Promotion of Washington, DC.

Accepting a position with the Monash University as Head of the Department of Physiology, Clayton, Victoria, Australia, **Warwick P. Anderson** was formerly associated with the Baker Medical Research Institute, Prahran, Victoria, Australia.

**Kenneth L. Barker** is no longer affiliated with the Department of Research and Graduate Studies, Texas Tech University Health Science Center, Lubbock. Barker is now affiliated with the State University New York Health Science Center, Syracuse, NY.

**Caroline A. Connelly** has accepted an appointment with the Department of Surgery, Transplant, Research, Cedars-Sinai Medical Center, Los Angeles, CA. Prior to her new position, Caroline A. Connelly was with the Department of Surgery, University of California, Davis, Sacramento, CA.

Formerly with Reiss Science, Georgetown University, Washington, DC, **Michael Graham Espey** is now with the Laboratory of Neuroscience, NIDDK, NIH, Bethesda, MD.

**Diane T. Finegood** is now affiliated with the School of Kinesiology, Simon Fraser University, Burnaby, British Columbia, Canada. Formerly, Fine-good was with the Division of Endocrinology and Metabolism, Uni-versity of Alberta, Canada.

**William Freas** has joined the Center for Biologics Evaluation and Research, Food and Drug Administration, Rockville, MD. Freas was affiliated with the Anesthesiology Department, the Uniformed Services University of Health Science, Bethesda, MD, prior to his new appointment.

**Bret H. Goodpaster** has accepted a position with the Department of Medicine, University of Pittsburgh, Pittsburgh, PA. Prior to his new position, Goodpaster was associated with the Human Performance Laboratory, Ball State University, Muncie, IN.

**Vyvian Gorbea-Oppliger** has moved from the Department of Pharmacology and Toxicology, Michigan State University, East Lansing, MI, to the Hypertension and Vascular Research Division, Henry Ford Hospital, Detroit, MI.

Formerly associated with the Department of Animal Science, North Carolina State University, **Friederike Luking Jayes** has accepted a position with the Department of Internal Medicine, University of Virginia Health Science Center, Charlottesville, VA.

**Shinya Kuno** is no longer affiliated with the Department of Life Science, University of Tokyo Graduate School, Meguro-ku, Tokyo, Japan. Kuno is now with the Institute of Health and Sports Science, University of Tsukuba, Tsukuba, Japan.

**Matthew Gerard Melaragno** has obtained a position with the Department of Medicine, University of Washington,

Seattle, WA. Prior to his new assignment, Melaragno held a position with the Department of Pharmacology/Toxicology, Michigan State University, Lansing, MI.

Now associated with the Second Department of Internal Medicine, Nagoya City University Medical School, Nagoya, Japan, **Koichi Miyagawa** was formerly associated with the Oregon Regional Primate Research Center, Beaverton, OR.

**Patrick J. Mueller** has left the Department of Pharmacology/Physiology Science of St. Louis, Mo. Mueller is now with the Department of Anesthesiology, Medical College of Wisconsin, Anesthesia Research, VA Medical Center, Milwaukee, WI.

No longer affiliated with the Department of Cell Biology, University of Medicine and Dentistry, Stratford, NJ, **Rudravajhala Ravindra** has relocated to the Endocrine Research Department, VA Medical Center, North Chicago, IL.

**Ann Schreihof** is currently with the Department of Pharmacology, University of Virginia, Charlottesville, VA. Previously, Schreihof was affiliated with the Department of Neuroscience, University of Pittsburgh, Pittsburgh, PA.

**Don David Sheriff** has accepted a position as a Research Physiologist with the Armstrong Laboratory, Brooks Air Force Base, TX. Prior to his new position, Sheriff was affiliated with the Cardiology Department, St. Elizabeths Medical Center, Tufts University School of Medicine, Boston, MA.

Previously with the Ophthalmology and Physiology Departments, New York University Medical Center, New York, NY, **Jose A. Zadunaisky** has accepted a position with the Rosenstiel School of Marine & Atmospheric Science, Marine Biology and Fisheries, Miami, FL.

**Dion H. Zappe** has joined Astra Merck, Inc., Providence, RI. Previously, Zappe was affiliated with the Department of Physiology and Biophysics, University of Mississippi Medical Center, Jackson, MS.

### Deceased Members

Clarissa H. Beatty	Portland, OR
S. Rulin Bruesch	Memphis, TN
Carl A. Goretsky	Montreal, Canada
Harold D. Green	Winston-Salem, NC
James W. Green	Highland Park, NJ
Richard A. Groat	Greensboro, NC
Gail H. Gurtner	Valhalla, NY
Hiroshi Hosomi	Kagawa, Japan
Michael T. Kopetzky	Lubbock, TX
Seward E. Owen	Sun City, AZ
Francis O. Schmitt	Cambridge, MA
Walter H. Seegers	Walnut Creek, CA
Paul W. Smith	Oklahoma City, OK

## Books Received

### Audiovisual Publication and Materials

Available from: American Gastroenterological Association Audiovisuals, Milner-Fenwick, Inc., Timonium, MD.

*Integrated Response to a Meal.* Stephen Pandol and Helen E. Raybould. Undergraduate Teaching Project, American Gastroenterological Association, 1995, slide unit with text, \$135.00.

Independent use or supplement to *Integrated Response to a Meal*. Complete set, 102 slides, 56-page text, and 19-minute video, \$195.00.

*Gastrointestinal Movements and Their Functions* (videocassette). Stephen Pandol and Helen E. Raybould: American Gastroenterological Association, 1995. 1 videocassette: 19 min., sound, color, \$75.00.

*Calcium Signalling in the Nervous System.* P.G. Kostyuk and A.N. Verkhratsky. New York: Wiley, 1996, 206 pp., illus., index, \$89.95. ISBN: 0-471-95941-3.

*Cell Physiology Source Book.* Nicholas Sperelakis (Editor). San Diego, CA: Academic, 1996, 738 pp., illus., index, \$49.95. ISBN: 0-12-65697-1.

*Comparative Vertebrate Neuroanatomy: Evolution and Adaptation.* Ann B. Butler and William Hodos. New York: Wiley, 1996, 552 pp., illus., index, \$74.95. ISBN: 0-471-88889-3.

*Control of the Cardiovascular and Respiratory Systems in Health and Disease.* C. Tissa Kappagoda and Marc P. Kaufman (Editors). Advances in Experimental Medicine and Biology, Volume 381. New York: Plenum, 1995, 224 pp., illus., index, \$79.50. ISBN: 0-306-45121-2.

*G Proteins.* Patrick C. Roche (Editor). New York: Academic, 1996, 409 pp., illus., index, \$90.00. ISBN: 0-12-185299-7.

*Imitation in Human and Animal Behavior.* Wanda Wyrwicka. New Brunswick, NJ: Transaction Publishers, 1996, 101 pp., illus., index, \$29.95. ISBN: 1-56000-246-8.

*Modeling and Control of Ventilation.* Stephen J.G. Semple, Lewis Adams, and Brian J. Whipp (Editors). Advances in Experimental Medicine and Biology, Volume 393. New York: Plenum, 1995, 373 pp., illus., index, \$95.00. ISBN: 0-306-45180-8.

*Muscle, Matrix, and Bladder Function.* Stephen A. Zderic (Editor). Advances in Experimental Medicine and Biology, Volume 385. New York: Plenum, 1995, 271 pp., illus., index, \$85.00. ISBN: 0-306-45193-X.

*Nitric Oxide and Radicals in the Pulmonary Vasculature.* E. Kenneth Weir, Stephen L. Archer, and John T. Reeves (Editors). Armonk, NY: Futura, 1996, 509 pp., illus., index, \$85.00. ISBN: 0-87993-631-2.

*Physiology of Cephalopod Molluscs: Lifestyle and Performance Adaptations.* Hans O. Pörtner, Ron K. O'Dor, and David L. Macmillan. Basel, Switzerland: Gordon and Breach, 1994, 214 pp., illus., index, \$94.00. ISBN: 2-88449-027-2.

*Psychophysiology: The Mind-Body Perspective.* Kenneth Hugdahl. Cambridge, MA: Harvard University Press, 1996, 429 pp., illus., index, \$49.95. ISBN: 0-674-72207-8.

## Book Reviews

### Physiological Monitoring and Instrument Diagnosis in Perinatal and Neonatal Medicine

Yves W. Brans and William W. Hay, Jr. (Editors)  
New York: Cambridge University Press, 1995, 385 pp., illus., index, \$130  
ISBN: 0-521-41951-4

This unique contribution to the neonatology literature describes the technology of physiological monitoring and instrument-derived assessments in neonatal and perinatal medicine.

The purpose of this new book is to describe how and why instruments in peri-

natal/neonatal medicine work and how they should be used. Additional purposes are to provide a single source for reference when technological questions occur and to provide an understanding of how each instrument works in order to optimize clinical applications and knowledge of strengths and limitations. The book meets these objectives in a consistent and comprehensive manner.

The book is targeted for physicians, nurses, students, and trainees. The extensive biomedical content, however, will likely be useful only to perinatal/neonatal clinicians and investigators, especially to neonatologists and neonatology trainees. The chapters on fetal pH monitoring and cardiotocography will also be relevant to perinatologists and perinatal trainees. The book will also be very useful to laboratory investigators and

graduate students utilizing any of the physiological monitors or instruments described herein.

Although not all of the authors are well known, this international group of authors presents a comprehensive review and the style is of consistently high quality. The book provides a state-of-the-art description of the technology, clinical applications, analytical strengths, and limitations of available instruments related to imaging, oxygenation, electrical monitoring, machines, blood flow, and hyperbilirubinemia. The focus is on the high risk neonate, but chapters on fetal pH and cardiotocography monitoring are also included. The references are comprehensive and pertinent both to the technology and to its applications. Each chapter includes pictures, graphs, and tables to



## Book Reviews

emphasize important points.

This book is a unique contribution to the wealth of available neonatal/perinatal textbooks, presenting in a single volume the technological background and clinical applications of all current instruments. This book should be read and frequently reread by all neonatologists and neonatal trainees. The two chapters related to fetal monitoring will also be of value to perinatologists and perinatal trainees. Although written with a clinical perspective in mind, the comprehensive biomedical content will also be invaluable to laboratory investigators desiring to monitor any of these physiological parameters.

*Carl E. Hunt  
Medical College of Ohio*

### August & Marie Krogh: Lives in Science

Bodil Schmidt-Nielsen  
New York: Oxford University Press, 1995,  
295 pp., illus., index, \$49.95  
ISBN: 0-19-509099

August Krogh may have been the greatest physiologist of the first half of the 20th century. Certainly, he was the most versatile. He was one of those few scientists of any period who make seminal contributions to several diverse areas of study and the last physiologist in modern times to do so. His contributions involved insights into gas exchange in the lungs, regulation of the capillaries (for which he was awarded the Nobel prize in 1920), comparative physiology of osmoregulation and respiration, transport of ions in animals and plants, the use of isotopes as tracers, exercise physiology, and insect flight, to name only the most obvious. He helped to show how knowledge of physiology could benefit humankind. His wife Marie, an accomplished scientist in her own right, contributed materially to Krogh's accomplishments through her intellectual stimulus and her loving and understanding support.

This biography traces the lives of this remarkable man and his highly accomplished wife. The author, Bodil Schmidt-Nielsen, the daughter of August and Marie Krogh, had two major assets in undertaking such a biography. First, she had access to voluminous correspondence between Krogh and his family, his scientific colleagues, and

his friends, as well as correspondence between members of Krogh's family. Drawing upon these resources as well as the scientific records of August and Marie Krogh and upon interviews with many who knew them, she has written a truly insightful biography, not simply a memoir of her father and mother, as interesting as that might have been. Second, as a distinguished physiologist herself (and a former president of the American Physiological Society), she has been able to interpret for the reader, both scientist and nonscientist, the development of Krogh's scientific ideas and his experimental techniques.

The description of Krogh's early life and school years gives a clear picture of the way in which his view of the world around him presaged his development as a creative scientist. The influence of a family friend, zoologist William Sorensen, on Krogh's interest in biological phenomena is clear, but it is even clearer that a natural curiosity about the world, a need to try to understand it in simple physical terms, and an ability to design simple devices formed the basis for his later intellectual and technical approaches to physiological problems.

Numerous other characteristics about Krogh and his approach to science emerge in the course of this biography. When Krogh made a decision to follow a particular route, he pursued that course with intense determination. This was true of his career choices, first to study biology and later to concentrate on physiology. It was also true of his choices of research problems, including his work that clearly demonstrated that oxygen moved from the lungs to the blood by diffusion, not active secretion as suggested by his teacher, Christian Bohr. The painful controversy with Bohr, who did not want to accept Krogh's findings, is sensitively and thoughtfully portrayed. This controversy delayed publication from 1906, when the first studies were performed, until 1910. Krogh was obviously saddened by Bohr's refusal to accept his findings, but he never deviated from the direction in which his experimental work led him. He simply performed additional studies to reconfirm his results. Schmidt-Nielsen's evocation of this research period also provides a clear picture of the technical innovations, so characteristic of Krogh, that made it possible for him to obtain critical data that others could not. His ability to picture in his mind the appropriate design of a piece of apparatus down to the

most minute detail before ever putting pencil to paper was truly remarkable. This period of Krogh's work also demonstrated how closely Marie Krogh collaborated with her husband, aiding in performing experiments, discussing ideas with him, and providing emotional support.

Schmidt-Nielsen's portrait of this remarkable scientist also provides a picture of one in whom considerable genuine humility coexisted with substantial self-confidence. Krogh did not think that his own work was necessarily more significant than that of other careful scientists or even close to what he hoped to achieve. However, although he had doubts about the relative importance of what he was accomplishing, as reflected in his letters and comments, he had no doubts about the technical quality of his work, and those around him recognized both its quality and his potential even when he was quite young.

When Krogh was awarded the Nobel prize for his work on the regulation of the capillaries he felt that the work was only a beginning, too preliminary and insignificant for such a great honor. He was both wrong and right in his assessment of his work: wrong because it deserved the honor, for it opened an entire field of study and gave it a direction that no one had envisioned; right because it was just a beginning for all that needed to be learned. That work is still cited today as the basis of much current research.

Despite Krogh's humility concerning the importance of his own research compared with that of others, he was unwavering in his belief in the significance of scientific data obtained with experimental rigor. When he had worked out all the technical details and had obtained data that had been tested in every conceivable way, he had full confidence in the explanations of biological phenomena that emerged. Such scientific explanations, derived from his own careful work, clearly gave him great joy and satisfaction.

I have only touched upon a few of the strengths of this biography and the pleasure and understanding that one can derive from reading it. I would like to end on a personal note. I have known for the past 35 years that Schmidt-Nielsen was gathering material for this book. For that entire period, I have looked forward to reading it. I have not been disappointed. It is an excellent book, which should be read by every physiologist. However, as one who finds Krogh a remarkable figure, I only regret not being able to

## Book Reviews

read the material that the author left out to keep the book focused and of readable length. Perhaps, that material could make an additional small memoir.

*William H. Dantzer  
University of Arizona*

### **Fever and Antipyresis: The Role of the Nervous System**

Keith E. Cooper  
New York: Cambridge University Press, 1995, 182 pp., illus., index, \$49.95  
ISBN: 0-521-41924-7

Interest in the mechanisms of thermoregulation and fever has inspired hundreds of research papers and numerous review articles, written from the varied perspectives of clinicians, physiologists, biochemists, and, more recently, neuroscientists. During the last four decades, Keith Cooper has been a steady contributor to our understanding of this multidisciplinary field. The strength of Cooper's most recent contribution lies in his ability to integrate early advancements and more contemporary issues into a readable and often detailed synopsis of thermoregulation in health and illness.

Although a general introduction to the subject makes this text suitable for a wide audience, its main emphasis clearly rests upon the complex function of the central and peripheral nervous systems in regulating fever and antipyresis. The publication of this book seems well timed to a resurgence of interest in the field during last decade, especially as it applies to new insights into neurochemical signal transduction in the central nervous system.

Research issues are organized into three major discussions. The first section defines the terminologies, biological and clinical relevance of the febrile process, and thermoregulation in general. Included in this introduction are excerpts drawn from many key studies on the physiology of fever, some dating back to the turn of the century.

This discussion is followed by an account of the often contentious observations that form our current understanding of the mechanisms of fever generation. These are highlighted by descriptions of the known biochemical mediators of fever, their sites of access into the central nervous system, and how the febrile process integrates with

the normal operations of thermoregulatory centers in the brain. The author recalls numerous studies from the 1950s through 1960s that culminated in our current views of the anterior hypothalamus/preoptic area as a key locus of fever regulation.

This section also summarizes a difficult body of evidence concerning possible mechanisms of action of various pyrogenic cytokines and prostaglandins on central thermosensitive neurons. It is concluded that, even though prostaglandins most likely play a major role in raising the febrile temperature "set-point," thermosensitivity of anterior hypothalamic/preoptic neurons may be altered by multiple neurochemical mediators in complex thermoregulatory pathways. The ensuing discussion summarizes mechanisms of hypothalamic control of thermogenic effector systems, such as shivering and nonshivering thermogenesis, and sympathetic vasomotor responses.

The last major section of the book describes a recently developed concept of endogenous antipyretic pathways within the central nervous system. It brings together some of the most interesting work to emerge from thermoregulatory research of late. Initial observations suggested that the central nervous system has the potential to suppress the normal febrile process in newborn and pregnant animals. Cooper summarizes the mounting evidence, from his and other laboratories, that neuropeptides such as arginine vasopressin and alpha-melanocyte stimulating hormone are released from discrete brain sites to prevent fever or to reset febrile body temperature toward normal values. This process holds special clinical interest, since many of our current "fever medicines" may interact with these endogenous antipyretic mechanisms to produce their pharmaceutical benefits and/or contraindications.

This book is well written and provides an informative review of a multidisciplinary field. This is especially true for neurobiologists who may find it difficult to put the rapid advancements in neuropharmacology of fever into perspective with the earlier physiological studies on fever generation and temperature regulation.

*Bruce Mathieson  
Dalhousie University*

## Announcements

### **FASEB Career Resources Serves Employers and Job Seekers**

The FASEB Career Resources Office offers three services to both employers and job seekers in the biomedical industry. These services are available for a small fee to all interested persons.

Careers OnLine is an electronic job bank that matches applicants at all stages of their careers with employers who are seeking biomedical scientists and technicians. FASEB hopes to introduce an interactive registration process and search capability through the World Wide Web within a few months.

FASEB is currently running a "sale" on registration to Careers OnLine. Student registration is currently \$20 if the student enters the data him or herself and \$30 for FASEB to enter the data for the student. Nonstudent registration is currently \$30 for self-entry and \$40 for FASEB to enter the data.

FASEB Job Fairs feature computerized registration and searches and interviewing facilities at selected meetings of both national and international member and non-member societies. Recently, a Job Fair was held at the American Association of Immunologists Annual Meeting June 2-6 in New Orleans. Small registration fees may apply to the employer of the job seeker.

FASEB Career Resources publishes Careers HardCopy, a newsletter devoted solely to employment opportunities and positions desired within the biomedical professions.

To register for Careers OnLine, to find out information on Job Fairs, or to get a copy of Careers HardCopy please contact the FASEB Career Resources Office at: 9650 Rockville Pike, Bethesda, MD 20814-3998; tel: 301-530-7086; fax: 301-530-7001. ❖



## Announcements

### APS Research Career Enhancement Awards

**Statement of Purpose:** The APS Research Career Enhancement Awards are designed to enhance the career potential of our members. The awards will provide up to \$4,000 to allow individuals in the early phases of their careers to obtain special training and in later phases of their careers to develop new skills and to retrain in areas of developing interests.

The Awards can be used to support short-term visits to other laboratories to acquire new scientific skills or atten-

dance at special courses devoted primarily to methodologies appropriate for both new investigators and more senior investigators entering a new field of research.

**Application Procedure:** Candidates, who are regular members in good standing, may submit an application form including a curriculum vitae, justification for requesting an award, description of enhancement activity and current research program (not to exceed 2 pages), and anticipated budget for the

proposed program of enhancement. The applicant must also include a letter of support either from his/her department chair, host laboratory, or other appropriate individual.

**Application Deadlines:** February 15 and August 15.

**Additional Information and Application Materials:** Martin Frank, PhD, Executive Director, The American Physiological Society, 9650 Rockville Pike, Bethesda, MD 20814-3991. Tel: 301-530-7118; fax: 301-571-8305. ♦

### NASA Research Announcements for Microgravity Biotechnology

The National Aeronautics and Space Administration (NASA) has announced a solicitation for scientific research proposals. The release date for the announcement was May 24, 1996.

#### NASA Research Announcement (NRA-96-OLMSA-03)

*Microgravity biotechnology: Research and Flight Experiment Opportunities*

**Letters of Intent Due: July 19, 1996**

**Proposals Due: August 27, 1996**

Proposals requested by these announcements may be for ground-based research investigations or space flight experiments designed for spacecraft such as the Space Shuttle or the International Space Station.

The solicitation is available electronically via the Internet at <https://peer1.idi.usra.edu>. Paper copies of these announcements are available to those who do not have access to the Internet by calling 202-358-4180 and leaving a voicemail message. Please leave your full name and address, including zip code and telephone number with area code.

Questions regarding these announcements can be addressed to NASA Headquarters, Code UG/Microgravity Science and Applications Division, Washington, DC 20546, Attn: Stephen Davidson. Tel: 202-358-0813; e-mail: [stephen.davidson@hq.nasa.gov](mailto:stephen.davidson@hq.nasa.gov).

### Videos on Scientific Integrity Now Available

A set of five videos designed as a training tool to promote responsible conduct in scientific research is available from the American Association for the Advancement of Science (AAAS). The videos dramatize "gray areas" in which people may differ over the proposed course of action, triggering discussion about options for responding to the situations.

Ethical issues addressed include sharing of data, allocation of credit, reporting suspicions of misconduct, and disclosure of privileged information. A Discussion and Resource Guide offers tips on using the videos, which are suitable for a variety of settings.

The price is \$79.75 (\$63.96 for AAAS members), plus \$6.50 for postage and handling. For an order form, contact the Directorate for Science and Policy Programs. Tel: 202-326-6600; fax: 202-289-4950; e-mail: [science\\_policy@aaas.org](mailto:science_policy@aaas.org). ♦

Please notify APS Membership of any change in your status as soon as possible. The change will be printed in the next available issue of *The Physiologist* and entered in our member records.

## Announcements

### FASEB Releases Nutrition Report

The Federation of American Societies for Experimental Biology Life Sciences Research Office (LSRO) has released the Third Report on Nutrition Monitoring in the United States. The report was submitted to Congress in February by the US Departments of Agriculture (USDA) and Health and Human Services (HHS).

The report fulfills a requirement of the national Nutrition Monitoring and Related Research Act of 1990 which requires the USDA and the HHS to contract an independent scientific body to develop such a report at least every five years.

The report's main emphasis is on low-income and high-risk population sub-

groups. Major components include: 1) dietary status summaries on food and nutrient intake, dietary supplement use, food expenditures, food insufficiency, and translation of diet-health awareness to action; 2) nutritional and health-related status summaries on blood lipids, overweight, hypertension, osteoporosis, and maternal and child health; 3) assessments of nutrients that are current or potential public health issues; 4) trends in annual per capita food and nutrient supplies; and 5) an overview of food composition data.

The report can be obtained from the Superintendent of Documents, US Government Printing Office, Washington, DC 20402; tel: 202-512-

1800; fax: 202-512-2250. The two-volume report (stock number 001-000-04619-5) is \$40; an executive summary (stock no. 001-000-04620-9) is \$3.75.

The executive summary is also available on the Web and by gopher or telnet: <http://www.nalusda.gov/fnic.html>, or <http://www.cdc.gov/nchswwww/nchshome.htm>; [gopher.nalusda.gov](mailto:gopher.nalusda.gov) (select NAL information centers, then Food and Nutrition Information Center); or telnet to a public gopher site (such as the library of Congress at [marvel.loc.gov](http://marvel.loc.gov), log in as marvel) and choose Food and Nutrition Information Center/USDA. ♦

## 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  
Amgen, Inc.  
Astra Arcus USA, Inc.  
Axon Instruments, Inc.  
Bayer Corporation  
Berlex Biosciences  
Boeing Defense & Space Group  
Burroughs Wellcome Company  
DuPont Pharmaceuticals  
Genentech, Inc.  
Gould Instrument Systems, Inc.  
Grass Foundation  
Groupe de Recherche Servier, France  
Harvard Apparatus  
Hoechst-Roussel Pharmaceuticals, Inc.  
Hoffman-LaRoche Inc.  
Jandel Scientific  
Janssen Research Foundation  
R. W. Johnson Pharmaceutical Research Institute

Kabi Pharmacia  
Eli Lilly and Company  
The Mack Printing Group  
MacLab Division, ADInstruments, Inc.  
Marion Merrell Dow, Inc.  
Merck & Company, Inc.  
Norwich Eaton Pharmaceuticals, Inc.  
Nycomed, Inc.  
Pfizer, Inc.  
Pharmacia and Upjohn, Inc.  
Procter & Gamble Company  
Quaker Oats Company  
Rhône-Poulenc Rorer  
Sandoz Pharmaceuticals Corporation  
W.B. Saunders Company  
Schering-Plough Research Institute  
G.D. Searle and Company  
SmithKline Beecham  
Sutter Instrument Company  
Wyeth-Ayerst Laboratories  
Zeneca, Inc.

## Announcements

### Charles E. Culpeper Foundation Scholarships in Medical Science

The Charles E. Culpeper Foundation is currently accepting applications for its 1997 Scholarships in Medical Science Program designed to support the career development of academic physicians.

Up to three awards of \$100,000 per year for three years will be made to US medical schools on behalf of candidates who are US citizens, have received their MD degree from a US medical school in 1988 or later, and are judged worthy of support by virtue of the quality of their research proposals. All scientific research relevant to human health is eligible for consideration. No institution may nominate more than one candidate.

In selecting awardees, emphasis will be on identifying young physicians with clear potential for making substantial contributions to science as academic physicians. Since January 1988, 26 physicians have been selected as Charles E. Culpeper Foundation Medical Scholars.

Deadline for applications is August 15, 1996. Awards will be announced by January 10, 1997 for activation on or about July 1, 1997. Application forms and instructions may be obtained by contacting the Charles E. Culpeper Foundation at Financial Center, 695 East Main Street, Suite 404, Stamford, CT 06901. ❖

### ISAN Holds First Congress

The recently established International Society for Autonomic Neuroscience will be holding its inaugural Congress in September 1997 in Cairns, Australia, home of the Great Barrier Reef.

The Congress will include 10 symposia and 11 plenary lectures, as well as up to 500 poster communications. The following topics will be covered in the symposia:

- Transmission of autonomic synapses
- Actions of transmitters in effector organs
- Extrinsic and intrinsic neurons of the digestive system
- Properties of ganglion cells
- Development of the autonomic nervous system
- Autonomic control of blood vessels
- Sympathetic preganglionic and premotor neurons
- Medullary control of autonomic functions
- Disorders of the autonomic nervous system

For more information on the Congress, visit the ISAN web page at <http://plexus.physiol.unimelb.edu.au/isan/isan.htm> or write to Joel Bornstein, Department of Physiology, University of Melbourne, Parkville, VIC 3052, Australia. Fax: 61-3-9344-5818; e-mail [joel@plexus.physiol.unimelb.edu.au](mailto:joel@plexus.physiol.unimelb.edu.au). ❖

### Belgian Foundation to Award Prize

In accordance with the wishes of its founder, the Fondation de Physiopathologie Professeur Dautrebande will award a prize in 1997 to an author or authors in the field of human or animal clinical physiopathology.

The award, which consists of approximately \$150,000 US, is given every three years to allow the winners to continue advanced investigations in physiopathology, preferably with therapeutic implications. The prize may be shared by two authors or groups, with a possible additional \$30,000 going to the youngest researcher.

Candidates must send three copies of the following before December 1, 1996: 1) curriculum vitae, including a list of all awards and funds received in the past five years; 2) a short (3 pages maximum) summary of their scientific work; 3) a publications list, with a separate listing of 20 of the most significant papers; 4) any further reports, books, booklets, etc., published or unpublished; and 5) letters of two persons who are full or associate members of National Academies, university lecturers, or previous awardees.

For more information, contact Jean Stalport, "Maison Batta", 3 Avenue Batta, B.4500 Huy, Belgium. ❖

---

## Call for Nominations

### for the Editorship of *American Journal of Physiology: Gastrointestinal and Liver Physiology*

Nominations are invited for the editorship of the *AJP: Gastrointestinal and Liver Physiology* to succeed David H. Alpers, who will complete his term as Editor on June 30, 1997. The Publications Committee plans to interview candidates in October 1996. Applications should be received on or

before August 15, 1996. Nominations, accompanied by a curriculum vitae, should be sent to the chair of the Publications Committee: Leonard R. Johnson, Publications Department, American Physiological Society, 9650 Rockville Pike, Bethesda, MD 20814-3991.

# Scientific Meetings and Congresses

---

## 1996

---

June 30-July 6

**12th International Symposium on Flavins and Flavoproteins**, Calgary, Canada. *Information:* Kenneth J. Stevenson, Department of Biological Sciences, University of Calgary, Calgary T2N 1N4, Alberta, Canada. Fax: 403-284-4184.

July 14-17

**4th IUBMB Conference: The Life and Death of the Cell**, Edinburgh, Scotland. *Information:* The Conference Assistant IUBMB 1996, The Biochemical Society, 59 Portland Place, London W1N 3AJ, UK. Tel: 0171 580 5530; fax: 0171 637 7626; e-mail: meetings@biochemsoc.org.uk.

July 14-17

**Overtraining & Overreaching in Sport: Physiological, Psychological, and Biomedical Considerations**, Memphis, TN. *Information:* Laura Wilhelm. Tel.: 800-747-4457; Int. Tel.: 217-351-5076.

July 21-26

**Bioartificial Organs: Science and Technology**, 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.

August 4-10

**VI World Conference on Clinical Pharmacology and Therapeutics and VI Congress of the Interamerican Society for Clinical Pharmacology and Therapeutics**, Buenos Aires, Argentina. *Information:* CPT96 and ISCPT VI, Marcelo T. de Alvear 1980, 1122 Buenos Aires, Argentina. Tel: 54-1-81-6650; fax: 54-1-814-2733.

August 5-9

**Advances in Tissue Engineering**, Houston, TX. *Information:* Rice University School of Continuing Studies, 6100 Main Street, Houston, TX 77005-1892. Tel: 713-520-6022; fax 713-285-5213; e-mail: scs@rice.edu.

August 23-25

**Bernstein's Traditions in Motor Control**, University Park, PA. *Information:* Mark Latash, Pennsylvania State University, Biomechanics Laboratory, University Park, PA 16802. Tel: 814-863-5374, fax: 814-865-2440, e-mail: mll11@psu.edu.

September 5-7

**Society of General Physiologists 50th Annual Symposium: Membrane-Cytoskeletal Interactions**, Woods Hole, MA. *Information:* Society of General Physiologists, PO Box 257, Woods Hole, MA 02543-0257. Tel: 508-540-6719; fax: 508-540-0155; e-mail: sgp@mbi.edu.

September 24-27

**Second World Congress of High Altitude Medicine**, Cusco, Peru. *Information:* 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.

October 3-6

**Biomedical Engineering Society Annual Fall Meeting**, University Park, PA. *Information:* Rita Kline, Bioengineering Program, Pennsylvania State University, 205 Hallowell Building, University Park, PA 16802-6804. Tel: 814-865-1407; fax: 814-863-0490; e-mail: rxk1@psu.edu.

October 7-9

**Progression of Renal Disease: Evaluation, Growth Factors, and Other Mechanisms**, Montecatini Terme, Italy. *Information:* Claudio Bianchi, Professor of Nephrology, Unita di Nefrologia, Clinical Medica 2, University of Pisa, 56100 Pisa, Italy. Tel: 39-50-592573; fax: 39-50-553414.

October 12-15

**NAASO Annual Conference**, Breckenridge, CO. *Information:* NAASO Conference, Barbara McMurry, Center for Human Nutrition, UCHSC Box C225, 4200 E. Ninth Ave., Denver, CO 80262. Tel: 303-270-4084; fax: 303-270-3273; e-mail: Barbara.McMurry@UCHSC.edu.

October 20-24

**Second World Congress on Alternatives and Animal Use in the Life Sciences**, 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.

October 28-30

**Advances in Pediatric Nutrition**, Baltimore, MD. *Information:* Program Coordinator, Office of Continuing Medical Education, Johns Hopkins University School of Medicine, Turner Building 20, 720 Rutland Ave., Baltimore, MD 21205-2195. Tel: 410-955-2959; fax: 410-955-0807; e-mail: rturner@som.adm.jhu.edu.

---

## 1997

---

February 18-22

**10th International Hypoxia Symposium: Women at Altitude**, Lake Louise, Alberta, Canada. *Information:* Sharon Studd, Continuing Education, Faculty of Health Sciences, McMaster University, Room 1M7, 1200 Main Street West, Hamilton, Ontario, Canada L8N 3Z5. Tel: 905-525-9140; fax: 905-572-7099; e-mail: studd@fhs.csu.mcmaster.ca.

July 27-August 1

**16th International Congress of Nutrition**, Montreal, Canada. *Information:* Congress Secretariat, IUNS 97, National Research Council Canada, Building M-19, Montreal Road, Ottawa, ON, Canada K1A 0R6. Tel: 613-993-7271; fax: 613-993-7250.

September 14-20

**First International Congress of the International Society for Autonomic Neuroscience**, 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.

**APS Conference I**  
**pHysiology of Acid-Base Regulation:**  
**From Molecules to Humans**

**July 12–15, 1996**  
**Snowmass Resort**  
**Snowmass, Colorado**

**Official Program**  
**with Contributed Abstracts**

*pHysiology of Acid–Base Regulation — Conference-at-a-Glance*

Friday, July 12	Saturday, July 13	Sunday, July 14	Monday, July 15
<p>2:00 PM <b>Registration Opens</b></p> <p>6:30–8:00 PM <b>Opening Reception</b> buffet dinner and cash bar</p> <p>8:00–9:30 PM <b>1. Welcome and Overview of Conference</b> Chair: <b>Robert Gillies,</b> <i>Univ. of Arizona</i> Speakers: Albert Roos, <i>Washington Univ.</i> David W. Deamer, <i>UC–Davis</i></p>	<p>8:30 AM–12:00 Noon <b>2. pH Measured <i>in vivo</i></b> Chair: <b>John Griffiths</b> <i>St Georges Hosp, London, UK</i> Speakers: John Griffiths, <i>St. Georges Hosp, London, UK</i> Martin Kushmerick, <i>Univ. of Washington</i> Mitch Chesler, <i>New York Univ.</i> Jeff Evelhoch, <i>Wayne State Med. Ctr.</i> Zaver Bhujwalla, <i>Johns Hopkins Univ.</i></p> <p>4:00–6:00 PM <b>3. Poster Session: Cell and Subcellular</b> from contributed abstracts</p> <p>8:00–9:30 PM <b>4. Cell Physiology I</b> Chair: <b>Walter Boron,</b> <i>Yale Univ.</i> Speakers: Michael F. Romero, <i>Yale Univ.</i> Sergio Grinstein, <i>Hosp for Sick Children, Toronto</i> George Sachs, <i>UCLA</i></p>	<p>8:30 AM–12:00 Noon <b>5. Cell Physiology II</b> Chair: <b>Richard Vaughn-Jones,</b> <i>Oxford Univ., UK</i> Speakers: Richard Vaughn-Jones, <i>Oxford Univ., UK</i> Robert Gillies, <i>Univ. of Arizona</i> Walter Boron, <i>Yale Univ.</i> Keith Buckler, <i>Oxford Univ., UK</i> Jacques Pouyssegur, <i>Univ. of Nice, France</i></p> <p>4:00–6:00 PM <b>6. Poster Session: Organismal/Systemic/Tissue</b> from contributed abstracts</p> <p>4:00–6:00 PM <b>7. Poster Session: Molecular</b> from contributed abstracts</p> <p>8:00–10:00 PM <b>8. Workshop/Open Mike Session – What are the Molecular Targets for Intracellular H</b> Moderator: <b>Robert Alpern</b> <i>UT–Southwestern Med Sch</i></p> <p>Members of the audience will be called upon to document effects of altering pH on specific intracellular molecular targets</p>	<p>8:30–11:00 AM <b>9. Regulation of pH in Subcellular Systems</b> Chair: <b>Mike Forgac,</b> <i>Tufts Univ.</i> Speakers: Mike Forgac, <i>Tufts Univ.</i> Masamitsu Futai, <i>Osaka Univ., Japan</i> Ted Steck, <i>Univ. of Chicago</i> Patty Kane, <i>SUNY–Syracuse</i> Barry Bowman, <i>UC–Santa Cruz</i></p> <p>12:30–4:30 PM <b>10. Molecular Systems</b> Chair: <b>Carolyn Slayman</b> <i>Yale Univ.</i> Speakers: Carolyn Slayman, <i>Yale Univ.</i> Roland Baron, <i>Yale Univ.</i> Ron Kopito, <i>Stanford Univ.</i> Mike Caplan, <i>Yale Univ.</i> Tom Stevens, <i>Univ. of Oregon</i> Steve Gluck, <i>Washington Univ.</i></p> <p>4:30–7:00 PM <b>11. Workshop/Open Mike Session – Bookkeeping: Can We do Better than Back-of-the Envelope?</b> Moderator: <b>Robert Putnam</b> <i>Wright State Univ.</i></p> <p>Audience will examine the stoichiometry and activities of H<sup>+</sup> transporting mechanisms and relate them to the magnitudes of the so-called "acid-load", imposed by metabolism and by transmembrane H<sup>+</sup> influx</p> <p>7:00–10:00 PM <b>Banquet</b></p>



## GENERAL INFORMATION

### Location

Snowmass Resort, P.O. Box 5566, Snowmass, Colorado 81615, telephone: 970-923-2000.

### Conference Office

Snowmass Conference Center Registration Office telephone: 970-923-6110 or 970-923-2000—ask for Conference Center Registration Office.

### On-Site Registration

The scientific registration fee includes entrance to the symposia and poster sessions and admittance to the opening reception on Friday, July 12 and conference banquet on Monday, July 15.

Nonscientist family members and guests of registrants may register for a fee of \$60. The guest registration fee includes admittance to the opening reception, banquet and poster sessions only. Guest registrants may not attend symposia sessions.

### Registration Office

#### Registration and Office Hours:

Friday, July 12..... 2:00 PM–9:30 PM  
Saturday, July 13..... 7:30 AM–5:30 PM  
Sunday, July 14..... 8:00 AM–5:00 PM  
Monday, July 15..... 8:30 AM–5:00 PM

#### On-Site Registration Fees:

APS Member.....	\$250
Retired Member.....	\$150
Nonmember.....	\$300
Postdoctoral.....	\$200
Student.....	\$150
Guest*.....	\$ 60

(\*nonscientist—family members of registrants)

### Message Center

There will be a message board near the Registration Desk in the Conference Center Lobby. Registrants should check for messages daily. Please suggest that callers who wish to reach you during the day leave a message at the Conference Office during registration hours, 970-923-6110.

### Press

Press badges will be issued in the Conference Office only to members of the working press and freelance writers bearing a letter of assignment from an editor. Representatives of allied fields (public relations, public information, public

affairs, etc.) may register as non members in the registration area.

### Travel Reservations

The official travel agent for the conference is Mitchell/Fitzgerald & Associates (formerly G.E.T. Travel of Washington, DC). Reduced fares to the conference can be obtained by contacting Jenonne Schaefer of Mitchell/Fitzgerald & Associates at: 1-800-228-0861 or 202-530-4455. Be sure to identify yourself as an APS Snowmass Conference Attendee. United Airlines has been designated the official airline for the Conference. To take advantage of the special fares you may contact Mitchell/Fitzgerald & Associates or United directly at 1-800-521-4041 and refer to file number 564UV.

### Car Rental

Alamo Rent a Car has been appointed the official car rental company for the conference. Special discounted rates have been extended to conference participants. Call 1-800-732-3232 and refer to Group I.D. #68970 Rate Code GR.

### Airport Transportation

Aspen/Snowmass Airport is located 6 miles from Snowmass Resort. Complimentary shuttle service is provided from the Aspen/Snowmass Airport through the hotel and condominium complexes.

Denver International Airport is 200 miles from Snowmass Resort. Colorado Mountain Express can provide transportation from Denver for those not wishing to rent a car. Contact Colorado Mountain Express for schedule information at 1-800-525-6363 or 970-927-9778. Travel time is approximately 4 hours.



## GENERAL INFORMATION

---

### Social Program

*Opening Reception* — The Opening Reception will be held on the Roof Garden in the Snowmass Conference Center, 6:30-8:00 PM on Friday, July 12, 1996. Hors d'oeuvres and a cash bar will be featured.

*Conference Banquet* — All registrants are invited to the conference banquet, 7:00-10:00 PM, Monday, July 15.

### Publications

The Program/Abstract Volume (the June issue of *The Physiologist*) was mailed to all APS members and will be given to registrants on-site. Replacement copies may be purchased for \$25.00 in the Conference Office.

### CME

Category I Continuing Medical Education (CME) credits will be offered based on attendance at this meeting. CME application forms will be available at the Registration Desk. For the purposes of Continuing Medical Education credits toward the American Medical Association's Physician's Recognition Award, this APS Conference is jointly sponsored by the Federation of American Societies for Experimental Biology, the official accrediting organization. There is a \$25 CME application fee, payable upon submission of the form for processing. For more information regarding CME credit, please contact the FASEB Office of Scientific Meetings and Conferences at (301) 530-7010.

---

### Council

#### *President*

James A. Schafer

#### *Past President*

Leonard S. Jefferson

#### *President-Elect*

Allen W. Cowley, Jr.

#### *Councillors*

Walter F. Boron  
Gerald F. DiBona

Diana L. Kunze  
Celia D. Sladek

Heinz Valtin  
John A. Williams

#### *Ex Officio Members*

Frank Belloni  
Edward Blaine

Martin Frank  
Leonard R. Johnson

Ethan R. Nadel  
Richard J. Traystman

### Conference Organization

Robert J. Gillies and Walter F. Boron, Cochairs

### Acknowledgement

The Society and Organizing Committee gratefully acknowledge financial support received from:

**Hoechst Marion Roussel**

## DAILY SCHEDULE

**FRIDAY, JULY 12, 1996**

### Opening Reception

6:30–8:00 PM  
Ballroom Lobby Area

### 1. Welcome and Overview of Conference

FRI. 8:00 PM  
Hoaglund Room  
Chaired: **R. Gillies**

- 8:00 1.1 Historical Origin of Two Basic Concepts:  
The Logarithm of  $[H^+]$  and the Lipid Bilayer. **A. Roos**. Washington Univ.
- 8:45 1.2 Where Do We Go From Here? **D.W. Deamer**. Univ. of California, Davis.

**SATURDAY, JULY 13, 1996**

Symposium

### 2. pH Measured *in vivo*

SAT. 8:30 AM  
Hoaglund Room  
Chaired: **J. Griffiths**

- 8:30 Chair's introduction.
- 8:40 2.1 pH of Tumors Measured *in vivo* by MRS. **J. Griffiths**. St. George's Hospital Medical School, London.
- 9:20 2.2 pH of Muscle. **M. Kushmerick**. Univ. Washington.
- 10:00 2.3 Rapid Modulation of Brain pH by Neural Activity. **M. Chesler**. New York Univ.
- 10:40 2.4 Factors Influencing the Relationship Between Tumor pH and Tumor Blood Flow *in vivo*. **J. Evelhoch**. Wayne State Univ.
- 11:20 2.5 The Role of pH in Solid Tumors. **Z.M. Bhujwalla**. The Johns Hopkins Univ. Sch. Med.

## DAILY SCHEDULE

Poster

### 3. Cell and Subcellular

SAT. 4:00 PM  
Erickson/Carroll/Sinclair Room

Board #

- 1 3.1 Measurement of intracellular pH of gastric surface epithelial cells *in vivo*. **S. Tanaka and J.D. Kaunitz**. VA Med. Ctr., Los Angeles and UCLA.
- 2 3.2 Effects of acidic extracellular pH on bronchoalveolar macrophages. **T. Heming, T.S. Wheeler and A. Bidani**. Univ. of Texas Med Br.
- 3 3.3 pH modulates alveolar epithelial cell phenotypic properties *in vitro*. **R. Lubman, O. Tirmizi, D. Joseph, X.L. Zhang, S. Zabski, and S.I. Danto**. Will Rogers Pulm. Res. Ctr., Univ. So. California, Los Angeles.
- 4 3.4 Regulation of rat liver endosome acidification by G proteins and ion channels. **R. Van Dyke and C. Bear**. Univ. Michigan and Hosp. for Sick Children, Toronto.
- 5 3.5 Regulation of intracellular pH by bronchoalveolar macrophages. **A. Bidani and T.A. Heming**. Univ. of Texas Med. Br.
- 6 3.6 Intracellular pH and multiple drug resistance: chemomodifiers verapamil, cyclosporine A and tamoxifen decrease pHi in human colon cancer cells. **E. Consentini, G. Hamilton, J. Zacherl, G. Bischof, B. Teleky, M. Riegler, W. Feil, R. Schiessel, and E. Wenzl**. Univ. Clin. Surg., Vienna, Austria.
- 7 3.7 Regulation of spatially restricted secretion and membrane retrieval during human neutrophil phagocytosis. **H. Tapper and S. Grinstein**. Hosp. for Sick Children, Toronto.
- 8 3.8 Effect of extracellular pH and CO<sub>2</sub> on intracellular pH of ventromedial medullary neurons. **J. Zhao, G.B. Richerson, W. Wang, and W.F. Boron**. Yale Univ. and VA Med. Ctr., New Haven, CT.
- 9 3.9 Extracellular pH affects growth and intracellular pH regulation of human colon carcinoma cells. **G. Bischof, E. Consentini, G. Hamilton, M. Reigler, J. Zacherl, B. Teleky, T.E. Machen, E. Wenzel**. Univ. Clin. Surg., Vienna, Austria and Univ. California, Berkeley.
- 10 3.10 Lack of shrinkage-induced activation of Na<sup>+</sup>/H<sup>+</sup> exchange in sub-confluent cultures of C6 glioma cells. **R.W. Putnam, L.D. Shrode, J.D. Klein, W.C. O'Neil, and P.B. Douglas**. Wright State Univ. Sch. Med. and Emory Univ. Sch. Med.
- 11 3.11 The measurement of intracellular pH of single neurons in brainstem slices during acid loads. **N.A. Ritucci, J.S. Erlichman, J.B. Dean, and R.W. Putnam**. Wright State Univ. Sch. Med.
- 12 3.12 Regulation of cell volume and pH: a computer laboratory. **H.G. Hempling**. Univ. So. Carolina.
- 13 3.13 Angiotensin II stimulation of Na<sup>+</sup>/H<sup>+</sup> exchange activity in myocardium is mediated by protein kinase C. **M.C. Camili6n de Hurtado, A.R. Mattiazzi, B. Alvarez, N.G. P6rez, M.**

**Vila-Petroff, and H.E. Cingolani**. La Plata Sch. Med., Argentina.

- 14 3.14 Cardiomyocyte pHi regulation: adaptation to exercise training. **V.R. Danes and G.F. Tibbitts**. Simon

- Fraser Univ., Burnaby, British Columbia.
- 15 3.15 Effect of angiotensin II on Na/H exchange in rabbit atrial myocytes. **C.V. Livsey, R.L. Skolnick, and K.W. Spitzer** Univ. Utah.
- 16 3.16 Permeability properties of apical vs. basolateral barriers of colonic-crypt epithelial cells. **S.K. Singh, A.C. Cimini, and W.F. Boron** Yale Univ.
- 17 3.17 Expression cloning of the renal electrogenic Na/HCO<sub>3</sub> cotransporter from *ambystoma tigrinum*. **M.F. Romero, M.A. Hediger, E.L. Boulpaep, and W.F. Boron** Yale Univ. and Brigham & Women's Hosp., Boston.

#### Symposium

### 4. Cell Physiology I

SAT. 8:00 PM  
Hoaglund Room  
Chaired: **W. Boron**

- 8:00 4.1 The Electrogenic Sodium Bicarbonate Cotransporter: Expression Cloning and Physiology. **M.F. Romero** Yale Univ.
- 8:30 4.2 Non-invasive Measurement of the Luminal pH of Compartments of the Secretory Pathway. **S. Grinstein** Hosp. of Sick Children.
- 9:00 4.3 pH Regulation in Parietal Cells. **G. Sachs** Univ. California, Los Angeles.

## SUNDAY, JULY 14, 1996

#### Symposium

### 5. Cell Physiology II

SUN. 8:30 AM  
Hoaglund Room  
Chaired: **R.D. Vaughn-Jones**

- 8:30 Chair's introduction.
- 8:40 5.1 Dual Acid-Loading Versus Dual Acid-Extrusion in the Heart. **R.D. Vaughn-Jones** Univ. Oxford.
- 9:20 5.2 Why Are Vacuolar-Type H<sup>+</sup>-ATPases at the Plasma Membrane in Tumor Cells? **R.J. Gillies** Univ. Arizona.

- 10:00 5.3 pH Regulation in Renal Cells. **W. Boron** Yale Univ.
- 10:40 5.4 Role of Intracellular pH, [Ca<sup>2+</sup>]<sub>i</sub> and K<sup>+</sup>-Channels in Acid Chemoreception by the Carotid Body. **K.J. Buckler** Univ. Lab Physiol, Oxford, UK.
- 11:20 5.5 To be announced. **J. Pouyssegur** Univ. Nice.

#### Poster

### 6. Organismal/Systemic/Tissue

SUN. 4:00 PM  
Erickson/Carroll/Sinclair Room

#### Board #

- 1 6.1 Seasonal changes of blood acid-base status in *Rana catesbeiana*. **L.G.S. Branco and P.L. Rocha** Univ. de São Paulo, Brazil.
- 2 6.2 Measurement of extracellular pH *in vivo* by <sup>31</sup>P NMR Spectroscopy. **N. Raghunand, N.R. Aiken, Z.H. Bhujwalla, and R.J. Gillies** Univ. Arizona Hlth. Sci. Ctr. and Johns Hopkins Univ. Sch. Med.
- 3 6.3 [BE] vs [SID]: are they really different? **R. Schlichtig** Univ. Pittsburgh and VA Med. Ctr.
- 4 6.4 Endothelin-1 inhibits distal tubule HCO<sub>3</sub> secretion induced by dietary HCO<sub>3</sub>. **D.E. Wesson and G.M. Dolson** Texas Tech. Univ. Hlth. Sci. Ctr., Houston VA Med. Ctr., and Baylor Col. Med.
- 5 6.5 Bicarbonate-dependent fraction of the cAMP-stimulated chloride current across murine duodenum. **L.L. Clarke and M.C. Harline** Univ. Missouri, Columbia.
- 6 6.6 Intracellular pH regulation of isolated turtle heart during normoxic and anoxic acidosis. **H. Shi, P.H. Hamm, R.S. Meyers, R.G. Lawler, and D.C. Jackson** Brown Univ.
- 7 6.7 About an electrogenic Na<sup>+</sup>/HCO<sub>3</sub> cotransport in ventricular myocardium. **H.E. Cingolani, M.C. Camillión de Hurtado, A. Aiello, B. Alvarez, and N.G. Pérez** La Plata Sch. Med., Argentina.
- 8 6.8 NMR studies and identification of brain compartments containing P<sub>i</sub>. **D.D. Gilboe, J.H. Fitzpatrick, Jr., D. Kinter, M. Anderson, S.E. Emoto, and W.M. Westler** Univ. Wisconsin.
- 9 6.9 K<sup>+</sup>/NH<sub>4</sub><sup>+</sup> Antiporter: a unique ammonium carrying transporter. **H. Amlal and M. Soleimani** Univ. Cincinnati Sch. Med. and VA Med. Ctr., Cincinnati, OH.
- 10 6.10 How is acid-based balance maintained in patients with type IV renal tubular acidosis? **M.L. Halperin, M. Gowrishankar, S. Cheema-Dhadli, and K. Kamel** Univ. Toronto.

## DAILY SCHEDULE

#### Poster

### 7. Molecular

SUN. 4:00 PM  
Erickson/Carroll/Sinclair Room

Board #

- 11 7.1 1:1 stoichiometry of electrogenic sulfate/chloride exchange by AE1 E699Q. **S.L. Alper, L. Jiang, M. Hand, M. Crest, K. Strange, and M.N. Chernova.** Beth Israel and Children's Hosp., Marseille, France.
- 12 7.2 RNase H mapping and cloning of multiple glutaminase mRNAs. **D. Porter and N.P. Curthoys.** Colorado State Univ.
- 13 7.3 Identification of multiply proteins which bind to the 3'-untranslated region of the glutaminase mRNA. **N.P. Curthoys and O. Laterza** Colorado State Univ.
- 14 7.4 Differential acid-based regulation of glutaminase and pepck in gluconeogenic LLC-PK<sub>1</sub>-FBPase<sup>+</sup> cells. **G. Gstraunthaler, T. Holcomb, E. Feifel, D. Porter, and N.P. Curthoys.** Univ. Innsbruck, Austria and Colorado State Univ.
- 15 7.5 Activation of Na-H exchange is required for rhoA-induced actin cytoskeleton reorganization and focal adhesion assembly. **Z. Vexler and D.L. Barber.** Univ. California, San Francisco.
- 16 7.6 NIP1, a novel protein, interacts with the Na-H exchanger and inhibits exchange activity. **X. Lin and D.L. Barber** Univ. California, San Francisco.
- 17 7.7 pH dependence of Cl<sup>-</sup> efflux in cytomegalovirus infected human fibroblast. **W.E. Crowe, L.M. Maglova, and J.M. Russell.** Med. Col. Pennsylvania and Hahnemann Univ.
- 18 7.8 Site-directed mutagenesis of the yeast V-ATPase B subunit. **Q. Liu, P.M. Kane, P.R. Newman, and M. Forgac.** Tufts Univ. and SUNY, Syracuse.

Workshop

**8. Workshop/Open Mike Session: What are the Molecular Targets for Intracellular H**

SUN. 8:00 PM  
Hoaglund Room  
Moderator: **R. Alpern**

- 8:00 8.1 Molecular Targets for Intracellular Hydrogen Ions. **R.J. Alpern.** Univ. Texas Southwestern Med Ctr.

Symposium

**9. Regulation of pH in Subcellular Systems**

MON. 8:30 AM  
Hoaglund Room  
Chaired: **M. Forgac**

- 8:30 9.1 Structural and Functional Studies of the V-ATPases. **M. Forgac** Tufts Univ.
- 9:00 9.2 Acidic Organelles: Synaptic Vesicles and Micro Vesicles. **M. Futai** Osaka Univ.
- 9:30 9.3 Proton Pumps, Contractile Vacuoles and Water Homeostasis in Dictyostelium. **T.L. Steck.** Univ. Chicago.
- 10:00 9.4 Assembly and Regulation of the Yeast V-ATPase. **P. Kane** SUNY, Syracuse.
- 10:30 9.5 Structure and Regulation of the Vacuolar ATPase. **B. Bowman** Univ. California.

Symposium

**10. Molecular Systems**

MON. 12:30 PM  
Hoaglund Room  
Chaired: **C. Slayman**

- 12:30 10.1 Molecular Systems. **C. Slayman.** Yale Univ.
- 1:10 10.2 V-type H<sup>+</sup> ATPase of Osteoclasts. **R. Baron.** Yale Univ.
- 1:50 10.3 Mechanisms of Anion Exchange. **R. Kopito.** Stanford Univ. Stanford Univ.

**MONDAY, JULY 15, 1996**

- 3:10 10.5 Assembly of the Yeast Vacuolar H<sup>+</sup>-ATPase Complex. **T.H. Stevens** Univ. Oregon.
- 3:50 10.6 V-type H<sup>+</sup>-ATPase of Renal Cells. **S. Gluck.** Washington Univ.



## DAILY SCHEDULE

---

Workshop

**11. Workshop/Open      Mike      Session:**  
**Bookkeeping: Can We Do Better than**  
**Back-of-the- Envelope?**

MON. 4:30 PM  
Hoaglund Room  
Moderator: **R. Putnam**

4:30 11.1      Quantitative Aspects of the Study of Intracellular  
pH. **R.W. Putnam** Wright State Univ.

### Conference Banquet

MON. 7:00–10:00 PM  
Erickson/Carroll/Sinclair Ballroom

## ABSTRACTS OF SPEAKER TALKS AND POSTER PRESENTATIONS

---

### Friday

1.0 Welcome and Overview of Conference.....	140
---	-----

### Saturday

2.0 pH Measured in vivo.....	140
3.0 Cell and Subcellular Posters.....	141
4.0 Cell Physiology I.....	144

### Sunday

5.0 Cell Physiology II.....	145
6.0 Organismal/Systemic/Tissue Posters.....	146
7.0 Molecular Posters.....	147
8.0 What are the Molecular Targets for Intracellular H.....	149

### Monday

9.0 Regulation of pH in Subcellular Systems.....	149
10.0 Molecular systems.....	151
11.0 Bookkeeping: Can we do Better than Back-of-the-Envelope?.....	151

<b>Author Index.....</b>	<b>152</b>
--------------------------	------------

The number to the left of the decimal designates the session. The program number follows the decimal. An asterisk (\*) indicates invited speakers.

---

**A**

---

Aiello, A., 6.7  
Aiken, N.R., 6.2  
Alper, S.L., 7.1  
Alpern, R., 8.1\*  
Alvarez, B., 3.13, 6.7  
Amlal, H., 6.9  
Anderson, M., 6.8

---

**B**

---

Barber, D.L., 7.5, 7.6  
Baron, R., 10.2\*  
Bear, C., 3.4  
Bhujwalla, Z.H., 6.2  
Bidani, A., 3.2, 3.5  
Bischof, G., 3.6, 3.9  
Boron, W.F., 3.16,  
3.17, 3.8, 4.0\*,  
5.3\*  
Boulpaep, E.L., 3.17  
Bowman, B., 9.5\*  
Branco, L.G.S., 6.1  
Bhujwalla, Z., 2.5\*  
Buckler, K., 5.4\*

---

**C**

---

Camili3n de Hurtado,  
M.C., 3.13, 6.7  
Caplan, M., 10.4\*  
Cheema-Dhadli, S.,  
6.10  
Chernova, M.N., 7.1  
Chesler, M., 2.3\*  
Cimini, A.C., 3.16

Cingolani, H.E., 3.13,  
6.7  
Clarke, L.L., 6.5  
Consentini, E., 3.6, 3.9  
Crest, M., 7.1  
Crowe, W.E., 7.7  
Curthoys, N.P., 7.2,  
7.3, 7.4

---

**D**

---

Danes, V.R., 3.14  
Danto, S.I., 3.3  
Deamer, D.W., 1.2\*  
Dean, J.B., 3.11  
Dolson, G.M., 6.4  
Douglas, P.B., 3.10

---

**E**

---

Emoto, S.E., 6.8  
Erlichman, J.S., 3.11

---

**F**

---

Feifel, E., 7.4  
Feil, W., 3.6  
Fitzpatrick, J.H., Jr.,  
6.8  
Forgac, M., 7.8, 9.1\*  
Futai, M., 9.2\*

---

**G**

---

Gilboe, D.D., 6.8  
Gillies, R.J., 1.0\*, 6.2,  
5.2\*  
Gluck, S., 10.6\*  
Gowrishankar, M.,  
6.10

Griffiths, J., 2.1\*  
Grinstein, S., 3.7, 4.2\*  
Gstraunthaler, G., 7.4

---

**H**

---

Halperin, M.L., 6.10  
Hamilton, G., 3.6, 3.9  
Hamm, P.H., 6.6  
Hand, M., 7.1  
Harline, M.C., 6.5  
Hediger, M.A., 3.17  
Heming, T., 3.2  
Heming, T.A., 3.5  
Hemplin, H.G., 3.12  
Holcomb, T., 7.4

---

**J**

---

Jackson, D.C., 6.6  
Jiang, L., 7.1  
Joseph, D., 3.3

---

**K**

---

Kamel, K., 6.10  
Kane, P.M., 7.8, 9.4\*  
Kaunitz, J.D., 3.1  
Kinter, D., 6.8  
Klein, J.D., 3.10  
Kopito, R., 10.3\*  
Kushmerick, M., 2.1

---

**L**

---

Laterza, O., 7.3

Lawler, R.G., 6.6  
Lin, X., 7.6  
Liu, Q., 7.8  
Livsey, C.V., 3.15  
Lubman, R., 3.3

---

**M**

---

Machen, T.E., 3.9  
Maglova, L.M., 7.7  
Mattiazzi, A.R., 3.13  
Meyers, R.S., 6.6

---

**N**

---

Newman, P.R., 7.8

---

**O**

---

O'Neil, W.C., 3.10

---

**P**

---

P3rez, N.G., 3.13, 6.7  
Porter, D., 7.2, 7.4  
Pouyssegu, J., 5.5\*  
Putnam, R.W., 3.10,  
3.11, 11.1\*

---

**R**

---

Raghunand, N., 6.2  
Reigler, M., 3.9  
Richerson, G.B., 3.8  
Riegler, M., 3.6  
Ritucci, N.A., 3.11  
Rocha, P.L., 6.1  
Romero, M.F., 3.17,  
4.1\*

Roos, A., 1.1\*  
Russell, J.M., 7.7

---

**S**

Sachs, G., 4.3\*  
Schiessel, R., 3.6  
Schlichtig, R., 6.3  
Shi, H., 6.6  
Shrode, L.D., 3.10  
Singh, S.K., 3.16  
Skolnick, R.L., 3.15  
Slayman, C., 10.1\*  
Soleimani, M., 6.9  
Spitzer, K.W., 3.15  
Steck, T., 9.3\*  
Stevens, T., 10.5\*  
Strange, K., 7.1

---

**T**

Tanaka, S., 3.1  
Tapper, H., 3.7  
Teleky, B., 3.6, 3.9  
Tibbits, G.F., 3.14  
Tirmizi, O., 3.3

---

**V**

Van Dyke, R., 3.4  
Vaughn-Jones, R.,  
5.1\*  
Vexler, Z., 7.5  
Vila-Petroff, M., 3.13

---

**W**

Wang, W., 3.8  
Wenzel, E., 3.9  
Wenzl, E., 3.6  
Wesson, D.E., 6.4  
Westler, W.M., 6.8  
Wheeler, T.S., 3.2

---

**Z**

Zabski, S., 3.3  
Zacherl, J., 3.6, 3.9  
Zhang, X.L., 3.3  
Zhao, J., 3.8

**APS Conference II**

**Neural Control of Breathing:  
Molecular to Organismal Perspectives**

**July 21–25, 1996**  
**Madison Concourse Hotel**  
**Madison, Wisconsin**

**Official Program**  
**with Contributed Abstracts**

## Neural Control of Breathing — Conference at a Glance

SUN., JULY 21	MON., JULY 22	TUES., JULY 23	WED., JULY 24	THUR., JULY 25
1:00–9:00 PM <b>REGISTRATION</b>	7:30 AM–5:00 PM <b>REGISTRATION</b>	8:30 AM–4:30 PM <b>REGISTRATION</b>	8:30 AM–4:00 PM <b>REGISTRATION</b>	8:30 AM–12 Noon <b>REGISTRATION</b>
2:00–2:15 PM <b>1. WELCOME ADDRESS</b> Meeting overview and geographic orientation	9:00 AM–12:10 PM <b>3. NEUROCHEMICALS IN VENTILATORY CONTROL</b> Moderator: <b>D.E. Millhorn</b> , Cincinnati Participants: A.J. Berger, Seattle; M.S. Dekin, New Brunswick; D.W. Richter, Göttingen; M. Czyzyk-Krzeska, Cincinnati; G.D. Funk, Auckland; L.K. Kubin, Philadelphia	9:00–12:10 PM <b>6. INTEGRATED VENTILATORY RESPONSES: SENSORY MECHANISMS</b> Moderator: <b>G.E. Bisgard</b> Madison Participants: D.F. Donnelly, New Haven; G.G. Haddad, New Haven; T.G. Waldrop, Urbana; S.W. Mifflin, San Antonio; F.L. Powell, San Diego; E.N. Bruce, Lexington	9:00 AM–12:10 PM <b>8. PHYLOGENY AND ONTOGENY IN VENTILATORY CONTROL</b> Moderator: <b>S.J. England</b> New Brunswick Participants: N.J. Smatresk, Arlington, TX; E.W. Taylor, Birmingham, UK; M.A. Hanson, London; D.A. Bayliss, Charlottesville; J. Champagnat, Gif-Sur-Yvette; L. Ling, Madison	8:30 AM–12:05 PM <b>10. INTEGRATED VENTILATORY RESPONSES: EXERCISE AND SLEEP</b> Moderator: <b>J.A. Dempsey</b> , Madison Participants: D.M. Ainsworth, Ithaca; D.F. Boggs, Missoula; R.F. Fregosi, Tucson; M.P. Kaufman, Davis; L. Adams, London; A.I. Pack, Philadelphia; W.K. Milsom, Vancouver
2:15 PM–5:25 PM <b>2. THE CENTRAL NEURAL NETWORK — MECHANISMS OF RHYTHM GENERATION</b> Moderator: <b>E.E. Marder</b> Boston; Participants: N.I. Syed, Calgary; J-M. Ramirez, Göttingen; J.L. Feldman, Los Angeles; B.G. Lindsey, Tampa; J.M. Orem, Lubbock	12:10–2:00 PM <b>FREE TIME</b>	12:10 AM–1:30 PM <b>FREE TIME</b>	12:10–2:00 PM <b>FREE TIME</b>	
5:30–7:30 PM <b>OPENING RECEPTION</b> hors d'oeuvres and cash bar	2:00–5:10 PM <b>4. CENTRAL CO<sub>2</sub>-SENSORY MECHANISMS</b> Moderator: <b>P. Scheid</b> Bochum Participants: J.A. Neubauer, New Brunswick; E.E. Nattie, Hanover, NH; J.S. Erlichman, Dayton; H.V. Forster, Milwaukee; S.A. Shea, Cambridge, MA	1:30–4:00 PM <b>7. POSTER PRESENTATIONS</b>	2:00–5:10 PM <b>9. MODULATION AND PLASTICITY IN VENTILATORY CONTROL</b> Moderator: <b>G.S. Mitchell</b> , Madison Participants: J.C. Houk, Chicago; D.R. McCrimmon, Chicago; D.L. Turner, Leeds; D.M. Katz, Cleveland; K.P. Strohl, Cleveland; G.C. Sieck, Rochester, MN	
	4:00–6:00 PM <b>FREE TIME</b>	6:00–7:00 PM <b>PRE-BANQUET RECEPTION</b> Featuring music by <b>Josue Pizarro</b>		
	5:10–7:30 PM <b>FREE TIME</b>	7:00–9:00 PM <b>BANQUET</b> Featuring comedian <b>Ron Detinger</b>		
	7:30–10:00 PM <b>5. POSTER PRESENTATIONS</b>			



### Location

The Madison Concourse Hotel, One West Dayton Street, Madison, Wisconsin 53703, telephone: 1-800-356-8293 or 608-257-6000 is located off interstates I-90 and I-94 providing easy access to Chicago (2½ hours) and Milwaukee (90 minutes). Madison's Dane County Regional Airport is 15 minutes from the hotel and offers over 600 domestic and 70 international destinations.

### Conference Office

The Conference Office is located in conference Room I of the Madison Concourse Hotel. Telephone number 608-257-6000, *extension* 201.

### On-Site Registration

The scientific registration fee includes entrance to the symposia and poster sessions and admittance to the opening reception on Sunday, July 21 and conference banquet on Tuesday, July 23.

Nonscientist family members and guests of registrants may register for a fee of \$60. The guest registration fee includes admittance to the opening reception, banquet and poster sessions only. Guest registrants may not attend symposia sessions.

### Registration Office

#### Registration and Office Hours:

Sunday, July 21.....	1:00 PM–9:00 PM
Monday, July 22.....	7:30 AM–5:00 PM
Tuesday, July 23.....	8:00 AM–4:30 PM
Wednesday, July 24.....	8:30 AM–4:00 PM
Thursday, July 25.....	8:30 AM–12:00 Noon

#### On-Site Registration Fees:

APS Member.....	\$250
Retired Member.....	\$150
Nonmember.....	\$300
Postdoctoral.....	\$200
Student.....	\$150
Guest*.....	\$ 60

(\*nonscientist—family members of registrants)

### Message Center

There will be a message board in the ballroom lobby area adjacent to the poster session room. Registrants should check for messages daily. Please suggest that callers who wish to reach you during the day leave a message at the Conference Office during registration hours: 608-257-6000 ext. 201.

### Press

Press badges will be issued in the Conference Office only to members of the working press and freelance writers bearing a letter of assignment from an editor. Representatives of allied fields (public relations, public information, public affairs, etc.) may register as nonmembers in the registration area.

### Travel Reservations

The official travel agent for the conference is Mitchell/Fitzgerald and Associates (formerly G.E.T. Travel of Washington, DC). Reduced fares to the conference can be obtained by contacting Jenonne Schaefer of Mitchell/Fitzgerald & Associates at: 1-800-228-0861 or 202-530-4455. Be sure to identify yourself as an APS Madison, Wisconsin conference attendee. Northwest Airlines has been designated the official airline for the Conference. To take advantage of the special fares contact Mitchell/Fitzgerald and Associates or Northwest directly at 1-800-328-1111 and refer to world file #NCAEL.

### Car Rental

For car rental information in the Madison area contact Jenonne Schaefer at Mitchell/Fitzgerald and Associates at 1-800-228-0861. Identify yourself as an APS Madison, Wisconsin conference attendee.

### Airport Transportation

Madison's Dane County Regional Airport is 15 minutes from The Madison Concourse Hotel. Complimentary transportation service is available via Concourse Airport Shuttle.

## GENERAL INFORMATION

---

### Social Program

*Opening Reception* — The Opening Reception will be held in the Ballroom Lobby on 5:30-7:30 PM on Sunday, July 21, 1996. Hors d'oeuvres and a cash bar will be featured.

*Conference Banquet and Reception* — All registrants are invited to an evening of relaxing music, excellent food and hearty laughter. The conference banquet, 6:00-9:00 PM, Tuesday, July 23 will begin with a one-hour reception featuring music by local artist Josue Pizarro. The dessert hour will feature the antics of comedian Ron Dentinger.

*Area Attractions and Spousal Activities* — the Local Organizing Committee provided brochures of local attractions and spousal activities to advance registrants. On-site registrations may pick up local information at the Conference Registration Desk.

### Publications

The Program/Abstract Volume (the June issue of *The Physiologist*) was mailed to all APS members and will be given to registrants on-site. Replacement copies may be purchased for \$25.00 in the Conference Office.

### CME

Category I Continuing Medical Education (CME) credits will be offered based on attendance at this meeting. CME application forms will be available at the Registration Desk. For the purposes of Continuing Medical Education credits toward the American Medical Association's Physician's Recognition Award, this APS Conference is jointly sponsored by the Federation of American Societies for Experimental Biology, the official accrediting organization. There is a \$25 CME application fee, payable upon submission of the form for processing. For more information regarding CME credit, please contact the FASEB Office of Scientific Meetings and Conferences at (301) 530-7010.

---

## The American Physiological Society Council

*President*  
James A. Schafer

*Past President*  
Leonard S. Jefferson

*President-Elect*  
Allen W. Cowley, Jr.

### *Councillors*

Walter F. Boron  
Gerald F. DiBona

Diana L. Kunze  
Celia D. Sladek

Heinz Valtin  
John A. Williams

### *Ex Officio Members*

Frank Belloni  
Edward Blaine

Martin Frank  
Leonard R. Johnson

Ethan R. Nadel  
Richard J. Traystman

### Neural Control of Breathing Conference Organizer

Gordon S. Mitchell

### Conference Steering Committee

Gerald Bisgard  
Jerome Dempsey

Jack Feldman  
Marc Kaufman

Donald McCrimmon  
William Milsom

### Acknowledgement

This conference has been partially supported by an educational grant from:

**Ohmeda, Inc.**

## DAILY SCHEDULE

### SUNDAY, JULY 21, 1996

#### 1. Welcome Address

SUN. 2:00 PM  
Wisconsin Ballroom  
Chaired: **G. Mitchell**

Meeting overview and geographic orientation

Symposium

#### 2. The Central Neural Network--Mechanisms of Rhythm Generation

SUN. 2:15 PM  
Wisconsin Ballroom  
Chaired: **E.E. Marder**

- 2:15 2.1 Mechanisms and Modulation of Rhythm Generation. **E.E. Marder**. Brandeis Univ., Waltham, MA.
- 2:30 2.2 Cellular Mechanisms Underlying Respiratory Rhythmogenesis in a Model System. **N.I. Syed**. Univ. of Calgary.
- 3:05 2.3 A Comparative Approach to Understanding the Mammalian Respiratory Rhythm Generator. **J.-M. Ramirez**. Univ. of Goettingen, Germany and Univ. of Chicago.
- 3:40 2.4 How a (Neonatal) Mammal Breathes: My Best Guess! **J.L. Feldman** UCLA.
- 4:15 2.5 Functional Logic of Distributed Neuronal Assemblies. **B.G. Lindsey**. Univ. of South Florida Med. Ctr.
- 4:50 2.6 Respiratory Neuronal Activity in Intact, Unanesthetized Animals: Lessons From and Lessons For Students of Reduced Preparations. **J.M. Orem** Texas Tech Univ. Hlth. Sci. Ctr.

#### Opening Reception

SUN. 5:30-7:30 PM  
Capitol Ballroom

Symposium

#### 3. Neurochemicals in Ventilatory Control

MON. 9:00 PM  
Wisconsin Ballroom  
Chaired: **D.E. Millhorn**

- 9:00 3.1 Regulation of Gene Transcription in O<sub>2</sub>-Sensitive Cells by Reduced O<sub>2</sub> Tension: Signal Transduction and Genomic Mechanisms. **D. Millhorn** Univ. of Cincinnati.
- 9:10 3.2 Modulation of Respiratory Neuron Properties. **A.J. Berger** Univ. of Washington, Seattle.
- 9:40 3.3 Functional Significance of Neurotransmitter Coexistence: Second Messenger Interactions. **M.S. Dekin**. Robert Wood Johnson Med. Sch., UMDNJ.
- 10:10 3.4 Intracellular Signal Pathways Controlling Respiratory Neurons. **D.W. Richter**. Univ. of Goettingen, Germany.
- 10:40 3.5 Post-Transcriptional Regulation of Tyrosine Hydroxylase Gene Expression During Hypoxia. **M. Czyzyk-Krzeska** Univ. of Cincinnati.
- 11:10 3.6 Neuromodulation of Hypoglossal Motor Neurons (XII MNs): Developmental Changes. **G.D. Funk**. Univ. of Auckland, New Zealand.
- 11:40 3.7 State-Dependent Control of Respiratory Motoneurons: Role of Serotonin. **L.K. Kubin**. Univ. of Pennsylvania.

Symposium

#### 4. Central CO<sub>2</sub>-Sensory Mechanisms

MON. 2:00 PM  
Wisconsin Ballroom  
Chaired: **P. Scheid**

- 2:00 4.1 What Makes a Respiratory Chemoreceptor? **P. Scheid**. Ruhr-Univ., Bochum, Germany.
- 2:15 4.2 Is Carbonic Anhydrase Necessary but not Sufficient For CO<sub>2</sub>-Chemosensitivity? **J.A. Neubauer**. UMDNJ-Robert Wood Johnson Med.

### Monday, July 22, 1996

## DAILY SCHEDULE

- 2:50 4.3 Where are the Mammalian Central Chemoreceptors?. **E.E. Nattie**. Dartmouth Med. Sch.
- 3:25 4.4 CO<sub>2</sub> Chemoreception in the Pulmonate Snail, *Helix*. **J.S. Erlichman**. Wright State Univ., Dayton, OH.
- 4:00 4.5 Role of the Ventrolateral Medulla in Ventilatory Control: Awake Animals. **H.V. Forster**. Zablocki VA Med. Ctr., Milwaukee.
- 4:35 4.6 Life Without Ventilatory Chemoreception. **S.A. Shea**. Harvard Sch. Public Hlth.

Poster

### 5. Poster Sessions of Contributed Abstracts I

MON. 7:30 PM  
Madison Ballroom

Board #

- 1 5.1 Recent evidence for the hybrid pacemaker-network model of respiratory rhythm generation in mammals. **J.C. Smith, N. Koshiya, and E. Simon**NIH.
- 2 5.2 Modeling neural mechanisms for respiratory rhythmogenesis. **I.A. Rybak, J.F.R. Paton, and J.S. Schwaber**. Dupont Central Research, Wilmington, DE and Univ. of Bristol, UK.
- 3 5.3 Rhythmic signaling and network associations of synthetic neurons. **A. Pappelis, S.W. Fox, and B. Yu**. Southern Illinois Univ. and Univ. of South Alabama.
- 4 5.4 Cardiorespiratory rhythmicities and medullary projections of caudal medullary raphe cells. **L. Kubin, V. Fenik, G. Woch, S. Okabe, R.O. Davies, and A.I. Pack**. Univ. of Pennsylvania.
- 5 5.5 Synaptic connections between inspiratory, ventral-group bulbospinal neurons and their spinal connections studied with cross-correlation in decerebrate rats. **G.-F. Tian and J. Duffin** Univ. of Toronto.
- 6 5.6 Medullary neurons that shape inspiratory laryngeal motoneuron activity during fictive coughing: evidence from spike triggered averaging. **R. Shannon, K.F. Morris, D.M. Backey, Z. Li, and B.G. Lindsey**. Univ. of South Florida, Tampa, FL.
- 7 5.7 Responses of medullary raphe neurons to peripheral chemoreceptor and high-threshold mechanoreceptor stimulation: correlations with modulation of breathing. **Z. Li, K.F. Morris, R. Shannon, and B.G. Lindsey**. Univ. of South Florida, Tampa, FL.
- 8 5.8 Respiratory pattern generation by the isolated bullfrog brainstem spinal cord. **S.Reid and W. Milsom**. Univ. of British Columbia.
- 9 5.9 Expiratory neurons mediate expiratory

- lengthening in a lung attached *in vitro* brainstem-spinal cord preparation. **N.M. Mellen, D.R. McCrimmon, and J.L. Feldman**. UCLA and Northwestern Univ. Med. Sch.
- 10 5.10 Hypothalamic modulation of respiration under hypovolemic conditions. **I. Bra\_oková, M. Murín, Š. Kujanik, and P. Švorc**. Šafarik Univ., Košice, Slovak Republic.
- 11 5.11 Differential roles of N-Methyl-D-Aspartate and non-NMDA receptors in the mediation of excitatory inputs to inspiratory bulbospinal neurons in dogs. **M. Krolo, Z. Dogas, M. Tonkovic-Capin, E. Stuth, F. Hopp, D. McCrimmon, and E. Zuperku**. Zablocki VA Med. Ctr., Milwaukee, Med. Col. of Wisconsin and Northwestern Univ.
- 12 5.12 Role of GABA and glycine receptors in the mediation of lung inflation responses of medullary expiratory bulbospinal neurons. **M. Tonkovic, J. Bajic, F. Hopp, D. McCrimmon, E. Stuth, Z. Dogas, and E. Zuperku**. Zablocki VA Med Ctr., Milwaukee, Med. Col. of Wisconsin and Northwestern Univ.
- 13 5.13 Gain modulation in respiratory motor control mediated by GABA receptors with novel pharmacology. **F. Hopp, Z. Dogas, E. Stuth, D. McCrimmon, and E. Zuperku**. Zablocki VA Med. Ctr., Milwaukee, Med. Col. of Wisconsin and Northwestern Univ.
- 14 5.14 Functional characteristics of gain modulation in the reflex control of respiratory bulbospinal neurons. **E. Zuperku, Z. Dogas, M. Tonkovic-Capin, E. Stuth, F. Hopp, M. Krolo, and D. McCrimmon**. Zablocki VA Med. Ctr., Milwaukee, Med. Col. of Wisconsin and Northwestern Univ.
- 15 5.15 GABA<sub>A</sub> effects on hypoglossal motor neurons *in vitro*: comparison of immature rodents and marsupials. **J.P. Farber** Univ. of Oklahoma.
- 16 5.16 Effects of vagal blockade on respiratory timing before and after baclofen, a GABA<sub>B</sub> receptor agonist, in rats. **E. Seifert and T. Trippenbach**. McGill Univ.
- 17 5.17 Adenosine stimulates voltage-dependent K current in pheochromocytoma cells via activation of A<sub>2</sub> receptor. **S. Kobayashi, L. Conforti, W.H. Zhu, and D.E. Millhorn** Univ. of Cincinnati Col. Med.
- 18 5.18 Presynaptic inhibition of glutamatergic synaptic transmission to rat motoneurons by serotonin. **J.H. Singer, M.C. Bellingham, and A.J. Berger**. Univ. of Washington Sch. Med., Seattle.
- 19 5.19 Dopamine increases frequency of central respiratory rhythm in an *in vitro* medulla preparation from adult turtles. **R.A. Johnson, S.M. Johnson, and G.S. Mitchell** Univ. of Wisconsin.
- 20 5.20 Differential respiratory muscle recruitment by clonidine in the awake goat.

## DAILY SCHEDULE

- M.S. Hedrick, M.L. Dwinell, P.L. Janssen, J. Pizarro, and G.E. Bisgard**. California State Univ., Hayward, CA and Univ. of Wisconsin.
- 21 5.21 Various aspects related to K<sup>+</sup> channels in bovine

- tracheal smooth muscle. **Y. Sakai, B.H. Zhu, A. Shamoto, and I. Homma**. Showa Univ. Sch. Med., Tokyo, Japan.
- 22 5.22 Localization of carbonic anhydrase in bullfrog

- olfactory receptor neurons. **E.L. Coates, C.M.O. Wells, A. Kovscek, and M.A. Romeo.** Allegheny College, Meadville, PA.
- 23 5.23 Properties of cultured rat ventromedial medullary neurons sensitive to respiratory acidosis. **G.B. Richerson and W. Wang.** VA Med. Ctr., West Haven, CT and Yale Univ.
- 24 5.24 Firing patterns and CO<sub>2</sub> responses of the neurons in the nuclei parapyramidalis superficialis and raphe pallidus: important sites of the rat central chemoreception. **Y. Okada, Z. Chen, and F.L. Eldridge** Univ. of North Carolina.
- 25 5.25 Identification of connections between the CO<sub>2</sub> sensitive cells in the superficial ventral medulla and the VRG region. **Z. Chen, Y. Okada, W. Jiang and F.L. Eldridge** Univ. of North Carolina.
- 26 5.26 Effect of CO<sub>2</sub> on discharge frequency and recruitment of rat phrenic motoneurons. **F. Hayashi, A. Aouda, Y. Okada, and Y. Fukuda.** Chiba Univ., Japan.
- 27 5.27 Acetazolamide injection in the ventral respiratory group of the anesthetized rats increases phrenic nerve activity and decreases tissue pH but with different temporal patterns. **A. Li and E.E. Nattie.** Dartmouth Med. Sch.
- 28 5.28 Chronic serotonin reuptake inhibition impairs short term modulation of the exercise ventilatory response in goats. **D.M. Konkle, D.R. Henderson, S.D. Bartholow, and G.S. Mitchell.** Univ. of Wisconsin.
- 29 5.29 Effects of chronic serotonin reuptake inhibition on long term modulation of the exercise ventilatory response in goats. **D.R. Henderson, D.M. Konkle, S. D. Bartholow, and G.S. Mitchell.** Univ. of Wisconsin.
- 30 5.30 Regulation of arterial carbon dioxide tension during exercise in newborn lambs. **P.L. Entin, R.E. Rawson, and D. Robertshaw** Cornell Univ.
- 31 5.31 Control of nasal dilator muscle activities during exercise: role of nasopharyngeal afferents. **D. Fuller, J. Sullivan, and R.F. Fregosi.** Univ. of Arizona.
- 32 5.32 Ventilatory response during light exercise in patients with severe peripheral vascular disease. **P. Haouzi, J.J. Hirsch, F. Marchal, and E. Alloui.** Faculty of Med., Nancy, France.
- 33 5.33 Mutual interactions of respiratory and finger movements in humans. **B. Rassler, S. Waurick, and K. Heusser** Univ. of Leipzig, Germany.
- 34 5.34 Perception of the inflation of a single lobe of a lung. **S.A. Shea, A. Guz, R. Brown, R. Schwartzstein, R. Lansing, and R.B. Banzett.** Harvard Sch. of Public Hlth., Boston, MA.
- 35 5.35 Breathlessness during exercise in subjects lacking ventilatory chemosensitivity. **C.M. Spengler, S.A. Shea, D.M. Systrom, and R.B. Banzett.** Harvard Sch. of Public Hlth. and Massachusetts General Hosp., Boston.
- 36 5.36 'Air Hunger' adapts to chronic hypercapnia in ventilator-dependent subjects. **R.B. Banzett, E. Bloch-Salisbury, S.A. Shea, K. Evans, and R. Brown.** Harvard Sch. of Public Hlth. and Brockton & West Roxbury VA Med. Ctr., Boston.
- 37 5.37 Nasal inhalation of 1-menthol reduces respiratory discomfort during loaded breathing. **T. Nishino, and T. Ishikawa** Chiba Univ., Japan.
- 38 5.38 Neuromechanical inhibition of VT occurs after brief trials of mechanical ventilation. **C.W. Wilson, S. Manchanda, J. Quam, J.B. Skatrud, and J.A. Dempsey.** Univ. of Wisconsin and Middleton VA Hospital, Madison, WI.
- 39 5.39 Inspiratory and expiratory changes in the upper airway cross sectional area of breaths preceding an obstructive sleep apnea in humans. **M.J. Morrell and M.S. Badr.** Middleton VA Hosp., WI and Univ. of Wisconsin.
- 40 5.40 The effects of varying tidal volume during assisted ventilation on respiratory motor output and timing. **A.M. Leevers and J.A. Raudzus.** Queen's Univ., Kingston, Ontario.
- 41 5.41 The effect of laryngeal denervation on upper airway negative pressure responses in awake and sleeping dogs. **A.K. Curran, P.R. Eastwood, C.A. Smith, and J.A. Dempsey** Univ. of Wisconsin.
- 42 5.42 Modulation by sleep of the response to transient hypoxia in man. **D.R. Corfield, C.A. Roberts, M.J.D. Griffiths, and L. Adams.** Charing Cross and Westminster Med. Sch., London, UK.
- 43 5.43 Is the hypoxic ventilatory response in the rat time-of-day dependent? **J. Peever and R. Stephenson** Univ. of Toronto.
- 44 5.44 Central pattern generation in the golden-mantled ground squirrel. **S.K. Franks and W.K. Milsom.** Univ. of British Columbia.
- 45 5.45 Effects of NMDA blockade and vagal interruption on breathing in ground squirrels. **M.B. Harris and W.K. Milsom** Univ. of British Columbia.

## DAILY SCHEDULE

**Tuesday, July 23, 1996**

### Symposium

#### 6. Integrated Ventilatory Responses: Sensory Mechanisms

TUES. 9:00 PM  
Wisconsin Ballroom  
Chaired: **G.E. Bisgard**

- 9:00 6.1 Pharmacological and Physiological Modulation of the Carotid Body Response to Prolonged Hypoxia. **G.E. Bisgard** Univ. of Wisconsin.
- 9:10 6.2 How Does the Carotid Body Sense Hypoxia? **D.F. Donnelly** Yale Univ. Sch. Med.
- 9:40 6.3 Neuronal Response to O<sub>2</sub> Deprivation: O<sub>2</sub>-Sensing Mechanisms. **G.G. Haddad** Yale Univ. Sch. of Med.
- 10:10 6.4 Role of Caudal Hypothalamic and Ventrolateral Medullary Neurons in the Respiratory Responses to Hypoxia. **T.G. Waldrop** Univ. Illinois, Urbana.
- 10:40 6.5 Initial Central Integration of Arterial Chemoreceptor Inputs. **S.W. Mifflin** Univ. of Texas Hlth. Sci. Ctr.
- 11:10 6.6 Time Domains of Hypoxic Ventilatory Responses in Vertebrates. **F.L. Powell** UCSD.
- 11:40 6.7 Nonlinear Modulation of Respiratory Pattern by Vagal Feedback. **E.N. Bruce** Univ. of Kentucky.

### Poster

#### 7. Poster Sessions of Contributed Abstracts II

TUES. 1:30 PM  
Madison Ballroom

### Board #

- 1 7.1 Tyrosine hydroxylase mRNA, Dopamine D<sub>2</sub> mRNA and *c-fos* expression in the goat carotid body. **D. D. Xue, I.M. Keith, and G.E. Bisgard** Univ. of Wisconsin.
- 2 7.2 Interaction of dopamine receptors with the O<sub>2</sub>-sensitive K<sup>+</sup> current in PC12 cells. **W.H. Zhu, L. Conforti, and D.E. Millhorn** Univ. of Cincinnati Col. Med.
- 3 7.3 The regulation of the tyrosine hydroxylase gene by reduced oxygen tension: the role of calcium and protein kinase C. **R.M. Raymond and D.E. Millhorn** Univ. of Cincinnati.
- 4 7.4 Augmented calcium current density in glomus cells from chronically hypoxic rats. **S.C. Hempleman** Northern Arizona Univ., Flagstaff.
- 5 7.5 Acetylcholine and carotid body chemotransduction of hypoxia in the cat. **R.S. Fitzgerald, M. Shirahata, Y. Ishizawa, and J.S.K.**

- Sham** Johns Hopkins Med. Inst.
- 6 7.6 Afferent sensory activity from catfish gills. **M.L. Burleson and N.J. Smatresk** Univ. of Texas, Arlington.
- 7 7.7 Single unit carotid chemoreceptor responses to hypoxia in adult rats. **E.B. Olson, Jr., E.H. Vidruk, L. Ling, and G.S. Mitchell** Univ. of Wisconsin.
- 8 7.8 Chronoamperometric determination of hypoxic-induced dopamine efflux from the cat carotid body. **R. Iturriaga, J. Alcayaga, and P. Zapata** Catholic Univ. of Chile, Santiago, Chile.
- 9 7.9 Hypoxic excitation of cultured neurons from the rostral ventrolateral medulla. **E. Mazza, N.H. Edelman, and J.A. Neubauer** UMDNJ-Robert Wood Johnson Med. Sch.
- 10 7.10 Acute systemic hypoxia increases neuronal Fos expression in the caudal hypothalamus of conscious rats. **E.M. Horn, M. Jain, and T.G. Waldrop** Univ. of Illinois, Urbana.
- 11 7.11 Hypoxia stimulates ventilation following disinhibition of neurons in the pre-Bötzinger complex. **I.C. Solomon, N.H. Edelman, and J.A. Neubauer** UMDNJ-Robert Wood Johnson Med. Sch.
- 12 7.12 The response to superior laryngeal nerve stimulation is decreased following brief hypoxia in adult rats. **T.E. Dick, M.I. El-Khatib, P.A. Martinak, and S.K. Coles** Case Western Reserve Univ.
- 13 7.13 Post hypoxic depression of phrenic burst frequency in rats requires  $\alpha_2$  adrenergic receptors. **K.B. Bach and G.S. Mitchell** Univ. of Wisconsin.
- 14 7.14 CNS mechanisms modulating the arterial ventilatory chemoreflex in awake rats. **M.C. Jordan and F.L. Powell** Univ. of California, San Diego.
- 15 7.15 Residual hypoxic ventilatory increases after selective chemodenervation are NMDA receptor dependent in conscious rats. **P.J. Ohtake, G.R. Graff, J.E. Torres, and D. Gozal** SUNY at Buffalo and Tulane Univ. Sch. Med.
- 16 7.16 Constitutive nitric oxide synthase isoforms and peripheral chemoreceptor stimulation in conscious rats. **D. Gozal, E. Gozal, Y.M. Gozal, and J.E. Torres** Tulane Univ. Sch. of Med.
- 17 7.17 Dopamine infusion does not prevent ventilatory acclimatization to hypoxia in awake goats. **P.L. Janssen, M.R. Dwinell, J. Pizarro, and G.E. Bisgard** Univ. of Wisconsin.
- 18 7.18 Do awake goats exhibit long term facilitation and roll-off with continuous isocapnic hypoxia? **M.R. Dwinell, P.L. Janssen, and G.E. Bisgard** Univ. of Wisconsin.
- 19 7.19 Ventilatory responses of toads. **Bufo**

- marinus*) to intermittent hypoxic exposure. **T.L. Baker and N.J. Smatresk.** Univ. of Texas, Arlington.
- 20 7.20 Long-term facilitation of upper airway respiratory muscle activity in the vagotomized and vagally intact cat. **J.H. Mateika and R.F. Fregosi.** Univ. of Arizona.
- 21 7.21 Evidence for change of respiratory phase variance and changes in synchrony of raphe neuron assemblies during long term facilitation. **K.F. Morris, R. Shannon, and B.G. Lindsey.** Univ. of South Florida Med. Ctr.
- 22 7.22 Magnitude of the excitatory effect of serotonin varies among distinct pools of upper airway motoneurons. **V. Fenik, L. Kubin, S. Okabe, A.I. Pack and R. O. Davies** Univ. of Pennsylvania.
- 23 7.23 Evidence for heterogeneity in serotonergic modulation of phrenic and hypoglossal motor output in rats. **R. Kinkead, K.B. Bach, and G.S. Mitchell** Univ. of Wisconsin.
- 24 7.24 Ventilatory and metabolic responses to ambient hypoxia in rats exposed to co-hypoxia. **H. Gautier, C. Murariu, and M. Bonora.** Fac. Med. St. Antoine, Paris, France.
- 25 7.25 Respiratory modulation by cervical sympathetic nerves in the rat. **K.D. O'Halloran, D. Cantillon, A.K. Curran, and A. Bradford.** Royal Col. of Surgeons in Ireland, Dublin, Ireland.
- 26 7.26 Chemoreceptor control of breathing in the carp. **M.L. Lumsden and W.K. Milsom.** Univ. of British Columbia.
- 27 7.27 Changes in arterial O<sub>2</sub> content affect cardiac shunt but not ventilation in turtles. **T. Wang, J.W. Hicks, and W.K. Milsom.** Univ. of British Columbia and Univ. of California, Irvine.
- 28 7.28 The peripheral-chemoreflex ventilatory response to CO<sub>2</sub>. **J. Duffin and R. Mohan** Univ. of Toronto.
- 29 7.29 Dynamic ventilatory response to hyperoxia in exercise. **C.M. St. Croix, D.A. Cunningham, D.H. Paterson, and J.M. Kowalchuk.** The Univ. of Western Ontario.
- 30 7.30 Carbon dioxide modulation of the human ventilatory and cardiac responses to sustained hyperoxia. **S.D. Lucy, D.A. Cunningham, J.M. Kowalchuk, and D.H. Paterson.** Univ. of Western Ontario.
- 31 7.31 Peripheral and central chemoreceptor thresholds in decerebrate cats. **S. Iscoe, M. Beaton, and J. Duffin.** Queen's Univ., Kingston, Ontario.
- 32 7.32 Developmental changes in ionic conductances contributing to membrane resistance in rat genioglossal motoneurons. **W.E. Cameron, P.A. Nunez-Abades, T.A. Hodgson, and J.M. Pattillo** Oregon Hlth. Sci. Univ.,
- 33 7.33 Developmental changes in the transverse rhythmic slice of mice. **P. Telgkamp, F.P. Elsen, and J.M. Ramirez.** Univ. of Chicago and Univ. of Goettingen, Germany.
- 34 7.34 Phrenic nerve and diaphragm development in fetal rats: potential mechanisms underlying congenital diaphragmatic hernia. **J.J. Greer and D.W. Allan.** Univ. of Alberta.
- 35 7.35 Characterization of gill and lung ventilatory activities of cranial nerves in the spontaneously breathing tadpole, *Rana catesbeiana*. **M.J. Gdovin, C.S. Torgerson, and J.E. Remmers.** Univ. of Calgary.
- 36 7.36 Ontogeny of central chemoreception during fictive gill and lung ventilation of an *in vitro* brainstem preparation of the larval bullfrog, *Rana catesbeiana*. **C.S. Torgerson, M.J. Gdovin, and J.E. Remmers** Univ. of Calgary.
- 37 7.37 Threshold dose of indomethacin for increased fetal breathing is similar via vein or cerebral ventricle. **S.L. Adamson, D. Engelberts, and K.J. Whiteley.** Mt. Sinai Hosp., Toronto.
- 38 7.38 Prostaglandin E<sub>2</sub> induces cluster breathing in newborn lambs. **T.C. Tai and S.L. Adamson.** Mt. Sinai Hosp., Toronto.
- 39 7.39 Prostaglandin E<sub>2</sub> transiently inhibits fetal breathing movements independently of electrocortical activity during reduced uterine blood flow in sheep. **C.S. Watson, J.R.G. Challis, and A.D. Bocking.** Univ. of Western Ontario.
- 40 7.40 Effect of hypoxia on the thyroarytenoid muscle electromyogram in unanesthetized fetal sheep. **J.M. Bissonnette, A.R. Hohimer, and S.J. Knopp.** Oregon Hlth. Sci. Univ.
- 41 7.41 A thalamic locus involved in abolishing hypoxic inhibition of breathing in fetal sheep. **B. Koos, A. Chau, M. Matsuura, O. Punla, and L. Kruger.** UCLA.
- 42 7.42 Attenuation of the late decrease in phrenic activity during hypoxia after caudal mesencephalic decerebration in newborn piglets. **R.A. Darnall, and W.M. St. John** Dartmouth Med. Sch.
- 43 7.43 Microdialyzed enkephalin and substance-P from brain stem of chronically instrumented piglets: effect of hypoxia. **K.A. Waters, J. Paquette, A. Laferrière, and I.R. Moss.** McGill Univ. and Montreal Children's Hosp. Res. Inst.
- 44 7.44 <sup>3</sup>H-naloxone binding to brainstem opioid receptors in the sudden infant death syndrome. **H.C. Kinney, J.J. Filiano, S. Assmann, and W.F. White.** Harvard Med. Sch.
- 45 7.45 Integrated phrenic responses to isocapnic hypoxia in adult rats following perinatal hyperoxia. **L. Ling, E.B. Olson, Jr., E.H. Vidruk, and G.S. Mitchell.** Univ. of Wisconsin.
- 46 7.46 Carotid sinus nerve responses to



## DAILY SCHEDULE

- hypoxia and cyanide are attenuated in adult rats following perinatal hyperoxia. **E.H. Vidruk, E.B. Olson, Jr., L. Ling, and G.S. Mitchell.** Univ. of Wisconsin.
- 477.47 Transgenic mice lacking brain-derived neurotrophic factor are deficient in chemoafferent neurons and display a severe developmental deficit in control of breathing. **J.T. Erickson, J.C. Conover, V. Borday, J. Champagnat, G.D. Yancopoulos and D.M. Katz.** Case Western Reserve Univ. Sch. Med.
- 487.48 Phrenic motoneuron adaptations induced by removal of excitatory drive. **Y.S. Prakash, W.Z. Zhan, H. Miyata, K.G. Smithson, and G.C. Sieck** Mayo Fndn.
- 497.49 Diaphragm neuromuscular junction adaptations to inactivity. **G.C. Sieck, Y.S. Prakash, H. Miyata, and W.Z. Zhan** Mayo Fndn.

### Conference Banquet

TUES. 6:00–7:00 PM  
Capitol Ballroom  
**Pre-Banquet Reception**  
Featuring music by **Josue Pizarro**

TUES. 7:00–9:00 PM  
**Banquet, Awards, and Entertainment**  
Featuring comedian **Ron Detinger**

### Wednesday, July 24, 1996

#### Symposium

#### 8. Phylogeny and Ontogeny in Ventilatory Control

WED. 9:00 AM  
Wisconsin Ballroom  
Chaired: **S.J. England**

- 9:00 8.1 Ontogeny and Phylogeny in Respiratory Control. **S.J. England.** UMDNJ–R.W. Johnson Med. Sch., New Brunswick, NJ.
- 9:10 8.2 Phylogeny of Vertebrate Ventilatory Control. **N.J. Smatresk** Univ. of Texas, Arlington.
- 9:40 8.3 Phylogenetic and Developmental Transitions in Central Cardiorespiratory Control. **E.W. Taylor.** Univ. of Birmingham, UK.
- 10:10 8.4 Control of Breathing in the Fetus and Neonate. **M.A. Hanson** Univ. Col., London, UK.
- 10:40 8.5 Neuromodulation of Hypoglossal Motoneurons: Cellular and Developmental

Mechanisms. **D.A. Bayliss** Univ. of Virginia.

- 11:10 8.6 Early Ontogeny of Rhythm Generation and Control of Breathing. **J. Champagnat.** CNRS, Gif-sur-Yvette, France.
- 11:40 8.7 Developmental Plasticity of the Hypoxic Ventilatory Response. **L. Ling** Univ. of Wisconsin.

#### Symposium

#### 9. Modulation and Plasticity in Ventilatory Control

WED. 2:00 PM  
Wisconsin Ballroom  
Chaired: **G.S. Mitchell**

- 2:00 9.1 Modulation and Plasticity in Respiratory Motor Control. **G.S. Mitchell** Univ. of Wisconsin.
- 2:10 9.2 Brain Mechanisms for Adaptive Motor Control. **J.C. Houk** Northwestern Univ. Med. Sch.
- 2:40 9.3 Modulation of the Synaptic Drive to Respiratory Premotor and Motor Neurons. **D.R. McCrimmon** Northwestern Univ. Med. Sch.
- 3:10 9.4 Modulation and Plasticity of the Exercise Ventilatory Response. **D.L. Turner.** Univ. of Leeds, UK.
- 3:40 9.5 Transmitter Plasticity in Developing Chemoafferent Neurons. **D.M. Katz.** Case Western Reserve Univ.
- 4:10 9.6 Neonatal Conditioning of Respiratory Behavior. **K. Strohl** Case Western Reserve Univ.
- 4:40 9.7 Plasticity in Diaphragm Motor Units. **G.C. Sieck** Mayo Clinic and Fndn.

## DAILY SCHEDULE

**Thursday, July 25, 1996**

Symposium

**10. Integrated Ventilatory Responses:  
Exercise and Sleep**

THURS. 8:30 AM  
Wisconsin Ballroom  
Chaired: **J.A. Dempsey**

- 8:30 10.1 Memory Effects in Ventilatory Control and Their Implications for Sleep-Disordered Breathing. **J.A. Dempsey** Univ. of Wisconsin.
- 8:35 10.2 Pulmonary:Locomotor Interactions in Exercising Quadrupeds. **D.M. Ainsworth**. Cornell Univ.
- 9:05 10.3 Respiratory Entrainment During Flight. **D.F. Boggs**. Univ. of Montana, Missoula.

- 9:35 10.4 Recruitment of Upper Airway Muscles During Exercise. **R.F. Fregosi** Univ. of Arizona.
- 10:05 10.5 The Muscle Reflex: Its Relationship to the Control of Breathing. **M.P. Kaufman**. Univ. of California, Davis.
- 10:35 10.6 Cortical Control of Ventilation During Exercise. **L. Adams**. Charing Cross and Westminster Med Sch., London, UK.
- 11:05 10.7 Ventilatory Irregularities During Sleep. **A.I. Pack** Univ. of Pennsylvania Med. Sch.
- 11:35 10.8 Breathing in Hypometabolic States. **W.K. Milsom** Univ. of British Columbia.

## **ABSTRACTS OF SPEAKERS' TALKS AND POSTER PRESENTATIONS**

---

### **Sunday**

2.0	The Central Neural Network Mechanisms of Rhythm Generation.....	167
-----	---	-----

### **Monday**

3.0	Neurochemicals in Ventilatory Control.....	169
4.0	Central CO <sub>2</sub> -Sensory Mechanisms.....	171
5.0	Poster Sessions of Contributed Abstracts.....	173

### **Tuesday**

6.0	Integrated Ventilatory Responses: Sensory Mechanisms.....	181
7.0	Poster Sessions of Contributed Abstracts.....	183

### **Wednesday**

8.0	Phylogeny and Ontogeny in Ventilatory Control.....	191
9.0	Modulation and Plasticity in Ventilatory Control.....	193

### **Thursday**

10.0	Integrated Ventilatory Responses: Exercise and Sleep.....	195
------	---	-----

<b>Author Index.....</b>	<b>198</b>
--------------------------	------------

## AUTHOR INDEX

The number to the left of the decimal designates the session. The program number follows the decimal. An asterisk (\*) indicates invited speakers.

### A

Adams, L., 5.42, 10.6\*  
Adamson, S.L., 7.37,  
7.38  
Ainsworth, D.M., 10.2\*  
Alcayaga, J., 7.8  
Allan, D.W., 7.34  
Allioui, E., 5.32  
Aouda, A., 5.26  
Assmann, S., 7.44

### B

Bach, K.B., 7.13, 7.23  
Badr, M.S., 5.39  
Baekey, D.M., 5.6  
Bajic, J., 5.12  
Baker, T.L., 7.19  
Banzett, R.B., 5.34, 5.35,  
5.36  
Bartholow, S.D., 5.28,  
5.29  
Bayliss, D.A., 8.5\*  
Beaton, M., 7.31  
Bellingham, M.C., 5.18  
Berger, A.J., 3.2\*, 5.18  
Bisgard, G.E., 5.20, 6.1\*,  
7.1, 7.17, 7.18  
Bissonnette, J.M., 7.40  
Bloch-Salisbury, E., 5.36  
Bocking, A.D., 7.39  
Boggs, D.F., 10.3\*  
Bonora, M., 7.24  
Borday, V., 7.47  
Bracoková, I., 5.10  
Bradford, A., 7.25  
Brown, R., 5.34, 5.36  
Bruce, E.N., 6.7\*  
Burleson, M.L., 7.6

### C

Cameron, W.E., 7.32  
Cantillon, D., 7.25  
Challis, J.R.G., 7.39  
Champagnat, J., 7.47,  
8.6\*  
Chau, A., 7.41  
Chen, Z., 5.24, 5.25  
Coates, E.L., 5.22  
Coles, S.K., 7.12  
Conforti, L., 7.2  
Conover, J.C., 7.47  
Corfield, D.R., 5.42  
Cunningham, D.A., 7.29,  
7.30

Curran, A.K., 5.41, 7.25  
Czyzyk-Krzeska, M.,  
3.5\*

### D

Darnall, R.A., 7.42  
Davies, R.O., 5.4, 7.22  
Dekin, M.S., 3.3\*  
Dempsey, J.A., 5.38,  
5.41, 10.1\*  
Dick, T.E., 7.12  
Dogas, Z., 5.11, 5.12,  
5.13, 5.14  
Donnelly, D.F., 6.2\*  
Duffin, J., 5.5, 7.28, 7.31  
Dwinell, M.L., 5.20,  
7.17, 7.18

### E

Eastwood, P.R., 5.41  
Edelman, N.H., 7.9, 7.11  
El-Khatib, M.I., 7.12  
Eldridge, F.L., 5.24, 5.25  
Elsen, F.P., 7.33  
Engelberts, D., 7.37  
England, S.J., 8.1\*  
Entin, P.L., 5.30  
Erickson, J.T., 7.47  
Erlichman, J.S., 4.4\*  
Evans, K., 5.36

### F

Farber, J.P., 5.15  
Feldman, J.L., 2.4\*, 5.9  
Fenik, V., 5.4, 7.22  
Filiano, J.J., 7.44  
Fitzgerald, R.S., 7.5  
Forster, H.V., 4.5\*  
Fox, S.W., 5.3  
Franks, S.K., 5.44  
Fregosi, R.F., 5.31, 7.20,  
10.4\*  
Fukuda, Y., 5.26  
Fuller, D., 5.31  
Funk, G.D., 3.6\*

### G

Gautier, H., 7.24  
Gdovin, M.J., 7.35, 7.36  
Gozal, D., 7.15, 7.16  
Gozal, E., 7.16

Gozal, Y.M., 7.16  
Graff, G.R., 7.15  
Greer, J.J., 7.34  
Griffiths, M.J.D., 5.42  
Guz, A., 5.34

### H

Haddad, G.G., 6.3\*  
Hanson, M.A., 8.4\*  
Haouzi, P., 5.32  
Harris, M.B., 5.45  
Hayashi, F., 5.26  
Hedrick, M.S., 5.20  
Hempleman, S.C., 7.4  
Henderson, D.R., 5.28,  
5.29  
Heusser, K., 5.33  
Hicks, J.W., 7.27  
Hirsch, J.J., 5.32  
Hodgson, T.A., 7.32  
Hohimer, A.R., 7.40  
Homma, I., 5.21  
Hopp, F., 5.11, 5.12,  
5.13, 5.14  
Horn, E.M., 7.10  
Houk, J.C., 9.2\*

### I

Iscoe, S., 7.31  
Ishikawa, T., 5.37  
Ishizawa, Y., 7.5  
Iturriaga, R., 7.8

### J

Jain, M., 7.10  
Janssen, P.L., 5.20, 7.17,  
7.18  
Jian, W., 5.25  
Johnson, R.A., 5.19  
Johnson, S.M., 5.19  
Jordan, M.C., 7.14

### K

Katz, D.M., 7.47, 9.5\*  
Kaufman, M.P., 10.5\*  
Keith, I.M., 7.1  
Kinkead, R., 7.23  
Kinney, H.C., 7.44  
Knopp, S.J., 7.40  
Konkle, D.M., 5.28, 5.29  
Koos, B., 7.41  
Koshiya, N., 5.1  
Kovscek, A., 5.22

Kowalchuk, J.M., 7.29,  
7.30  
Krolo, M., 5.11, 5.14  
Kruger, L., 7.41  
Kubin, L., 3.7\*, 5.4, 7.22  
Kujanik, S., 5.10

### L

Laferrière, A., 7.43  
Lansing, R., 5.34  
Leevers, A.M., 5.40  
Li, A., 5.27  
Li, Z., 5.6, 5.7  
Lindsey, B.G., 2.5\*, 5.6,  
5.7, 7.21  
Ling, L., 7.7, 7.45, 7.46,  
8.7\*  
Lucy, S.D., 7.30  
Lumsden, M.L., 7.26

### M

Manchanda, S., 5.38  
Marchal, F., 5.32  
Marder, E.E., 2.1\*  
Martinak, P.A., 7.12  
Mateika, J.H., 7.20  
Matsuura, M., 7.41  
Mazza, E., 7.9  
McCrimmon, D., 5.9,  
5.11, 5.12, 5.13,  
5.14, 9.3\*  
Mellen, N.M., 5.9  
Mifflin, S.W., 6.5\*  
Millhorn, D.E., 3.1\*,  
5.17, 7.2, 7.3  
Milsom, W.K., 5.8, 5.44,  
5.45, 7.26, 7.27,  
10.8\*  
Mitchell, G.S., 5.19,  
5.28, 5.29, 7.13, 7.7,  
7.23, 7.45, 7.46, 9.1\*  
Miyata, H., 7.48, 7.49  
Mohan, R., 7.28  
Moris, K.F., 5.6  
Morrell, M.J., 5.39  
Morris, K.F., 5.7, 7.21  
Moss, I.R., 7.43  
Murariu, C., 7.24  
Murin, M., 5.10

### N

Nattie, E.E., 4.3\*, 5.27  
Neubauer, J.A., 4.2\*,

7.9, 7.11  
Nishino, T., 5.37  
Nunez-Abades, P.A.,  
7.32

---

**O**

O'Halloran, K.D., 7.25  
Ohtake, P.J., 7.15  
Okabe, S., 5.4, 7.22  
Okada, Y., 5.24, 5.25,  
5.26  
Olson, E.B., Jr., 7.7,  
7.45, 7.46  
Orem, J.M., 2.6\*

---

**P**

Pack, A.I., 5.4, 7.22,  
10.7\*  
Pappelis, A., 5.3  
Paquette, J., 7.43  
Paterson, D.H., 7.29,  
7.30  
Paton, J.F.R., 5.2  
Peever, J., 5.43  
Pizarro, J., 5.20, 7.17  
Powell, F.L., 6.6\*, 7.14  
Prakash, Y.S., 7.48, 7.49  
Punla, O., 7.41

---

**Q**

Quam, J., 5.38

---

**R**

Ramirez, J.M., 7.33  
Ramirez, J-M., 2.3\*  
Rassler, B., 5.33  
Raudzus, J.A., 5.40  
Rawson, R.E., 5.30  
Raymond, R.M., 7.3  
Reid, S., 5.8  
Remmers, J.E., 7.35,  
7.36  
Richerson, G.B., 5.23  
Richter, D.W., 3.4\*  
Roberts, C.A., 5.42  
Robertshaw, D., 5.30  
Romeo, M.A., 5.22  
Rybak, I.A., 5.2

---

**S**

Sakai, Y., 5.21  
Scheid, P., 4.1\*  
Schwaber, J.S., 5.2  
Schwartzstein, R., 5.34

Seifert, E., 5.16  
Sham, J.S.K., 7.5  
Shamoto, A., 5.21  
Shannon, R., 5.6, 5.7,  
7.21  
Shea, S.A., 4.6\*, 5.34,  
5.35, 5.36  
Shirahata, M., 7.5  
Sieck, G.C., 7.48, 7.49,  
9.7\*  
Simon, E., 5.1  
Singer, J.H., 5.18  
Skatrud, J.B., 5.38  
Smatresk, N.J., 7.6, 7.19,  
8.2\*  
Smith, C.A., 5.41  
Smith, J.C., 5.1  
Smithson, K.G., 7.48  
Solomon, I.C., 7.11  
Spengler, C.M., 5.35  
St. Croix, C.M., 7.29  
St. John, W.M., 7.42  
Stephenson, R., 5.43  
Strohl, K., 9.6\*  
Stuth, E., 5.11, 5.12,  
5.13, 5.14  
Sullivan, J., 5.31  
Svorc, P., 5.10  
Syed, N.I., 2.2\*  
Systrom, D.M., 5.35

---

**T**

Tai, T.C., 7.38  
Taylor, E.W., 8.3\*  
Telgkamp, P., 7.33  
Tian, G.-F., 5.5  
Tonkovic, M., 5.12  
Tonkovic-Capin, M.,  
5.11, 5.14  
Torgerson, C.S., 7.35,  
7.36  
Torres, J.E., 7.15, 7.16  
Trippenbach, T., 5.16  
Turner, D.L., 9.4\*

---

**V**

Vidruk, E.H., 7.7, 7.45,  
7.46

---

**W**

Waldrop, T.G., 6.4\*,  
7.10  
Wang, T., 7.27  
Wang, W., 5.23  
Waters, K.A., 7.43  
Watson, C.S., 7.39  
Waurick, S., 5.33  
Wells, C.M.O., 5.22  
White, W.F., 7.44  
Whiteley, K.J., 7.37  
Wilson, C.W., 5.38  
Woch, G., 5.4

---

**X**

Xue, D.D., 7.1

---

**Y**

Yancopoulos, G.D., 7.47  
Yu, B. 5.3

---

**Z**

Zapata, P., 7.8  
Zhan, W.Z., 7.48, 7.49  
Zhu, W.H., 5.17  
Zhu, B.H., 5.21  
Zuperku, E., 5.11, 5.12,  
5.13, 5.14