Published by The American Physiological Society
Integrating the Life Sciences from Molecule to Organism

The Physiologist

INSIDE

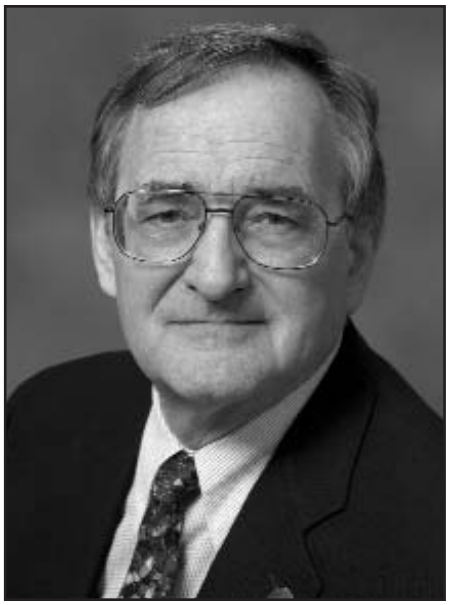
The People Who Tell the Story, Shape the Culture

Robert W. Gore,
University of Arizona, College of Medicine
2005 Arthur C. Guyton Teacher of the Year Award

I am deeply honored to be selected the recipient of the 2005 Arthur C. Guyton Teacher of the Year Award. I accept this award with all the grace and dignity that I can muster, and I accept it on behalf of all the people who have taught, influenced, scolded, nurtured, and trained me over the years. It is, in a sense, their award.

I want especially to acknowledge the teachers who stimulated my personal commitment to teaching. I was shaped by my experiences as an undergraduate trained in the liberal arts at Carleton College, in Northfield, Minnesota, where I was exposed to excellent Full Professors who were in the classroom every day. I also had the good fortune to have excellent mentors such as William J. Whalen, Charles Wunder, Henry B. Bull, G. Edgar Folk and Paul C. Johnson, among others, during my graduate and postdoctoral years. I also thank the people who nominated me, and the Teaching Section of the American Physiological Society that judged me worthy of this prestigious award.

I hope that I can bring honor to The Guyton Award, in the name of teaching, in the same way that previous awardees have. I believe The Guyton Award is a symbol of how very important it is for all of us in this discipline to teach the physiological sciences to this, and future generations, with the same degree of commitment and energy that we focus on our quest in the research laboratory, to discover the mysteries of the "normal functions of organs and organ systems within all living organ-



Robert W. Gore

isms"—(which is the definition of Physiology).

I have many views and ideas about teaching that have evolved from personal experiences at all levels in the classroom over a period of nearly 44-years. I first began teaching from the moment I entered graduate school in the Department of Physiology and Biophysics at the University of Iowa in the Fall of 1961. Teaching was a requirement, not an option, of the PhD program at Iowa when I first entered there. Since then, I have taught grade school children, high school students, undergraduate and graduate students, postdoctoral students, physical therapists, physical edu-

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The Physiologist

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Published bimonthly and distributed by The American Physiological Society

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

Subscriptions: Distributed to members as part of their membership. Nonmembers in the USA (print only): individuals $60.00; institutions $95.00. Nonmembers in Canada: individuals $65.00; institutions $100.00. Nonmembers elsewhere: individuals $70.00; institutions $105.00. Single copies and back issues when available, $20.00 each; single copies and back issues of Abstracts issues when available, $30.00. Subscribers to *The Physiologist* also receive abstracts of the Conferences of the American Physiological Society. The online version is available free to all worldwide.

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Printed in the USA

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cation majors, exercise and sports science majors, dentists, nurses, engineers, biomedical engineers, physicists, optical scientists, biophysicists, physicians' assistants, medical students, medical residents and more. Thus, to attempt to tell the whole story in this article would take up far more space then the pages of *The Physiologist* will allow, and to do so would surely cause the readers to tear the pages from this issue to use as fire-starters on a cold February day. Hence, I will share with you in a general way only a few of the elements of my rather simple teaching philosophy—ones that I consider essential features of my teaching style. In the process, I hope the readers will be able to extract something of value to carry forward in their own search for better ways to inspire and touch the minds and souls of their students. Haramati, the Guyton Awardee in 2000, referred to "Lighting a Fire" within students (2), and Ordway, the Awardee in 2003 extended the theme and spoke of spreading "The Fire Beyond the Lecture Hall" (4). In the spirit of their comments, I would like to "Pass The Torch" of some of my thoughts on to other teachers.

Remind Yourself Why You Teach

A general rule I use to help focus on the essential features of a satisfying teaching experience is to periodically ask myself: "Why am I teaching?" "What am I teaching?" How am I teaching?" Self evaluation is good. These questions remind me to revise and change my approach to teaching and to stay alert to how the students' world and mine are changing, sometimes in different directions. This simple question, "why," helps me reexamine my commitment to my students, and to my profession as a Physiologist. Indeed, it was when I asked these questions of myself in 1996, as director of our Human Physiology course for freshman medical students, that I realized the need to fully embrace the World Wide Web. The result was that I developed a complete, searchable, interactive web site that includes our entire physiology course, and made it available to the world at: http://human.physiol.arizona.edu. The details of its development and the true power of the Internet for teaching, and how it subsequently evolved in our department are for another article. Suffice it to say that I encourage everyone who teaches to take full advantage of the Internet. Stay up with current technology. Learn how to use it. Contribute to its advancement. Stay in the "now." It is where all the students live, and so to be effective, one ought to know how to speak their language in cyberspace.

"I believe The Guyton Award is a symbol of how very important it is for all of us in this discipline to teach the physiological sciences to this, and future generations, with the same degree of commitment and energy that we focus on our quest in the research laboratory....."

Connect Your Teaching and Your Learning

My commitment to teaching is energized by a feeling of excitement when I am able to return to the classroom from the research laboratory to share my enthusiasm with anyone who will listen to my tales of the results of a new observation, or previously unknown phenomenon seen in the laboratory. I believe that sort of excitement is sustained when one is teaching on a regular basis and can rush from the laboratory back into the classroom to tell students what you have just observed. Unfortunately, that experience is sometimes more difficult to achieve in medical school basic science curricula, than it is in undergraduate or graduate curricula these days, simply because of the basic needs of medical students, the time constraints, and the consequent structure of basic medical curricula.

Share Your Ideas

Because of the competition and stress generated by the increasing emphasis on gathering more research funds, free "sharing" of ideas sometimes becomes an issue among colleagues. It is sad, but increasingly evident. However, I find that to "be" in the classroom among junior and senior level undergraduates in the physiological sciences, or among graduate students, is an ideal atmosphere in which to share new observations and ideas because students, though often less sophisticated than one's colleagues, are far less likely to have professional turf to protect.

At Arizona, we have pioneered an undergraduate physiological sciences major that is part of the college of medicine. It has grown to be the fourth largest declared major at the University of Arizona. I agreed to join in the development of the undergraduate program in 1997 and, as a result, changed my obligations to our medical program. I was skeptical at first, but as a senior faculty member I was more prepared than our junior faculty to design and implement full semester courses, cardiovascular in my case. Also, I could help take some of the teaching load off the younger faculty who needed to concentrate more on their research careers.

It turned out that to return to the undergraduate classroom was one of the most rewarding decisions of my career. Indeed, I encourage all physiologists, especially senior faculty, to consider designing and teaching an undergraduate course in their discipline. It has been a joyous and enriching experience for me, and a refreshing and "rediscovered" venue for the free exchange of ideas about research. Isn't that partly why we got into this business in the first place, to work ourselves into an intellectual froth during the free exchange of new and exciting ideas?

Do Your Job

I am also reminded, when I ask myself why I teach, that when one is promoted within the academic world, one ought to feel some sense of obligation to teach. After all, the title of Full Professor is awarded by one's academic peers for fulfilling the criteria of excellence, simultaneously, in three areas: teaching, research and service, and at the international level. The honor of the title professor is a beginning, not an end. There is an implied obligation to continue teaching, within reason, throughout one's career if one is to retain the privilege of that title.

In the current atmosphere of tight budgets and rising costs there is some logic to suggest changing the title Full

Professor to Research Professor if one leaves the classroom to do only research with little or no association with students, except as extra hands in the laboratory. It seems extreme to suggest this, but if hard state salary dollars were tied more closely to teaching and soft research dollars tied to research, the role of teaching as generally viewed in the basic sciences might well change for the better. Indeed, this concept is beginning to appear in casual administrative discussions at the University of Arizona, and elsewhere around the country.

Tell "The Story":

For me, the most important ingredient for effective teaching is simply to "tell the story." The telling of a story is the essence of my teaching style. It has, in my view, broad implications at many levels. Indeed, the idea of telling the story is the primary message that I hope to pass on to the readers of this article.

When we teach our own children, we tell them stories. When they are growing up they say to us: "Tell me a story about the 'olden' days.;" When we write scientific papers and grants, we often are most successful when we grasp the image of how best to "tell the story." Our research is driven by a quest to translate and read nature's story. Similarly, I have the most success communicating ideas and concepts to students when I find a way to shape them in the context of a story or intellectual image, so the student can take possession of those ideas, internalize them, and so carry them forward and improve upon them. After all, isn't that the point of the whole thing?

It is helpful early in the preparation of a good set of lectures to think of how best to tell the story in a way that will interest students, capture their imaginations, and help them to understand and retain the concepts. More importantly, it is one of the better ways I have found to place the material in the context of the evolution of an idea, or ideas, that I am helping students to master or grasp. I find that a story helps students to "connect the dots." Students really do love history, and they remember material much better when they have a sense of where a concept came from, how it was derived, where it is now, and where it might go. Indeed, good examples of story telling in the teaching process can be found in the works of James Burke, a British "storyteller" who did a series sometime ago on PBS entitled "Connections." In my own case I like to bring the development of an idea alive by injecting the humanity of a scientist into my presentation of a concept. For example, I find that almost all my Arizona students are drawn into thinking about the Fick principle if they learn that Fick was the author of a concept used by William Hamilton (APS President, 1955) who was born in Tombstone, AZ, and whose father, Isaac B. Hamilton, was a mining camp doctor who was thought to have treated the Erp brothers after the shoot-out at OK corral, and that Isaac just might have been aware of the importance of osmotic pressure and fluid movement that day in his office long before Starling and Landis. The truth about the last part of that story we may never know, but it adds "Cholula" to the mystery and the myth. The "story" is a way of remembering the facts, and ultimately is part of the glue that makes science a living art, not a catalog.

"...I have the most success communicating ideas and concepts to students when I find a way to shape them in the context of a story or intellectual image, so the student can take possession of those ideas, internalize them, and so carry them forward....."

Some students will immediately integrate the story into the learning process, and so the teaching will be enriched. But, it is not really so important whether individual students listen and hear the story when you first tell it. Some will hear and some will not but most of them will remember it when the time is right for them. Sometimes it takes a long time for the "fire" to light, and the "torch" to be passed. The "Ahh" moment may not even occur until many years later. I am reminded here of the Zen concept: "When the student is ready, the teacher will appear." The corollary to that is: "If the student is not ready, nothing will happen." Indeed, that is why I think emphasis on the "method" of teaching is not a particularly important ingredient. Repeat: "If the student isn't ready, nothing will happen." But trust that something will happen, sometime.

Telling the stories when you teach is a constant reminder to the students, and to us as teachers, that teaching is both the keystone and the cornerstone of our civilization and culture. Also, simply embracing the Zen concept places the responsibility for learning on the student, and the responsibility for teaching on you. It is important to remember that the two responsibilities, teaching and learning, are separate. Education, after all, is a redemptive enterprise. The student should feel rewarded and involved in the classroom experience. Ultimately, however, what happens for them may have little to do with you, at the moment you are teaching, and more to do with the seeds that are sewn. I should add parenthetically, that although "Student Evaluations" are informative in one sense, it is important to place them in a context that recognizes the short-term and the long-term effects and affects of teaching. Don't worry too much about student evaluations. Over emphasis on them, in the extreme, is like asking your three-year old child where the family should take their summer vacation.

Why do I believe "telling the story" is the very essence of teaching? Well, to explain, I shall tell you my story about when I first internalized the idea that telling the story is for me the fundamental ingredient for effective teaching.

I was born in North Dakota in 1939. While growing up there, I went hunting a lot with my father. It is an integral part of the culture in the Dakotas. One of our favorite places to hunt was along the Cannonball River in the southwestern corner of the state. On one of our trips when I was eight we stopped for a few hours to visit a Native American friend of my father's, Vine Deloria, Sr. (3), on the Standing Rock Reservation near Fort Yates, ND. I remember very little about those few hours, except that my father held Vine in high esteem and was visibly inspired by him. I, being eight, was more interested in visiting

the burial site of Tatanka Yotanka (Chief Sitting Bull).

Forty years later, I reconnected with this fascinating and accomplished man in Tucson, AZ, at the end of his life. Vine, Sr., was born 11 years after the massacre at Wounded Knee and grew up during the very traumatic period of transition as the Sioux Nation adjusted to the end of the buffalo and equestrian period that was their world, and the onset of assimilation. During our conversations Vine made the simple observation: **"The people who tell the story, shape the culture."**

His words shot through me like an arrow and connected to the very core of what I now believe is the essence of teaching and its real importance. He was talking about what happened to his people, but his insight suddenly made me profoundly aware that communication is the human imperative, and that it is the writers and storytellers in all cultures who are the teachers. Living in Arizona in the southwest, I was surrounded by the culture of "the storyteller," but he brought new meaning for me to the word, "storyteller," in a single sentence.

I was a Full Professor by then, and I thought I was Mr. "Cool," or Mr. "Hot," depending upon the day. I was at the peak of my career in teaching, research and service. I was serving on "important" research and peer review committees. I was involved in telling the world about what constituted "good" research versus "bad" research (I had gotten one of the first NIH-MERIT Awards). I was deeply involved in curricular affairs. I had all kinds of complex ideas about what was "good" versus "bad" teaching. I felt strongly about teaching and the application of cool, special methods. I would tell you all about my certainties, even if you didn't ask. The word hubris comes to mind.

Suddenly, Vine's simple, profound comment made all that noise vanish. The Full Professor was ready, and so the teacher appeared. What I realized was that when one stops telling and sharing the stories that are the foundations of a culture or a scientific discipline (physiology for example), then that culture will cease to evolve and will surely die. You don't have to tell the whole story or even the old story. The point is that the telling of the story is the beginning, the end, and the motivation for teaching. The classroom elements are all interwoven. The story is the teacher, but the teacher tells the story. The teacher need not be a person, but could as well be an event at a critical moment that is long remembered (student laboratories?). So, the story that you tell in the classroom will trigger at some time, the fusion of the bits and pieces of students' individual life experiences, into their story that will someday inspire them. In the process of fusion the discipline is sustained.

Vine's words are now a constant reminder to me that teaching has profound and deep implications. The details of "Method" and "How To" and "Problem Based" and "PowerPoint," though important in their own right, often just contribute more to the noise, than to the signal. I am reminded of the words of Jonathan Miller (3), a British neurologist and well known "storyteller" who once said: "First know your subject. Audiovisual aids alone are simply orthopedic devices for the didactically disabled." So, rather than focus on method, I tell the students to listen to the story I want to share, and I tell them why. I try to help them connect to the origins of the idea I am presenting, to help them see where that idea came from, where it is now, and to challenge them to think about how they may move the story forward, or change it, or yes, even rewrite it. In that regard, I have my students write papers and I read them all.

Remember Those Who Taught You

I want now to end my comments about "the story" and teaching by remembering the man in whose name this award is given. To do so, I must ask a question, in the classic Guytonian style of teaching, but with a North Dakota accent:

"So, why was Dr. Guyton such a renowned teacher, then?"

"Oh ya. Now that's a good question."

I was fortunate to have known Dr. Guyton, to converse with him, and to observe him in the classroom. He used, what I call "The Southern Socratic Method" because he would always ask or state a question to begin the presentation of a concept or idea. But unlike Socrates, he would not wait for you to answer, but rather he would answer it for you in his special way that was a distinguishing feature of his style. His style was that of "the storyteller."

Guyton was from Mississippi, and grew up in the great tradition of famous and very talented storytellers from the south like Eudora Welty, Tennessee Williams, Walker Percy, Shelby Foote, and William Faulkner, among many others. Indeed, Guyton maintained a long friendship with Faulkner and played chess with him. He understood the power and importance of "telling the story."

Whether you agreed with the details of some of Guyton's ideas or not—-and I admit that I have never been a fan of his venous return approach to cardiac function—-he was without question a great teacher because he "told the story" whenever he taught. And consequently, he shaped the culture of physiology for nearly 50 years. It is for that reason that I feel deeply honored to have received an award for teaching in the name of a man whose teaching skills and deep motivation to "telling the story," shaped a significant portion of our scientific culture and tradition in physiology during the second half of the 20th century.

In closing let me again express my pride in being chosen for a teaching award, and this award in particular. I am proud because I think often about how teaching and teachers shape the culture. We must not let that notion be trivialized in an academic world that seems to be driven more and more by the quest for ever increasing research dollars, sometimes at the expense of teaching and those who "pass the torch" of ideas in the classroom to the next generation. I say to those teachers, especially younger faculty, who may sometimes be made to feel "less than" by tribes of senior research colleagues demanding more space. Remember the words of Tatanka Yotanka of the Lakota: "It is not necessary for eagles to be crows."

The people who tell the story, shape the culture. They are the eagles. ❖

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1. Encyclopedia of North American Indians. See Web Site Address: http://college.hmco.com/history/readerscomp/naind/html/na_010200_deloriavines.htm

2. "Haramati, A. Teaching Physiology: Filling a Bucket or Lighting a Fire?' *The Physiologist* 43(3): 117; 119-121, 2000.

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APS Council Holds Strategic Plan and Fall Council Meeting in Houston

The APS Council hosted a Strategic Plan meeting on October 29-31 at The Woodlands Resort and Conference Center, Houston, TX. Attendees at the meeting included APS section chairs, selected members of the Trainee Advisory Committee, members of the Long-Range Planning Committee, committee chairs, and the APS managers. The meeting attendees used the results of the Membership Survey (conducted in spring 2005) and informational documents provided by the APS committees and sections to begin the process of drafting a new Strategic Plan. The Council will meet in February 2006 to finalize the new Strategic Plan. The new Strategic Plan will be published in a future issue of *The Physiologist*.

The APS Council held their fall meeting on November 1, 2005 at The Woodlands Resort and Conference Center, Houston, TX. Council was presented with reports from the Joint Program, Finance, Membership, Publications, and Women in Physiology committees. APS staff members Marsha Maytas, Robert Price, and Margaret Reich joined the meeting to assist with the committee report presentations.

The Joint Program Committee presented a proposal for an APS Conference entitled *Sex Steroids in Physiology and Pathophysiology of the Cardiovascular-Renal System*. The goal of the conference is to bring together a critical mass of scientists who have interests in the roles of sex steroids in the physiology of the cardiovascular and renal systems to promote exchange of ideas and potential collaborations in the future. The conference is tentatively scheduled for October 2007. Council approved the conference proposal.

The Publications Committee reported that the Journal Impact Factors made a strong showing in 2004 as they had in previous years. They also reported that more articles have been added to the *Classic Articles* series. The essays are located on the APS web site at http://www.the-aps.org/publications/classics/index.htm. Both the essays and classic articles can be accessed free of charge.

The Publications Committee has made the decision to discontinue the Translational Physiology Call for Papers, which was instituted for all journals in June 2001; Translational Physiology will remain as an article type. In 2004, 130 papers were submitted and 54 were published in this category. In 2005, 93 articles were submitted and 58 have been published to date.

The Publications Committee recommended that Council reinstate the benefit of free color to student members since they will now be charged a student membership fee. Color is free if the first or last author is an APS member. Council approved the reinstatement of this benefit for students.

The Finance Committee presented Council with the final 2005 budget and the proposed 2006 budget, both of which were accepted and approved by Council.

The Finance Committee reported on The Katrina Fund. The fund was started by APS to help graduate students and postdoctoral fellows cope with the affects of the storm. APS provided an initial commitment of $50,000 to the fund, and, through October 5, the Society had received $14,355 in outside contributions to support this effort. Funds are being provided through unrestricted grants of $2,000 to help students and fellows replace belongings, pay for relocation costs, etc. APS has been working with chairs of the affected departments to assess the needs. To date, APS has received 51 applications for assistance, authorized 35 awards, and distributed 23 payments totaling $46,000.

The Women in Physiology Committee reported that L. Gabriel Navar, Department of Physiology, Tulane University School of Medicine, has been selected as the 2006 Bodil Schmidt-Nielsen Distinguished Mentor Awardee. Navar has had a tremendous mentoring career, having mentored 21 predoctoral students, 42 postdoctoral fellows, and four visiting scientists during the past 40 years. Many of these mentees have gone on to a wide variety of positions, in academia as well as in medicine, and are leading successful scientific careers. Navar will receive his award at the EB06 meeting.

Additional details of the Council's 2005 fall meeting and the Strategic Plan meeting will be presented to the membership at the 2006 APS Business Meeting. The Business Meeting will be held at EB06 on Tuesday, April 4 at 5:45 pm in the Moscone Convention Center (San Francisco), room 134. All APS members are invited to attend.

Council Action Items

Council approved the recommendations of the Finance Committee accepting the 2005 estimated budget and approved the 2006 proposed budget.

Council approved a proposal for an APS Conference entitled *Sex Steroids in Physiology and Pathophysiology of the Cardiovascular-Renal System*.

Council unanimously approved a motion to transfer the following 14 regular members to emeritus membership status: Jack K. Barclay, Maurice F. Crass, Otto Hansen, Carlton F. Hazelwood, Thomas F. Hornbein, Thomas A. McKean, Bryan D. Myers, Buford L. Nichols, Oakley S. Ray, Donald B. Stratton, Zvi Talor, Stuart R. Taylor, Barry L. Zaret, Douglas P. Zipes.

Council unanimously approved the requests of 9 regular members for reinstatement: Theodore J. Angelopoulos, Eberhard E. Fetz, Christopher S. Garrard, Ravinder K. Gill, H. Craig Heller, Herbert F. Janssen, Benjamin M. Rigor, Seema Saksena, Saul Yedgar.

Council unanimously approved the selection of Allen Cowley as the 2006 Daggs Awardee.

Council approved selection of L. Gabriel Navar as the Bodil Schmidt-Nielsen Awardee. ❖

Front row: Sue Barman, Douglas Eaton, Dale Benos, D. Neil Granger. Back row: Irving Zucker, Gary Sieck, Carol Leidtke, Tom Lohmeier, Peter Wagner, Curt Sigmund, Rob Carroll, Helen Raybould, Kenneth Baldwin, Jeff Sands.

New Regular Members

***Transferred from Student Membership**

Julye Marie Adams*
Univ. of Kentucky, Lexington
Alexey Aleshin
Columbia Univ., NY
Mark G. Angelos
Ohio State Univ.
Bruno B. Averbeck
Univ. of Rochester, NY
Lino Chua Balonan
Univ. of Hong Kong, China
Luis Beltran-Parrazal
Univ. of California, Los Angeles
Lue Bouwens
Free Univ., Brussels, Belgium
Wengang Cao
Univ. of Florida, Gainesville
Margaret Patricia Chandler*
Case Western Reserve Univ., OH
Liming Chen
Yale Univ., CT
Mitchell Chesler
New York Univ.
B. Ruth Clark
Washington Univ., MO
Charles Samuel Cox
Univ. of Texas Med. Sch., Houston
Stephen James Crozier*
Univ. of Michigan
Nazan Dolu
Erciyes Univ. Med. Fac., Turkey
Van Alan Doze
Univ. of North Dakota
Stuart E. Dryer
Univ. of Houston, TX
Jay M. Edelberg
Weill Medical College, Cornell Univ., NY
Cheryl L. Fattman
Univ. of Pittsburgh, PA
Edgar Garcia-Rill
Univ. of Arkansas
Joshua A. Goldberg
Univ. of Texas, San Antonio
Lawrence A. Golding
Univ. of Nevada, Las Vegas
David Golomb
Ben-Gurion Univ., Negev, Israel
Cara Jane Gottardi
Northwestern Univ., IL
Denise G. Hemmings
Univ. of Alberta, Canada
Tzung K. Hsiai
Univ. of Southern California, Los Angeles
Anastaia Y. Kariagina
Michigan State Univ.
Donald B. Katz
Brandeis Univ., Waltham, MA
Needlam Khaper*
Northern Ontario Sch. of Med., Canada
Scott D. Kirkton
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Kenichiro Kitamura
Kumamoto Univ. Sch. of Med., Japan
Shigeru Kitazawa
Juntendo Univ., Tokyo, Japan
Wilfried Klein
Univ. Federal Da Bahia, Brazil
Susurmu Koyama
Univ. of Illinois, Chicago
Rafael Kurtz
Bielefeld Univ., Bielefeld, Germany
Tianbo Li
Northeastern Ohio Univ.
Ying-Ming Liou
National Chung-Hsing Univ., Taiwan
Sumei Liu*
Ohio State Univ.
Yongjun Lu
Univ. of Iowa
Vijay Lyall
Virginia Commonwealth Univ.
Safraaz Mahamed*
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Univ. of California, San Diego
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Nevada Sch. of Medicine, Reno
Naveen Nagarajan
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Ai-Lun Yang*
Natl. Cheng-Kung Univ., Taiwan
David S. Zee
Johns Hopkins Hosp., MD

Recently Deceased Members

Lee L. Bernardis
Buffalo, NY

Julian P. Cooke
San Antonio, TX

Daniel S. Feldman
Evans, GA

Gregory R. Ferrier
Halifax, NS, Canada

Ronald D. Reed
USAF Academy, CO

James S. Robertson
Gaithersburg, MD

Yasuhiko Takeda
Denver, CO

New Student Members

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Univ. of Texas Med. Sch.
Sunanda Baliga
Rutgers Univ., NJ
Kimberly Barnholt
Univ. of California, Davis
Destinee Chambers
Univ. of Massachusetts
Gin-Fu Chen
Univ. of Florida
Tom Cherng
Univ. of New Mexico
John Chidlow
Louisiana State Univ.
Jennifer Copeland
Univ. of North Texas
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California State Univ., Northridge
Jennifer Long
Yale Univ., CT
Brenna Lynn
Univ. of Oregon
Amin Majdalawich
Dalhousie Univ., Canada
Martha Maldonado Cervantes
UASLP Sch. Med., Mexico
Matthew Maneen
Univ. of Vermont
Aaron Marshall
Univ. of Cincinnati, OH
Robin McGregor
Heriot-Watt Univ., UK
William Merryman
Univ. of Pittsburgh, PA
Leah Miller
Meharry Medical College, TN
Aaron Mishin
Pennsylvania State Univ.
Angelica Montoya Contreras
Univ. of San Luis Potosi Sch. Med., Mexico
Lisa Nashold
Univ. of Wisconsin, Madison
Amanda Nelson
Univ. of Illinois, Urbana-Champaign
Mark Newton
Inst. Jozef Stefan, Slovenia
Wei Ni
Michigan State Univ.
Ogbeyalu Onumah
Meharry Med Coll., TN
Zoe Pafili
Natl & Kapodistrian Univ., Greece
Ravisankar Palaniappan
Jawaharlal Inst. of Postgrad. Med. India
Rohit Pawar
Brody Sch. of Medicine, CA
Paulitha Pasala
Ball State Univ., IN
Melanie Powers
Univ. of Florida
Jesse Procknow
St. Louis Univ., MO
Ismaila Raji
Kampala Int'l. Univ., Uganda
Julie Rennison
Case Western Univ., OH
Mary Schwab
Dartmouth Medical School, NH
Yi Shi
Univ. of Hong Kong
Craig Steinback
Univ. of Western Ontario
Elinor Sullivan
Oregon Health Sci. Univ.
Scott Tamminga
Cerritos College, CA
Aaron Teitelbaum
McMaster Univ., Canada
Tiffany Thai
Univ. of North Carolina, Chapel Hill
Ameer Thompson
Univ. of California, Davis
Kandy Velazquez
Univ. of Puerto Rico, Med. Sci. Campus
Georgios Vlasseros
Harokopio Univ., Greece
David Welch
LSU Health Sciences Ctr., LA
Jason Williams
Drexel Univ., PA
William Wright
Louisiana State Univ., HSC
Sheng Wu
Univ. of Nebraska Medical Center
Natividad Ybarra
Univ. of Texas, San Antonio
Gokhan Yilmaz
Louisiana State Univ., HSC
Hui Jing Yu
SUNY, Stony Brook, NY
Rong Zhao
Indiana Univ. Sch. of Med.

New Affiliate Members

Naomi E Brooks
Tufts Univ., MA
Ruth Williams
Oakton Community College, IL

Moving?

If you have moved or changed your phone, fax or Email address, please notify the APS Membership Office at 301-634-7171 or Fax to 301-634-7241. Your membership information can also be changed by visiting the Members Only portion of the APS Website at http://www.the-aps.org. ❖

Navar Receives Third Schmidt-Nielsen Distinguished Mentor and Scientist Award

The APS Women in Physiology Committee is pleased to announce that **L. Gabriel Navar**, Professor and Chairman of the Department of Physiology at Tulane University School of Medicine, has been selected as the third recipient of the Bodil M. Schmidt-Nielsen Distinguished Mentor and Scientist Award. The Committee was extremely impressed with both his mentoring excellence and his outstanding contributions to physiological research.

Navar received his PhD at the University of Mississippi under the direction of Arthur Guyton. He served as a faculty member at the University of Mississippi School of Medicine and at the University of Alabama at Birmingham prior to his appointment as Professor and Chairman of the Department of Physiology at Tulane University in 1988. Navar is also a co-Director of the Tulane Renal and Hypertension Center of Excellence. Navar has a very successful research program, contributing significantly to fundamental research in the fields of renal hemodynamics and hypertension. Navar's excellence in scientific research has been honored with awards from the American Physiological Society, the American Heart Association, and the American Society of Hypertension.

Navar has had a tremendous mentoring career, having mentored 21 pre-doctoral students, 42 postdoctoral fellows, and four visiting scientists during the past 40 years. Many of these mentees have gone on to a wide variety of positions, in academia as well as in medicine, and are leading successful scientific careers. Many of the people writing the supporting recommendation letters attested to Navar's unique mentoring style, his commitment to life-long mentoring of trainees, his scientific integrity, his love of science, his role in introducing trainees to experts in the field, and his ability to make his trainees feel like family. As summed up by one of Navar's mentees, "*Despite his considerable scientific contributions, his most important, and enduring legacy can be found in the lives, careers and contributions of the people he has trained and shaped throughout his career. These individuals were set upon their career paths after having been prepared and nurtured under Dr. Navar's supervision.*"

L. Gabriel Navar

Navar will give a talk entitled, "From Mentee to Mentor: Lessons Learned Along the Way," at the 2006 Experimental Biology meeting in San Francisco, CA, on Monday, April 3 at 12:00 pm at the San Francisco Marriott, Yerba Buena 10/11. All trainees and mentors are invited.

APS congratulates Dr. Navar on this well-deserved honor.

Call for Reviewers for APS Archive

The APS Archive of Teaching Resource is streamlining its review process beginning in January 2006. We are looking for reviewers who can assist in the March review of materials.

Materials submitted to the APS Archive will now be reviewed twice yearly. New deadline dates for submissions are February 15 and September 15. Volunteer review panels will be convened March 1 and October 1 and have two weeks to complete reviews of submitted materials. Reviews will be sent to authors on March 22 and October 22.

For the February 15 submission deadline, calls for submissions of undergraduate and graduate materials in the following fields will be sent out via the section/group listservs: Cardiovascular, Comparative and Evolutionary, Environmental & Exercise, Genomics, Hypoxia, Muscle Biology, Renal, Respiration, Translational Research, and Water and Electrolyte Homeostasis.

This new review process allows for more APS members to be involved in the review of materials submitted to the APS Archive. It also allows for a timelier turn-around period for the authors to receive feedback on their submissions.

If you are interested in being a reviewer for materials submitted in those fields, please email Melinda Lowy at mlowy@the-aps.org.

APS Launches New Professional Skills Training Program

APS, in conjunction with the American Society for Microbiology (ASM), is pleased to announce the trainees who have been accepted to participate in the first Professional Skills Workshop on "Writing and Reviewing for Scientific Journals" which was held on January 12-15, 2006 in Orlando, FL.

The trainees are:

Sharilyn Almodovar-Camacho
Ponce School of Medicine

Almaris Alonso
Univ. of Massachusetts, Amherst

APS Refresher Course on Gender Differences in Physiology
Sponsored by the APS Education Committee
Saturday, April 1-8:00 AM-12:00 Noon
Convention Center, Room 130

Organizer: Martha L. Blair

Speakers:

Martha L. Blair: "What do we know, and what should we teach, about gender differences in physiology?"

Margaret Wierman: "Sex steroid effects on different target tissues: Mechanism of action"

Virginia Huxley: "Cardiovascular system: gender differences in normal function and disease"

Marybeth Brown: "Skeletal muscle and bone: effects of sex steroids and aging"

Denise Faustman: "Common autoimmune signaling defects: what does gender have to do with it?"

Jill Bell
East Carolina Univ., Brody School of Med.
Carmencita Cartagena
Univ. of Puerto Rico, Rio Piedras
Lillian Cruz-Orengo
Univ. of Puerto Rico, School of Medicine
Edelmarie De Jesus
Ponce School of Medicine
Adrienne Dolberry
Drexel Univ.
Cerrone Foster
East Tennessee State Univ.
Alfredo Garcia III
Wright State Univ.
Jose Garcia-Colon
Univ. of Puerto Rico, Medical Sciences
Christoper Gentile
Virginia Polytechnic and State Univ.
Anjelica Gonzalez-Simon
Baylor College of Medicine
Charletha Irvin-Wilson
Meharry Medical College
Barbara Jacob
Emory Univ., School of Medicine
Erin Keen-Rhinehart
Emory Univ.
Scott Kirkton
Univ. of California, San Diego
Stephen Kolwicz
Temple Univ.
Nathan Kuipers
Penn State Univ., College of Medicine
Claribel Luciano-Montalvo
Univ. of Puerto Rico, Med. Sci. Campus
Joeli Marrero
Tufts Univ. School of Medicine
Jenni McCord
Univ. of Oregon
Andrew Melton
Univ. of California, San Francisco
Raissa Menendez Delmestre
Univ. of Puerto Rico, Med. Sci. Campus
Anabel Puig-Ramos
Univ. of Puerto Rico, Med. Sci. Campus
John Pulliam
Emory Univ.
Kanika Pulliam
Emory Univ.
Andrew Ray
SUNY, Buffalo
Nilda Rodriguez
Univ. of Iowa
Enrique Rodriguez Borrero
Univ. of Puerto Rico, Rio Piedras
Wilmara Salgado-Pabon
Univ. of Wisconsin, Madison
Hiromi Sanders
East Carolina Univ.
Cariluz Santiago-Ortiz
Ponce School of Medicine
Karen Spach
Univ. of Vermont
Quiona Stephens
Uniformed Services of the Health Sci.
Nicole Stob
Univ. of Colorado, Boulder
Dianedis Toro Nieves
Univ. of Puerto Rico, Med. Sci. Campus
Shayla West
Wake Forest Univ. Health Sciences
Debra Zamora
Univ. of Texas, San Antonio

APS and ASM members participating as mentors and instructors are as follows:

Kim Barrett, Univ. of California, San Diego; **Robert Hester**, Univ. of Mississippi Medical Center; **Barbara Horwitz**, Univ. of California, Davis; **Mark Knuepfer,** Saint Louis Univ.; **Larry McDaniel**, Univ. of Mississippi Medical Center (ASM); **Lori McMahon**, Univ. of Alabama, Birmingham; **Jo Morello**, Univ. of Chicago (ASM); **Judith Neubauer**, UMDNJ, RW Johnson Medical School; **Joan Slonczewski**, Kenyon College (ASM); **R. Clinton Webb**, Medical College of Georgia; **Dale Benos,** Univ. of Alabama, Birmingham; **Greg Florant,** Colorado State Univ.; **Evangeline Motley,** Meharry Medical College; **Rudy Ortiz**, Univ. of California, Merced; **Irving Zucker,** Univ. of Nebraska Medical Center.

The workshop is especially designed to attract underrepresented minority students. It will bring together trainees from both APS and its partner, the American Society for Microbiology, with experienced mentors and scientists from the two societies.

During the course, trainees will receive hands-on training at writing and reviewing their own writing and that of their colleagues. They are required to complete pre-workshop homework (readings, writing, sending in a draft manuscript), as well as additional evening homework during the course.

The course is supported by a grant to APS from the National Institute of General Medical Sciences at the NIH (Grant #GM073062-01).

A second workshop on the same topic will be conducted again on May 4-7, 2006 in Denver, CO. Applications for the second course will be available in late January. For more information or to sign up for email notification of a future short course, see the Professional Skills website at http://www.the-aps.org/education/professionalskills/.

Medical Physiology Course Directors Experimental Biology 2006 Meeting

Date: Monday, April 3
Time: 3:00-4:00 PM
Location: San Francisco Marriott Hotel, Pacific H

If you attending Experimental Biology 2006 in San Francisco, plan on attending a meeting for Medical Physiology Course Directors meeting to learn more about the APS web site for course directors.

Find out about the web site devoted to course directors
Find out how to access information about courses at other institutions
Find out how to post information about your course
Find other resources that could be of help to you
Discover a directory of course directors and contact information

APS Trainee and Mid-Career Symposia at EB

Symposium on Career Development for Mid-Level Academic Scientists
Sunday, April 2, 2:00-4:00 pm
Convention Center

Organizer: Marian R. Walters

Speakers: Edward Bocko: "General Strategies in Seeking Career Changes;" Marian R Walters: "New Directions: Office of Research and Graduate Studies;" Margaret E.M. Tolbert: "New Directions: Careers at NSF;" Richard Vari: "Finding a New Focus in Education."

APS/ASPET Mentoring Workshop
Mastering the Juggling Act: Laboratory, Life, and Leadership Roles (sponsored by the APS Women in Physiology and ASPET Women in Pharmacology Committees)
Monday, April 3, 8:00 – 10:00 am
Convention Center, Room 130

Organizers: Ann Schreihofer and Deborah Damon (APS) and Laura

Nisenbaum (ASPET)

Speakers: Ida Llewellyn-Smith: "Juggling Research-Related Duties: How to Stop Putting Out Fires and Use Your Time Wisely;" Lynn Wecker: "Juggling Research With Service and Teaching Duties: How Much, What Kind, and When;" Marilyn J. Cipolla: "Juggling for the Dual Career Couple: Strategies for Maximum Job Satisfaction;" Susan Steinberg: "Juggling Job and Family: Balancing Home Life and Careers."

APS Careers Symposium
Navigating the Interview: How to Make It Work for You (sponsored by the APS Career Opportunities in Physiology Committee)
Monday, April 3, 5:45 – 7:45 pm
Convention Center, Room 252/260

Organizers: Nansie A. McHugh and William R. Galey

Speakers: Richard E. Klabunde: "Interviewing in Industry vs. Academia;" Donna H. Korzick: "That First Faculty Position Interview: Preparation and Etiquette!" David P. Brooks: "Interviewing for the Pharmaceutical Industry: What Does It Involve and How to Succeed?" Daniel E. Michele: "I Survived the Academic Interview."

APS Trainee Symposium
Transition from Postdoc to Jr. Faculty: Surviving the Initial Years (sponsored by the APS Trainee Advisory Committee)
Tuesday, April 4, 8:00 – 10:00 am
Convention Center, Room 132

Organizers: Rudy M. Ortiz and Ryan W. Bavis

Speakers: L. Gabriel Navar: "Negotiating a Faculty Position. The Do's and Don'ts;" Karie Scrogin: "Setting Up the Lab;" Ann Schreihofer: "Down the Road to Funding: Getting That First Grant;" Sean Stocker: "Juggling the Responsibilities of a Young P.I.: Insights From Personal Experience."

New Trainee Web Site

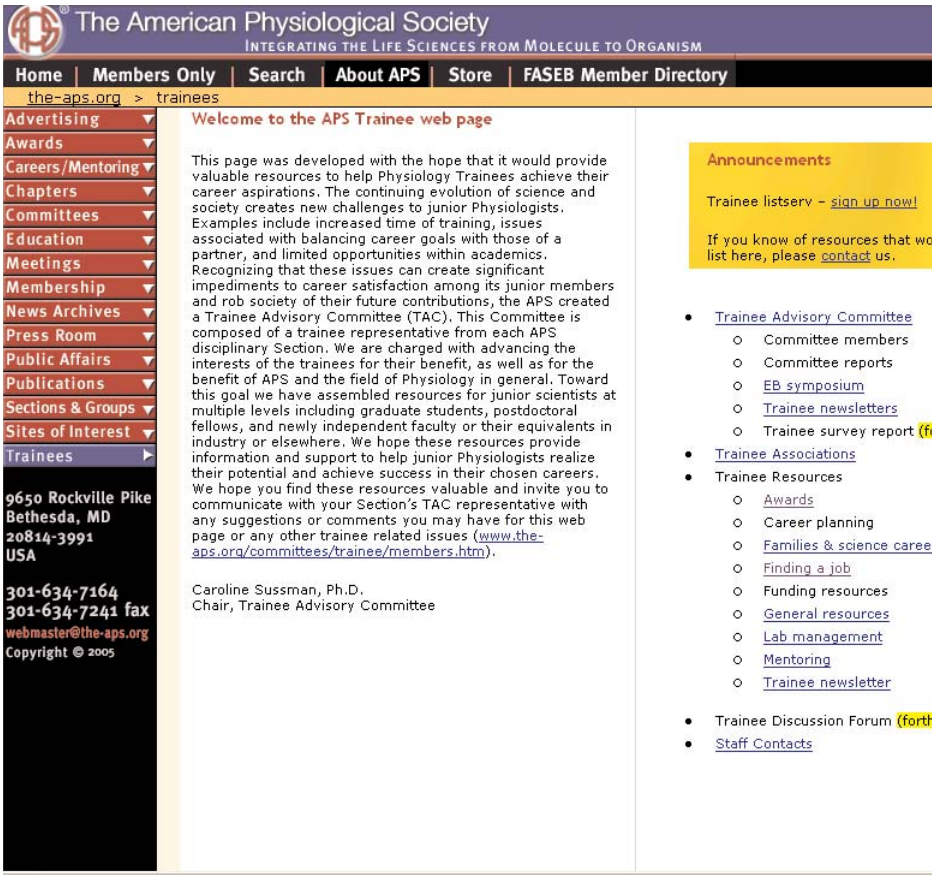
The Trainee Advisory Committee is pleased to announce a new web site just for trainees.

Included on the web site are pages for Trainee Advisory Committee activities like the symposium at Experimental Biology, trainee newsletters, and the survey report.

Also included are pages for trainee associations and trainee resources, such as awards, career planning, families & science careers, finding a job, funding resources, general resources, lab management, and mentoring. A discussion board where trainees can discuss issues of interest is planned for spring 2006.

The web site will be accessible from the main APS home page at http://www.the-aps.org or directly at http://www.the-aps.org/trainees/. ❖

Figure 1. New APS Trainee Web Page



APS Presents Awards at ABRCMS Conference

The APS presented awards to minority undergraduate researchers and was a major conference sponsor at the Annual Biomedical Research Conference for Minority Students (ABRCMS) at the Hyatt Regency in Atlanta, GA from November 2-5, 2005. ABRCMS is a national conference designed to facilitate increased minority involvement in biomedical and behavioral science careers. This three-day conference encompassed scientific presentations, professional development workshops, poster and oral presentations, and numerous networking opportunities with faculty and administrators from graduate schools, government agencies, scientific societies and foundations. According to numbers provided by ABRCMS, approximately 2,600 individuals, including 1,203 undergraduate students, 316 graduate students and postdoctoral scholars, and 900 faculty and administrators attended this meeting.

The APS, represented by Education Office staff member, Brooke Bruthers, was pleased to present $250 awards to eight undergraduate students for the best poster presentations in physiology during the conference. Students also receive a complimentary one-year print subscription to *Physiology*, an APS denim shirt and are added to the Minority Physiologists Listserv. Twenty judges, including APS members, **Mike Brands**, Medical College of Georgia, **Margaret Colden-Stanfield**, Morehouse School of Medicine and **Barbara Horwitz**, University of California-Davis, selected the winners:

APS staff member Brooke Bruthers presents award to the best poster & oral presentation awardees with APS volunteers, Nancy Aguilar-Roca and Cassandra Delgado-Reyes.

Best Sophomore Poster Presentation: Cherie Ognibene, Langston Univ., Guthrie, OK; Abstract Title: "Fluorescent Imaging In Trabecular Meshwork Cells: A Model System To Evaluate Glucocorticoid-Induced Phagocytosis"

Best Junior Poster Presentations; Divine Nininahzwe, Winston Salem State Univ., Winston-Salem, NC; Abstract Title: "Development of New Monoclonal Antibodies To Identify Novel Scavenger Receptors On Murine Macrophages"

Brandon Penn, Univ. of Maryland, Baltimore County, Baltimore, MD; Abstract Title: "Disruption of the ß2 Adrenergic Receptor PDZ Binding Motif: Impact Upon Cardiac Structure and Function."

Best Senior Poster Presentations

Ashley Bolden, Univ. of Missouri, Columbia, MO; Abstract Title: "Estrogenic Effects Of Polyphenols On Ovariectomized Rats"

DaShawnda Lindsey, Wayne State Univ., Detroit, MI; Abstract Title: "The Effect of Intracerebroventricular Infusion of ß-Endorphin on the Cardiovascular Dynamics in Spontaneously Hypertensive Rats and Normal Wistar Rats"

Christa Osuna, Univ. of California, Irvine, CA; Abstract Title: "The Effect of Age on Estrogen Modulation of Cerebrovascular Inflammation"

Mahendranauth Samaru, Hunter College, New York, NY; Abstract Title: "PPARgamma Ligands Exacerbate Free Cholesterol-Induced Macrophage Death, Raising The Possibility of An Adverse Effect In The Progression of Advanced Atherosclerotic Lesions."

Best Oral Presentation

Luwanda Jenkins, California State Univ., Long Beach; Abstract Title: "Increases In Apoptosis And Declines In Bcl-X_L Protein Characterize Testicular Regression In American Cows (*Corvus Brachyrhynchos*)"

The APS congratulates the students on a job well done and wishes them the best in their academic pursuits.

The APS Education office also staffed an exhibit booth, highlighting the following awards, programs and resources for minority groups underrepresented in science:

APS/NIDDK Minority Travel Fellowship, providing travel support for 50-70 students annually. This fellowship provides funds to attend Experimental Biology and the fall APS conferences. Awardees also are paired with a mentor, an APS member, in their area of research. The intent of this program is to increase participation of pre- and postdoctoral minority students in the physiological sciences.

Undergraduate Summer Research Fellowship, supporting up to 12 fellowships each year. Fellowships support full-time undergraduate students to work in the laboratory of an APS member. The goal of this program is to excite and encourage students to pursue a career as a basic research scientist.

Explorations in Biomedicine Undergraduate Summer Research Fellowship, which immerses Native American undergraduates from across the nation in the world of cutting-edge physiology and biomedical research for 8-10 weeks during the summer. The Fellowship also provides the student an opportunity to participate in a major scientific meeting to experience the different ways science is communicated.

Porter Physiology Fellowship Program, supporting minority students pursuing full-time studies toward a PhD in the physiological sciences.

The Career brochure and updated Career web site, the Archive of Teaching Resources, the Timeline of Physiology, membership for students, and Experimental Biology 2006 also were provided for participants.

The ABRCMS meeting is sponsored by a grant from the National Institute of General Medical Sciences (NIGMS) Minority Opportunities. ❖

FY 2006 Research Funding

At the close of fiscal year (FY) 2005 on October 1, 2005, Congress had finalized only two of the 12 appropriations bills that will fund federal programs in FY 2006. To avoid having to combine the remaining bills into a single omnibus measure, Congress passed a series of continuing resolutions that funded federal programs at last year's level through the fall while members continued to work on passing the individual bills. By the end of November, ten of the appropriations bills were finished. Contained in the ten completed bills was funding for biomedical research at NSF, the VA and NASA. As of mid-December, the unfinished Labor-HHS-Education bill that will fund the NIH was mired in controversy over decreased funding for health, education and social programs.

While all four agencies are expected to receive an increase over last year's appropriation, the budget growth in most cases fails to keep up with inflation. This year's budget was dominated by unanticipated costs for Hurricane Katrina, the war in Iraq and rising energy prices. To control federal spending, Congress was expected to impose a 1% across the board cut to all non-defense discretionary spending in the final appropriations bill.

Details for each agency are provided below. The totals do not reflect the anticipated 1% cut.

National Institutes of Health (NIH)

NIH was expected to be funded at $28.8 billion in FY 2006, which represents an additional $253 million dollars (0.9% increase) over FY 2005. This falls below the projected rate of inflation for biomedical research, currently estimated at 3.2%. Of the $253 million added to the NIH budget, $100 million is targeted for the Global Fund to Fight HIV/AIDS, Malaria and Tuberculosis, making the overall increase for the agency closer to 0.5%. With the anticipated across the board cut, this will effectively decrease the NIH budget for the first time since 1970. NIH predicts that this level of funding will decrease the number of research project grants funded and drop success rates to an average of 21% across institutes.

National Science Foundation (NSF)

For FY 2006, Congress allocated $5.6 billion to NSF, a 3% increase over last year's level. Following a 2% cut last year, this returns the budget to roughly 2004 levels. This funding level still falls short of the authorized level, established in legislation passed in 2002 that declared Congress' intent to double NSF's budget.

Following a 10% cut last year, the Education and Human Resources budget at NSF is reduced again, falling 4.4% in FY 2006. This is despite strong support in Congress for NSF education programs, and reflects an effort by the administration to shift programs such as the Math and Science Partnerships from NSF to the Department of Education. The Research and Related Activities budget is increased over last year; however, a significant portion of the increase ($48 million) will go for Coast Guard icebreakers that provide access to Artic and Antarctic facilities, a new financial responsibility for the agency.

Department of Veterans Affairs (VA)

Medical and prosthetic research at the VA will receive $412 million in FY 2006. This represents an increase of 2.4% over last year and a 4.8% increase over the administration's request, which would have cut funding to $393 million.

NASA

For FY 2006, NASA received an allocation of $16.4 billion, a 1.3% increase over last year. Despite the overall increase for the agency, funding for Human Systems Research and Technology at NASA falls to $799 million from $925 million last year (a decrease of 13.6%). Funding at the agency has been redistributed to reflect new priorities, including a return to manned space flight.

Conferees Delete Akaka Restrictions

In late October Congress dropped a provision from the FY 2006 agriculture appropriations bill that would have barred funding from research facilities that purchase animals from certain USDA-licensed dealers. The amendment, backed by Sen. Daniel Akaka (D-HI), had been added to the must-pass spending bill in late September.

In introducing the legislation, Akaka said that his amendment would protect family pets by forcing institutions to stop using so-called Class B dealers to supply non-purpose-bred dogs and cats for medical research. He claimed this step was needed because the pet theft is a significant problem and, in any case, non purpose-bred dogs and cats are not good research models. To counter the potentially deleterious effects of this bill, the APS engaged in concerted efforts to educate members of both the House and Senate about existing pet protection legislation and the importance of ongoing research involving non-purpose bred dogs and cats. The APS underscored the importance of protecting family pets, as well as the need to preserve important animal models of medical research.

The Akaka amendment quickly created alarm in the research community because it was written so broadly. If enacted, it would have cut off USDA funding to institutions that purchased any animal regulated under the Animal Welfare Act from dealers holding Class B licenses, which would have affected a large number of institutions. Fortunately, the Members of Congress who drafted the agreement reconciling the differences between the House and Senate versions of the agriculture funding bill recognized the seriousness of the situation and dropped the provision in conference. However, the fact that a measure intended to ban research with non-purpose bred dogs and cats scored an easy preliminary victory may encourage activists to try a similar gambit in the near future.

Focusing on Young Investigators at NIH

Among the many priorities at the National Institutes of Health (NIH), the success of trainees and new investigators is considered one of the most important. With tightening budgets, officials at NIH worry that next generation of scientists will be disproportionately affected by falling success rates, and they have taken a number of steps to identify and correct potential problems.

Tuition and NRSA Fellowships

On November 30, 2005, officials at the NIH met with members of the biomedical research community to discuss the problem of rising tuition costs associated with training grants. Tuition increases that outpace inflation have caused the current tuition payment policy for Ruth L. Kirschstein National Research Service Awards (NRSAs) to become unsustainable. NIH has already taken the step of freezing tuition payments on

competing renewals of NRSA awards in 2006 while they consider permanent solutions.

NIH presented the community with three options: capping tuition payments, providing a fixed allowance per trainee for tuition, or maintaining the current system with the understanding that fewer trainees would be funded each year. Currently, the NIH pays the first $3,000 of each student's tuition, and 60% of the remainder. NIH predicts that maintaining the current system would result in the loss of 4,000 trainees over the next 10 years.

Representatives from several universities and associations presented their comments at the meeting, and views varied widely on the proposed options. APS and FASEB both submitted comments in response to this issue, stressing the importance of maintaining benefits for trainees as a solution is developed. Under the current funding formula, tuition and health insurance funds are combined in the same category on training grants. The APS and FASEB expressed concern that if this category is limited in order to control tuition costs, trainees may risk losing their health benefits.

A draft policy is expected to be prepared in January, followed by issuance of the final policy in March or April. To see the comments submitted on behalf of APS, go to: http://www.the-aps.org/pa/action/news/NRSA.pdf

Two Ways to Help Young Investigators Achieve Independence

When the Advisory Committee to the NIH Director met in early December, a working group recommended a new grant mechanism that would help researchers transition from postdoctoral fellow to independent investigator. The awards would provide up to five years of support, starting with a one to two year advanced fellowship, followed by three years of support as an independent researcher. MDs, PhDs and MD/PhDs would be eligible to apply, but the program is contingent upon the awardee securing an independent research position. This award program still needs to be approved by NIH director Elias Zerhouni, MD, but the goal is to accept applications beginning in February and distribute the first round of awards by the end of 2006.

In another effort to aid new investigators take the next step in their careers by securing their first major R01 grants, NIH announced a pilot study to shorten the review cycle for first-time applicants. A limited number of study sections will participate and accept revisions from new investigators on an accelerated schedule. The results of the pilot study will then be reviewed before more extensive changes are made. This is part of a larger effort at NIH to streamline and modernize the peer review system.

For more information, see the notice in the NIH Guide to Grants and Contracts: http://grants1.nih.gov/grants/guide/notice-files/NOT-OD-06-013.html. ❖

Communications

Get an early start at EB!

Communications-Public Affairs April 1 Symposium: Creating a Buzz About Science Through Community, Media and Constituency Outreach

According to one poll, 80% of Americans say they don't know a single scientist! That means every scientist should become an active educator about what we do, and how science positively impacts everyone's lives.

Three experts in their fields share their approaches on how physiologists and other scientists easily can become champions for research while also increasing community awareness of science. As community members, every researcher has a unique opportunity to be a resource for reporters, politicians, and the average citizen to learn about science.

These three areas of community outreach will be covered, with examples of successful pro-active approaches: outreach to local media, relationship development with community political leaders, and "direct-to-neighbor" communications – even where no infrastructure exists.

Local Media

Lisa A. Lapin, Assistant Vice Chancellor for University Communications, University of California, Davis, will discuss how to become a "reliable source" and scientific sounding board as well as a science advocate to your local media, from your school newsletter to the local network television affiliate.

Community Leader Outreach

Gary Kline, FASEB Legislative Analyst, describes the importance of political influence practiced locally, but aimed at the state and national levels. Because elected officials listen to their electorate, you'll learn when and how to approach state and national politicians to influence funding levels, curricula and general well-being.

Direct-to-Neighbor Communications

Vernard W. Henley, Director, Educational Programs and Public Outreach, California Society for Biomedical Research/California Biomedical Research Association will show how in addition to active "lobbying" efforts, scientists need to speak directly with friends, neighbors and community groups to increase understanding and support for research issues. Presentations can be as informal as talking to a neighbor, or giving a "teenage-friendly" presentation to a high school class or Parent-Teacher Associations.

Chair: Hannah Carey

1 PM to 3 PM

Saturday, April 1, 2006, Room 250/262 Moscone Convention Center

To register, or if you have questions, write: CommOff@The-APS.org. ❖

EXPERIMENTAL BIOLOGY:
April 1–5, 2006
Moscone Convention Center,
San Francisco, CA

CALL FOR LATE-BREAKING ABSTRACTS

Deadline for Submission:
Wednesday, February 8, 2006
www.eb2006.org

Late-breaking abstracts will be accepted for poster sessions to be scheduled on Wednesday, April 5, 2006. Late-breaking abstracts will be published in an addendum to the meeting program. The addendum will be distributed at the meeting. Late-breaking abstracts will NOT be published in *The FASEB Journal* and are not citable.

Abstracts must be submitted at **www.eb2006.org** with payment of $90. Payment and abstracts must be submitted on or before Wednesday, February 8, 2006. The submission site will open the week of Monday, December 5, 2005.

Late Breaking Abstract Submission Site
www.eb2006.org
Abstract Submission Fee: $90
Experimental Biology Meeting Office
Phone: (301) 634-7010
Fax: (301) 634-7014
Email: eb@faseb.org

For information about the meeting, including each Society's preliminary program, housing, and registration forms go to www.eb2006.org.

Save Money! Register online by February 3 and make your housing reservations by February 24.

PHYSIOLOGY IN PERSPECTIVE: THE WALTER B. CANNON AWARD LECTURE (SUPPORTED BY THE GRASS FOUNDATION)

Jo Rae Wright
Duke Univ. Medical Center

"The Wisdom of Lung Surfactant: Balancing Host Defense and Surface Tension Reducing Functions"

SATURDAY, APRIL 1, 5:45 PM

HENRY PICKERING BOWDITCH AWARD LECTURE

Ulrich Hans Von Andrian
Harvard Medical School

"Migrants on a Single-minded Mission: How T Cells Find Their Antigen"

SUNDAY, APRIL 2, 5:45 PM

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

Thomas Coffman
Duke Univ. Medical Center

"The Critical Role of the Kidney in Hypertension: Implications for Pathogenesis and Therapy"

SUNDAY, APRIL 2, 8:00 AM

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

Gunnar Wallin
Univ. of Göteborg

"Interindividual Differences in Sympathetic Activity: A Key to New Insight into Cardiovascular Regulation?"

SUNDAY, APRIL 2, 10:30 AM

HORACE W. DAVENPORT DISTINGUISHED LECTURESHIP OF THE GASTROINTESTINAL & LIVER SECTION

Kim Barrett
Univ. California, San Diego

"Friends and Foes: The Physiology of Gut Epithelial Interactions With Luminal Bacteria"

SUNDAY, APRIL 2, 2:00 PM

CLAUDE BERNARD DISTINGUISHED LECTURESHIP OF THE TEACHING OF PHYSIOLOGY SECTION

Dee Silverthorn
Univ. of Texas

"Teaching and Learning in the Interactive Classroom"

SUNDAY, APRIL 2, 2:00 PM

CARL W. GOTTSCHALK DISTINGUISHED LECTURESHIP OF THE RENAL SECTION

Peter Igarashi
Univ. of Texas Southwestern Medical Center

"Transcriptional Mechanisms of Renal Cystogenesis"

SUNDAY, APRIL 2, 3:15 PM

HUGH DAVSON DISTINGUISHED LECTURESHIP OF THE CELL AND MOLECULAR PHYSIOLOGY SECTION

Michael J. Welsh
Univ. of Iowa

"Pursuing Cystic Fibrosis"

MONDAY, APRIL 3, 9:00 AM

Robert M. Berne Distinguished Lectureship of the Cardiovascular Section

Thomas Hintze
New York Medical College

"The Other Action of NO: Control of Cardiac Mitochondrial Oxygen Consumption and Substrate Use in Health in Disease"

Monday, April 3, 10:30 am

Joseph Erlanger Distinguished Lectureship of the Central Nervous System Section

Paul Sawchenko
The Salk Institute

"Circuits and Mechanisms Providing for Adaptive Responses to Stress"

Monday, April 3, 2:00 pm

Edward F. Adolph Distinguished Lectureship of the Environmental and Exercise Physiology Section

Frank W. Booth
Univ. of Missouri

"Fundamental Question of Biology: How Does the Body Adapt to Physical Inactivity?"

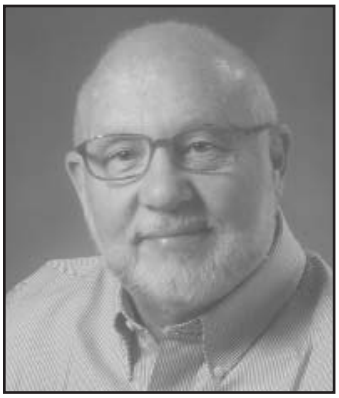
Monday, April 3, 3:15 pm

August Krogh Distinguished Lectureship of the Comparative & Evolutionary Physiology Section

Hiroko Nishimura
Univ. of Tennessee HSC

"Urine Concentration and Aquaporin Water Channels—Evolution and Development"

Tuesday, April 4, 9:00 am

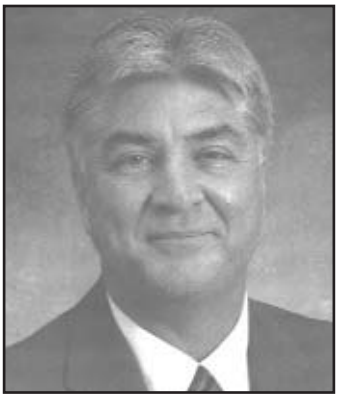


Solomon A. Berson Distinguished Lectureship of the Endocrinology and Metabolism Section

Richard N. Bergman
Univ. of Southern California School of Medicine

"Confessions of a Supermodel"

Tuesday, April 4, 10:30 am



Julius H. Comroe, Jr. Distinguished Lectureship of the Respiration Section

Joe G.N. Garcia
Univ. of Chicago Medical Center

"Genomic Insights into Inflammatory Lung Injury"

Tuesday, April 4, 2:00 pm

Walter C. Randall Lecturer in Biomedical Ethics

Randall S. Prather
National Swine Resource and Res. Ctr., Univ. of Missouri-Columbia

"Transgenic Animals for Medicine and Agriculture: Do the Ends Justify the Means?"

Tuesday, April 4, 2:00 pm

Bodil M. Schmidt-Nielsen Distinguished Mentor and Scientist Award

L. Gabriel Navar
Tulane Univ.

"From Mentee to Mentor: Lessons Learned Along the Way"

Monday, April 3, 12:00 Noon

Saturday April 1, 2006

134			(5:45-6:45): Physiology in Perspective: The Walter B. Cannon Memorial Award **Wright**
135	(1:00-3:00 PM): Workshop: Atomic Force Microscopy for Physiological Studies at the Nano Scale **Meininger and Davis**	(3:30-5:30): Workshop: Advanced Techniques in Imaging: From Cell to Animal **Peti-Peterdi and Bell**	
131		(3:00 PM-5:00 PM) Symp: Microcirculatory Society President's Symposium: Microcirculation: Unanswered Questions **Hester**	(5:30-7:30 PM): MCS Business Meeting and Social
130	(8:00 AM - 12 NOON): Refresher Course: Gender Differences in Physiology **Blair**		
250/262	(1:00-3:00 PM): Ground-Floor Communications: Creating a Buzz About Science Through Community and Constituency Outreach **Carey**		

Bowditch Award Lecture

The Bowditch Lectureship is awarded to a regular member, under 42 years of age, for original and outstanding accomplishments in the field of physiology. Selected by the APS President, the recipient presents a lecture at the Experimental Biology meeting, which is considered for publication in the Society journal of their choosing. The recipient receives an honorarium of $2,500, reimbursement of expenses incurred while participating in the Experimental Biology meeting, and a plaque. The membership is invited to submit nominations for the Bowditch Lecturer. A nomination shall be accompanied by a candidate's curriculum vitae and one letter detailing the individual's status, contributions, and potential.

More information on the award and nomination procedures are available at http://www.the-aps.org. Nominations should be sent to: The APS Bowditch Lecture Award, c/o Linda Jean Dresser, 9650 Rockville Pike, Bethesda, MD 20814-3991; or submitted online at http://www.the-aps.org/cgi-bin/Election/Lecture_form.htm.

Physiology in Perspective
Walter B. Cannon Memorial Lecture

The Cannon Memorial Lecture, sponsored by the Grass Foundation, honors Walter B. Cannon, President of the Society from 1913-1916, and is presented annually at the spring meeting to an outstanding physiological scientist, domestic or foreign, as selected by the President-Elect with the consent of Council. The recipient presents a lecture on "Physiology in Perspective," addressing Cannon's concepts of "The Wisdom of the Body." The lecture is considered for publication in the Society journal of their choosing. The recipient receives an honorarium of $4,000, a plaque, and reimbursement of expenses incurred in association with delivery of the lecture. The membership is invited to submit nominations for this lecture. A nomination shall be accompanied by a candidate's curriculum vitae and one letter detailing the individual's status and contributions.

More information on the award and nomination procedures are available at http://www.the-aps.org. Nomina-tions should be sent to: The APS Cannon Lecture Award, c/o Linda Jean Dresser, 9650 Rockville Pike, Bethesda, MD 20814-3991; or submitted online at http://www.the-aps.org/cgi-bin/Election/Lecture_form.htm.

Sunday April 2, 2006

	8:00-10:00 AM	10:30 AM-12:30 PM	3:15-5:15 PM
104	(8:00-9:00 AM): Ernest H. Starling Distinguished Lectureship **Coffman** (9:00-10:00 AM) WEH Young Investigator Award Lecture **TBA**	(10:30-11:30 AM):Carl Ludwig Distinguished Lectureship **Wallin**	(2:00-3:00 PM): Horace W. Davenport Distinguished Lectureship **Barrett**
130	Symp: The Physiology of Performance: From Mechanisms to Application **Spierer and Zion**	FT: Physiological Genomics of Skeletal Muscle Adaptation in Health and Disease **Nader**	Symp: Spinal Interneurons: Underappreciated Players in Autonomic and Respiratory Regulation? **Llewellyn-Smith and Schramm**
131	Symp: The Role of Glucose in Modulating Cell Function in the Cardiovascular System **Chatham and Hall**	(10:30-11:30 AM): MCS: Landis Award Lecture **TBA**	(2:00-3:00 PM): Claude Bernard Distinguished Lectureship **Silverthorn** FT: NADPH Oxidase vs. Mitochondria: From Where do Vascular Reactive Oxygen Species Arise? **Wolin and Gutterman**
132	Symp: Protein-Protein Interactions in Epithelial Physiology **Bradbury and Fuller**	Symp: Development and Maintenance of Epithelial Polarity **Weisz and Casanova**	Symp: Neurovascular Interactions **Segal**
133 134	Symp: Cellular and Molecular Signals Regulating Plasticity of Skeletal Muscle Fiber Type and Size **Schneider and Esser**	Phys InFocus: Investigating Cellular Signaling with Atomic Force Microscopy Methods **Mizaikoff and Eaton**	Symp: Human Integrative Physiology: The Missing Link in Systems Biology? **Joyner** (5:45-6:45 PM): Henry Pickering Bowditch Award **Von Andrian**
135	AFMR Symp: A Comprehensive Stem Cell Research Update **Hawkins**	Symp: Neuroendocrine Programming of the Respiratory Control System **Kinkead and Joseph**	Carl W. Gottschalk Distinguished Lectureship **Igarashi**
250/262	FT: Undergraduate Skills: What Should Students Be Able to Do? **Silverthorn**	AFMR Symp: HIV Lipodystrophy: Lessons From a Novel Metabolic Syndrome **Grinspoon and Schambelan**	SEBM Symp: The Role of Modern Biology and Medicine in Drug Development in Academia and Industry **Blake and Barker**
252/260	Symp: New Insights Into Ammonia Transport **Weiner and Westhoff**	FT: Air Pollutants or Intracellular Messengers? Inorganic Signaling Molecules in Vascular Regulation **Leffler**	MCS Symp: Regulation of Cerebrovascular Function in Health and Disease **Johnson and Durante**
270/272	FT: Lipid Metabolism and Liver Inflammation **Zhang**	Symp: Physiological Effects of Ovarian Hormone Deficiency **Toth and Tchernof**	FT: Functions of Gasotransmitters in the Cardiovascular System **Dombkowski**
274/276	Symp: Regulation of Glomerular Function by Podocytes **Bates and Deen**	Symp: Advances in Ion Channel Physiology **Martin**	Symp:Pathological Calcification: Crystallization Infection or Cell Transdifferentiation **Miller and Lieske**

Monday April 3, 2006

	8:00-10:00 AM	10:30 AM-12:30 PM	3:15-5:15 PM
104	(9:00-10:00 AM): Hugh Davson Distinguished Lectureship **Welsh**	Symp: Novel Partners and Mechanisms in Oxygen Sensing **Prabhakar and Peers**	(3:15-4:15 PM): Edward F. Adolph Distinguished Lectureship **Booth**
130	Symp: Mastering the Juggling Act: Laboratory Life, and Leadership Roles **Schreihofer, Damon, and Nisenbaum**	Symp: Oscillations and Rhythms in the Neural Control of the Circulation **Barman and Kenney**	FT: Wiggers Award: Pivotal Role of Endothelium in Deranged Vascular Control **Vanhoutte and Zhang**
131	Symp: Innovative Technologies for Proteomic Approaches to Systems Biology **Greene**	(10:30-11:30 AM): Robert M. Berne Distinguished Lectureship **Hintze**	Endothelial Permeability: Paracellular Pathway vs. Transcellular Pathway **Yuan and Breslin**
132	Symp: How Prepared Are Your Students to Learn Physiology? **Kutchai**	Symp: Could Hyperosmotic Stress on Cells Promote Obesity and Chronic Disease? A Multidisciplinary Look at the Effects of Hypertonicity **Stookey**	FT: New Advances in Renal and Acid-Base Balance **Breton**
133	Symp: Linking Mitochondrial Function in Skeletal Muscle to Disease **Neufer and Hood**	FT: Epithelial Ion Channels **Hallows and Drummond**	BMES Symp: Regulation of Leukocyte Recruitment on Inflamed Endothelium **Simon**
134			Symp: CO^2-H_+ Chemoreceptors: Where Are They, What Do They Do? **Forster and Hodges**
135	FT: Junctional Regulation in Barrier Cells **Bhattacharya**	Phys InFocus: Integrating Cellular Functions: The Role of the Primary Cilium in Cell Proliferation and Kidney Disease **Chapman and Sale**	(2:00-3:00 PM): Joseph Erlanger Distinguished Lectureship **Sawchenko** Phys InFocus: The Lipid in Lipid Rafts: Lipids as Signaling Molecules **Ma**
250/262	FT: Control of Renal Function and Blood Pressure in Metabolic Syndrome and Diabetes **Ecelbarger**	FT: Gastric Inflammation and Cancer Genesis **Sibley and Samuelson**	FT: Autonomic Adjustments to Stress in Humans **Ray**
252/260	FT: Molecular Regulation of eNOS Activity and Vascular Reactivity **Mitchell**	Symp: Molecular Characterization of Skeletal Muscle Plasticity in Non-model Organisms **Szucsik and Rourke**	(5:45-7:45 PM): Symp: Navigating the Interview: How to Make it Work for You **McHugh and Galey** FT: Mechanisms of Neuroprotection after Brain Injury **Schreihofer and Wyss**
270/272	FT: Neural Control and Autonomic Regulation Trainee Featured Topic **Grippo and Stocker**	FT: New Advances in the Peripheral Neuroendocrine System **Sridaran**	Symp: Regulation of Cardiac Muscle Contraction **McDonald**
274/276	AFMR Symp: Mechanism Based Neurotherapeutics for Osteoarticular Pain **Mahowald**	Pubs Symp: Publishing 101: Dos and Don'ts of Publishing in APS Journals **Barrett**	FT: Role of Epithelial Cells in Initiation and Propagation of Intestinal Inflammation **Merlin**

Tuesday April 4, 2006

	8:00-10:00 AM	10:30 AM-12:30 PM	3:15-5:15 PM
104	FT: Regulation of Renal Transporters **McDonough and Ortiz**	Symp: Aerobic Function in Aging Skeletal Muscle: From Molecular to Systemic Mechanisms **Rossiter and Hepple**	Symp: Pancreas Development and Insulin Secretion **Hay**
130	FT: Lipid Signaling, Lipid Rafts and Epithelial Transport **Levi**	FT: Signaling Mechanisms Associated with Hypoxia **Schumacker**	(2:00-3:00 PM): Julius H. Comroe, Jr. Distinguished Lectureship **Garcia** FT: Neural Control of Cardiovascular Function During Exercise **Kaufman**
131	Symp: Integrating Mechanical, Electrical, Metabolic, and Signaling Events in the Computer Modeling of the Heart **Beard and Bassingthwaighte**	Symp: Lipid Mediated Regulation of Membrane Transport **Awayda and Stockand**	FT: Regulation of Renal Hemodynamics **Pollock and Munger**
132	Symp: Transition From Postdoc to Jr. Faculty: Surviving the Initial Years **Ortiz and Bavis**	Symp: New Treatment Strategies to Combat Heart Failure **Lefer and Tian**	FT: Donald J. Reis Memorial Trainee Symposium **Busija and Hamblin**
133	Symp: Bench to Bedside: Targeting Coagulation and Fibrinolysis in Acute Lung Injury **Ware and Matthay**	Phys InFocus: Integrating Acute Lung Injury and Regulation of Alveolar Fluid Clearance **Guidot and Matthay**	Symp: Cell Signaling Underlying the Pathophysiology of Pneumoia **Bhattacharya and Mizgerd**
134			(5:45-7:00 PM): APS Business Meeting
135	(9:00-10:00 AM): August Krogh Distinguished Lectureship **Nishimura**	Symp: Tubule Perfusion: 40 Years Old and Still Going Strong **Burg and Sands**	(2:00-3:00 PM): Walter C. Randall Lecture on Biomedical Ethics **Prather** (5:45-7:45 PM): Poster Discussion Graduate Student Highlights in Respiration Physiology **Stevens and Neubauer**
250/262	FT: Physiologic Adaptations to Intermittent Hypoxic Exposure **Muza**	FT: Autonomic Motor Patterns and Their Central Circuits **McAllen**	FT: Activity-Dependent Plasticity in Central Homeostatic Systems **Stern and Horvath**
252/260	Symp: Melanocyte Stimulating Hormones and Their Receptors **Humphreys**	(10:30-11:30 AM): Solomon A. Berson Distinguished Lectureship **Bergman**	Symp: The Obesity Epidemic: A Historical Perspective **Bray**
270/272	FT: Disease and Plasticity in the Neural Control of Breathing **Golder and Fuller**	FT: Developmental Changes in Respiratory Control in Neonatal Rodents **McCrimmon**	FT: Muscle Fatigue **Renaud and Nosek**
274/276	FT: Fibroblasts and Myofibroblasts: Function and Tissue Repair **Insel**	FT: Sex Differences in Renal and Cardiovascular Disease **Sandberg**	FT: Xenobiotic Transporters **Pelis**

Wednesday April 5, 2006

	8:00-10:00 AM	10:30 AM-12:30 PM	3:15-5:15 PM
130	FT: Regulation of Vascular Tone in Diabetes and Metabolic Syndrome **Tune**	Symp: Hyperpolarization-Activated HCN Pacemaker Channels: Role in the Brain, Heart, and Disease **Siegelbaum and Kocsis**	
131	Symp: Physiological Genomics and the Gastrointestinal Tract **Ferraris and Kwitek**	BMES Symp: Fundamental Mechanisms of Mechanotransduction: Optical and Computational Approaches **Butler and Kamm**	
132	FT: Clinical Disorders and Vasopressin **Claybaugh and Bie**	Symp: Molecular Mechanisms of Intestinal Iron Transport **Collins and Mackenzie**	
133	Symp: The Hot Brain **Montain**	Symp: Obesity and Renal Disease **Harrison-Bernard and Maric**	
250/262	FT: Exercise-Regulated Signaling Pathways and Insulin Action **Fisher**	Subcellular Organization of Second Messenger Signaling **Stevens and Lynch**	
252/260	FT: Myocardial Blood Flow Heterogeneity: A Response to Mechanical and Metabolic Drive **Bassingthwaighte**	FT: Mechanisms of Hypoxic Vasoconstriction **Russell**	
270/272	FT: Mechanotransduction and Lung Cells **Quinn and Margulies**	FT: Control of Breathing: Exercise **Babb and Dempsey**	
274/276	ALACF Symp: Hypothalamus-Brainstem: Modulation of the Cardiovascular Function **Antunes-Rodrigues and Rettori**	FT: Physiology of Fibroblast Growth Factors **Hoying**	

Postdoctoral Positions

Postdoctoral Position in Stem Cell Electrophysiology: A postdoctoral position funded by the Canadian Institutes of Health Research is offered to outstanding candidates interested in studying the electrophysiology of cardiogenic differentiation in mesenchymal stem cells in the Department of Physiology at Queen's University, Kingston, Ontario, Canada, under the joint mentorship of Drs. Luis G. Melo and Chris A. Ward. The candidate is also expected to participate in a second project involving the cloning and characterization of novel sodium channel isoforms in the heart. The optimal candidate should be proficient in cardiac electrophysiology and, preferably, have some basic knowledge of molecular biology techniques. Two years of funding are available with possibility of renewal upon mutual agreement. Salary and benefits will be commensurate with experience and in accordance with CIHR guidelines and Queen's University employment regulations. Applicants are encouraged to consult Queens University website at www.queensu.ca for information about the University and postdoctoral employment. Please send an updated CV and three letters of reference to Dr. Luis G. Melo, Department of Physiology, 18 Stuart Street, Kingston, Ontario, K7L 3N6; Email: melol@post.queensu.ca.

Postdoctoral Position: Calcium Signaling in Smooth Muscle: Postdoctoral position immediately available to study calcium sparks, calcium waves, and potassium channels in arterial smooth muscle cells. Experience with cardiovascular physiology, patch-clamp electrophysiology, confocal microscopy and/or calcium imaging preferred. Required qualifications include a PhD or MD in Physiology or a related field. Send curriculum vitae and names and addresses of three references to Jonathan H. Jaggar PhD, Department of Physiology, University of Tennessee Health Science Center, 894 Union Avenue, Memphis, TN 38163, USA; Email: jjaggar@physio1.utmem.edu. The University of Tennessee is an EEO/AA/Title VI/Title IX/Section 504/ADA/ADEA employer. [AA/EOE]

Postdoctoral Fellow: A position for a Postdoctoral Fellow is available to study excitation-contraction coupling in cardiomyocytes with genetically altered levels of the sodium-calcium exchanger. We have especially interesting data on the adaptations of mice in which the sodium-calcium exchanger has been knocked out (*Circ. Res.* 95:604-611, 2004). The project will involve the application of electrophysiological and imaging techniques to isolated myocytes and provides an excellent training opportunity. The experiments will be done in collaboration with Dr. Josh Goldhaber. We would prefer someone with EC coupling or electrophysiological experience though this is not essential. Research will be carried out in the Cardiovascular Research Laboratories in the School of Medicine at UCLA providing a stimulating multidisciplinary environment. Applicants should send a CV including the names of three references to Dr. Kenneth Philipson (kphilipson@mednet.ucla.edu).

Postdoctoral Position: Ion channel regulation in vascular smooth muscle. A postdoctoral position is available to study the influence of inwardly rectifying potassium channels on cell-to-cell communication in the resistance vasculature. This project will involve the use of electrophysiological and Ca^{2+} imaging techniques on resistance arteries in which siRNA or dominant negative constructs have been employed to alter channel expression/activity. This multidisciplinary project provides an excellent training opportunity in vascular biology. Some experience in vascular biology and electrophysiology is preferable although not essential. Research will be conducted within the Smooth Muscle Research Group in the Faculty of Medicine at the University of Calgary (Alberta, Canada). Applicants should send a CV including the names of two references to Dr. Donald Welsh, HMRB-86, Smooth Muscle Research Group, Faculty of Medicine, University of Calgary, 3330 Hospital Dr. N.W. Calgary, Alberta, Canada, T2N-4N1. (dwelsh@ucalgary.ca).

Postdoctoral Research Fellow: Electrophysiologist. School of Biomedical Sciences, The University of Queensland, St Lucia. A postdoctoral position is available for studies on the expression, function and modulation of recombinantly expressed and native ion channels in mammalian peripheral and central neurons. Studies will include the use of whole-cell and single channel patch clamp recording techniques. The successful applicant will have a PhD or similar qualification in Physiology, Pharmacology, Neuroscience or other relevant biomedical science, and demonstrated experience and proficiency with electrophysiological (patch clamp) techniques. Experience with molecular biological and fluorescence imaging techniques would be an advantage. Further information about the School and research group can be found on the web site (http://profiles.bacs.uq.edu.au/David.Adams.html). This is a full-time, fixed term appointment, for one year (renewable subject to funding) and is available immediately. Depending on qualifications and experience, the remuneration package will be in the range of $64,986-$69,759 per annum, including employer superannuation contributions of 17%. Obtain the position description and selection criteria online or contact Professor David Adams at dadams@uq.edu.au. Telephone Professor David Adams, (07) 3888 9987, to discuss the role. Applications quoting position number 3008856, and including a curriculum vitae and the names and contact details of at least two professional referees should be sent to Professor David J. Adams, School of Biomedical Sciences, University of Queensland, Brisbane, Qld 4072 Australia, or Email dadams@uq.edu.au. Closing date for applications: 20 January 2006, Reference Number: 3008856. We reserve the right to appoint by invitation.

Postdoctoral Position: Available in a research program devoted to the study of renal control of blood pressure primarily through the use of a wide variety of mutant mouse models. Investigations and training will include in vivo and in vitro characterization of cardiovascular and renal function in mice using state-of-the-art techniques at the cell, tissue and whole animal level. Approaches include telemetry, determination of pressure-flow relationships and hemodynamics, evaluation of renal function at the whole kidney level as well as at the single nephron level by microperfusion and micropuncture, measurement of nerve activity, and analysis of intracellular ion concentration using epifluo-

rescence, confocal and multi-photon microscopy. Current areas of investigation are focused on the gastrointestinal control of renal electrolyte excretion, and the role of various epithelial ion transporters in the regulation of fluid and electrolyte balance. A doctoral degree and experience in cardio-renal physiology/pharmacology is required; fluency in both spoken and written English is essential. Applicants should send a CV, a brief statement of career goals and objectives, and a list of three references to: John Lorenz, PhD, University of Cincinnati College of Medicine, Department of Molecular & Cellular Physiology, PO Box 670576, Cincinnati, OH 45267-0576, USA. Electronic applications (preferably pdf) are strongly encouraged: email: john.lorenz@uc.edu.

Faculty Positions

Assistant/Associate Professors: The Department of Physiology and Biophysics at Rosalind Franklin University of Medicine and Science is seeking applications to fill two tenure-track faculty positions at the Assistant/Associate Professor level. The successful candidates will be expected to develop meritorious, extramurally funded research programs and have a strong commitment to medical and graduate student education. We are particularly interested in individuals who will complement existing departmental and institutional strengths, including: membrane transport, protein trafficking, protein structure, cell biology, virology, neuroscience, and cardiovascular and respiratory physiology. The Department is located in a new, state-of-the-art research building designed for multidisciplinary research group interactions. The University has begun an expansion campaign to fill 25 new faculty slots, all with nationally competitive salaries and start-up packages. Rosalind Franklin University of Medicine and Science is located in North Chicago, IL, a suburb approximately 40 miles north of the city of Chicago. Nearby tollways and train stations provide easy access to the many cultural and recreational amenities of metropolitan Chicago. Please submit a curriculum vita along with a one-page summary of research and teaching interests and future plans. The review of applicants will begin immediately, and continue until the positions are filled. Applications and nominations should be submitted by mail or email to: Robert J. Bridges, PhD, Chairman, Department of Physiology and Biophysics, Rosalind Franklin University of Medicine and Science, 3333 Green Bay Road, North Chicago, IL 60064, bob.bridges@rosalindfranklin.edu. [AA/EOE]

Assistant Professor: The Department of Kinesiology at the College of William and Mary invites applications for a tenure-track position at the level of Assistant Professor, beginning in August of 2006. The College of William and Mary is perennially identified by *US News and World Report* as the best small public university in the nation and is considered one of the elite "Public Ivy" institutions. **Exercise Physiologist with emphasis in Aging Studies:** Applicant must have an earned doctorate or medical degree in appropriate areas. Responsibilities include: *a*) teaching and developing courses in clinical exercise physiology, especially in the area of aging; additional teaching responsibilities may include courses in statistics and exercise prescription; *b*) research; *c*) seeking external funding for research; *d*) student advising; and, *e*) developing and directing a program in cardiac health for older populations. Clinical Exercise Physiologist certification required within a reasonable period of time post-employment. Salary is commensurate with qualifications and experience. Applicants should send a letter of application including future research agenda, curriculum vitae, terminal degree transcript, and three letters of reference to: Dr. Kenneth W. Kambis, Department of Kinesiology, College of William and Mary, PO Box 8795, Williamsburg, VA 23187-8795. Review will begin November 15, 2005 and will continue until the position is filled. For additional information about this position and the department, refer to http://www.wm.edu/Kinesiology/. [AA/EOE]

Faculty Position: New York Chiropractic College (NYCC), a leading college of chiropractic, is seeking to fill an immediate full-time opening in the Basic Sciences Department. Located in Seneca Falls, NY, in the heart of New York's Finger Lakes Region, NYCC is dedicated to academic quality and integrative health care. NYCC currently enrolls 700 students in its five degree-granting programs: Doctor of Chiropractic, Master of Science in Acupuncture, Master of Science in Acupuncture and Oriental Medicine, Master of Science in Diagnostic Imaging, and a Bachelor of Professional Studies. Chiropractic enrollment currently constitutes over 90 percent of the student body. Qualifications include: Doctorate in physiology or related field, and demonstrated ability to teach courses in Systems Physiology and other courses within area of expertise. Ideally, the successful candidate should also have publications in appropriate journals, post-doctoral training preferred, and a demonstrated ability to maintain an active research program. Applicants should possess the ability to work productively and collaboratively with staff, faculty and students. Applicants should be teacher-scholars who combine an active research program with excellence in teaching for health sciences students. Responsibilities include teaching courses in the Basic Sciences Department with an emphasis on Systems Physiology. Biochemistry and Pathophysiology are other potential areas of teaching. The ideal candidate should also maintain a research program in physiology or related field, publish research in refereed journals, and pursue external funding to support research activities. To learn more about NYCC please go to www.nycc.edu. To learn more about this position, click on the tab for "About NYCC" and then click on "Employment Opportunities." Interested candidates, please submit a cover letter, current resume/vitae, and a list of three references to: Office of Human Resources, New York Chiropractic College, 2360 State Route 89, Seneca Falls, NY 13148; Email your response to: cmcdermott@nycc.edu. Applications will be accepted until a suitable candidate is found. [AA/EOE/M/F/V/D]

Assistant or Associate Professor: Integrative Physiologist, Tenure-track Position, Portland State University, Department of Biology. Vertebrate organismal physiologists are invited to apply for a tenure-track position at the Assistant or Associate Professor level. Comparative systems physiologists that are skilled in cellular and molecular approaches or cellular/molecular physi-

ologists that appreciate the importance of higher levels of integration are equally acceptable. The quality of the research program is more important than the specific area of focus. The successful candidate will be expected to establish an independent research program that will attract extramural funding. The candidate will also be expected to contribute to the undergraduate curriculum, as well as provide research training for undergraduate and graduate students. An earned doctorate and an established research career are required. Interested applicants should send a current curriculum vita, three letters of reference, a statement of research goals, and teaching philosophy and interests to: Jason Podrabsky, Chair, Physiologist Search, Department of Biology, PO Box 751, Portland State University, Portland, OR 97207-0751. This position will remain open until filled; review of applications will begin December 1, 2005. [AA/EOE]

Department Head: The Department of Biological Sciences, Rochester Institute of Technology (http://www.biology.rit.edu) invites applications for Department Head and member of the Faculty. We are a dynamic, expanding department of 20 diverse faculty and more than 400 undergraduate and graduate students. We are seeking a highly qualified person to lead an exciting transformation from a predominant focus on undergraduate teaching to one that also fosters research and scholarship, while maintaining our excellence in teaching and career development. Vigorous efforts to advocate for substantial research funding and facilities, and to recruit and retain students and faculty from groups that are underrepresented in the biological sciences are also important components of the position. The successful candidate will be an astute listener and an effective communicator with good people skills who will be able to understand the value of, and advocate for, each of the programs, and who can unite the diverse interests of the faculty into a single shared vision. The Head is supported by a shared department administrative structure consisting of six Staff; an Associate Department Head; and six collaborative faculty teams that hold direct responsibility for all aspects related to the four undergraduate degree programs, the graduate programs, and a year-round undergraduate research program. Faculty rank and credit towards tenure are negotiable and dependent on experience and credentials. Substantial research space and other resources will be made available to allow the successful candidate to continue to vigorously pursue her or his research interests, and to mentor students in those research endeavors. The specific area of research is negotiable. A complete application, from individuals holding a doctorate in a pertinent area of life sciences, must include a *curriculum vitae*, brief summaries of research interests and administrative and teaching philosophies, and four letters of reference sent to Dr. G. Thomas Frederick, Chair, Department Head Search Committee (PC#8911-APS), Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623. Review of applications will begin no later than December 1, 2005 and will continue until suitable candidates are identified. We wish to fill this 12-month position by July 1, 2006. [AA/EOE]

Assistant Professor: Faculty Position in Exercise and Nutrition Science. The University at Buffalo, State University of New York, invites applications for a tenure-track faculty position at the Assistant Professor level in the Department of Exercise and Nutrition Sciences, School of Public Health and Health Professions. The start date is negotiable. Screening of applicants will begin February 1, 2006 and continue until the position is filled. Candidates should have an earned doctorate in a discipline relevant to exercise science. All applicants will be considered but preference will be given to candidates with research expertise in one of the following areas: metabolism, immunology, biomechanics, or cardiovascular, pulmonary, or neuromuscular physiology. Postdoctoral research experience is required. A record of outstanding achievement in research with publications in high quality journals is desired. Successful candidates will be expected to develop an independent research program, seek external funding, and contribute to teaching and service. Candidates should submit *1*) a letter of application; *2*) a curriculum vitae; *3*) a brief statement of future research plans; and *4*) the names and contact information for three references to: Ms. Maureen Lannen, Assistant to the Chair, Department of Exercise and Nutrition Sciences, Kimball Tower, Room 405, University at Buffalo, Buffalo, NY 14214-8028; Email: lannen@buffalo.edu. The Department of Exercise and Nutrition Sciences is one of the academic units in the School of Public Health and Health Professions. There are well-established research programs and excellent facilities available within the School and Department. The Department employs 18 full-time faculty and offers a BS in Exercise Science, a BS/MS in Exercise Nutrition, a BS/MS in Athletic Training, a Dietetic Internship with Advanced (Graduate) certificate program, MS degrees in Exercise Science and Nutrition and a PhD degree in Exercise Science. The University at Buffalo is a Research I institution. With 24,000 students, it is New York's largest and most comprehensive university. The Western New York area provides a highly livable environment rich in music, theater, and professional sports, in addition to the advantages of its location on the international border with Canada. [AA/EOE] The Department of Exercise and Nutrition Sciences is interested in identifying prospective minority and women candidates and professionals with disabilities. Qualified individuals with a disability may request needed reasonable accommodation to participate in the application process. No person in whatever relationship with The State University of New York shall be subject to discrimination on the basis of age, creed, color, disability, national origin, race, religion, ethnicity, sex, sexual orientation, marital or veteran status.

Associate or Full Professor and Chair of Exercise Science: Full-time, tenure-line position; begins Fall Term 2006. Teach courses in one or more of the following areas: motor learning/control, neuroscience, kinesiology/biomechanics, sport/behavioral psychology, nutrition, or public health and physical activity. Serve as chair of a four-person department for one or more three-year rotations. Standard teaching assignment is three courses or their lab equivalent per semester less one unit per year for service as chair. Courses taught may be in the exercise science major, an anticipated interdisciplinary program in neuroscience, and the university core curriculum (see http://www.ups.edu/bulletin/core/shtml, in particular freshman seminars and junior-level connections courses). Maintain an active research program involving undergraduate students.

PhD, and commitment to undergraduate teaching and liberal arts education, including an emphasis in writing in all courses. Interested individuals are encouraged to submit application materials postmarked no later than **January 5, 2006** to ensure consideration. To apply, submit interest letter, teaching and research statements, curriculum vitae, and three letters of reference to: Exercise Science Search-681, University of Puget Sound, 1500 N Warner #1007, Tacoma, WA 98416-1007. [AA/EOE]

Assistant Professor of Biology: The Biology Department at the University of Illinois at Springfield (UIS) invites applications for three tenure-track appointments at the Assistant Professor level, beginning August 2006. The primary teaching responsibility of one position will be courses in comparative vertebrate biology and physiology; candidates filling this position will also be expected to advise students preparing for admission to medical, veterinary, and dental school. The ideal candidate will have previous experience and research interests in electron microscopy, toxicology, ornithology, ichthyology, herpetology, or mammology. The ability to teach introductory level courses for biology majors and non-majors is expected, as is the ability to develop additional courses in the candidate's area of expertise. Qualifications: a PhD in biological sciences or a related field. Applicants with postdoctoral research and college teaching experience, as well as a record of publications and the ability to acquire external funding will be given preference. More information about this position and the UIS Biology department can be accessed at http://www.uis.edu/biology. Located in the state capital, UIS is one of three campuses of the University of Illinois. For more information, please see: http://www.uis.edu. A cover letter addressing the applicant's suitability to the position, curriculum vitae, and a summary of teaching and research interests in PDF format should be submitted to bonacum.james@uis.edu. Three letters of reference should also be submitted by mail to: Dr. James Bonacum, Biology Department, University of Illinois at Springfield, One University Plaza, MS HSB 223, Springfield, IL 62703-5407. Review of complete applications will begin 30 November 2005. Applications received by this date will receive first consideration. [AA/EOE]

Assistant Professor of Exercise Physiology: The Exercise Physiology Program in the Department of Health and Kinesiology at Texas A&M University is currently seeking candidates to join an outstanding faculty at the rank of Assistant Professor. Our program currently has eight tenured or tenure-track physiology faculty within a departmental faculty of 30, and has been identified as a Signature Program within the College of Education and Human Development, bringing additional college and university resources. Texas A&M University is a land-, sea- and space-grant institution located in College Station, roughly equidistant from Houston, Dallas and San Antonio. NSF ranked Texas A&M 15th in the nation in research expenditures in FY 2000, which more currently stand at $4 million/year, with 2.5 million sq. ft. dedicated to research space (see http://vpr.tamu.edu/remarkable). Texas A&M ranks among the top 10 US institutions in enrollment of National Merit Scholars and is among the lead in number of PhD degrees awarded to minority students. Our College and Department are dedicated to the goal of building a diverse faculty and student population, and strongly encourage the application of women and minority candidates. Position: Assistant Professor of Kinesiology. Qualifications: record of scholarly productivity and cutting-edge research program with external funding support, or clear evidence of strong potential to gain funding, preferably in an area that complements or coordinates with existing program strengths in musculoskeletal, microgravity, aging or cardiovascular physiology; excellence as a teacher, both in the classroom and the laboratory; and experience in, or evidence of potential for, successful recruiting and mentoring of graduate students from diverse backgrounds. Responsibilities: maintain a focused research agenda funded by federal grants; recruit and mentor doctoral students; contribute to the teaching of undergraduate and/or graduate physiology courses; maintain a national presence in the appropriate professional societies. Appointment: nine-month tenure track appointment; typical workload distribution: 50% research, 40% teaching, 10% service. Salary: competitive; commensurate with qualifications. Application: send letters of application or nomination, curriculum vitae, and names, addresses, email addresses, and telephone numbers of three references to: Dr. Susan A. Bloomfield, Search Committee Chair, Department of Health and Kinesiology, Texas A&M University, College Station, TX 77843; Email: sbloom@tamu.edu; Department web site: http://hlknweb.tamu.edu. Review Date: Review of candidates will begin on December 7, 2005, and will continue until the position is filled. [AA/EOE]

Assistant, Associate or Full Professor: Regulation of Feeding, Department of Foods and Nutrition and Food Science or Psychology, Purdue University. Applicants are sought for a tenure-track research/teaching position at the assistant, associate or full professor level at Purdue University. It will be a joint position in the Departments of Foods and Nutrition (primary) and either Food Science or Psychology (secondary). The successful candidate is expected to establish a research program related to sensory, metabolic or neural signals related to feeding. Preference will be given to applicants with interests and expertise in one of the following areas: energy balance, metabolism, fitness; bone health; or botanicals. An emphasis in the former area is particularly desired because of a recent University-based emphasis on cluster hires in obesity research and newly established Ingestive Behavior Research Center (IBRC). Collaborations with faculty in existing strong program areas of appetite, chemosensory function, energy balance, neurobiology, behavior, bioactive peptides and/or functional foods is expected. Qualifications include a record of scholarly activity as evidenced by publications and successful grantsmanship. Salary will be commensurate with experience. Initial screening of applications will begin January, 2006 and continue until a successful applicant is identified. The application, including: *1*) a description of current and planned scholarly activities; *2*) a curriculum vitae; and *3*) the names, addresses, Email and telephone numbers of three persons willing to serve as references, should be mailed to: Richard D. Mattes, MPH, PhD, RD, Search Committee Chair, Department of Foods and Nutrition, 1264 Stone Hall, Purdue University, West Lafayette, IN 47907-2059; Tel.: 765-494-0662; Fax: 765-494-

0674; Email: mattes@purdue.edu. Purdue University provides the resources and amenities of a Big Ten University in a setting that offers a high quality of life. [AA/EOE]

Assistant Professors: Cell Biologist and Vertebrate Biologist. The Department of Biology and Marine Biology at the University of North Carolina, Wilmington invites applications for two tenure-track positions starting August 2006. Cell biologist: candidates in any sub-discipline of eukaryotic cell biology are encouraged to apply. Vertebrate biologist: candidates with an interest in integrative and comparative biology are encouraged to apply. Duties for both positions include undergraduate and graduate teaching, and maintaining an active research program that involves both graduate and undergraduate students. The Department offers a BA in Biology, BS and MS degrees in Biology and in Marine Biology, and a PhD in Marine Biology. Modern laboratories and diverse core facilities are available in the Department and at the Center for Marine Science (http://www.uncw.edu/bio/ and http://www.uncw.edu/cmsr/). Candidates must have a PhD and postdoctoral experience. To apply, complete the online application available at http://consensus.uncw.edu. The application package should include a letter of interest that must contain brief statements of teaching and research interests, a CV, and contact information for three references. MS Word and Adobe PDF documents are the preferred programs for attachments. The Chair of the Cell Biologist search is Dr. Stephen Kinsey (910-962-7398), and the Chair of the Vertebrate Biologist search is Dr. D. Ann Pabst (910-962-7266), Department of Biology and Marine Biology. For questions about the online application process, contact Ms. Tracie Chadwick at 910-962-3536. Application review will begin January 10, 2006. Under North Carolina law, applications and related materials are confidential personnel documents and not subject to public release. [AA/EOE]

Faculty Positions: The Department of Cell Biology and Physiology at the University of Pittsburgh School of Medicine invites applications for tenure-track positions at all professorial levels. Departmental research strengths include: epithelial cell biology, regulation of membrane traffic of proteins and lipids and the regulation of gene expression and signal transduction in endocrine systems. We seek individuals whose research will interface with and extend the existing strengths of the Department in these areas. Space and start-up funds will be provided by the Department of Cell Biology and Physiology. Applicants should have a PhD and/or MD degree and postdoctoral experience. Send curriculum vitae, summary of research interests and names of three references to: Raymond A. Frizzell, PhD, Department of Cell Biology and Physiology, University of Pittsburgh School of Medicine, S368 Biomedical Science Tower, 3500 Terrace Street, Pittsburgh, PA 15261. [AA/EOE]

Assistant/Associate Professor: Biomedical Engineering Faculty Position in Tissue Engineering. The Department of Biomedical Engineering at Indiana University Purdue University Indianapolis (IUPUI) is seeking qualified individuals for a tenure-track position in tissue engineering, at the Assistant/Associate Professor level. Applicants must have a PhD in engineering or a related discipline and research expertise in one of the following areas: biomaterials, molecular biotechnology, tissue engineering, or biomechanics. The successful candidate will be expected to teach undergraduate and graduate courses in biomedical engineering and establish a state-of-the-art research program in collaboration with the Indiana University School of Medicine on the IUPUI campus. Qualified candidates may be offered joint appointments in both engineering and medicine. The desired start date is August 1, 2006. Full considerations will be given to applications received online before January 15, 2006. Apply online at: http://www.engr.iupui.edu/employment/index.shtml by submitting curriculum vitae along with a brief research and teaching plan and a list of at least three references. Questions concerning the positions can be addressed to Dr. Charles Turner, Chair of the Search Committee at turnerch@iupui.edu. [AA/EOE]

Assistant or Associate Professor: Biomedical Engineering Faculty Position. The Department of Biomedical Engineering, Purdue School of Engineering and Technology in conjunction with the Stark Neurosciences Research Institute (SNRI), Indiana University School of Medicine invite applications for a tenure-track faculty position at the Assistant or Associate Professor level. Primary departmental affiliation will be in BME with a joint appointment in the SNRI. Of particular interest are candidates with a PhD in engineering or a related discipline who employ analytical and applied life science methodologies in the study of one or more of the following areas: pain and sensory systems, developmental neurobiology, regeneration and neurodegenerative disorders. Sagacious consideration will be given to applicants whose research can capitalize upon the extensive facilities for translational research and technology development available through Purdue's Brindley Biosciences Center and Birck Nanotechnology Center. A competitive startup package is available to facilitate the transition to extramural research support. Yearly teaching obligations are limited to one undergraduate course in BME and one graduate course in the applicant's area of interest. The anticipated start date is August 1, 2006. Full consideration will be given to all applications received before February 20, 2006. All applications must be submitted online and include: curriculum vitae, statements of research and teaching interests along with the contact information for least three professional references. To apply, visit http://www.engr.iupui.edu/employment/index.shtml. Specific questions concerning the position can be addressed to Dr. John Schild jschild@iupui.edu. [AA/EOE]

Faculty Position: The Department of Biomedical Sciences at Baylor College of Dentistry, Texas A&M University System Health Science Center, Dallas, is seeking outstanding candidates for full-time faculty positions at the assistant, associate or full professor level for either the tenure or non-tenure track. A PhD in physiology or a related science area is preferred, although consideration will be given to any person holding a PhD who has substantial experience teaching physiology. The successful candidate will participate primarily in a team-taught physiology course to first-year dental students and graduate students. Applicants should have a broad system-based knowledge of physiology and/or endocrinology. For the tenure track posi-

tion, applicants must have a demonstrated ability to establish an independent research program and procure extramural funding. Current departmental research strengths include inflammation/pain and craniofacial biology; specifics can be seen at http://www.bcd.tamhsc.edu. Applications will be reviewed as they are received and the search will continue until the position is filled. Please submit a curriculum vitae, summary of current research activities, statement of career goals and teaching philosophy, and the names and contact information of at least three individuals for letters of recommendation to: Dr. Brendan Wong, Search Committee Chair, Department of Biomedical Sciences, Baylor College of Dentistry, TAMUSHSC, 3302 Gaston Avenue, Dallas, TX 75246; Email: bwong@bcd.tamhsc.edu. [AA/EOE]

Assistant Professor: The Department of Exercise Science at Syracuse University seeks a tenure-track Assistant Professor to begin August 2006. Candidates should hold an earned doctorate in exercise physiology or related discipline; postdoctoral experience is highly preferred. The successful candidate will be expected to develop a solid, extramurally funded research program, contribute to undergraduate and graduate teaching, as well as advise MS and PhD student research. Unique opportunities exist for participation in translational exercise research and interdisciplinary research collaborating with the medical school and basic science departments. Although outstanding candidates in all areas of physiology will be considered, special consideration will be given to investigators in cardiovascular, neural, metabolic, or physiology, as well as those that complement new institutional commitments in cell signaling and disability studies. Initial screening of applications begins January 2, 2005 but applications will be accepted until the position is filled. Send letter of application outlining past research accomplishments and future directions, CV, and three letters of recommendation to Dr. Lori Ploutz-Snyder, Search Committee Chair ,Exercise Science, Rm 201 Womens Bldg, Syracuse University, Syracuse, NY 13244-5040; Email: llploutz@syr.edu; Tel.: 315-443-2114; Fax: 315-443-9375. [AA/EOE]

Assistant Professor in Physical Education: (Exercise Science Emphasis), Dept. of Physical Education, Health and Recreation. Position/Salary: Full-time tenure-track, beginning September 2006. Competitive salary. Qualifications: Required: Doctorate in Exercise Science-related field (Biomechanics, Exercise Physiology, etc.) by August 2006. Capacity to teach a range of courses in the Exercise and Sport Science program. Evidence of successful teaching at the university level, scholarly contribution to the field, or potential for scholarly contribution, and professional involvement/service. Preferred: Extensive student involvement (e.g., advising, student-faculty research, mentoring). Ability and/or experience working with a diverse student body and staff Capacity to seek internal and external funding. Responsibilities: The teaching role involves undergraduate instruction in kinesiology, biomechanics, exercise physiology, statistics in exercise and sport sciences, and a survey of physical education and health course. In addition, teaching of a wellness course and/or graduate courses in the applicant's area of expertise may be required. The applicant will also be expected to: conduct research in exercise and sport science and disseminate findings through professional channels; seek internal and external funding; provide professional service for the department, university, community, and profession; advise Exercise and Sport Science majors; and contribute to the leadership and design of the Exercise and Sport Science program. Department: The PEHR Department, located within the College of Humanities and Social Sciences, has a full-time faculty of 13, and offers five degree programs including a BA in Education in Physical Education and Health, BS in Exercise and Sport Science, BS in Community Health, BA in Recreation, and MS degree in Human Movement and Performance. The department is one of the oldest and largest programs at Western Washington University. Western Washington University is a public four-year institution with competitive admissions and is nationally recognized for its educational programs, students, and faculty. Enrollment is approximately 12,500 students. The University has a strong tradition of faculty involvement in governance and in participation in professional and community organizations. The University is located in Bellingham, a city of approximately 67,000, and is nestled near the water and mountains in a scenic area between Puget Sound and the Canadian mountains. The University site offers easy access to major research libraries and a variety of recreational and cultural opportunities, including greater Seattle and Vancouver, BC. Application materials must be received by February 1, 2006 to ensure full consideration. Interested candidates should submit a letter of application establishing their qualifications; curriculum vita; graduate school transcripts; and three letters of recommendation addressing the candidate's qualifications in teaching and scholarly endeavor. Candidates are encouraged to address each required and preferred qualification listed in the job description. Address inquiries and send materials to: Lorrie Brilla, PhD, Exercise Science Search Chair (#05PEHR-02), PEHR Department, Western Washington University, 516 High Street, Bellingham, WA 98225-9067; Tel.: 360-650-3056; Fax: 360-650-7447; Email: brilla@cc.wwu.edu. For additional information about Western Washington University, visit http://www.acadweb.wwu.edu/hr/Employment/profilewwu.htm. WWU is an equal opportunity/affirmative action employer, committed to assembling a diverse, broadly trained faculty and staff. Women, minorities, persons with disabilities, Vietnam-era veterans and disabled veterans are encouraged to apply. For disability accommodation, call the Employee Relations-Disability Specialist/ADA Coordinator at 360-650-7410 or 360-650-7696 (TTY). All employees must show employment eligibility verification as required by the US Citizenship and Immigration Services before beginning work at WWU. WWU is committed to fostering a safe learning and working environment. Our Annual Campus Security Report can be viewed at http://www.wwu.edu/depts/vpsa/asr.htm and includes information on campus crime and WWU safety policies and procedures. For a paper copy, call Human Resources at 360-650-3774, TTY 360-650-7696.

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2 Tenure-Track Assistant Professor Positions: Biology/Biomedical Engineering, Indiana University-Purdue University at Indianapolis (IUPUI). Applications are invited for two tenure-track Assistant Professor positions joint-

ly supported by the IUPUI Departments of Biology and Biomedical Engineering in the Purdue Schools of Science and Engineering & Technology in Indianapolis. The home department will be the Department of Biology with membership in the Indiana University Center for Regenerative Biology and Medicine. Both positions seek candidates engaged in research in Cell/Developmental/Molecular Biology. Candidates for the first position should have an interest in systems level physiological/immunological responses to implanted materials, devices, materials, gene or drug delivery systems. Candidates for the second position should have an interest in growth and trophic factors, cell signaling, stem cell biology, regeneration or differentiation. Teaching will be at the undergraduate and graduate level. Students will be drawn from Biology and Biomedical Engineering. Qualifications: PhD and post-doctoral experience in relevant fields required. Competitive startup packages and laboratory space will be provided. The IUPUI Department of Biology has 18 primary faculty (http://www.biology.iupui.edu). The IUPUI campus is located in an attractive modern, downtown location and is home to 19 academic schools including the Purdue School of Engineering and Technology and the Indiana University Schools of Dentistry and Medicine. Appointed faculty will be encouraged to establish research collaborations across the campus. Please send your curriculum vitae, statement of research plans, statement of teaching philosophy and names and addresses for three letters of reference to smerrell@iupui.edu or: Biology/Biomedical Engineering Search, IUPUI-Department of Biology, 723 W. Michigan St., SL 306, Indianapolis, IN 46202-5132. Electronic application submission is preferred. [AA/EOE]

Lecturer in Anatomy: Department of Exercise Science, The University of Iowa: Applications are invited for the position of Lecturer in anatomy, non-tenure track for the academic year 2006-2007. Candidates are sought who have demonstrated excellence in teaching general anatomy to undergraduate students through lecture and dissection. The successful applicant will teach general anatomy to beginning and upper-level undergraduate students through lecture, discussion, and laboratory formats, and serve on departmental committees. Applicants must hold a doctorate degree. The position is renewable on an annual basis pending demonstrated excellence in teaching and collegiate approval. Review of applications will begin immediately and continue until the position is filled. Submit a letter of application, curriculum vitae, and the names and contact information of three references to: Kelly J. Cole, PhD, Department of Exercise Science, S. 501 Field House, The University of Iowa, Iowa City, IA 52242. Minorities, women and disabled individuals are strongly encouraged to apply. Applicants must demonstrate a commitment to promoting a diverse environment. [AA/EOE]

Lecturer, Physical Education and Movement Science: The Division of Kinesiology at the University of Michigan (http://www.kines.umich.edu) is seeking a full-time lecturer with expertise in the areas of Movement Science and Physical Education. This position offers an excellent opportunity to enhance teaching skills at the undergraduate level. Teaching responsibilities include content courses in the core areas of physical education and movement science and require expertise in the areas of functional anatomy, exercise physiology and biomechanics. Other duties may include student advising and participation in curricular unit administrative activities. Please note: this is a three-year, full-time, non-tenure track teaching position with the possibility for renewal. Terms and conditions of employment for this position are subject to the provisions of a Collective Bargaining Agreement between the University of Michigan and the Lecturers Employee Organization. Qualifications: ABD or PhD in Kinesiology, Exercise Science, or related field preferred. Candidates are expected to have at least one year of teaching experience at the college and/or university level. To Apply: review of applications will begin immediately and will continue until the position is filled. Please send a curriculum vitae and official transcripts, along with the names and contact information (telephone and email) of three references to Pat Van Volkinburg, Chair, Kinesiology Lecturer Search Committee; 401 Washtenaw Avenue; Ann Arbor, MI 48109-2214. [AA/EOE]

Research Positions

Graduate Research Opportunity: Graduate research opportunity in Exercise Physiology and Biomechanics at the University of Southern California (USC), Los Angeles, CA. Opportunities for studying Exercise Physiology or Biomechanics are available at the University of Southern California. In Exercise Physiology, our research focuses on metabolism (Carbohydrates, Lipids) and its regulation during exercise, with aging and in pathophysiological conditions (Type I Diabetes, Type II Diabetes, Obesity). In Biomechanics, our research focuses on the mechanisms humans use to generate and control momentum during multi-joint movements (Athletic, Ergonomic, and Clinical Populations). We currently have several positions open for highly motivated Graduate Students. Courses for Doctoral Students are offered within and outside the department in areas such as Biomedical Engineering, Computer Science, Integrative and Evolutionary Biology, Physiology, Gerontology, and Statistics. Doctoral students will enter one of two Interdisciplinary Degree Programs available at USC; Biomedical Engineering (Biomechanics) or Integrative and Evolutionary Biology (Biomechanics and Exercise Physiology). Students are encouraged to apply for Graduate Fellowships as well as Teaching & Research Assistantships. Recipients receive stipends, health benefits and tuition remission as part of their Assistantships or Fellowships. If you are interested in learning more about the programs, please contact: Biomechanics Program: Dr. Jill McNitt-Gray, mcnitt@usc.edu. If interested in Exercise Physiology Dr. Lorraine Turcotte PhD, Chair/Associate Professor, Department of Kinesiology, turcotte@usc.edu.

In Vivo Pharmacology Opportunities: Novartis Institutes for BioMedical Research, Cambridge, MA, is Novartis' global research organization and is committed to discovering innovative medicines that cure disease and improve human health. By conducting more relevant and predictable drug discovery that can yield new and better medicines for patients, Novartis Institutes for BioMedical Research is redefining drug discovery in the post-genomic era. Over

the past four years, Novartis Pharmaceuticals has had the greatest number of new molecular entities approved by the US FDA. With its broad focus on diseases for which there is a need for better medical therapies, and with 3,000 talented, dedicated research scientists worldwide, Novartis Institutes for BioMedical Research is well-positioned to ensure Novartis maintains its strong pipeline and highly successful track record in new drug discovery. Novartis Institutes has sites in Cambridge, MA (headquarters); Basel, Switzerland; Horsham, UK; East Hanover, NJ; Vienna, Austria; and Tsukuba, Japan. Novartis Institutes' Cambridge facilities encompass 750,000 square feet of laboratory and office space. Research in cardiovascular disease, oncology, infectious disease, and diabetes is headquartered in Cambridge. In addition, Cambridge is home to the following platform technologies: Global Discovery Chemistry, Functional Genomics, Developmental & Molecular Pathways, and Models of Disease Center. In order to attract and develop an exceptionally talented and committed staff, Novartis Institutes for BioMedical Research offers an innovative and comprehensive benefits package, including healthcare, insurance, savings, retirement, and work/life benefits. **Job Description:** Perform in vivo pharmacology research to support the selection and development of therapeutic agents in the following disease areas: Oncology, Cardiovascular, Diabetes and Metabolism, Infectious Diseases and Ophthalmology. Perform experiments for in vivo model development and implementation. Engage in projects for drug discovery and demonstrates innovative thinking and generates project ideas. Understand drug discovery process and brings innovation and new technology to the research organization. Work collaboratively with other groups in the research organization to meet objectives and timelines. Document study results through internal reports and external publications and present research findings at internal and external meetings. **Minimum requirements:** MD/ PhD. **Minimum Requirements:** MD or PhD in physiology, pharmacology or other related life sciences. Extensive hands-on experience in animal models and in vivo pharmacology is essential; sound understanding of pharmacodymamics and pharmacokinetics; proficiency in experimental design, data interpretation and statistical analysis; excellent leadership, communication and interpersonal skills; highly motivated with a strong work ethic and ability to work in teams; proven record on scientific writing with publications in scientific peer-reviewed journals. Exceptional knowledge in one of the following disease areas: infectious diseases, diabetes, glucose and lipid metabolism, cardiovascular research, oncology or ophthalmology. **Research Associate Minimum Requirements:** MS or BS in life sciences with documented experience in multiple dosing routes, including I.P., I.M., I.V. and oral administration; knowledge of techniques and relevant in vivo model systems, including, but not limited to, rodent animal handling, dosing, bleeds, husbandry, health monitoring and surgery. Competent in experimental design, metabolite measurements, data analysis and interpretation, and scientific writing; highly motivated with a strong work ethic; familiarity with Excel, Word, PowerPoint, and graphic applications; solid interpersonal communication skills; demonstrated ability to work in teams. Exceptional knowledge in one of the following disease areas: infectious diseases, diabetes, glucose and lipid metabolism, cardiovascular research, oncology or ophthalmology. Experience in one of the following disease areas: infectious diseases, diabetes, glucose and lipid metabolism, cardiovascular research, oncology or ophthalmology a plus. Required years of experience Three-Five Years. To apply for this position, go to: http://www.novartis.com/careers/en/job_search/brassring/index_usa.shtml, search Openings, Keyword 8044BR. [AA/EOE/M/F/D/V].

Anatomist/Physiologist. The Department of Biological Sciences in the School of Health and Natural Sciences at Messiah College is seeking an Anatomist/Physiologist to fill a full-time, term-tenure track position. Responsibilities: primary teaching responsibilities will be in the area of human anatomy and physiology. Secondarily, there may also be limited opportunities to teach cell biology and microbiology. The successful candidate will also be expected to develop upper level courses in their area of expertise and to teach in the general education science program. Lastly, this individual must be able to mentor undergraduate research projects, develop their own scholarship to meet term-tenure and promotion requirements and contribute to institutional service, such as: academic advising, committee work, student recruitment etc. Qualifications: PhD, or comparable degree, in Anatomy, Physiology or related disciplines. Demonstrated excellence in college teaching, mentoring of student research, and scholarship is preferred. The successful candidate must be committed to best educational practices as applied to undergraduate science education and the integration of Christian faith and learning. The College: Messiah College is a Christian college of the liberal and applied arts and sciences. The College is committed to an embracing evangelical spirit rooted in the Anabaptist, Pietist and Wesleyan traditions of the Christian Church. Our mission is to educate men and women toward maturity of intellect, character, and Christian faith in preparation for lives of service, leadership and reconciliation in church and society. Messiah College is a teaching institution which emphasizes instruction but values research and public service. Strong support is given to faculty growth and scholarship. Position Open: Fall 2006. Compensation: Salary and rank commensurate with qualifications and experience. Applications: Nominations and applications are welcome. The search committee will begin reviewing completed applications immediately until a suitable candidate is hired. Applicants should submit a letter of interest and an application (downloadable from http://www.messiah.edu/offices/hr/forms/Faculty_Empl_Appl.pdf). Please address all inquires, applications and nominations to: Sheri Boyce, PhD, Chair of the Search Committee, PO Box 3030, Messiah College, Grantham, PA 17027. [AA/EOE]

Administration Positions

Chair—Division of Pharmacology: The School of Pharmacy at the University of Missouri, Kansas City (UMKC) is seeking a qualified and motivated individual for the position of Chair of the Division of Pharmacology. The responsibilities of this position include: administration of a team of eight faculty members responsible for pharmacology instruction to pharmacy, dental, graduate, and nursing students; mentoring and recruitment of new faculty; coordination of both division and interdisciplinary research programs;

and an active individual research program. This position reports directly to the Dean of the School of Pharmacy and has interactions with other units involved in both professional and graduate education. The successful candidate should have a terminal doctoral degree (PhD, PharmD, MD) and significant research accomplishments including a high level of extramural research funding which would qualify the individual for the rank of professor. Preference will be given to individuals with prior administrative experience and/or an exemplary record in professional leadership. Salary will be commensurate with experience. The position will be available on or after April 1, 2006. For full consideration, applications should be received by February 1, 2006. UMKC is a comprehensive research university exemplifying the values of education first, innovation, accountability, diversity and collaboration. The School of Pharmacy is one of the four health professional schools on the UMKC campus, and is engaged in a University-wide initiative to advance the life sciences in the Kansas City corridor through the Kansas City Area Life Sciences Institute (KCALSI) (www.kclifesciences.org). The Division of Pharmacology is one of three divisions in the School of Pharmacy, interfacing with the Divisions of Pharmaceutical Sciences and Pharmacy Practice. Construction of a new facility to house the School of Pharmacy is underway, and the successful candidate will have an opportunity for extensive input into the Pharmacology space. More about UMKC is at http://www.umkc.edu/strategicplan, or go to http://www.umkc.edu/pharmacy. Nominations and applications indicating interest in the position, a complete curriculum vita and three letters of reference should be forwarded to: Robert W. Piepho, PhD, Chair, Search Committee, School of Pharmacy, University of Missouri-Kansas City, 5100 Rockhill Road, Kansas City, MO 64110-2499; Tel: 816-235-1609; Email: piephor@umkc.edu. [AA/EOE].

Chair, Department of Exercise and Sport Science: Position and Responsibilities: The University of Utah invites applications and nominations for the position of Chair of the Department of Exercise and Sport Science. Faculty rank will be Associate Professor or Full Professor depending upon qualifications. The Chair of the Department will serve as leader of and advocate for the Department. The Chair will also contribute to the mission of the Department by being actively involved in research activities and through teaching, and service. The Chair reports to the Dean of the College of Health. The Department of Exercise and Sport Science is one of seven academic units situated in the College of Health in the University of Utah Health Sciences Center. The Health Sciences Center includes the Colleges of Health, Pharmacy, Nursing and the School of Medicine and University Health Care. The Department offers a richly diverse array of degree options: five undergraduate programs (Exercise Physiology, Exercise Science, Fitness Leadership, Athletic Training Education Program, Physical Education Teacher Education); and four tracks for masters or doctoral (PhD) degrees (Psychosocial Aspect of Sport, Special Physical Education, Sport Pedagogy, Exercise Physiology). Qualifications: A doctoral degree with emphasis in or substantial relevant experience with exercise and sport science is required. The successful applicant will have demonstrated leadership and organizational skills, a history of continued funded scholarship, the ability to mentor and facilitate the faculty in the department, and the ability to promote the department across the campus and within the community. The individual must meet the requirements for tenure within the Department. Application Deadlines and Start Date: **Applications should be received by January 1, 2006 for earliest consideration.** Additional applications may be considered following this date until the position is filled. The planned start date for the position is July 1, 2006. Salary and rank are dependent upon experience and qualification. Contact: Nominations and applications (application should include letters of interest, vitae, and three letters of reference) should be submitted to R. Scott Ward, PhD, Chair, ESS Search Committee, 250 South 1850 East, Room 241, The University of Utah, Salt Lake City, Utah 84112. ❖

Three APS Members Elected to the Institute of Medicine

The Institute of Medicine of the National Academies of Science announced 69 new inductees in October. New members to this esteemed organization are elected by current members from candidates nominated for their professional achievement and commitment to service.

"As the Institute of Medicine celebrates this milestone, it is a great pleasure to welcome these distinguished individuals as members," said IOM President Harvey V. Fineberg. "Election recognizes those who have made major contributions to the advancement of the medical sciences, health care, and public health. It is considered one of the highest honors in these fields."

APS extends sincere congratulations to its three member inductees: **Peter Agre**, Duke University Medical Center; **Emilio Bizzi**, Massachusetts Institute of Technology; **Gerald Shulman**, Yale University School of Medicine. ❖

Motley-Johnson Appointed Associate Dean

The School of Graduate Studies and Research of Meharry Medical College is pleased to announce the appointment of **Evangeline Motley-Johnson**, an APS member, as the Associate Dean, effective January 1, 2006. Motley-Johnson currently is the Chair of the Division of Cardiovascular Biology in the Department of Biomedical Sciences, a post she will retain until the end of 2005.

She received a BA degree in Biology from the University of Virginia and her doctorate in Physiology and Biophysics from Howard University. She joined Meharry Medical College as an Assistant Professor in the Department of Physiology in 1993 after completing her postdoctoral training at the University of Cincinnati.

While at Meharry, Motley-Johnson has significantly contributed to the training of graduate, medical, and dental students. She has received several awards for excellence in mentoring and teaching students in the graduate school, including the Mentorship Award in 1999, 2003 and 2005; the Graduate Teaching Excellence Award in 2003; and the Faculty Scholar Award in 2000. She has trained seven PhD students in her laboratory, served on the Committee of Instruction (COI) of a significant number of PhD graduates, and served to assist them to attain travel awards to national meetings.

Motley-Johnson's student advocacy has been evident nationally as well as locally. She served on the American Physiological Society (APS) Porter Development Committee from 1998 to 2003 and her efforts were instrumental to secure three pre-doctoral fellowships for Meharry graduate students. She is currently a member of the APS-Cardiovascular Trainee Committee. Motley-Johnson also is a member of the Minority Affairs Committee of the Endocrine Society and serves as a mentor for minority students who attend national scientific meetings. As a member of the Endocrine Society's Student Affairs Committee, she has visited several HBCUs as a lecturer for the short course, "Program in Endocrinology," which encourages students to pursue careers in the health sciences.

In addition to her involvement with students, Motley-Johnson has sustained an active research program in the area of cardiovascular diseases, such as atherosclerosis and hypertension. She has 41 peer-reviewed publications in her field. She has received funding from the American Heart Association, the National Heart Lung and Blood Institute as well as the National Institute of General Medical Sciences.

Motley-Johnson is a member of the Network of Minority Research Investigators sponsored by the National Institute of Diabetes and Digestive and Kidney Diseases. She is a member of several societies, including the American Heart Association, American Physiological Society, Endocrine Society, and Society of Experimental Biology and Medicine, and she has served as a member of a peer-review committee for funding by the American Heart Association. ❖

Robert Andrew Augustyniak has accepted the position of Assistant Professor, Department of Medicine and Physiology, Wayne State University School of Medicine, Detroit, MI. Augustyniak formerly was a Postdoctoral Fellow, Department of Internal Medicine, Division of Hypertension, University of Texas Southwestern Medical Center, Dallas, TX.

Harold J. Bell a Postdoctoral Fellow, has joined the Department of Cell Biology and Anatomy, University of Calgary, Canada. Bell was formerly a Research Associate, affiliated with the Department of Physiology, University of Toronto, Ontario, Canada.

Neil Albert Bradbury recently affiliated with the Department of Physiology and Biophysics, Chicago Medical School, N. Chicago, IL, as Professor. Bradbury formerly was an Associate Professor, Department of Cell Biology and Physiology, University of Pittsburgh School of Medicine, Pittsburgh, PA.

Robert J. Bridges is currently Professor and Chair, Department of Physiology and Biophysics, Rosalind Franklin University of Medicine and Science, North Chicago, IL. Bridges had previously been Professor and Vice Chair, Department of Cell Biology and Physiology, University of Pittsburgh School of Medicine, Pittsburgh, PA.

Miriam Yvette Cortez-Cooper has accepted the position of Assistant Professor, Medical College of Georgia, Physical Therapy Department, Augusta, GA. Cortez-Cooper had been affiliated with the Department of Kinesiology and Health Education, University of Texas, Austin, TX.

Paul L. Dudas, a Research Scientist, has joined Centocor/Johnson & Johnson, Radnor, PA. Dudas was previously a Postdoctoral Fellow, Department of Internal Medicine, Division of Nephrology, Yale University School of Medicine, New Haven, CT.

David G. Edwards has been appointed Assistant Professor, Department of Health, Nutrition, and Exercise Sciences, University of Delaware, Newark, DE. Edwards was formerly associated with the Department of Kinesiology, University of New Hampshire, Durham, NH.

Paul Joseph Fadel, an Assistant Professor, is currently affiliated with the Department of Medical Pharmacology and Physiology, University of Missouri, Columbia, MO. Fadel had been a Postdoctoral Fellow, Department of Internal Medicine, University of Texas Southwestern Medical Center, Dallas, TX.

Janie M. Fouke recently accepted the position of Provost and Senior Vice President, University of Florida, Gainesville, FL. Fouke had been Associate Professor, College of Engineering, Michigan State University, East Lansing, MI.

Linda C. Giudice is currently Professor and Chairman, Department of Obstetrics/Gynecology and Reproductive Sciences, University of California, San Francisco, CA. Formerly, Giudice was Professor, Department Obstetrics/Gynecology, Stanford University Medical Center, Stanford, CA.

Roxann Diez Gross, an Assistant Professor, has joined the Eye & Ear Institute, University of Pittsburgh, PA. Gross was formerly with the Audiology and Speech Pathology Department, VA Pittsburgh Healthcare System, Pittsburgh, PA.

Thomas N. Hansen accepted the position of President and CEO, Children's Hospital and Regional Medical Center, Seattle, WA. Hansen was formerly Professor and Chairman, Department of Pediatrics, Ohio State University, Columbus, OH.

Yoshihiro Ishikawa has accepted the position of Professor, Department of Physiology, Yokohama City University School of Medicine, Yokohama, Japan. Ishikawa was formerly an Adjunct Associate Professor, affiliated with the Department of Cell Biology, Molecular Medicine, and Medical Cardiology, University of Medicine and Dentistry, New Jersey Medical School, Newark, NJ.

Ole Johan Kemi, an Assistant Professor, has affiliated with the Institute of Biomedical and Life Sciences, University of Glasgow, Scotland, UK. Prior to his new assignment, Kemi was with the Department of Circulation and Medical Imaging, Norwegian University of Science and Technology, Trondheim, Norway.

Kwang Chul Kim recently affiliated with the Lovelace Respiratory Research Institute, Albuquerque, NM. Kim was formerly associated with the Department of Pharmaceutical Sciences, University of Maryland School of Pharmacy and Medicine, Baltimore, MD.

David Douglas Kline, an Assistant Professor, joined the Department of Biomedical Science/Dalton Cardiovascular, University of Missouri-Columbia, Columbia, MO. Kline was formerly a Research Associate, Department of Neuroscience, Case Western Reserve University, Cleveland, OH.

Thomas A. Knight, a Postdoctoral Fellow, has affiliated with the Pharmacology Institute, University of Heidelberg, Germany. Knight was previously with the Department of Physiology and Biophysics, University of Washington, Seattle, WA.

Gregory Thomas Knipp, an Assistant Professor, has accepted a position at the Department of Industrial and Physical Pharmacy, Purdue University, West Lafayette, IN. Knipp was formerly associated with the Department of Pharma-ceuticals, Rutgers University, Piscataway, NJ.

Osun Kwon, an Associate Professor of Medicine, has affiliated with the Hershey Medical Center, Division of Nephrology, Penn State College of Medicine, Hershey, PA. Kwon was formerly an Assistant Clinical Professor of Medicine, Harbor-UCLA Medical Center, Torrance, CA.

Courtney C. Lane, a Research Scientist, has joined Advanced Bionics, Oxnard, CA. Prior to her new affiliation, Lane was affiliated with the Department of Electrical and Computer Engineering, Rice University, Houston, TX.

Jane Leopold has joined the Faculty of the Cardiovascular and Medicine Division, Brigham and Women's Hospital, Boston, MA. Leopold was formerly a Member of the Faculty, Department of Cardiology, Whitaker Cardiovascular Institute, Boston University School of Medicine, Boston, MA.

Peter Lindholm, a Postdoctoral Fellow, Environmental Physiology joined the Department of Physiology and Pharmacology, Karolinska Institutet, Stockholm, Sweden. Lindholm was formerly a Postdoctoral Fellow, Department of Physiology and Pharmacology, Center for Research & Education in Special Education, Buffalo, NY.

Yanping Liu, is a Health Scientist Administrator, National Center for Research Resources, National Institutes of Health, Bethesda, MD. Formerly, Liu was associated with the Cardiovascular Research Center, Medical College of Wisconsin, Milwaukee, WI.

William Joseph Martin joined the Department of Pharmacology, Theravance, Inc., South San Francisco, CA, as a Senior Director. Prior to his new assignment, Martin was Director, Department of Pharmacology, Merck and Company, Inc., Rahway, NJ.

Luis A. Martinez-Lemus has accepted the position of Assistant Professor, University of Missouri-Columbia, Dalton Cardiovascular Research Center, Columbia, MO. Formerly, Martinez-Lemus was Assistant Research Scientist, Department of Medical Physiology, Texas A&M University, College Station, TX.

Shizue Masuki has associated with the Department of Sports Medical Sciences, Shinshu University Graduate School of Medicine, Matsumoto, Japan, as an Assistant Professor. Prior to her new assignment, Masuki was formerly a Research Fellow, Department of Anesthesiology, Mayo Clinic, Rochester, MN.

Julia Ann Moffitt, is currently an Assistant Professor, Department of Kinesiology, Cornell College, Mt. Vernon, IA. Formerly, Moffitt was a Senior Research Scientist, Guidant Corporation, St. Paul, MN.

Eleni Mylona-Lagoudaki, a Postdoctoral Fellow, has affiliated with the Foundation for Research and Technology, FORTH: Institute of Applied and Computational Mathematics, Heraklion Crete, Greece. Mylona-Lagoudaki was previously associated with the Department of Pharmacology, Emory University School of Medicine, Rollins Research Center, Atlanta, GA.

Kazunobu Okazaki, a Postdoctoral Fellow, has affiliated with the Department of Sports Medical Science, Shinshu University Graduate School of Medicine, Matsumoto, Nagano, Japan. Okazaki had formerly been with the Institute for Exercise Environmental Medicine, Department of Exercise Physiology, Dallas, TX.

Kenneth R. Olson, a Professor, has joined the Indiana University School of

Medicine, South Bend, IN. Olson was previously affiliated with the Center for Medical Education, Indiana University School of Medicine, University of Notre Dame, Notre Dame, IN.

Steven John Prior has affiliated with the Department of Geriatrics, Baltimore VA Medical Center, Baltimore, MD. Prior was previously associated with the Department of Kinesiology, University of Maryland, College Park, MD.

Pascale M. Rabbah is a Postdoctoral Fellow, Department of Biological Sciences and Math, New Jersey Institute of Technology, Newark, NJ. Rabbah was formerly a Postdoctoral Student, associated with the Department of Biology, Rutgers University, Newark, NJ.

Gordon Reid has moved to the Department of Physiology, University College, Cork, Ireland. Reid was previously associated with the Department of Animal Physiology and Biophysics, University of Bucharest Faculty of Biology, Bucharest, Romania.

Carol D. Rodgers, an Associate Professor, is currently affiliated with the College of Kinesiology, University of Saskatchewan, Saskatoon, Saskatchewan, Canada. Formerly, Rodgers was with the Department of Physical Education and Health, University of Toronto, Ontario, Canada.

John G. Semmler, a Lecturer, has recently joined the School of Molecular and Biomedical Science, University of Adelaide, Adelaide, South Australia. Semmler was previously associated with the Department of Exercise and Nutritional Sciences, Deakin University, Burwood Victoria, Australia.

Galia K. Soukhova-O'Hare, a Research Associate, has associated with the Department of Physiology and Biophysics, Albert Einstein College of Medicine, Bronx, NY. Soukhova-O'Hare was formerly a Postdoctoral Fellow, Department of Pediatrics, University of Louisville, KY.

Katalin Szaszi has accepted the position of Assistant Professor, St. Michael's Hospital, Toronto, Ontario, Canada. Szaszi was formerly a Senior Postdoctoral Fellow, Department of Transplantation Research, Toronto General Hospital, Ontario, Canada.

Hirofumi Tanaka has moved to Austin, TX, as an Assistant Professor, Department of Kinesiology and Health Education, University of Texas at Austin. Tanaka was previously affiliated with the University of Wisconsin-Madison, Department of Kinesiology, Madison, WI.

Bunyen Teng has accepted the position of Research Assistant Professor, Department of Physiology and Pharmacology, West Virginia University, Morgantown, WV. Previously, Teng had been a Research Instructor, Department of Pharmacology and Toxicology, East Carolina University, Greenville, NC.

Jason J. Villarin, a Postdoctoral Fellow, has affiliated with the University of Calgary, Faculty of Kinesiology, Calgary, Canada. Villarin was formerly a Graduate Student, Department of Physiology and Membrane Biology, University of California, Davis, CA.

Saeed Zeinoaldini is currently affiliated with the Animal Science Group and Agriculture Faculty, Ilam University, Ilam, Iran. Zeinoaldini was previously associated with the Department of Animal Science, Wageningen University, Wageningen, The Netherlands.

Peng Zhao, a Postdoctoral Associate, has joined the Department of Neurology/VA Connecticut House Care System, Yale University School of Medicine, West Haven, CT. Zhao was previously affiliated with the Department of Pediatrics/Section of Respiratory Medicine, Yale University School of Medicine, New Haven, CT.

Gift Planning Opportunities

APS is pleased to invite the membership to consider including APS in their gift giving plans. In the past, the Society has received donations of land and securities, all of which have been used to launch the Society's young investigator award programs.

Many options exist if you are interested in including the APS and its Endowment Fund in your financial or estate planning. Some options include:

Immediate Gifts: Cash, gifts of appreciated securities, gifts of closely held stock, gifts of tangible personal property, retirement assets, charitable lead trusts and gifts of real estate.

Life Income Gifts: Gift annuities, deferred payment gift annuities, charitable remainder trusts, charitable remainder unitrusts, and charitable annutiy trusts.

Gifts of Insurance: Ownership of life insurance policies can be donated, or the APS can become the beneficiary of policies owned by others.

Designated Gifts: Gifts given to honor or memoralize an individual or an organization; can include scholarships, programs, etc, which are specified for support and named for individuals.

Gifts by Will: Bequests of a percentage of estate, stated dollar amount or specific property or assets.

For more information on gift giving to APS, please contact Martin Frank, Executive Director (301-634-7118; mfrank@the-aps.org, or Robert Price, Director of Finance (301-634-7173; rprice@the-aps.org).

Animal Physiology: From Genes to Organisms

Lauralee Sherwood, Hillar Klandorf, and Paul H. Yancey. Belmont, CA: Thomson Brooks/Cole, 2005, 759 pp., illus, index, $106.95.
ISBN: 0-534-55404-0

Animal Physiology: From Genes to Organisms is the latest physiology textbook offering from Dr. Lauralee Sherwood of the University of West Virginia School of Medicine. Sherwood has spent nearly 40 years teaching physiology to a vast array of pre-health students, and this textbook is an excellent companion to her two previous textbooks on human physiology. This book provides a comparative physiology approach that should be useful for students interested in zoology, animal physiology, comparative physiology, and veterinary sciences.

One of the main goals of this book is to take an integrative approach to animal physiology that includes molecular and genetic mechanisms as well as organ, systems, and organism-level function, and for the most part it accomplishes this goal competently. While the molecular end of things tends to be somewhat thin, the authors do attempt to integrate known, well established molecular signaling pathways, such as the regulation of heat shock gene expression by elevated temperature. However, given the tremendous importance that gene expression plays in physiological responses, a more detailed explanation of transcription, mRNA processing and alternative splicing, and signal transduction might improve future editions.

The main strength of this textbook likes in the systems level physiological processes. The authors tackle many complex physiological phenomena and some of the many different ways in which different organisms go about the processes of reproduction, adaptation to environmental stimuli, waste elimination, and so forth. A substantial portion of the book deals with neurophysiology, with chapters on membrane electrophysiology, neuronal anatomy and physiology, nervous systems, and sensory physiology. The sensory physiology chapter in particular highlights the strengths of the comparative approach, primarily by utilizing excellent and insightful examples of how different organisms from insects to snakes to mammals sense and respond to their environment. The section on muscle physiology is also solid, covering all of the major topics relevant to this concept, including the cross bridge cycle, calcium activation of muscle contraction, muscle twitch and tetany characteristics, motor unit recruitment, length-tension and force-velocity relationships, muscle metabolism, and muscle fiber types. The authors also delve into some of the differences in muscle function in different organisms by exploring insect flight muscle, though here an expansion to include how insect flight differs or is similar to mammalian and avian flight would have been helpful. Other chapters explore circulatory, immunological, excretory, reproductive and digestive physiology, and these chapters also provide excellent instruction in the similarities and differences between different species in how they regulate these processes. A final suggestion would be to include a chapter on aging and death in future editions; given the vast array of species used for aging research (including migrating fish, C. elegans, and mammals among others) this too could be a fertile area of exploration into the concepts underlying senescence, the role of metabolism in aging, and the mechanisms contributing to loss of cellular function with age.

Other aspects of this book also shine. The figures, which combine schematics with photographs of organisms and micrographs of cells and tissues, are very clear and illustrative of the key concepts discussed in the text. Special boxed sections on such topics as "Molecular Biology and Genomics," "A Closer Look at Adaptation," and "Beyond the Basics" add the type of side-interest topics that students enjoy, and, if anything, more of these per chapter would be even better. Finally, the review questions at the end of the chapter provide both students and teachers with a good resource for preparing for examinations based on the material.

In summary, Sherwood's latest textbook is a solid companion to her previous books on human physiology. The text is well-written and coherent and could be used for undergraduate courses in animal and/or comparative physiology as well as for introductory graduate courses in animal science, food science, and veterinary science programs. It should be a welcome addition to anyone teaching these or similar courses. ❖

David L. Allen
University of Colorado, Boulder

Books Received

Advances in Vagal Afferent Neurobiology.
Bradley J. Undem and Daniel Weinreich, (Editors).
Boca Raton, FL: CRC Press, 2005, 523 pp., illus., index, $139.95.
ISBN:0-8493-2131-X.

Blood Substitutes.
Robert M. Winslow, (Editor).
Linn, MO: Elsevier: Academic Press, 2005, 548 pp., illus.,index, $199.95.
ISBN: 10: 0-12-759760-3.

Case-Based Medical Physiology.
Christopher Bell, Cecil Kidd, and Trefor Morgan.
Oxford, United Kingdom: Blackwell Publishing, 2005, 176 pp., illus., index, $29.95.
ISBN: 1-4051-2061-4.

Physics in Molecular Biology.
Kim Sneppen and Giovanni Zocchi.
New York: Cambridge Univ. Press, 2005, 311 pp., illus., index, $70.00.
ISBN: 0-521-84419-3.

The Physiologist
Vol. 49, No. 1, 2006

The Wine Wizard

Peter Wagner

At the request of APS leadership, I have been asked to provide expert guidance for those of you who, like me, are cheap and are looking for great, underpriced wines to imbibe. What follows is certainly not expert, and probably does not even qualify as guidance. But when has that stopped me from speaking out?

I will be suggesting wines that I think are good and also good value. Any dumb physiologist can recommend Chateau Petrus, or Ch. d'Yquem even if they cannot afford them. It takes much more effort to locate the bargains. Moreover, I need to find wines that you have some small chance of locating in your town. That means, wines that are made in decent quantity and widely distributed. Unfortunately, I have no control over the latter, but searchable internet sites abound, only too happy to ship you wines if state law allows. Some wine shops will order specific wine in if you bribe them enough. Will you be happy if I tell you about a great cheap wine you cannot get? Didn't think so. So here goes for starters:

Peter Wagner

White: two great Sauvignon Blancs from California: Geyser Peak ($7-12) and St. Supery ($10-15). Both are wonderfully herbal-grassy, clean, bright (= good acid, but not raw lemon juice) with excellent balance (=good fruit intensity to match the acid) and have NO OAK (thank goodness). They are NOT the dull, melony, generic, typical SB's we see so much of. Current vintage likely to be 2004, but each year these are well-priced winners. Tip: DO NOT AGE these wines, they will not likely do well. Drink them within six months of buying them, and try to avoid past year's vintages for that reason. Drink them at below room temperature, but warmer than Frig temp.

Red: I kid you not, try Yellowtail Shiraz ($5-8). Or any of these Zinfandels: Castle Rock ($9-12); Seven Deadly Zins ($8-12) or Seghesio Sonoma Zinfandel ($13-16). Yellowtail is everywhere and for the price is very tasty. Not complex and not to be aged, great party wine with simple hearty food. Nice vanilla oak and spice, but the black berry fruit is intense. The three Zins are all very tasty with forward red and dark berry fruit, all have spice, briary/stemmy edges typical of the wine, and medium light tannin. All have bright acid and are dry (no residual sugar) with decent length. Don't age them either—Zins are meant to be drunk young.

Happy Tasting! ❖

Endocrinology and Metabolism: The Clinical State-of-the-Art

March 31, 2006-April 01, 2006
Tremont Grand and Plaza Hotel
Baltimore, MD

Presented by: Johns Hopkins Medicine; Department of Medicine; Division of Endocrinology.

Course Description:

The intent and goal of this course is to educate primary care providers in the management of basic endocrine problems such as thyroid disorders, diabetes, dyslipidemia and osteoporosis, in a logical and cost-effective manner, since much of the care for these problems takes place outside of a specialist's office. Additionally, important areas that all primary care providers need to be familiar with, such as pituitary and adrenal disease, hypogonadism and polycystic ovarian syndrome, will be reviewed.

Target Audience:

Endocrinologists, Internists and Family Practitioners

Following this activity, the participant should be able to:

evaluate patients with possible pituitary tumors or hypopituitarism

evaluate and treat common thyroid diseases

enhance their ability to diagnose and treat dyslipidemia, diabetes and osteoporosis

have an improved understanding of male gonadal dysfunction and polycystic ovarian syndrome.

Fees:

Physicians $450

Residents*/Fellows*/Allied Health Professionals $100

*with verification of status

A $10 discount will apply for Physician on-line registrations. You will receive confirmation by e-mail if you have provided your e-mail address. Otherwise confirmation will be sent by mail. If you have not received it by March 24, 2006, call 410-955-3169 to confirm that you are registered. Certificates of attendance will be mailed by May 15, 2006. The Johns Hopkins University reserves the right to cancel or postpone any course due to unforeseen circumstances. In this event, the University will refund the registration fee but is not responsible for travel expenses.

The Johns Hopkins University School of Medicine is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.

The Johns Hopkins University School of Medicine designates this educational activity for a maximum of 16.5 category 1 credits toward the AMA Physician's Recognition Award. Each physician should claim only those credits that he/she actually spent in the activity. The American Medical Association has determined that physicians not licensed in the US who participate in this CME activity are eligible for AMA PRA category 1 credit. Applications for other appropriate credits have been submitted. ❖

March 3-6

Second International Meeting on Physiology and Pharmacology of Temperature Regulation, Phoenix, AZ. *Information:* Andrej A. Romanovsky, MD, PhD, Director, Systemic Inflammation Laboratory Trauma Research, St. Joseph's Hospital and Medical Center, 350 West Thomas Road, Phoenix, AZ 85013 USA. Tel: 602-406-5059; Fax: 602-406-4113; Email: aromano@chw.edu; http://www.feverlab.net/meeting/index.htm.

March 6-8

International Symposium on Clinical Neurology and Neurophysiology, Tel Aviv, Israel. *Information:* ISAS International Seminars, PO Box 574, Jerusalem 91004, Israel. Tel: ++972-2-6520574; Fax: ++972-2-6520558. http://www.neurophysiologysymposium.com.

March 29-April 1

3rd International Conference on Functional Genomics of Aging, Palazzo Reale, Palermo, Sicily. *Information:* Conference Secretariat Lyn Aitken, Grennacres, The Green, Goosey, Faringdon, Oxon SN7 8PA UK. Tel: +44 0 1367 718500; Fax: +44 01367 718300; email: fga2006@elsevier.com.

April 22-26

8th International NPY Meeting, Clearwater, FL. *Information:* http://www.doce-conferences.ufl.edu/npy.

May 16-20

The American Society of Hypertension, Inc. 21st Annual Scientific Meeting and Exposition - Linking Blood Pressure and Cardiovascular Health, New York, NY. *Information:* Internet: http://www.ash-us.org/annual_meeting/index.htm.

May 31-June 4

Membrane Proteins in Health and Disease, Niagara-on-the-lake, Ontario, Canada. *Information:* Email: r.reithmeier@utoronto.ca; Internet: http://www.csbmcb.ca/e_index.html.

June 24-29

31st FEBS Congress: Molecules in Heath and Disease (hosted by Turkish Biochemical Society), Istanbul, Turkey. *Information:* ODS Congress Management Sari Asma Sok. No: 8, 34464 Yenikoy, Sariyer, Istanbul, Turkey. Tel: +90 212 299 99 80; Fax: +90 212 299 99 77; Email : febs@febs2006.org; http://www.febs2006.org/.

June 28-July 1

5th International Congress of Pathophysiology, Beijing, China. *Information:* Prof. Liling Wu, Secretary General of ISP2006, Department of Pathophysiology, Peking University Health Science Center, 38 Xueyuan Road, Beijing 100083, China. Fax: +86 10 82802403; E-mail: wull@isp2006.org.cn or pathophy@bjmu.edu.cn; http://www.isp2006.org.cn.

July 3-7

The Third International Symposium on Aero Aqua Bio-Mechanisms (ISABMEC 2006), Okinawa, Japan. *Information:* Internet: http://abmech.org/isabmec2006/.

July 31-August 3

3rd Annual Symposium of the American Heart Association Council on Basic Cardiovascular Sciences - Translation of Basic Insights into Clinical Practice, Keystone, CO. *Information:* Internet: http://www.americanheart.org/presenter.jhtml?identifier=3032066.

September 2-6

European Respiratory Society 2006 Annual Congress, Munich, Germany. *Information:* http://www.ersnet.org.

September 3-8

2006 Gordon Research Conference on Molecular Mechanisms in Lymphatic Function and Disease, Les Diablerets, Switzerland. *Information:* http://www.grc.org/.

October 26-29

Joint World Congress on Stroke: International Stroke Society, Mediterranean Stroke Society and Southern African Stroke Foundation, Cape Town, South Africa. *Information:* Global Congress Organizers and Association Management Services, 17 Ru du Cendrier, P.O. Box 1726, CH-1211 Geneva 1, Switzerland. Tel: +44 22 908 0488; Fax: +44 22 732 2850; Email: stroke2006@kenes.com; http://www.kenes.com/stroke2006.

MEMBERSHIP APPLICATION FORM
The American Physiological Society

1. Check membership category you are applying for: ❑ Regular ❑ Affiliate ❑ Student
2. Do you currently hold membership in the APS? ❑ Yes ❑ No
3. If you answered yes to above, what is your category of Membership? _____ Year elected? _____
4. Name of Applicant: _____ / _____ / _____
   First Name or Family Name *First Name* *Middle Name*
5. Date of Birth _____ / _____ / _____ Optional: Male ❑ Female ❑
   Month *Day* *Year*
6. Institution Name _____ Department _____
   (Please do not abbreviate Institution Name)
7. Institution Street Address _____
8. *City/State/Zip/Country*
9. Home Address ***(Students only)*** _____
10. Work Phone _____ Home Phone _____
11. Fax _____ E-mail _____

12. **EDUCATIONAL STATUS:** ▶ **IMPORTANT for STUDENTS: **If you are enrolled as a student for an advanced degree (Ph.D., M.D., D.V.M.) please include the month and year you expect to receive your degree.**

Dates**	Degree	Institution	Major Field	Advisor

13. **WHAT IS YOUR SECTION AFFILIATION?** Please identify and rank up to three sections to which you desire affiliation. (e.g., 1 = primary affiliation, 2 = secondary affiliation, 3 = tertiary affiliation). **There can be only one "Primary" affiliation.**

___Cardiovascular	___Endocrinology & Metabolism	___Renal Physiology
___Cell & Molecular Physiology	___Environmental & Exercise Physiology	___Respiration Physiology
___Central Nervous System	___Gastrointestinal & Liver Physiology	___Teaching of Physiology
___Comparative & Evolutionary Physiology	___Neural Control & Autonomic Regulation	___Water & Electrolyte Homeostasis

14. **DO YOU WORK IN INDUSTRY?** ❑ YES ❑ NO

15. **SPONSORS** (Sponsors must be Regular APS Members. If you are unable to find sponsors, check the box below, and we will locate them for you.)

CHECK THIS BOX IF APPLICABLE: ❑ Please locate sponsors on my behalf.

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**Signature indicates that sponsor attests applicant is qualified for membership.*

▶ **Please turn over for more questions...and mailing instructions.**

Membership Application (Continued...) **Applicant Last Name** (please print)_____

16. OCCUPATIONAL HISTORY [Check if student ☐]

Current Position:

Dates	Title	Institution	Department	Supervisor

Prior Positions:

Dates	Title	Institution	Department	Supervisor

17. LIST YOUR MOST SIGNIFICANT PUBLICATIONS, WITH EMPHASIS ON THE PAST 5 YEARS (Publications should consist of manuscripts in peer-reviewed journals. List them in the same style as sample below.)

Sample: MacLeod RJ and Hamilton JR. Volume Regulation initiated by Na^+-nutrient cotransport in isolated mammalian villus enterocytes. Am J Physiol Gastrointest Liver Physiol 280: G26-G33, 1991.

18. DOCTORAL DISSERTATION TITLE (if applicable):

19. POSTDOCTORAL RESEARCH TOPIC (if applicable):

20. WHICH FACTOR INFLUENCED YOU TO FILL OUT OUR MEMBERSHIP APPLICATION?

☐ Mailer ☐ Meeting (Which meeting?_____) ☐ Colleague ☐ Other_____

Mail your application to: Membership Services Department, The American Physiological Society
9650 Rockville Pike, Bethesda, Maryland 20814-3991 (U.S.A.)
(or fax to 301-634-7241) (or submit online at: www.the aps.org/membership/application.htm)

Send no money now - you will receive a dues statement upon approval of membership.
Approval Deadlines: Membership applications are considered for approval on a monthly basis.
Questions? Call: 301 634 7171, Fax: 301 634 7241, E-mail: members@the aps.org, Web: www.the aps.org

R/ 2005

Reminiscences of the XXXV International Congress of Physiological Sciences

March 31-April 5, 2005
San Diego, California

IUPS Reminiscences Contents

Preface

Shu Chien, University of California, San Diego
Chair, US National Organizing Committee, 35th IUPS Congress

The 35th IUPS Congress held in March 31-April 5, 2005, in San Diego, California, USA was a great success, as a result of the tremendous efforts by many wonderful colleagues all over the world and the enthusiastic participation by scientists interested in physiological sciences everywhere. This IUPS Congress, with the theme of "From Genomes to Functions," has served extremely well as an international forum to bring together more than 5,000 physiologists from around the world to converge in a single place to exchange novel knowledge, renew old acquaintances, and forge new relationships.

The 2005 Congress in San Diego marks the third time for an IUPS Congress (which started in Basel in 1889) to be held in the United States, i.e., following the previous ones in Boston (1929) and Washington, DC. (1968). The 35th Congress marks the first time an IUPS Congress has been held conjointly with a national meeting of physiological sciences and related fields of experimental biology, i.e., the EB 2005 meeting. This experiment proved to be a great success, with the resulting enrichment of the scientific program and cross-fertilization among disciplines. The 35th IUPS Congress was a momentous event that gathered one of the largest groups of international physiological scientists, with outstanding scientific and social programs.

After the completion of the Congress, I continued to receive many positive comments. This prompted me to think about the value of having some written documentation of this precious event by those who were actively involved. When I discussed this with Marty Frank, he was in enthusiastic support and suggested that *The Physiologist* published by the American Physiological Society can be a place for the publication of these articles. In June and July 2005, I wrote to members of IUPS Council, the US National Organizing Committee, and Scientific Program Committees, Organizers of Satellite Symposia, and others, inviting them to contribute to such a collection of articles commemorating the 35th IUPS Congress. Marty also contacted a few Travel Fellowship Awardees. I am very pleased that we received an excellent response. There are some 30 most valuable articles and wonderful photographs about the Congress. They will provide a glimpse of this wonderful Congress, which has made significant impacts on the advancement of our knowledge in physiological sciences. This collection of articles and photographs will keep the fond memories of the 35th IUPS Congress for years, decades, and perhaps centuries. ❖

IUPS National Organizing Committee Chair Shu Chien addresses Congress participants.

IUPS 2005—From Genomes to Functions

The passing of the IUPS flag from **Shu Chien**, Chair, IUPS 2005 National Organizing Committee (NOC), to Akimichi Kaneko, IUPS 2009 Organizing Committee, was a memorable moment for all those involved in the planning and execution of the XXXVth International Congress of Physiological Sciences. It represented the end of a wonderful, though at times tortuous, journey that began in St. Petersburg, Russia in 1997.

At the 1997 IUPS Congress, the United States was one of eight countries that submitted a bid to host the Congress in 2005. **Stanley Schultz**, Chair, IUPS US National Committee, comprised of representatives from the American Physiological Society (APS), Society for Neuroscience, Society for Integrative and Comparative Biology, Society of General Physiologists, the Microcirculatory Society, and the Biomedical Engineering Society, made the presentation in St. Petersburg. The official letter of invitation was issued by Bruce Alberts, President of the National Academy of Sciences, and it noted that the last IUPS Congress held in the United States was in 1968 and that "a US meeting will provide a fertile venue for formal and informal communication and interaction between physiologists of many nations." In making the presentation, Schultz invited the IUPS to hold the 2005 Congress in Washington, DC in August.

The APS Council and the National Organizing Committee (NOC) began to have second thoughts about the timing and location of the Congress as it prepared to re-confirm its bid at the 2001 IUPS Congress in Christchurch, New Zealand. Would the international physiological community want to spend a balmy summer week in Washington, DC? Would the program be strong enough to draw physiologists away from the Experimental Biology meeting, the venue where many US and foreign physiologists would have already presented their work?

Shu Chien and **Allen Cowley, Jr.**, outgoing NOC Chair, worked closely with Ewald Weibel, IUPS President, prior to the Christchurch Congress to convince all parties that holding the IUPS 2005 Congress in conjunction with the Experimental Biology 2005 meeting would be beneficial to the Congress and physiology. The IUPS Council was concerned that the Congress would lose its identity if it were held in conjunction with the larger EB meeting. Similarly, the Experimental Biology Board needed to be convinced that a joint IUPS Congress/Experimental Biology meeting was beneficial and that the EB meeting would not be overwhelmed by the world physiological community. Both groups were satisfied by the suggestion that the two meetings would not completely overlap; the IUPS Congress would start a day earlier in order to develop its identity before the start of the EB meeting.

At the Christchurch Congress, the IUPS General Assembly accepted the US invitation to meet in San Diego in 2005, holding the IUPS Congress in conjunction with the Experimental Biology 2005 meeting. It was, therefore, official and the US, represented by Chien, accepted the IUPS flag from Tony Macknight representing New Zealand, at the close of the 2001 IUPS Congress.

Shu Chien passing the IUPS flag to Akimichi Kaneko.

The IUPS 2005 National Organizing Committee was thus charged with moving the planning for the Congress into high gear. The NOC put together several committees to coordinate the planning and development of the Congress. The most critical committees, the International and US Scientific Program Committees (ISPC and USSPC), were chaired by **Walter Boron**. The Fundraising Committee was chaired by **L. Gabriel Navar**, and the Local Arrangements Committee was chaired by **Frank Powell**.

The NOC issued an invitation to the world physiological community to submit suggestions for the scientific program. Additionally, Boron consulted closely with the APS Joint Program Committee, chaired by **Curt Sigmund,** to create a cooperative environment to draw upon their traditional expertise in planning the program within the Experimental Biology framework. The goal of the USSPC and ISPC was to create *programming tracks* that would carry a particular topic (such as muscle) from the molecule to comparative genomics, to genetic models, to disease, to higher level functions. In response to the call for proposals, the USSPC/ISPC received over 300 suggestions for symposia, featured topics, tracks, and satellite meetings. It was impossible to use all of the suggestions because of scheduling limitations, overlap, relevance, and international representation. However, the USSPC/ISPC was able to cull through the proposals to build a strong program while insuring that there was adequate international representation on the program. From these suggestions, the Committee identified the topics and organizers for over 150 symposia, featured topics, lectures and workshops which were programmed into the 15 programming tracks: Calcium Signaling, Cardiac, Ecophysiology for the 21st Century, Epithelia, Feeding, Fuel and Fat, Genomics, Mechano- and Chemo- transduction, Muscle and Exercise, Neural Control of Locomotion:

From Genes to Behavior, Renal Control of Blood Pressure, the Regulatory Brain, Thermoregulation and Energetics, Tissue Dynamics in the Lung, and Vascular Physiology.

The symposia, lectures and featured topic program involved over 475 scientists with nearly 40% from outside of the United States, and 15% of the speakers were female. In addition, 2,993 IUPS abstracts were submitted for the initial abstract submission deadline, along with 196 late breaking IUPS abstracts. These represented 35.7% of the 8,903 abstracts submitted for the joint IUPS/EB meeting (Table 1). The overall scientific registration for the IUPS/EB meeting was 12,613. Scientific registrants were asked to identify their society affiliations at the time of registration, resulting in some individuals selecting affiliation with multiple societies. As a result, there were 15,220 affiliations noted by the registrants of which 36.8% or 5,601 were associated with physiology. The IUPS/EB meeting also had an extensive exhibit program consisting of 557 exhibit booths provided by 405 companies.

The National Organizing Committee and International Scien-tific Program Committee also designated a number of satellite meetings as official meetings of the XXXV Congress. The meetings were scheduled within a 150-mile radius of San Diego and held immediately before or after the Congress. To further encourage the participation of satellite meeting participants in the Congress, individuals who registered for both a satellite meeting and the Congress received a $50 credit on the combined registration fee. In addition, the NOC offered the satellite organizers two $1000 travel awards for their meetings. The meetings held as pre-Congress satellites included: 4th International Meeting on Rapid Responses to Steroid Hormones; Bio-physical Adaptation and Bioinspired Engineering; Coordinating Hemo-dynamic, Filtration, and Reabsorptive Functions of the Kidney; Dyspnea: Mechanisms and Management; From Metabolome to Function via Dynamic Measurements and Computational Models; In Silico Physiology: From Genome to Physiome; Mechanism of the Acupuncture Treatment in Disease; The Prenatal Environment, Programming and Postnatal Conse-quences; and Urothelial Cell Physiology in Normal and Disease States. The tradition of offering an IUPS Teaching Workshop in conjunction with the IUPS Congress was continued as a post-Congress satellite.

As an international meeting, the NOC wished to encourage the participation of as many foreign scientists as possible in the IUPS Congress. Consequently, it allocated approximately $200,000 in support of an IUPS Travel Award program designed to encourage the participation of students and physiologists who are within 15 years of receiving their doctoral degree. The emphasis was placed on physiologists from underdeveloped countries and underrepresented minorities from the United States who had submitted abstracts to the Congress. Applications for travel awards were received from 413 individuals from over 65 countries and awards were made to 167 applicants. In addition, the APS and its disciplinary sections made awards to over 125 additional graduate students and postdoctoral fellows from both the US and abroad in recognition of their scientific presentations.

Of the 167 IUPS travel awards made, only 140 individuals were able to accept the awards because of inadequate support from their institutions, as well as difficulties associated with obtaining travel visas as a result of the newly instituted USA Patriot Act. The APS worked closely with the National Academy of Sciences to facilitate efforts by travel award recipients and Congress attendees to obtain their visas for the meeting. Of the 119 respondents to a Post-Congress Travel Award Recipient Survey, 56 award recipients were graduate students and 37 received their doctoral degrees between 2000 and 2004. When the respondents were asked how they would rate the 35th IUPS Congress, 87% or 104 rated the Congress as an 8 or higher (with 10 being best). Additional details of the IUPS Travel Award Program can be found in a related article.

The Opening Ceremony was held on Thursday, March 31 and involved presentations from Chien, Chair, NOC, Cowley, Jr., IUPS President, **Virginia Huxley**, Chair, US National Commit-tee of the IUPS, and **D. Neil Granger**, President, APS. After declaring the opening of the 35th IUPS Congress with the theme of "From Genomes to Functions," Chien welcomed the world physiological community to San Diego, CA, where he resides, and read a proclamation issued by the Mayor of San Diego, Dick Murphy. The proclamation noted that this was only the third meeting of the IUPS in the United States and the first to be held in San Diego. The proclamation ended as follows: "Now, therefore, I, Dick Murphy, the thirty-third Mayor of the City of San Diego, do hereby proclaim March 31, 2005, to be 'International Union of Physiological Sciences Day' and welcome 6,000 attendees of the 35th Congress to America's finest city, wishing everyone a happy and productive stay." Chien thanked the IUPS leadership, NOC members, APS, the Program Committees, EB, and all participants for working together to ensure the success of the Congress, which would make great impacts on the advancement of physiological sciences and the enhancement of health and well being of humankind.

Cowley acknowledged the efforts of US physiologists and of the APS to create an outstanding scientific program in an exciting venue. He also expressed his appreciation to the strong participation of the international physiological community in the 35th IUPS Congress. Huxley highlighted the venues of past IUPS Congress that were the steps leading up to the San Diego Congress: St. Petersburg, Russia, to Christchurch, New Zealand, and on to San Diego.

Granger welcomed the Congress attendees on behalf of the American Physiological Society. He noted that the IUPS has a long and successful history of organizing international meetings that have served to highlight and pro-

Table 1. IUPS/EB 2005 Abstracts and Society Affiliations

Discipline/Society	Abstracts	Affiliations/Attendance
Physiology	3,189	5,601
Anatomy	375	505
Biochemistry/Molecular Biology	1,172	1,969
Immunology	1,525	2,554
Nutrition	1,290	2,445
Pathology	566	725
Pharmacology	710	1,421
Teaching& Computer Sessions	76	
TOTAL	8,903	15,220

mote the progress of Physiology and to bring together physiologists from around the world in a forum for scientific exchange, for the creation of new research collaborations, to renew old friendships, and to forge new alliances.

Granger commented that in the 115-year history of the international physiological congresses, the American Physiological Society has had the privilege of hosting an international Congress on two previous occasions. He then proceeded to provide the attendees with an overview of those earlier US Congresses.

In 1929, the 13th Congress was held in Boston. Sixteen hundred members from 41 countries attended the Boston meeting, with 540 making the journey by sea from Europe. Most made the crossing on one of three ships—the SS *Stuttgart*, the SS *France*, and the *Minnekahda,* which transported four hundred physiologists from 20 nations and made the crossing in 10 days.
The physiologists on board "turned the voyage into virtual mini-congress." Many prominent physiologists of that era made the voyage to Boston, including Ivan Pavlov, A.V. Hill, and Otto Loewi. Indeed, nine of the passengers on the *Minnekahda* alone went on to receive the Nobel Prize in Physiology and Medicine.

The Boston meeting consisted of 495 scientific communications presented in six parallel sessions and the official languages included English, French, German and Italian. While the meeting proved to be an immense success, the next international physiology congress was not hosted by the US for another 38 years.

In 1968, the 24th Congress was held in Washington DC. The Washington Congress included over 3,600 active members of which one third were drawn from 56 foreign countries. The program of that meeting included five recipients of the Nobel Prize in Physiology & Medicine, and an additional 10 scientists who would go on to win the Award, including Hans Krebs, Rosalyn Yalow, and Robert Furchgott.

Granger expressed pleasure and pride as he welcomed all Congress participants, but especially the foreign delegates to this Congress. "We hope that you share our sense of satisfaction that this assembly, like those before it, will highlight the remarkable progress that has been made in physiology—a scientific discipline that remains as essential and relevant to medical progress today as it was when the first international physiology congress was held in our country over 75 years ago." As with earlier Congresses, the 35th IUPS Congress program included three recipients of the Nobel Prize, including **Peter Agre**, the Fenn Lecturer as well as **Eric Kandel** and **Erwin Neher**, and as in the past, others in attendance at the 35th Congress will likely win Nobel Prizes in the future.

Since 1901, the participants in the IUPS Congress have been able to purchase a commemorative medal. While medals have not been available for every Congress, they have been provided to attendees at 17 of the 34 IUPS Congress. With the encouragement of **Ralph Sonnenschein**, APS member, the National Organizing Committee decided to continue the tradition and commissioned Alex Shagin to capture the theme of the IUPS Congress "From Genomes to Functions" on a commemorative medal. It was designed to provide Congress attendees and physiologists a medal to commemorate the hosting of the IUPS Congress in the United States.

Following the presentation of the

Table 2. XXXV IUPS Congress Corporate Contributors

IUPS expresses its sincere appreciation to the following organizations for their contributions in promoting the physiological sciences:

21st Century Platinum
American Physiological Society
Cadmus Communications

21st Century Gold
GlaxoSmithKline Pharmaceuticals
International Union of Physiological Sciences
National Science Foundation
National Aeronautics and Space Administration

21st Century Silver
ADInstruments Pty Ltd
AstraZeneca Pharmaceuticals
Institut de Recherche Servier
Journal of Physiology

21st Century Bronze
Amylin Pharmaceuticals
Biomedical Engineering Society
Eli Lilly & Company
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Society for Neuroscience
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Experimental Physiology
Georgetown University Center for the Study of Sex Differences in Health, Aging and Disease
The Grass Foundation
Living Systems Instrumentation
Mini Mitter
Pharmanex, An NSE Company
ScholarOne
Society of General Physiologists
Taylor University
University of Missouri Center for Gender Physiology

Akimichi Kaneko accepts the IUPS flag and invites physiologists to attend IUPS 2009 in Kyoto, Japan.

opening Fenn Lecture by **Peter Agre** on the topic of "Aquaporin Water Channels: From Atomic Structure to Clinical Medicine," Congress attendees enjoyed drinks and a buffet dinner on the San Diego Convention Center terrace overlooking San Diego Harbor. As Congress registrants mingled, renewed old acquaintances and talked science, the Jason Robinson Quartet provided them with the sounds of jazz, a truly American form of music.

Following the IUPS President's Lecture, presented by Cowley, Congress participants were invited to participate in another American tradition, a casual IUPS Beach Party featuring typical Southern California beach music, ambience, and barbeque, which was held near Seaport Village. The Mar Dels provided the music while the physiological community ate and drank typical beach food - hamburgers, hot dogs, and beer. Attendees participated in a number of beach activities set up on the North Embarcadero, including volleyball, keg races, and surfing. The evening culminated with a 10-minute fireworks display to the surprise and pleasure of the international community.

The 35th Congress of Physiological Sciences was not just an opportunity to exchange research findings. It was also an opportunity for the animal rights community to demonstrate against animal research. The San Diego Animal Advocates and Michael Budkie of Stop Animal Exploitation Now organized a demonstration in front of the San Diego Convention Center on Sunday, April 3. The theme of the march was "Mad Scientists" and involved about 30-35 protestors in masks and lab coats. The demonstrators silently protested the "waste of our tax dollars to injure, torture, and kill animals with no discernible benefit to humans."

The Closing Ceremony was held at Copley Symphony Hall. Cowley thanked the host country for providing the international community of physiologists with an outstanding scientific meeting and social activities to promote interactions between colleagues from around the world. Chien expressed his appreciation for the support provided by the IUPS and international community and how pleased the US was to have had an opportunity to host the Congress once again. Chien also expressed his sadness that the Congress must end and that it was time to pass the IUPS flag to the next host country—Japan. Akimichi Kaneko accepted the flag from Chien, congratulated the US on an outstanding meeting and invited the world physiologists to the 2009 Congress in Kyoto, Japan.

Martin Frank then introduced the final element of the IUPS Congress, the world premiere performance by the San Diego Chamber Orchestra led by Nuvi Mehta of "Body Notes," a symphonic suite comprised of 13 movements dedicated to the beauty of human physiology and written by APS member, **Hector Rasgado-Flores**. A full-description of the "Body Notes" is available at http://www.iups2005.org/bodynotes.htm.

Following the performance of "Body Notes," Granger hosted a reception for the IUPS and Society leadership, as well as Congress donors. During the reception, Rasgado-Flores presented a signed copy of the score of the symphony to Bruce Thomas, President, Cadmus Communications, the corporate sponsor of the performance. Granger also took the opportunity to express the Society's thanks and appreciation to all those corporations who provided financial support for the Congress (Table 2). He extended a special thanks to the nearly 2,000 members who generously provided financial support for the Congress. ❖

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Excitement—Surprise—Concern—Excitement: The Genesis of the 35th IUPS Congress

Ewald R. Weibel, University of Berne, Switzerland
IUPS President 1997-2001

When I think about the 35th IUPS Congress I remember primarily an exciting scientific event, but I also recall the stumbling blocks that lay on the road to this event, stumbling blocks experienced mainly by the leadership of IUPS. I do hope that the worries and concerns of the time contributed to making the San Diego Congress the success it eventually was.

The story began in 1997 at the General Assembly that preceded the memorable 33rd IUPS Congress in St. Petersburg. That was the time when the IUPS delegates had to decide on the venue for the 35th Congress in 2005. IUPS Council had received seven invitations, from Canada, France, India, Israel, Japan, Spain and the United States, some of them very attractive. In preparing for the General Assembly, Council felt that one of the most important selection criteria must be the geographic distribution over the past 30 years, and this was one of the greatest stakes in favor of the US invitation because the last Congress to be held in this most active country took place in Washington, DC, in 1968. But it did not turn out to be an easy decision. It took four rounds of secret voting before the US bid prevailed over that of our Canadian colleagues by a rather slim majority of 47 to 39. Personally I was much relieved by this decision and I looked forward with excitement to a Congress organized by the US National Academy of Sciences and the American Physiological Society with its extraordinary, impressive constituency of physiologists active at the forefront—even though the prospect of spending a hot and muggy week in Washington in August tempered the excitement.

So all was well and quiet, until the time came when the US invitation to hold the Congress in 2005 in Washington was to be confirmed at the Christchurch General Assembly in August 2001. Well, this is perhaps not quite correct, as there had been, in the fall of 1998, a dispute between the US National Committee and myself as IUPS President that was carried out in a video conference and continued at a joint meeting of USNC and the IUPS Executive Committee in 1999. One of the main issues in this debate was the future of IUPS Congresses. My American colleagues questioned whether the old style Congress was really fit for the future. I replied that IUPS gives a lot of freedom to the local organizers, in this case the USNC and the APS, to reinvent the Congress at each occasion, that IUPS would be excited if the US organizers would come up with a radically new format, as long as the international nature of the IUPS Congress was respected (in retrospect, I am not sure how radically new the 2005 Congress was, but it was a success nevertheless). And then the fundamental question was raised, whether there was a justification for IUPS to exist——I must confess that this debate left me with serious concerns.

So the 2001 Congress in New Zealand approached and the USNC was asked to present the final invitation for confirmation by the General Assembly that met in Christchurch on August 26, 2001. This document reached the Paris office of IUPS on July 9, 2001, in time for the mailing to the delegates to the General Assembly. As this mailing had to leave the office on July 26 the document had been copied 100 times and packed. Then came the surprise, and the concerns: on the night of July 19 I received a call from Shu Chien informing me of new plans to merge the IUPS Congress with EB2005, to shift it to San Diego and April. After a

few moments of reflection I answered as follows: "I believe it is a good strategy to combine a local physiology meeting with the IUPS Congress ... Where I do see conflicts in combining IUPS with EB is that young American physiologists may be faced with a choice: the international physiological community versus the US experimental biologists. How can we make sure that IUPS is sufficiently attractive? ... If a good scheme can be worked out it can be very successful...." To Allen Cowley I wrote "My main concern is that, in the end, there will be no genuine IUPS meeting in 2005, that we will simply all go to the EB meeting, as many of us do anyway ... your new proposal is not merely a change in date and venue: it is a change in the principle of the IUPS Congress." Of course, my concerns had their roots in the video conference debate of 1988 discussed above, where such deep skepticism against the IUPS and its congresses had been voiced.

I immediately communicated the new proposal to IUPS Council. The reactions were quite strong: some advantages of the merger with EB were noted, but in general there was very wide concern that "this could be the end of IUPS, as we know it" and so on. The fact that APS had come up with this new arrangement at such short notice, and after having confirmed the original invitation in the first place merely two weeks earlier, added to the concerns of Council members. This gave me some sleepless nights as I did not immediately see how this problem could be resolved in the couple of weeks that remained until the General Assembly, how I could defend the best interests of IUPS as was my duty. What would happen if there was a motion in the GA to reject the new proposal—the GA had on occasion proved to be a bit erratic in its decision-making process. Also I remembered that it had not been easy to get the US invitation accepted in 1997. So I knew that the Executive Committee and Council had to resolve all the problems before raising the item at the GA.

It was fortunate that USNC and APS had appointed Shu Chien as the Chair of the National Organizing Committee for IUPS2005. Shu was still the Treasurer of IUPS and by that member of the Executive Committee. So he was fully aware of the concerns raised by Council members. Shu and I then sat together as soon as we had arrived at Christchurch and started to draft an agreement between APS and IUPS that addresses all the concerns and sought a solution agreeable to both sides. It is thanks to Shu's statesmanship and diplomatic skills that this could be achieved by the end of a joint meeting between IUPS Council and representatives of USNC. An agreement was signed by me as IUPS President and the USNC Chair Virginia Huxley, stating the conditions under which IUPS considers the new arrangement acceptable. The main point was to safeguard IUPS identity and ensure a broad contribution of the international community of physiologists to the scientific program. With that in hand we could confront the General Assembly. After some discussion the new arrangement was accepted with a vast majority. I felt much relieved.

Four years passed, four years of hard work on the part of the Organizing Committee under the leadership of Shu Chien, of APS and its officers led by Marty Frank, of the International Scientific Program Committee chaired by Walter Boron, and of the IUPS leadership with Allen Cowley at the helm. I could sit back and wait. I attended the Congress as a regular participant, chairing two sessions, a symposium on comparative physiology and a forum on ethics in physiology. I truly enjoyed this meeting, and I must say that the IUPS-APS part of the EB2005 meeting was so rich that I did not branch out to the other fields, not even to see my anatomy friends!

The concerns have turned to excitement again at the end. I wish to congratulate those who did all the work to make this 35th Congress a success — they did a very fine job. It was a good congress in the best tradition of the IUPS Congresses. The science was at the forefront, on the cutting edge of physiological research, and it had the broad international representation we expected. I wish to thank particularly the institutions responsible for this success: the American Physiological Society and its partners in the US National Committee for IUPS as well as the US National Academy of Sciences. I would indeed be curious to find out—but fortunately I never will—how the video debate of 1988 would go after the experience and excitement of this Congress. I still believe there is a place for IUPS and its scientific meetings in this world. Perhaps they can contribute to peace and to fair understanding between the peoples. In view of this fundamental function "innovative formats" are not so important. To gather people from all over the world in the pursuit of physiological understanding is in itself a great excitement. ❖

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Origins of the San Diego IUPS Congress

Denis Noble, Oxford University, Oxford, United Kingdom
(Secretary-General IUPS 1994-2001)

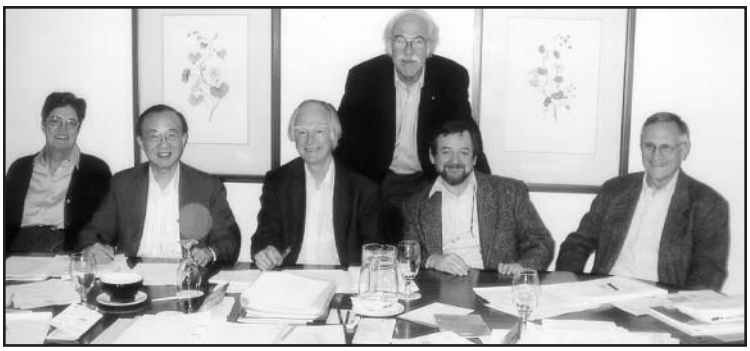
It all began in Russia.

The St. Petersburg Hotel dominates the waterfront opposite the mooring place of the battleship *Aurora* that fired the famous cannon shot during the Russian Revolution. It reeks of the atmosphere of the old Soviet regime. Matronly minders on every dimly lit floor, waiting to be "sweetened" to allow a vodka and champagne party to occur, public rooms that never seemed to be used, restaurants that either didn't serve anything or presented a menu that was essentially a diktat. And much of the hotel was, probably still is, a building site: a memorial to lost dreams as the Soviet Union collapsed just a few years before. Yes, there were also the elegantly furnished apartments that must have been the preserve of the high party officials in the old days. The Presidents of IUPS (Masao Ito as outgoing President and Ewald Weibel as incoming President) and I as the Secretary were allocated these oddly magnificent suites and we had marvellous views of the White Nights as the sun hardly seemed to set all night.

This was 1997, and the occasion was the IUPS International Congress in Russia. We did drink a fair amount of Soviet Champagne (if you knew enough Russian to know where to buy it from it was incredibly cheap), but our spirits were not exactly high. As the chief officers of IUPS we already knew that the organization was facing a major crisis, though we didn't yet know how really serious this was going to be financially. The truth came out later. The loss was more than the organisation could bear. And the professional congress organizers hadn't even paid the speakers their expenses! Into this terrible situation walked Shu Chien, just elected as the new Treasurer of IUPS, and later to become the Chairman of the San Diego Congress.

The old and new Executive first met each other over a simple dinner in the only subterranean restaurant that worked. So, there on the other side of the table I met this beaming Chinese-American who smiled and exuded the kind of enthusiasm that we had almost had beaten out of us. We set to work immediately thinking about how to run a lower-cost but innovative and successful Congress. This had a double significance since Shu was to look after IUPS finances for the next turbulent four years, and the American delegates to the IUPS Assembly had just, narrowly, won the vote to host the Congress in 2005. This bid was for Washington, a fact of great significance in this story. He and I and our fellow officers in IUPS were clearly going to sink or swim together during the years that followed, so we needed to get to know our shipmates well.

First, we mounted the salvage operation on St. Petersburg, a task in which Ewald Weibel, as President of IUPS, took a commanding and powerful lead with Shu and me as the support troops. Somehow the money was raised to reimburse every speaker at the Russian Congress who still needed expenses paid. I should explain here that the Russian Congress itself was enjoyable and it was a privilege to get to know the great city of St. Petersburg, its people and its fabulous art treasures. Our Russian colleagues also fought against great odds in organizing the Congress. The problem was money, not science or culture. Russia, following the collapse of the Soviet Union, was financially on its knees, its famed Academy of Sciences could not honour the financial guarantees given eight years before in Helsinki.



IUPS Executive meeting in Christchurch: Standing: Ewald Weibel, President; Seated: Sue Orsoni (Executive Secretary), Shu Chien (Treasurer), Denis Noble (Secretary-General), Ramon Latorre (Vice-President), Allen Cowley (incoming President).

Next we met together in the city of Christchurch to see what the New Zealand organizers were planning for the 2001 Congress. Unfairly, I think, they had to take much of the brunt of our retrospective concerns about 1997. But they also impressed us with their innovation and endless enthusiasm. Shu, of course, had the responsibility to give their budget a critical eye and to ensure that IUPS did not face another financial crisis of a level that would, quite simply, have been the end of the organization. We faced the prospect of bankruptcy.

That long trip in 1998 to the South Island of New Zealand was an important one, not only for the planning of the Congress there, but also for the coalescing of the relationships within IUPS Executive that were going to prove of vital importance three years later in the run up to the 2001 Assembly, and the need to confirm the American bid for 2005. Shu came with his charming wife K.C., and I remember getting the guitar out one evening to raise our spirits with some multi-lingual serenading that she greatly enjoyed. The guitar returns at the end of my story.

In the event, the 2001 Congress was a great success (see the IUPS Newsletter on the website www.iups.org), though it did make a modest financial loss. But we never expected it to be the financial saviour of IUPS. What was crucial to the reputation of IUPS was that it should be shown that it could still hold such a Congress and make it a *scientific* success. On this, our New Zealand colleagues did a magnificent job. With the prospect of an American-hosted Congress to follow, we were surely out of the wood.

Or were we?

I shall never forget a telephone call I received from Shu Chien at my home in Oxford just as I was to leave for a family holiday in France before going on to the Christchurch Congress. What he told me was the equivalent of another bombshell: the American delegates were going to propose that we abandon the Washington proposal (which in any case

had been won by only a narrow margin) and, apparently, fuse the IUPS Congress with the annual FASEB meeting in San Diego. Readers of this article need to know that the papers for the 2001 Assembly had already been circulated! A fundamental change at this late stage was unprecedented. The Assembly could conceivably reject the American confirmation, even leave IUPS with no Congress at all. Shu and I discussed the matter in the brief time we had available and we ended up agreeing that this was going to be a tough ride. The rest of the world was going to be highly suspicious of the Americans' motives, and even think that, this time, the death knell of IUPS really had been rung.

While in a remote part of South West France I tried to remain in touch via a primitive internet facility at the library of the local market town as emails, steadily getting more and more explosive and urgent, flew across the ocean. I remember a telephone call with the President that left us both feeling even more depressed than before. It looked as though we had jumped out of the hot frying pan of Russia only to land in the even hotter fire of the USA!

Yet—-and here is where I come back to the bonding session in Christchurch three years earlier—-I also knew that something I could be certain of was that Shu's motives and, I imagined, those of the whole American delegation to the Assembly, were very well intentioned. As I reflected over an email note that I drafted wearing my legal role as Secretary, I decided to include this carefully chosen phrase as well as doing what I had to do: to lay out the procedural and legal difficulties.

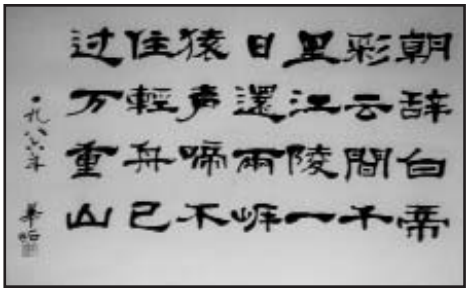
I believe that phrase was crucial in the events that followed. As soon as we arrived in Christchurch, Shu and I met at breakfast for a "cards on the table" and totally non-committal chat. This meeting confirmed my judgement. "Well-intentioned" was precisely the right description, and Shu had not only marshalled the arguments to deal with my own doubts, he had taken fully on board the discussion we had before my holiday: that the Americans were going to have a particularly tough time, so deep was the suspicion that this amounted to an American take-over. The situation was complicated even further by the news that the US National Committee had appointed Shu Chien to be the 2005 Congress Chairman! He was no longer a neutral IUPS officer. He had also to be the chief advocate for the new proposal.

Those few days as the Executive and Council met before the Assembly vote were the scenes of intense negotiations as the conditions for a San Diego Congress were hammered out. It is in such situations that friendships either deepen or wither. What came across to me from Shu and his American colleagues, particularly Virginia Huxley who had to make the presentation to the Assembly, was total enthusiasm and commitment. What eventually emerged was a very exciting proposal and one which I felt sure would succeed. Returning home from New Zealand, I looked forward to San Diego 2005 with great expectations. It could be the largest Congress since Glasgow 1993, and it could re-connect physiology with the other physiological sciences. And it was. It achieved both of these aims. It was brilliant.

My first sense of confidence was at the dinner given by Shu Chien for the Council and organisers just before the Congress began. It was held in his lovely home, full of magnificent Chinese calligraphy. The atmosphere was one of excitement and anticipation. Towards the end of the dinner, and while I was reflecting on the contrast with that other dinner, way back in the depths of the St. Petersburg Hotel, Shu's wife K.C. suddenly appeared with a guitar! Appropriately, we celebrated with the very same troubadour song with which I serenaded her back in New Zealand: a lovely touch connecting the confident present to the uncertain past.

Dinner party at Shu Chien's home, surrounded by beautiful Chinese calligraphy.

As I arrived at the Congress itself, following two successful and exciting satellites near San Diego, I could immediately sense that we were on the verge of triumph. As one of the UK delegates expressed it later, any fear that EB was going to take over IUPS was misplaced. If anything, IUPS took over EB. As soon as I returned to the UK I sent congratulatory emails to Shu, to Marty Frank and others involved in the organisation and planning.



Chinese calligraphy of Li Po's poem.

But what a craggy journey to have to make to get there!

Inspired by Shu's collection of Chinese calligraphy, I am reminded of that great poem by the greatest of Chinese poets, (Li Po), when he sailed down to Chiang-Ling after being released from prison:

"Po-ti I left at dawn in the morning glow of the clouds; the thousand li to Chiang-Ling we sailed in a single day. On either shore the gibbons' chatter sounded without pause while my light boat skimmed past a thousand sombre crags".) (Innes Herdan, 1973).

Three years before the Congress I had written to Shu: "I was Chairman of the 1993 Congress in the UK. So as one Congress chairman to another, 'good luck, Shu!'– I hope that 2005 will be the great event you and we all want it to be. Li Po sailed the thousand leagues down to Chiang Ling in a single day. Your journey will be even longer—four years. Don't listen too much to the ceaseless chatter of the gibbons on the river banks. Enjoy the morning-glow of the clouds, but bring the fragile boat of IUPS to its safe haven."

With the team of American and International Committees, IUPS did indeed arrive at a safe haven in San Diego. It can look forward to Kyoto in 2009 in a confident mood. It needs to. The challenges that physiology faces as it tries to interpret the wealth of genomic and proteomic data we now have is immense, but also exciting.

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Forty-four Years After Tokyo

Akimichi Kaneko, Seijoh University School of Rehabilitation, Aichi, Japan
President of IUPS

In 1965 Japan hosted the XXIII IUPS Congress in Tokyo, the first IUPS Congress held in Japan. The early 1960's were the years when Japan recovered from the disastrous damage of the WWII. In 1964, Tokyo hosted the XVIII Olympic Games and our country rapidly rebuilt its social infrastructure to meet the requirement. New bullet trains began their service 10 days before the opening ceremony of the Olympic Games. A new highway connecting Nagoya to Kobe opened almost at the same time. The IUPS Congress in 1965 in Tokyo was one of the first international congresses held in Japan in the postwar era. Forty-four years after Tokyo, we are hosting the IUPS Congress in Kyoto in 2009. The interval between the Tokyo Congress and the Kyoto Congress is similar to the 38-year interval of IUPS Congresses held in US: the 1929 Boston, the 1968 Washington DC and the 2005 San Diego.

What is the aim of an International Congress? It is one of the main activities of the Union, as clearly described in the Union's Constitution. The Congress offers a forum *a*) to encourage the advancement of the physiological sciences; *b*) to facilitate the dissemination of knowledge in the field of physiological sciences; and *c*) to foster and encourage research in the field of physiological sciences. In the present days when the vast amount of information can be exchanged swiftly due to the development of information technology, can the Congress still play its role?

The IUPS Congress in San Diego gave an answer to this question. The Congress was organized by scientific theme "From Genomes to Functions." It clearly shows that physiology aims at the understanding of the integrated function by piling up the knowledge from genomes, molecules, cells and tissues. The Congress and the Scientific Programming Committee, under the leadership of Walter Boron, showed the direction of the future of physiology. And this is a very important role of the quadrennial Congresses. The scientific theme of 2009 Kyoto Congress is "Function of Life: Elements and Integration," and this theme also indicates the future direction of physiology. The first International Scientific Programming Committee will be held in January 2006, and it is planned to discuss the fundamental policy of the Congress under the theme of "Function of Life: Elements and Integration." I have no doubt that the IUPS Congresses will lead the world physiologists' community to keep playing pivotal role in the biomedical sciences. ❖

Facing the World Physiological Community

Tai Yao
Professor, Fudan University Shanghai Medical College
President, Chinese Association for Physiological Sciences

As a Chinese physiologist, I had the pleasure of attending the 35th Congress of the International Union of Physiological Sciences (IUPS) and had a wonderful time in San Diego. Personally, this was the second time I participated in the IUPS Congress. The first time was in 1989 at Helsinki when I chaired a symposium on acupuncture research. While at the San Diego Congress, I saw the magnificent and substantial progress and changes physiological sciences had made since 1989; I realized more profoundly the future direction of the development of physiological sciences. The reason that I think the San Diego Congress has been a great success is not just the memorable settings and state-of-the-art facilities provided; what is most important is that the organizers have set a right theme and also the scientific program.

"From genomes to functions." The theme of the Congress has been very precise, explicit, and utterly important. What is more, the Scientific Program Committee chaired by Walter Boron and also the National Organizing Committee chaired by Shu Chien have designed and arranged an excellent program that matches perfectly the theme. I want to mention that the Fenn Lecture given by the Nobel Laureate Peter Agre and the President Lecture delivered by Allen Cowley, and of course many others, are excellent examples demonstrating how to work from genomes to functions, how to translate the achievements of molecular and cell biology to the functions of the complex organisms in health and disease, even though we are just making the first step on our march.

For years, we Chinese physiological scientists have been discussing the development of physiological sciences in the postgenomic era and the importance of promoting translational research and integrative physiology in China. However, in recent years, because of the tremendous advances in molecular and cell biology and the grant funding policies set by the scientific leadership, biomedical research is pushed in the direction of molecular and cellular biology, leaving only a small number of physiological scientists working at the whole body level. Now it becomes evident that pure reductionism has limitations to help us understand the functions of the living body. So what stimulated me the most in San Diego is the advocacy of conducting physiological research in ways that will provide an understanding of the functions of the whole living organism. Of course, this is not a simple way of going back to traditional organ-based physiology; the latest scientific knowledge and advanced state-of-the-art technologies, such as bioinformatics, genomics, proteomics, matabolomics, gene transfer, functional imaging, tissue engineering, nanotechnology, etc., must be emphasized and an interdisciplinary approach must be adopted. As Cowley stated, now is "the time to begin building the scientific infrastructures that will enable an integrated understanding of the function of complex organisms and chronic diseases" (IUPS Newsletter 7, September 2004). In this context, we Chinese physiologists also see opportunities and challenges for the development of life sciences in front of us. We have to learn, to work, to create, and to make significant progress. To achieve this goal, we must make efforts to strengthen the relationship and scientif-

ic exchanges and collaborations with our international colleagues.

"Facing the world" is one of the strategies the Chinese Association for Physiological Sciences (CAPS) has formulated. In recent years, China has been making rapid progress in economical and social development. We also made progress in science and technology. But still, there is a big gap between the level in China and the advanced level of the world, and we recognize that the overall impact of Chinese research in physiological sciences is below that of the developed countries. Because of the rapid progress of globalization, we understand that we have to make great efforts to vitalize scientific research and education; also, we must enhance the relations with our international colleagues and catch up with the world advanced level in various fields of science. It was with such wishes, the CAPS sent a delegation participating in the San Diego IUPS Congress. On behalf of the CAPS, I presented a proposal to the IUPS General Assembly, expressing our sincere desire of hosting the 37th IUPS Congress in Beijing, China. Though we did not get it, we experienced pleasure and happiness because our international colleagues gave us very warm encouragement. At the General Assembly, many delegates of various countries came to tell us that our presentation aroused great interest from them, and they encouraged us to make further efforts and wished us success in the future. We Chinese delegates were deeply moved by the friendship our international colleagues showed to us.

The CAPS will celebrate her 80th anniversary in 2006. Nearly 80 years ago, 17 Chinese physiologists formed the Chinese Physiological Society under the leadership of Professor Robert K.S. Lim. Since its establishment, the Society (which changed its name into CAPS in 1953) has been very active in promoting scientific activities and made outstanding contributions in the development of physiological sciences and training of physiological scientists in China. In 1980, the CAPS became an adhering body of the IUPS. This was a very important event for the Chinese physiologists, since participation in an international union would provide us a good platform to communicate with physiologists around the world and forge better relationships with physiologists at distant lands. All these would certainly have impact on us Chinese physiologists. China now adopts a policy of "opening to the world." During the past two decades, an increasing number of Chinese scientists, including physiologists, went abroad, working in different laboratories and institutions across the world. They play an active role in physiological research and many of them have made contributions to the development of physiological sciences in various fields. Evidently, they also play an important role in promoting the development of science and technology in China. In 2004, the CAPS organized the First International Conference of Chinese Physiological Scientists in Beijing. We had the honor to have Shu Chien, Honorary Member of CAPS, as the Co-Chair and have Allen Cowley, Akimichi Kaneko, and Irene Schulz attending and giving plenary lectures. Having over 200 participants, the conference proved to be a success in uniting the strengths of Chinese physiological scientists around the world and enhancing the research of physiological sciences in China to catch up with the international advances in scientific progress. A decision was made on the meeting that such Conference would be held regularly every four years. The success of this conference further stimulated and strengthened our confidence to host an IUPS Congress in China in the near future. When I was in San Diego, I felt a great happiness because the number of participants from mainland China was much more than the number in previous congresses; also, I saw many participants from various parts of the world were of Chinese origin. At this point, I am very optimistic that, by way of playing an active role on the platform provided by the IUPS, the Chinese physiological scientists will further strengthen the relationship and collaboration with their international colleagues and make their share of contributions to the development of physiological sciences in the world. ❖

A photograph taken at the entrance to the San Diego Convention Center on April 3, 2005, for some of the Chinese physiological scientists attending the 35th IUPS Congress. Third from left in the front row is Tai Yao, author of this article and President of Chinese Association for Physiological Sciences (CAPS). Fourth from left is Shu Chien, Chair of National Organizing Committee of the Congress and Honorary Member of CAPS.

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Vol. 49, No. 1, 2006

A Veteran's View

Ole H. Petersen
MRC Group
University of Liverpool, UK

The 2005 San Diego Congress was the result of a successful bid at the IUPS General Assembly in St. Petersburg in 1997 made by Stanley Schultz, on behalf of the US National Academy of Sciences, to bring the IUPS Congress back to the US for the first time since the International Congress in Washington DC almost 40 years ago. The 1968 Washington Congress had, in fact, been my very first International Congress and also the occasion for my first visit to the US. I had been engaged in experimental work in physiology for a few years, but at the time of the Congress I was still a medical student at The University of Copenhagen. I remember well the magnificent event in Washington DC and the generosity of The American Physiological Society (APS) in awarding travel grants to many young physiologists from Europe (including me!) at a time when travel money was considerably more limited than is now the case, at least in Western Europe. As always, one of the chief attractions for a young physiologist was simply to see and hear some of the great names. At the 1968 Washington Congress I remember particularly being impressed by Adrian and Eccles. However, I have to confess that for me the most important event at that time was the Satellite Symposium on Exocrine Glands in Philadelphia, just before the Congress, where I gave my first invited lecture at an international meeting and met Sir Arnold Burgen, who later played a significant role in my scientific career.

In 1968 I had, of course, very little feeling for the magnitude of the task of mounting a major international Congress, but at the 2001 IUPS Congress in Christchurch, New Zealand I was elected Secretary General of IUPS and became co-chair (with Walter Boron as Chair) of the IUPS International Scientific Program Committee. It was, therefore, my privilege to participate in the process of generating the San Diego Congress program.

There are basically two tasks involved in setting up a Congress: the practical (physical) arrangements and the organization of the scientific program. The two are obviously connected. The IUPS 2005 National Organizing Committee, chaired by Shu Chien, was, of course, in charge of the decisions that had to be made with regard to the physical framework and the practical organization of the Congress. The APS office, and particularly the Executive Director, Martin Frank, and the Meetings Manager, Linda Allen, had to shoulder a very major burden and did this with impressive efficiency. As expected, San Diego did provide a memorable setting and the state-of-the-art facilities in the excellent Conference Center made the Congress both enjoyable and efficient. The dignified and charming manner in which Shu Chien presided over the Congress and seemed—miraculously—to be present everywhere also did much to foster a

The International Scientific Program Committee, at its November 2003 Meeting in Landsdowne, near Washington DC. Front row from left: William Chin, Akimichi Kaneko, Shu Chien, JoRae Wright, Ole Petersen, Walter Boron. Second row: Yoshihisa Kurachi, Barbara Block, Ann Sefton, Malcolm Gordon. Third row: Curt Sigmund, Allen Cowley, Roger Nicoll, Bengt Saltin, Harold Atwood, Irene Schulz and Peter Hunter (photo taken by Martin Frank).

APS President D. Neil Granger welcomes Congress participants.

congenial atmosphere.

The most difficult part of any Conference Organization is to get the scientific program right. It can, of course, never be right for everyone. To achieve the appropriate balance between the different subject areas within the vast family of physiological science is in itself very difficult, but when this is combined with the need also to achieve a balance between chairs and speakers from different countries, then the task is extraordinarily difficult. The usual, and indeed inevitable, solution is to arrange for an International Scientific Program Committee composed of experienced physiologists from a wide range of countries active in physiological research. The difficult and time consuming task of chairing this committee fell to Walter Boron and as Vice-Chair of the Committee I can testify that Walter took this task very seriously. Walter used his vast and broad-ranging knowledge very wisely to guide the Committee through many difficult decisions to arrive at what most of the physiologists I have spoken to experienced as a very impressive program covering the full range of the best international physiology on offer.

An important innovation for the 2005 San Diego Congress was that a major part of the program was composed of tracks, each track being composed of, for example, three symposia and three featured topics. A typical symposium consisted of four 30 minute presentations by invited speakers, whereas a featured topic was usually made up of two major presentations from invited speakers with additional room for two speakers selected on the basis of the submitted abstracts. While the tracks could not cover the whole of physiology, they were wide-ranging: calcium signalling, cardiac physiology, ecophysiology for the 21st century, education, epithelia, feeding fuel and fat (energy metabolism), genomics, mechano-/chemotransduction, muscle-exercise, neural control of locomotion (from genes to behaviour), renal control of blood pressure, the regulatory brain, thermoregulation and energetics, and tissue dynamics in the lung and vascular physiology. Outside the tracks there were numerous free-standing symposia, as well as a number of distinguished lectures, including the spectacular Fenn Lecture on the Opening Day delivered by the Nobel Laureate Peter Agre and of course Allen Cowley's magisterial and inspiring President's Lecture.

Between the Washington DC Congress in 1968 and the 2005 San Diego Congress, IUPS held International Congresses of Physiological Sciences in many exciting locations: Munich (1971), New Delhi (1974), Paris (1977), Budapest (1980), Sydney (1983), Vancouver (1986), Helsinki (1989), Glasgow (1993), St. Petersburg (1997) and Christchurch (2001). It has been my great privilege to attend all these events and I think the San Diego Congress was one of the very best. Physiology has undergone very substantial changes since 1968 and some have spoken of the subject's relative decline, particularly in relation to impact factors for the physiological journals, as compared to the more molecular branches of biology. However, physiology at its best is in many ways in a stronger position now than ever before. The APS journal *Physiological Reviews* is representative of international physiology. It has separate US and European Editorial Boards, as well as Associate and Corresponding Members of these editorial boards from Africa, Asia, Australia and South America. For me it has been pleasing to note the general increase, over the years, in the impact factor rating for *Physiological Reviews*. In fact the latest figures (2004 Journal Citation Reports) show that *Physiological Reviews* is now ranked, with respect to impact factor, as number five of ALL scientific journals. This fits in well with the high profile and outstanding quality of physiological science presented at the IUPS Congress in San Diego. ❖

Fenn Lecturer Peter Agre addresses the Congress.

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Grown Up to Function

Irene Schulz, University of Saarland, Homburg, Germany
Vice-President, IUPS

The epilogue of the XXXV International Congress of Physiological Sciences was a concert with the symphonic suite "Body Notes" about human physiology composed by the physiologist Dr. Hector Rasgado-Flores. This suite is composed of 13 movements grouped in six sections: I. "Negentropy;" II. "Pumping Iron;" III. "Movement's Movement;" IV. "Right Connections;" V. "Moody Mood;" VI. "Apoptosis."

The piece of music describes many aspects of body functions and movements, such as heart "beating," "loving," "muscle working," "moods," which are influenced by our hormones as well as programming of cells for an orderly well controlled life cycle at the end of which they die, called "Apoptosis," The symphony reminded me of our efforts, discussions, fights we went through, as we tried to establish the program for the XXXV International Congress in San Diego 2005. But let me start at the beginning.

In 1997, on the occasion of the Congress of the International Union of Physiological Sciences (IUPS) in St. Petersburg, the invitation of the US National Academy of Sciences to hold the IUPS 2005 Congress in the United States of America was accepted by the General Assembly of IUPS. The new idea that the Congress should be held in conjunction with the Experimental Biology meeting of the Federation of American Societies caused concern and long discussions in the IUPS council. We were afraid of losing our identity and being overwhelmed by the American Scientists.

However, being used to experimenting and risk-taking, at the Christchurch Congress in 2001, the IUPS General Assembly accepted the US invitation to hold the IUPS congress in conjunction with the Experimental Biology 2005 Meeting in San Diego. At that time there were still concerns that it would be very difficult and would require enormous efforts to highlight sufficiently the central topics of physiology and to make them recognizable to the participants before they spread out in the totality of biological sciences. The constant fight against the increase in "scientific entropy" is a central issue in physiology as was emphasized by Rasgado-Flores when he entitled the first movement of his suite "Negentropy." But did this justify to merge physiology with the abundance of other biological sciences?

The IUPS 2005 National Organizing Committee (NOC) represented by Shu Chien, chair of NOC, put together several committees to coordinate the planning for the Congress 2005. Shu Chien spread a sense of confidence that every thing would succeed. The dinner given by him and Shu's wife K.C. was in an atmosphere of anticipation of pleasure, of inspiration and friendship. Each guest brought a CD of a typical music piece from his/her country, which was played during the evening and which brought up a lovely touch of connection.

IUPS has already eight standing commissions and two committees with main topic groups in different areas of physiology. The chair persons of these commissions together with members of the US committees formed the International Scientific Programming Committee (ISPC) together with the US Scientific Programming committee (USSPC) chaired by Walter Boron/USA and co-chaired by Ole Petersen/Great Britain.

It was the goal to create a program that represented all important areas of

Martin Frank presents flowers to Hector Rasgado-Flores in appreciation of his efforts to compose *Body Notes*.

physiology and also that physiologists from around the world, respecting countries and gender were appropiately represented in a good balance.

It turned out that the cooperation between USSPC and ISPC was extremely effective. For each topic, such as "Nervous System and Neural Control," or "Circulation and Cardiovascular," the program representatives of both the ISCP and the USSCP worked together. In the IUPS commission "Secretion and Absorption," chaired by myself, the aspects of "Epithelial transport" were discussed with the Chairperson David Cook/Australia of the subsection "epithelial" and with the advisors of this section and with Thomas Kleyman/USA, or for the subsection "renal" with François Verrey/Switzerland and advisors of this subsection for ISPC and with Curt Sigmund/USA, chair of the APS joint program committee and Mathew Breyer/USA for the USSCP committee.

We had a very good cooperation with Hannah Carey/USA from USSCP. We were in constant Email contact exchanging ideas and suggestions between continents. Similarly François Verry/Switzerland (chair for the IUPS subsection "renal") was in constant contact with Curt Sigmund/USA for USSPC.

The new idea of the scientific programming committees, represented by its president, Walter Boron, was to subdivide the various aspects of life sciences into well defined subgroups, which were called "tracks" that would carry a particular topic. Thus, taking my commission "Secretion and Absorption" with the subsection "epithelial" as an example, we had symposia and featured topics on basic questions on: "Molecular Mechanisms of Transporter Regulation;" "Epithelial Genomics, Proteomics and Genetic Models;" "Epithelial Polarity: Development to Disease;" "The Molecular Basis of Epithelial Diseases;" up to "PDZ Domain Scaffolding Proteins and their Functions in Polarized Cells" and finally whole cell function in "Epithelial Cells and their Neighbors."

In addition, distinguished lectures such as the Horace Davenport Distinguished Lectureship on "The Ins and Outs of Membrane Traffic in Polarized Cells," by Ann Hubbard/John Hopkins University, USA or the Robert Pitts Lecture "Signaling Across the Juxtaglomerular Apparatus-Message and Messengers," by Juergen Schnermann/NIDDK, NIH, USA were presented and also given by recipients of the Nobel Prize including Peter Agre, the Finn Lecturer, as well as Eric Kandel and Erwin Neher.

Several meetings with USSPC and ISPC to "brainstorm" and build up an outstanding program took place in the two years before the Congress.

The chairman, Walter Boron, guided both USSPC and ISPC with high sensitivity and respect for the ideas of each member through these meetings.

Finally, I can say that *because* of the conjunction of EB and IUPS, a program of highest quality was established, including all important areas and hot topics of physiology with a transparent and comprehensible organization, which made it easy to follow points of interest day by day and to hear talks from the best scientists from throughout the world.

The IV section of the suite by Rasgado-Flores, entitled "Right Connections," describes the enormous complexity of neuronal and hormonal interactions in the human body. It also can be interpreted to mean the important task of meetings like this congress to provide a forum for young scientists to present their work, to get into talks with senior scientists and to make connections, which may promote their career. These many scientists, most of which were not invited speakers, presented their contribution in form of posters. This is inevitable and so it was also inevitable that the exhibition hall had a length of almost half a mile, leading to the practical consequence, that even the best posters got drowned in these floods of others. Let´s hope that the talents and inspiration of our younger colleagues will not end up like the last movement of the symphonic suite, which was entitled "Apoptosis." However, this movement of the suite ends with a sense of peaceful acceptance of completing the life cycle and at the same time living forever. ❖

IUPS President Allen W. Cowley addresses the Congress.

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35th IUPS Congress

Harold L. Atwood, University of Toronto, Toronto, Canada

As a member of the IUPS Council and of the International Program Committee for the 35th Congress, I was fully immersed in the planning operations that led to the Congress in San Diego. Much earlier, I had also contributed to planning for the 1986 IUPS Congress in Vancouver, Canada. By comparison, that was a much smaller Congress; the San Diego Congress was coupled to the Annual Meeting of the American Physiological Society (APS), and the planning was of necessity more complex and more detailed. The expectations of both IUPS and the APS had to be met, and a dynamic interplay took place between the two organizations. Also, in the intervening years since the Vancouver Congress, the impact of modern technology had increased — the age of computers and accelerated information transfer had matured considerably. Also, the large size and scientific clout of the American Physiological Society increased both the resources available and the complexity of the planning exercise.

Several large planning meetings were organized by the APS, notably one near Washington, DC in very pleasant surroundings, and one at the April 2003 Experimental Biology Meeting in San Diego, where we could visit the facilities for the 2005 Convention. An unprecedented outreach appeal for symposium and track proposals generated a large number of diverse submissions, which when assembled in printed form almost equaled a small telephone book in thickness. The track concept was to link a series of symposia on a topic area together, providing insights at several different levels of observation for a selected high-interest topic. An additional feature of planning was Walter Boron's convening of small "focus groups" for intensive discussion of track proposals. As a representative of the Neural Commission of IUPS, I went to San Francisco for a four-person discussion group in late August, 2003. Here, recommendations were developed for selected tracks to be developed. Such decisions were difficult, given more good submissions than could be accommodated. Throughout the planning process, much to the credit of those involved in the planning, a great effort was made to ensure international representation, gender representation, adequate coverage of sub-disciplines, and scientific excellence.

This careful planning process produced many excellent symposia and tracks at the Congress. I attended several in sub-disciplines other than my own, and felt that I emerged better educated. An interesting feature of the San Diego Congress was the very good representation for Comparative Physiology, signaling growing interest in studying environmental effects on an organism through use of genetics-based technologies (including analysis of micro-arrays, tissue-specific gene expression, and other approaches). The same methodologies appeared in other symposia dealing with disease processes and responses to stress. Thus, the general theme of the Congress, emphasizing genes to organisms, was amply justified.

Congress participants enjoy keg racing during the IUPS Beach Party.

The very detailed planning process had its cost, as well as its benefits. Since only a fraction of the many solicited symposium proposals could actually be fitted into the program, there was bound to be disappointment among unsuccessful proposers. The track concept, by necessity, involved a competitive selection process which risked leaving some sub-disciplines poorly represented — but provision for many free-standing symposia ensured a safe-guarding counterbalance.

The many social events at the Congress allowed ample opportunities for collegial discussions and interactions. An unforgettable outdoor supper evening at the harbor-side park culminated in an impressive display of fireworks. The final evening featured a concert at which a newly composed musical suite based on human physiology was presented—-certainly a unique event! Although threatened disruptions by animal rights activists were anticipated and planned for, these did not amount to much when the time came. The activists had a much lower profile than had been the case in Christchurch, New Zealand. Taken as a whole, the Congress was an enjoyable experience.

For those interested in other aspects of San Diego and its surroundings, the timing of the Congress could not have been better. An unusually wet spring had stimulated an exuberant display of desert flowers, so on an off day, I rented a car and drove out to the Anza-Borrega Desert with my photography-addicted wife and Pavel Balaban (from Russia) and his wife. The desert lived up to expectations; even a desert horned lizard (horned toad) was photographed. On the way back to town, we sustained a flat tire and I found, to my dismay, that the jack provided with the car was missing some of its parts and could not be used. Luckily, a local motorist came by and stopped to help us. At first, he was disconcerted by our foreign accents, but I happened to be wearing a University of Iowa Hawkeye cap and explained that I had a son in the Physics Department at Iowa State University; this was reassuring to him, and in no time at all, the tire was changed and we made our way carefully back to town on the spare "micro tire." Our hotel, on hearing of our dilemma in the desert, called the car rental place, and we were excused from paying any rental charges. So we left San Diego in good spirits! ❖

Before the Opening Session Can Take Place...

Susan Orsoni,
IUPS Executive Secretary

One may think that putting together a large international congress every four years is a bit like organizing a symposium for several hundred people—-a relatively easy task. But the organization of each new congress of the Internation-al Union of Physiological Sciences (IUPS) is a lengthy process indeed. I've been part of this repeating procedure now since I first came to work for the IUPS to help prepare for the 1977 congress in Paris. Over the years the procedure has strengthened, the congresses become ever more professional, but as much as we continue to learn from the past, the wheel seems to be reinvented each time around.

The congress changed from three to four years back in 1989, so invitations to host such a congress are now presented to the General Assembly eight years before the event, a selection is made, and that selection is then confirmed by the General Assembly four years hence. The American group had hosted the 1968 IUPS Congress in Washington, and the US National Academy of Science decided to submit an invitation once again at the 1993 General Assembly in Glasgow to host the 2001 IUPS Congress. However, other invitations were also received and the Physiological Society of New Zealand was selected to host that meeting.

The Americans again submitted an invitation at the 1997 General Assembly to host the 2005 Congress with the plan being that it would take place at the new congress center in Washington DC. After four rounds of votes concerning six other societies that had presented a bid, the American invitation was selected and the machine set in motion, albeit slowly at first. It should be noted though, that after such a lengthy procedure it was decided that in the future the Executive Committee would review all dossiers and aim to submit the best three to the General Assembly.

The actual location within the host country is at the discretion of the inviting society. So when the National Organizing Committee, chaired by Shu Chien, decided several years later it would be beneficial to all concerned to move the site from the original suggestion on the East Coast to San Diego. This was so that it could be in conjunction with, but independent from, the annual Experimental Biology meeting. And the 2001 General Assembly fully confirmed this decision.

In order to help ensure that there is good international representation on the scientific program, the IUPS plays an important role by its participation in the International Scientific Program Committee. Generally, the IUPS representatives are the chairs of the eight Commissions, the Education and Physiome Committees and two other persons. And in the four years following the confirmation, these people met formally with the National Scientific Program Committee on two occasions and were consulted regularly by electronic mail. However, not having played an active role in this procedure, best that I let those who did so extend the compliments on how well everyone worked under Walter Boron's leadership.

My job was more directed to the practical level of the IUPS Council and General Assembly which would meet during the days preceding the congress: collecting reports, calling for delegates, distributing material, etc. and organizing a meeting of the new Council during the congress itself. As always, Marty Frank at the APS office and all his team did a remarkable job in making sure our needs were met well and efficiently.

When the time of the congress finally arrived, before its scientific excitement could get underway, the quadrennial business of the International Union of Physiology Sciences had to be dealt with: the meeting of the IUPS General Assembly. Seventy-one voting delegates (from Adhering Bodies and Council) and 18 observers participated in this meeting at the Hilton Gaslamp Hotel on Thursday 31 March. This compared with 76 voting delegates in Christchurch and 86 in St. Petersburg. This meeting is always an outstanding opportunity for the member societies of the IUPS to reestablish contact with one another even before they meet during the congress itself.

The meeting was begun by opening remarks of the IUPS President, Allen Cowley, with a report of the efforts which had been carried out during the previous four years as well some of the decisions taken at the Council meetings which had taken place the preceding two days. This was followed by a financial report of the Treasurer, Jimmy Neill, and a report from the Secretary General, Ole Petersen.

Thereafter, the chair of each of the committees, Membership, Education, Physiome, Ethics, and Nominating described the varied activities carried out by their groups over the past four years: the Union's membership had increased, there was again to be a large teaching workshop after the congress, several modeling projects are underway worldwide, the thorny question of ethics is being looked at, and a new Council was nominated and elected. As always they will hold office for a four year term until the next congress, with Akimichi Kaneko becoming President.

This was followed by a discussion of the commissions which had been reorganized following the 2001 congress from 33 into eight. It was proposed that a further refinement would be a benefit, thus two of them in the field of neurobiology were combined and a new one added to deal with molecular and cellular physiology. Again they will be called upon to help plan the scientific program for the next congress.

Toward the end of the meeting, a fair amount of time was spent reporting on the regional activities of the Union in the Asia Pacific, Europe, South American and Africa, and how important it is to have the IUPS play an active role in each. For instance, it has been decided to launch an African Initiative to help with the teaching of physiology throughout the African continent. But it is hoped that we will be able to reach well beyond that in our efforts.

The other major piece of business was to plan for future Congresses. First, the invitation from the Physiological Society of Japan to host the 2009 congress in Kyoto which had been approved in 2001 was confirmed. Then four very comprehensive invitations to host 2013 were presented. These were from the Austrian Physiological Society, Chinese Association for Physiological Sciences, Czech Physiological Society and The Physiological Society (UK). A difficult selection to make, but after two ballots, the invitation from The Physiological Society (UK) was accepted. This will be presented for confirmation to the General Assembly in 2009.

Thus, the cycle will continue, at least for the next eight years. During the four years to come the newly elected Council and its Executive Committee will once again do their best to follow the instructions and guidance of the General Assembly. They will ensure that the IUPS continues as a viable organization that not only sponsors outstanding congresses every four years but also promotes ongoing activities on a smaller scale that help to strengthen the field of physiology worldwide. ❖

The Physiologist
Vol. 49, No. 1, 2006

The XXXVth IUPS Congress in 2005: A Winding Road to a Wonderful Meeting in San Diego

Shu Chien
Chair, US National Organizing Committee, 35th IUPS Congress
Department of Bioengineering and Medicine (Physiology),
University of California San Diego, La Jolla, CA, USA

The 35th IUPS Congress held in March 31-April 5, 2005, in San Diego, California, USA was a great success, as a result of the marvelous joint efforts by many wonderful colleagues all over the world and the enthusiastic participation by thousands of physiological scientists. I feel extremely fortunate and grateful to be a small part of this extremely meaningful event in international physiological sciences. The 35th Congress was one of the most successful IUPS Congresses, but the road to this wonderful and memorable event was rather winding and there was a time when it was not certain whether the Congress would take place in the United States in 2005. I would like to share my personal experience of being a part of this marvelous event and to note how the mutual trust and joint endeavors among international physiologists have made possible the success of this Congress and started a renaissance of international physiology.

At the 33rd IUPS Congress in St. Petersburg, the General Assembly accepted the invitation presented by Stanley Schultz on behalf of US National Academy of Sciences President Bruce Alberts to hold the 35th Congress in August 2005 in Washington, D.C. This set the stage for the IUPS Congress to be held in the United States for the third time in its century-old history, following the Congresses in Boston in 1929 and Washington, DC in 1968. At the St. Petersburg Congress, 1997, I was elected as IUPS Treasurer (a four-year term ending in 2001) and thus became a member of its Executive Committee (ExCo). As Treasurer, I had the pleasure of working closely with other ExCo members: President Ewald Weibel, Secretary General Denis Noble, First Vice President Ernie Knobil (who unfortunately passed away in April 2000), and Second Vice President Ramon LaTorre, as well as the Executive Secretary Sue Orsoni. We worked together on a number of matters, including the resolving of the financial difficulties of the St. Petersburg Congress.

Following the 33rd Congress in St. Petersburg, Tony Macknight, Chair of the 34th IUPS Congress, and his colleagues worked very hard in preparing for the Congress to be held in Christchurch in 2001. In the mean time, planning also began for the 35th Congress in the United States. A US National Organizing Committee (NOC) for the 2005 Congress was formed under the auspices of the US National Committee (USNC) on IUPS, with Virginia [Ginger] Huxley as Chair, of the National Academy of Sciences. USNC and NOC are composed of representatives from six Societies related to physiology, viz., the American Physiological Society (APS), Society for Neuro-sciences, Society of Comparative Physiolo-gy, Society of General Physiology, Biomedical Engineering Society, and Microcirculatory Society, with APS as the lead Society for NOC and Allen Cowley as the Chairman. Under Allen's leadership, the theme of "From Genomes to Functions" was adopted as the theme of the Congress. In May 2001, however, Allen Cowley was nominated to be the next IUPS President to succeed Ewald Weibel. As a result, I was elected by NOC (of which I was not a member at that time) to be its Chair to replace Allen, and the notice of this election was sent to me by email on July 8, 2001. On July 10, I received from APS Executive Director Martin Frank a nicely prepared Prospectus for the 2005 Congress to be held in Washington, DC in August 2005. I replied saying that "The 2005 Congress will be a very exciting one. We must take advantage of the New Zealand Congress and transmit fully that excitement, both scientifically and socially (including all the attractions in the DC area and vicinity, as you so ably portrayed."

On July 15, 2001, however, I received an email sent by Marty Frank to Allen, Ginger, Walter Boron (US Scientific Program Committee Chair for the 2005 Congress), and me that the APS Council had just decided to have the 2005 IUPS Congress moved to San Diego in April to coincide with the Experimental Biology meeting (EB 2005). The reason for this decision was to avoid splitting the attendees from the physiology community for the two meetings in the same year less than four months apart. Marty also informed us that APS President John Hall and President-elect Barbara Horwitz wanted to set up a conference call on July 18 to discuss the 2005 IUPS Congress. In reading this email, I realized immediately that, while the proposed change is based on good reasons, it would encounter many difficulties in receiving approval from our international colleagues because of the potential perception that the IUPS Congress (with an attendance of not more than 3,000 in recent Congresses) would be overwhelmed by the larger EB meeting (often more than 10,000).

Although this proposal could be presented to the meetings of the IUPS ExCo, Council, and General Assembly in Christchurch in August 2001, the one-month period would not have been sufficient lead time for adequate deliberation in order to obtain a positive reaction. Since I was still serving on the ExCo and have been working closely with its members, I decided to phone Ewald and Denis right away because I felt that it would be much better to speak with them directly rather than using emails for such a difficult matter. Fortunately, I was able to reach both of them by phone on July 16.

Ewald was naturally surprised by this sudden change. After considerable discussions, during which I explained the benefits of avoiding the split of attendance and interacting with other disciplines in experimental biology that were offsprings from physiology, he began to feel that there might be positive aspects in this proposed change. He sent me an email on July 19 saying that he believed that it was a good strategy to combine the American Physiology meeting with the IUPS Congress as it would ensure the participation of the local physiologists. So in that sense he would approve this in principle. While he had some concerns, Ewald said that if a good scheme could be worked out it could be successful and that there might be the fringe benefit of having some non-physiologists exposed to physiology. But he rightly wanted it to be clear that IUPS 2005 would not simply be a small corner of the big EB 2005. He said that the change in time from August to spring should be no problem, but the change in location from Washington to San Diego would have to be justified, because the US invitation, which was accepted by the General Assembly in 1997, was built

strongly on the new Washington Convention Center. He did note, however, that UK and NZ also changed the Congress locations in 1993 and 2001, respectively. He gave the valuable advice that we present this as a new option for approval, but not as a *fait accompli*.

It was very fortunate that my phone call to Denis on July 16 caught him just in time before his leaving for a trip. I presented the proposal of changing the venue and time to him. After some thoughtful discussions, Denis was in favor of holding the meeting in San Diego in April. His main concern was also the identity of IUPS. He would not like to have the international community to have the conception (or misconception) that IUPS would become a subset of American Physiology.

I was not able to reach Ramon LaTorre until July 24. Ramon and I also had a fruitful discussion. His reaction was similar to that of Denis. He felt that overall the pluses override the minuses, but he would like to give this more thoughts and then contact me later. The major issue he brought up was again the identity of IUPS, and he wanted to be sure that the role of IUPS would not be lost in the process. Thus, the three IUPS ExCo members all felt that it was feasible to make the change, but, as I expected, there was a great deal of concern about the identity of IUPS in a larger crowd at the EB meeting.

While I was discussing this matter with the IUPS ExCo members, Marty contacted the EB office and the Executives of some FASEB Societies who would participate in EB 2005 and sent emails to NOC members. Geri Swindle of the EB Meeting Management Office said that it would be possible to hold the Congress along with EB and have a separate headquarter hotel assigned to IUPS. Two of the Society Executives contacted did not have objections but pointed out some of the potential difficulties. Most of the NOC members were in favor of the shift of IUPS 2005 to San Diego in April, but two members strongly disagreed with these proposed changes because of their concern of the adverse reactions by the international physiological communities.

During the APS teleconference call on July 18, 2001, I reported my conversations with Ewald and Denis, and Marty reported his communications with the EB office, FASEB Societies, and NOC societies. Following extensive discussions, the consensus was to do everything possible to assure the identity of the IUPS Congress by starting it ahead of and then in conjunction with EB in San Diego in April 2005. It was concluded that, while there would be difficulties, they were not insurmountable. The pluses of the proposed change include a better attendance, the planning of a single meeting in 2005, the attraction of participants from the sister EB societies, a pleasant venue with an amenable climate, easy accessibility for participants from the Pacific rim, and the availability of a large exhibit. The minuses include the potential impressions by the international physiology community that the EB meeting might overwhelm the IUPS Congress and by the EB sister societies that this would be only a Physiology meeting. Other factors are that schools would be in session and that the West Coast is less accessible from Europe. The results of the teleconference were summarized by an email sent by Ginger to the leadership of the six Member Societies of the USNC for comments and suggestions.

Based on the concerns about the IUPS identity, as expressed by the ExCo and some NOC members, I made the following statement in my July 24 email to NOC. "I think it is time for us to be magnanimous and be willing to say that we will NOT have an APS meeting as such and that we throw all our support to the IUPS Congress, which deals with the same science anyway. We should start the Congress 1 1/2 to 2 days ahead of the EB to hold the opening ceremony, some special lectures, workshops, etc., and start the regular symposia and poster sessions together with EB. As far as the relationship with EB is concerned, we can proceed in the regular way, but the banners and printed materials must say only IUPS. APS can still have its various functions, including the Section Distinguished Lectures, etc., but APS should be big-hearted enough to label the regular sessions IUPS. APS will not lose from this, but rather it will gain a tremendous amount of good will and appreciation from the international community, which is more precious than APS gaining any direct billing." On July 25 I sent an email to Marty saying that "I understand some of the difficulties involved in emphasizing IUPS and putting APS more in the background, but we must do as much as we can toward that goal. The principle is to give the international physiology community a clear sense that IUPS Congress is not a subset of the EB Meeting. I am sure that the IUPS Congress will bring better science and more scientists to the EB meeting in 2005. It is a win-win situation, and EB and IUPS should be partners for the betterment of science."

Following the July 18 teleconference and many email exchanges among the participants, Marty drafted a proposal to the IUPS for the United States to host the 35th Congress in San Diego in April instead of Washington, DC in August 2005. I made a number of revisions to further emphasize the identity of IUPS (while holding the Congress with an overlap with EB) and the benefits of the interactions with sister disciplines. I also made it clear that this was only a possible alternative (i.e., not a *fait accompli*) to the original proposal for the IUPS ExCo, Council, and General Assembly to consider for approval. We did not want to have this perceived as a unilateral decision, but rather as a proposal to the IUPS leadership, who clearly has the ultimate authority to make the decision. This proposal received the enthusiastic support of USNC Chair Ginger Huxley and most of its members, but several members expressed their concerns, particularly with respect to the question of the identity of IUPS.

Our proposal was submitted to the ExCo, Council and General Assembly of IUPS on July 31, 2001. It met with considerable opposition, with most of the email responses being negative, including suggestions of moving the Congress from the US to Canada, which was a close second in the 1997 voting by the General Assembly on the 2005 Congress site. In response to these messages, Ewald sent an email to the ExCo members on August 9, saying that "My concerns about the US proposal are rising." Then, with the consent of the ExCo, he sent an important message to IUPS Council on August 10, making the following points regarding the proposal: "(*1*) It appears as an interesting proposal to expand the spectrum of the physiological sciences … in EB. (*2*) The chief concern is that the proposal … may not safeguard the identity of the IUPS Congress, for two reasons: (*2a*) The actual IUPS events are limited to two days. …., after which the IUPS Congress becomes part of EB. (*2b*) There will be no specific registration for the IUPS Congress whereas all participants will have to register for the EB meeting." He asked the Council members "to look at these questions carefully and to also consider the consequence this new proposal will have on IUPS as an institu-

tion in the long run."

Ewald's message was received about a week before Allen Cowley and I were to depart for the New Zealand Congress. In the ensuing days, we had several telephone conversations with APS President John Hall, discussing with him the importance of assuring the identity of IUPS if the 2005 Congress were held in conjunction with EB. John made the important decisions of making ALL 2005 San Diego physiology sessions as IUPS instead of APS events and requiring all APS and its guest society members to register through IUPS. Given these new directions, I further revised the proposal to move the 2005 Congress to San Diego in April during my flight to New Zealand. This new revision included the following key points:

1. Registration for IUPS Congress will be clearly identified for all participants. APS will require all of its members to register through the IUPS.
2. The scientific program in physiology during IUPS 2005 (and EB 2005) will be that set up by the IUPS prepared by the International Scientific Program Committee.
3. Meeting

a.IUPS will have its headquarters at a top-level hotel adjacent to the San Diego Convention Center. On March 31 and April 1, IUPS will be the only meeting. On the ensuing days, IUPS Congress will have its own separate site and clear identity, and yet is close enough to others for interdisciplinary exchange.

The IUPS poster sessions, i.e., all physiology posters, will be positioned in a clearly identified area with definitive indication that they are the IUPS posters. They will be set up in such a way that the world physiological community can meet in that area for exchange of information.

I arrived in Christchurch in the afternoon of August 21. That evening Ewald invited Denis, Ramon, Allen, Sue Orsoni, my wife K.C. and me to have a drink in his suite in the Parkroyal Hotel, and then we had dinner together. Allen, who was sitting next to Ewald and Sue, told me after the dinner that it did not seem likely that we could get the proposed change approved. I arranged to have breakfast with Denis the next morning to review the proposed change for the 2005 Congress. Denis agreed with the rationale for the change, but felt that it was a difficult proposition to get approval and likened it to walking on a tight rope. He and I agreed that we would have to do everything right in order to succeed. I then spoke to Ewald and to Ramon about this. During the ExCo meeting on August 22 we first discussed many of the other IUPS agenda items, including budget, etc. The 2005 Congress was on the agenda for the next day, but Ewald decided to bring it up that afternoon. I presented the revised proposal that would assure the identity of IUPS, and it was generally well received. The discussion continued on the next day, and by the end of the ExCo meeting there was a consensus that the new proposal represented a workable solution. I was extremely pleased that Ewald asked Denis to draft a memorandum of agreement between IUPS and USNC to be signed by Ewald and Ginger, covering these points. Denis prepared a draft memo based on the document that I had prepared for the ExCo. Ginger arrived in Christchurch on August 23 and I briefed her about the situation and gave her the memo to be signed prior to the deliberation of this matter by Council at its meeting on August 24-25.

Originally, the 2005 Congress was an agenda item to be discussed at the Council meeting on August 25 in the morning, followed by the 2009 Congress site selection. Ewald felt rightly that, in order to allow sufficient time for Council to deliberate on the proposed changes in venue and time of the 2005 Congress, this issue should be brought up at the Council meeting in the afternoon of August 24. Ewald invited Ginger, Marty, and Wendy White of the National Academy of Sciences to also attend the Council meeting when this 2005 Congress was to be discussed. Marty arrived in Christchurch in the morning of August 24, and I was able to arrange for Ginger, Allen, Wendy, Marty and myself to meet immediately after his arrival. I went over the recent developments. With Marty's input, we were able to incorporate in the memorandum the financial arrangements, i.e., USNC/APS will allocate 5% of the registration fee to IUPS, as well as $100,000 or 25% of net profit, whichever is greater. I did everything I could, including running back and forth between the meeting room and the business office in the hotel for revisions, printing, and photocopying, in order to have the memorandum ready for signing prior to the IUPS Council meeting. I was pleased that Ewald approved this memorandum, which was signed by him and Ginger in the morning of August 24. At lunch time on August 24, I went over with Ginger, Marty and others the Powerpoint presentation on our alternative proposal, which incorporated all the key points of discussion, as well as slides on the Convention Center, hotels, and other attractive features in San Diego. This presentation was initially prepared by Marty, and I continuously worked on it, prior to leaving San Diego, during the flight, and in Christchurch.

In the afternoon of August 24, I made the presentation on the alternative proposal to Council. The members had several questions, mainly focused on the identity of IUPS and the mechanics of having the Congress overlapping partially with EB. At the end, they were satisfied with the answers. In the morning of August 25, I was very pleased that Council voted unanimously to approve the alternative plan. This was a critical step that positioned us for the General Assembly meeting to be held on the next day.

During the General Assembly meeting on August 25, Ewald gave an opening statement that summarized the events leading to the alternative proposal and stated that this proposal had received careful considerations by the ExCo and Council. He distributed the memorandum he signed with Ginger to the members of the General Assembly so that the members could understand the conditions involved. Ginger made an excellent presentation on the alternative proposal, using a further updated version of the Powerpoint document. There were a few questions from the floor, which Ginger answered very well. Denis made a superb summary of the actions taken by the ExCo and Council on this proposal. A secret ballot was taken, and our alternative proposal received an overwhelming endorsement by the General Assembly with a vote of 71 for and 3 against. This greatly exceeded our expectation!

Having received the IUPS approval, we next needed the approval by the EB Board to implement this joint effort. The Chair of the EB Board was Paul Insel, Professor of Pharmacology at UCSD, and I was able to discuss this issue directly with him. He was supportive of the idea of holding the IUPS Congress in conjunction with the EB meeting in 2005 and invited Marty and me to meet with the EB Board on January 24, 2002 at the FASEB head-

quarters in Bethesda, MD. I contacted the other five members of the Board by phone prior to the meeting and sent them an email message on January 2, 2002, outlining the proposal. At the meeting on January 24, I made a presentation to the EB Board, emphasizing the mutual benefits of the proposed joint venture. After some questions and answers, the Board enthusiastically endorsed the holding of the IUPS Congress in conjunction with the EB 2005 Meeting in San Diego in 2005. Paul communicated to me in writing the endorsement by the Board and the Board's view that this would be a great opportunity and an excellent precedent, and that this should be a win-win situation. He also transmitted the comments and suggestions by the Board on the mechanics of the meeting, which was satisfactorily addressed by the NOC at its meeting on April 24, 2002. Paul said in this collection of Congress articles, "Did the experiment work? From my personal point of view and that of those with whom I have spoken, including scientists who have interests that focus on either EB or IUPS, the answer is unquestionably 'yes'. I hope that this success encourages other international scientific congresses to consider joint meetings with Experimental Biology—perhaps even IUPS at some future time!"

After the approval by both IUPS and EB, we began to work on the planning of the Congress in San Diego to be held in conjunction with EB. The NOC met regularly for planning of the Congress and addressing the various relevant issues. Several subcommittees were formed. These include the Scientific Program Committee (chaired by Walter Boron), Fund Raising Committee (chaired by Gabe Navar and Bob Gunn; unfortunately Bob became ill after the appointment and passed away shortly after the Congress), and Local Organizing Committee (chaired by Frank Powell). Marty, working with Gabe, did a marvelous job in fundraising, getting the support by the constituent societies of USNC, by the members of these societies, especially APS, and from industry. With their relentless efforts, generous corporate contributions were obtained from scientific organizations, academic institutions, IUPS adhering bodies, US government funding agencies, private foundations, and industrial and publishing firms.

Scientific programming is one of the most important aspects of the Congress. The US Scientific Program Committee (USSPC) was first established, with Walter as the Chair, and he assembled an outstanding committee composed of leaders in physiology in the US. The IUPS ExCo needed to form an International Scientific Program Committee (ISPC), which would be composed of 18 members, with six from the host country (i.e., from USSPC). In the 1997 Congress, Stan Schultz was the Chair of the ISPC and he was the leader for the programming at St. Petersburg. For the 2001 Congress, Rainer Gregor was the Chair of the ISPC; unfortunately, he was struck by lightening while riding a bicycle shortly after the Program Committee meeting in 1999, and this led to his not being able to work on programming; unfortunately, most of the program-related materials on his laptop were also lost in that incident. Tony Macknight did a fantastic job in picking up the responsibility of programming for the Christchurch Congress. Thus, the programming of these two Congresses proceeded well with one person at the helm, though in one case this was the result of a very unfortunate circumstance. I felt that the 2005 programming should also be done with one person in the lead, rather than two different chairs for ISPC and USSPC. Therefore, prior to the IUPS ExCo meeting in July 2002, I contacted the ExCo members and made the suggestion that they consider appointing Walter as the Chair of ISPC with a Vice Chair from outside the US. I was very pleased that the ExCo made the decision of appointing Walter as the Chair and Ole Peterson as the Vice Chair of ISPC. Walter and Ole worked together very well to lead the extremely successful planning of the outstanding scientific programs. Walter, who provided outstanding leadership in programming, has written an article in this volume detailing the team efforts of ISPC, USPC and the APS Joint Program Committee.

At the end of May 2002, Marty, Linda Allen and Linda Dresser of APS and Geri Swindle (Director of EB Office of Scientific Meetings and Conferences) and Pauline Minhinnett of EB came to San Diego to have a site visit of the headquarter hotel for IUPS and other venues, including the symphony hall for the closing ceremony and the symphony performance on "Body Notes." The APS Headquarter Hotel had been decided to be the San Diego Marriott Hotel. In order to keep the identity of IUPS, we wanted to select another hotel. The initial plan was going to be the Weston Hotel, which held a very nice reception after giving us a tour of the facilities. Although the hotel is excellent, I felt the distance from the Convention Center (more than ten minutes of walk) was too far, and we then looked at hotels closer by. We finally decided upon the Gaslamp Hilton Hotel just across the Harbor Drive from the Convention Center. It is less than five minutes on foot. The hotel is smaller in size so that the IUPS Council members would be the major occupants, which is a desirable feature. The facilities are excellent, the rates are reasonable, and the hotel is close to restaurants with different ethnicities in the Gas Lamp District. Therefore, we decided on suggesting the use of Gaslamp Hilton as the IUPS Headquarter Hotel.

It so happened that the EB2003 was also held in San Diego, and IUPS Council decided to hold its meeting during that period so that they could use this opportunity to have an assessment of San Diego as a Congress site and to see the operation of the EB meeting. Arrangements were made for this council meeting to be held at the Gaslamp Hilton on April 8-10, during Experimental Biology 2003. This gave the Council members an opportunity to test out the suitability of this hotel as the IUPS headquarters. They were very pleased with the experience at the hotel, and the decision on Headquarter Hotel was finalized.

In the evening of April 9, 2003, K.C. and I invited members of IUPS Council and the Program Committees, who came from various parts of the world, to a reception and dinner in our house in La Jolla. There were 30 people at this dinner. Three tables were set up in our living room after removing all the furniture. It turned out to be a wonderful social event that provided the participants a chance to relax and get to know each other away from the meeting table. Several people stood up and told excellent jokes. The atmosphere was wonderful. Everyone had a great time.

Because I reside in San Diego, IUPS Executive Secretary Sue Orsoni asked me in July 2004 to find a restaurant for the dinner party to be hosted by IUPS in honored of the USNC, APS, and other US organizers on the eve before the beginning of the Congress (March 30, 2005). K.C. and I were just beginning to

add a wing to our house, and we thought that would have been done by the time of the Congress. Therefore, we suggested to have the dinner at our house again. Although there would be more people than in 2003, our added rooms should be able to accommodate the party well. The IUPS Executive Committee was enthusiastic about this arrangement, and Sue asked me to arrange the catering on behalf of IUPS. San Diego normally has very little rain, but in January-February 2005 it rained heavily and this retarded the progress of our house addition. As the end of March drew near, we had only the shell of the new addition finished, but there would be no electricity or water supply by March 30. We went to Plan B, i.e., to use the unfinished entertainment room for pre-dinner reception. We brought in electricity from the old part of the house with extensions, though it was still reasonably bright at reception time. The walls were primed but not yet painted, and we hung up K.C.'s paintings in the afternoon of March 30, with the help of the caterer. The polite Chinese saying when an artist gives his/her painting to someone is that, "This is for you to patch the wall," and we literally did that. The reception was most lively and people were having great times talking with one another, whether old friends or new acquaintances, or from whatever part of the world. When dinnertime came, I had to ring the Swiss bell that Ewald had given me to call everyone's attention for Allen to give his gracious remarks before this dinner hosted by IUPS. We had emptied four rooms in the old house and set up tables there plus the dining room for a catered sit-down dinner for 70 people. The food was delicious and the wines recommended by Peter Wagner were superb, but most of all the company was fantastic. Everyone had a wonderful time, as mentioned in the articles by Denis Noble, Irene Schulz and Frank Powell in this collection of Congress articles. With the invitations, Sue had transmitted my message of "no gift please" and said that the guests are welcome to bring a CD of the music of their country. These were played during the dinner, though at times drown out by the happy conversations that were going on. Frank wrote that the dinner party "provided a wonderful beginning to a week of renewing and making new friendships with colleagues from around the world. People who had collaborated by email on special events for the Congress finally got to meet and shake hands. All of the hard preparatory work had been done. The atmosphere at the party was filled with both excitement and relief as everyone anticipated the opening of the Congress the next day". Irene noted, "The dinner given by Shu and K.C. was in an atmosphere of anticipation of pleasure, of inspiration and friendship." Denis said, "The atmosphere was one of excitement and anticipation." As the evening came toward a close, Denis played a beautiful troubadour song, which he had also played at an ExCo dinner in Christchurch, using a guitar in our house. This was indeed "a lovely touch connecting the confident present to the uncertain past," as Denis wrote in his article.

Throughout the remainder of 2003 and 2004 we continued to prepare for the Congress in every aspect, including scientific programming, fundraising, local arrangements, planning of social activities (including the Symphony on "Body Notes"), establishment of the Congress website, preparation of registration, coordination with EB, designing and minting of Congress medals, etc., as noted by colleagues responsible for these activities in this collection of Congress articles. As we moved into 2005, the pace of the planning sped up, and we had to deal with several issues that arose as the Congress was getting closer in time.

In order to streamline the registration procedure for the conjoint meeting and allow participants to attend both IUPS and EB sessions, we decided to have a single registration fee at $250 for early registrations. This is almost half of the registration fee four years ago at Christchurch. While this presented a financial problem for the organizers, it had the advantage of providing a lower cost for the attendees, and this was particular valuable for scientists from economically disadvantaged nations.

To encourage international scientists, especially the young ones, in the less developed countries, and underrepresented US scientists to participate in the IUPS Congress, $200,000 were allocated for an IUPS Travel Award program. Following reviews by NOC, awards were made to 167 of the 413 applicants, and 140 of these were able to attend the Congress. The APS and its sections also made awards to over 125 additional graduate students and postdoctoral fellows from both the US and abroad in recognition of their scientific presentations. Details for this are given in the article by Marty Frank.

Because of the tightening of the visa granting process by the US State Department after 9/11, some of the international scientists had difficulty getting their visa. Laura Sheehan of the National Academy of Sciences provided a link to the NAS web site entitled, "Information for Scientists Travelling to the United States and for those Planning International Scientific Meetings in the United States." When visa problems arose, Marty worked closely with Laura and others at the National Academy of Sciences, who had access to the State Department to deal with this problem. Fortunately, this was worked out in most cases, but there were a few scientists who could not get visa in time to participate in the Congress. For this, I sincerely express our apology and regret.

In order to assure that the symposia organizers and invited speakers would know the program schedule and be present at the Congress, letter and email reminders were sent by Linda Allen to everyone for confirmation, and these were followed up with phone calls in some cases. Inevitably, a few of the invited speakers could not come at a very late moment, and arrangements had to be made to carry on the program effectively. All of these efforts made it possible for the program to move on smoothly.

Because of the need to assure the identity of IUPS at this conjoint meeting with EB, as repeatedly mentioned above, I had frequent discussions with Geri Swindle about the signage at the Convention Center and the arrangement of the scientific sessions and posters. She assured me that every effort would be made to make the signage of IUPS prominently displaced and the sessions clearly identified and yet juxtaposition to the EB meeting sites to promote interactions. Geri fully utilized the new addition to the San Diego Convention Center in making superb arrangements. When Walter, Marty and I went to the Convention Center on March 30, 2005, the day before the Opening Ceremony, we were very pleased by the arrangements. The signage in front of the Convention Center was elegantly prepared, with IUPS having at least equal, if not more prominent, billing as EB. The logos of IUPS and the Congress were beautifully presented, side-by-side with the EB logo. The sight was very impressive and moving. The meeting rooms for IUPS were in nicely arranged locations with clear display of elegant banners for IUPS with the logos. I am grateful to Geri

for her wonderful arrangements for this conjoint meeting of IUPS and EB. These thoughtful arrangements, together with ways in which the excellent scientific and social programs were organized, removed the doubts about the identity of IUPS at this conjoint meeting and made our international fellow scientists feeling comfortable and positive about the 2005 Congress.

On March 31, 2005, the 35th IUPS Congress took off with a marvelous beginning at the San Diego Convention Center. As Master of Ceremony, I declared the official opening of the Congress with a warm welcome to all the participants and read an declaration by San Diego Mayor Dick Murphy that "March 31, 2005, is the International Union of Physiological Sciences Day." Ginger, Neil Granger (APS President) and Allen gave excellent welcoming remarks. Allen then introduced the Fenn Lecturer Peter Agre, who delivered a superb lecture. The Opening Ceremo-ny was followed by a buffet reception at the Convention Center terrace, overlooking San Diego harbor, with wonderful food, drinks and jazz music. The official opening was the moment we all had been working toward and waiting for over many years, and it certainly started with a bang, both scientifically and socially.

On April 1, following Allen Cowley's outstanding IUPS President's Lecture, Congress attendees participated in a most enjoyable and relaxing IUPS Beach Party held at the North Embarcadero near Seaport Village, with Southern California beach music, barbeque, and beach activities such as volleyball, keg races, and surfing. There was a dramatic, beautiful fireworks display arranged specifically for the IUPS attendees.

In the six-day meeting, the IUPS Congress had over 3,000 abstracts and 5,600 registrants, which were approximately 37% of the numbers for the conjoint meeting of IUPS and EB. Therefore, the representation was nicely balanced, rather than what was feared as a possible lopsided meeting. As reported in Walter's article, the program consisted of symposia, special lectures, featured topics, and poster sessions. A unique aspect of the scientific program of this Congress was its organization along 15 thematic tracks highlighting the frontier areas in physiology. Each track was composed of a series of sessions that followed a progression from genomes to functions, in accordance with the theme of the Congress. Before and after the Congress, there were 11 satellite symposia, and most of these have reports in this issue written by the organizers. The conjoint meeting attracted a large exhibit program. All of these together provided a collection of scientific programs rich in content and excellent in quality, allowing the Congress to achieve its goal of bring together physiologists from around the world to converge in a single place to exchange novel knowledge and make/renew acquaintances. As Peter Brown from Manchester, UK, said in his reflection that has been reprinted from the Physiology News in this collection of Congress articles, "Any fears that IUPS would be swamped by Experimental Biology/FASEB failed to materialize. If anything, IUPS seemed to be swamping EB!" Ewald said, "The concerns have turned to excitement at the end. It was a good congress in the best tradition of the IUPS Congresses. The science was at the forefront, on the cutting edge of physiological research, and it had the broad international representation we expected. I still believe there is a place for IUPS and its scientific meetings in this world. Perhaps they can contribute to peace and to fair understanding between the peoples."

During the 34th IUPS Congress at Christchurch, NZ, there was a vocal group of animal activists protesting at the meeting site, making some of the participants uncomfortable walking in and out of the Congress site. In mid February 2005, a web site of animal activists in California sent an electronic message calling attention to California Activists that "A Huge Vivisection Conference Is Coming to San Diego" and asking them to "Join San Diego Animal Advocates to Protest March 31-April 5, 2005." The message called for a number of activities, including a "Massive protest on Sunday, April 3." In anticipation of a possible repeat or escalation of the demonstrative activities at Christchurch, a IUPS media response team was formed with the help of Marty Frank and APS Public Affairs Officer Alice Ra'anan. The team would serve as spokespersons for the Congress, and they were provided with relevant information and documents. During the Congress, however, there were only about 30 people there on April 3 giving a rather silent protest, with some acting of "mad scientists." To their credit, these activists did not cause any disturbance or disruption of the meeting.

All good things must come to an end. On April 5, 2005, the 35th Congress held its Closing Ceremony at the Copley Symphony Hall, and it was as glorious as the Opening. On behalf of IUPS, Allen thanked the host country for providing the international community of physiologists with an outstanding scientific meeting and social activities to promote interactions between colleagues from around the world. I expressed my appreciation for the support provided by the IUPS and international community and for the opportunity given to the US to host the Congress once again. After my passing of the IUPS flag to Akimichi Kaneko to symbolize the transition of the IUPS Congress to Japan in 2009, Aki congratulated the US on an outstanding meeting and invited the world physiologists to the 2009 Congress in Kyoto, Japan. At the end of this memorable Closing Ceremony, Marty introduced the world premiere of the wonderful symphony suite written by our outstanding APS colleague Hector Rasgado-Flore entitled "Body Notes," which was played beautifully by the San Diego Chamber Orchestra and won thunderous applause from the Congress participants in audience. What a great way to end this unbelievable week! This marvelous Congress will be remembered for years or even centuries to come.

In summary, with the team of International and American Physiological Committees working together and with the participation of thousands of physiological scientists worldwide, we did collectively "bring the fragile boat of IUPS to its safe haven in San Diego," as stated by Denis Noble (this collection of Congress articles). Although the road to this wonderful and terrific Congress was winding and tortuous, and at times the Congress in San Diego seemed like an impossible dream, it is the cooperative endeavor and mutual trust of everyone involved in this great international physiology community that finally won out and made it work. The more difficult and challenging the situation is, the sweeter and more satisfying is the consummation of the task. Everyone is happy that the 35th Congress ended on a high note, and I believe its success has started a new beginning or a renaissance for IUPS. A decade ago, I wrote a report with members of the APS Long Range Committee on the future of APS and Physiology with a title of, "The sun breaks through the clouds: A bright future for physiology" (*The Physiologist* 39:375-388, 1996). I think this also applies very well to IUPS and International Physiology. By putting the emphasis on "From Genomes to Functions", the discipline of physiology will again take the center stage in biomedical sciences in our efforts to enhance the health and wellbeing of humankind. ❖

Bringing the XXXV IUPS Congress to Fruition: Role of the Liaisons

**Virginia Huxley, University of Missouri School of Medicine,
Chair US National Committee, IUPS**

Mine is the tale of the mortar between the bricks. In writing this, I realize that it is a tale of the nebulous world of those who liaise between societies and organizations that are the recognizable "bricks." The reason I can relate my tale is that I happened to become the chair of the official group that extended the invitation to hold the hold the 35th IUPS congress in the United States in San Diego in conjunction with EB 2005. The task for me actually began back in 1986 when as a junior faculty person attending her first IUPS meeting in Vancouver, Canada I was invited to participate as a member of the then IUPS Commission on Microcirculation by Professors Christen Crone of Denmark, Peter Gaehtgens of then West Germany, and Eugene Renkin of the US. Through Gaehtgens' work that group met frequently at EB, and Microcirculatory functions throughout the world in conjunction with World Congresses, and regional or national meetings. It was an introduction into the world of people with like passions meeting about the apparently mundane matters of sharing information between societies and organizing future gathers from afar. Having learned several of the acronyms for societies, government agencies, universities, and other nefarious groups, I was asked by the Microcirculatory Society to act in their stead as a member of the United States National Committee to the International Union of Physiological Sciences (USNC/IUPS). This group, under the auspices of the US National Academies of Sciences, represents the community of Physiological Sciences in the United States to the parent international organization, the IUPS, and serves as a national liaison committee. The community of physiological sciences ("the US bricks") consists of The American Physiological Society (APS), The Society for Neuroscience (SFN), The Biomedical Engineering Society (BMES), The Society for Comparative & Integrative Biology (SCIB), The Society for General Physiologists (SGP), and The Microcirculatory Society (MCS). They are represented by the President-elect, President, and Past-President of the APS, two members of SFN, a single member from BMES, SCIB, SGP, and MCS, respectively, and two at-large members. IUPS officers residing in the US, the Executive Director of the APS and others deemed helpful to the mission of the USNC (read: Professors Shu Chien and Stan Schultz as Chair and Chair-emeritus of the National Organizing Committee for the 2005 meeting). To facilitate transfer of information between the groups, the USNC/IUPS generally meets twice a year, once with EB and once again in the fall at the US National Academy.

With respect to the 2005 meeting, my role represents a journey begun by Stanley Schultz and the US delegation to the 33rd IUPS congress in St. Petersburg, Russia where he presented the invitation on behalf of the US National Academies for the IUPS to hold the XXXV IUPS Congress in the United States. My task was to shepherd this invitation to Christchurch to the delegates of the XXXIV Congress in 2001 on behalf of the USNC. In the interval between St. Petersburg and

Table 1: 1998-2005 USNC/IUPS Membership.

IUPS Congress	**St. Petersburg (1997)**			**Christchurch**				**San Diego**
Year	1998	1999	2000	2001	2002	2003	2004	2005
Chair	Schultz	Huxley	Huxley	Huxley	Huxley	Huxley	Huxley	Huxley
Vice Chair	Huxley	Cowley	Cowley	Cowley	Cowley	Cowley	Cowley	Cowley
APS	Schafer	Boron	Boron	Boron	Horwitz	Horwitz	Horwitz	Eaton
APS	Cowley	Cowley	DiBona	DiBona	DiBona	Williams	Williams	Willams
APS	Navar	Navar	Navar	Hall	Hall	Hall	Granger	Granger
SNS		Humphrey	Humphrey	Houk	Houk	Houk	Houk	Houk
SNS	Spitzer	Spitzer	Spitzer	Spitzer	Landmesser	Landmesser	Landmesser	Landmesser
BMES	Shoukas	Shoukas	Shoukas	Shoukas	Greene	Greene	Greene	Greene
SGP	Oxford	Oxford	Oxford	De Weer	De Weer	De Weer	De Weer	De Weer
SICB	Terwilliger	Terwilliger	Terwilliger	Terwilliger	Burnett	Burnett	Burnett	Burnett
MCS	Huxley	Huxley	Sarelius	Sarelius	Sarelius	Sarelius	Sarelius	Sarelius
At-Large	Sarelius	Sarelius	Popel	Popel	Popel	Popel	Popel	Popel
At-Large	Knobil	Knobil	Knobil	Rasgado-Flores	Rasgado-Flores	Rasgado-Flores	Rasgado-Flores	
IUPS Officer	Chien	Chien	Chien	Chien	Neill	Neill	Neill	Neill
IUPS Officer				Cowley	Cowley	Cowley	Cowley	Cowley
Ex officio		Schultz	Schultz	Schultz	Schultz	Schultz	Schultz	Schultz
Ex officio					Chien	Chien	Chien	Chjen
NAS staff	Schoen	Schoen	Turner	White	Sheahan	Sheahan	Sheahan	Sheahan

Christchurch, the members of the USNC worked with the IUPS to review how congresses were run, how sites were chosen, how congresses were financed; we examined with our member societies whether there was still a place for large international meetings and how the science we conduct is shared. In Christchurch, we presented a proposal which was a culmination of this review and a departure from past history: leaving the format of the traditional "stand alone" meeting to one that intersected with disciplines related closely to physiological sciences, while still maintaining the identity of IUPS Congress. The US National Committee believed that the goal of IUPS, namely to promote the science of physiology in the changing arena of the 21st century, would be advanced significantly through endorsement of the proposal. Our further goal was that the attendees benefit from access to the industrial exhibits, as well as an array of results from life sciences hitherto not available at IUPS congresses. With great concern the delegates ratified the notion of having the XXXV IUPS Congress commence in advance of and then concurrently with EB 2005.

At the start of the 20th century, physiology was the principle basic biomedical science. Over the century, it spawned disciplines whose US members joined with the American Physiological Society to participate in EB 2005, including American Society for Biochemistry and Molecular Biology, the American Society for Pharmacology and Experimental Therapeutics, the American Society for Investigative Pathology, the American Society for Nutritional Sciences, American Association of Anatomists, and the American Association of Immunologists. While the discipline of physiology was giving rise to the other experimental biology disciplines, the focus of the biomedical sciences was becoming more and more reductionist. With the completion of the various genome projects the focus has shifted back to the vital skills of the physiologist at examining and understanding function. The theme of 2005 was indeed "From Genomes to Functions" and the meeting format highlighted our internationally based skills before a large audience that is becoming aware of the translation of genetic message to whole organ function but without the physiologist's perspective or skills. Thus, at Christchurch we argued that the proposed changes would enhance, rather than diminish, the identity of physiology and IUPS.

In the interval between meetings in Christchurch and San Diego, the tasks of the USNC/IUPS focused on the formation of the NOC, chaired by Chien, and the actual task of hosting a meeting. The other articles highlight the roles played by those participants. The USNC/IUPS remained in touch with our home societies soliciting information, funds, emotional and intellectual support; we coordinated with the National Academies and their contacts within the State Department to aid in the issuing of visas; we reviewed the proposals for travel funds within the United States and from the International community of scientists. Through it all, I doubt that even the people in my laboratory, no less outside of the hierarchy of the APS and the International Affairs office of the National Academies, would know who is a member of the USNC/IUPS, no less what it does! Therefore, I have tried to reconstruct a roster of its members who were with me at every step along the way in Table 1.

My tasks ended at the meeting in San Diego where I had the opportunity to thank the attendees for accepting our invitation on behalf of the societies, to what was a unique interdisciplinary meeting with the opportunity to integrate basic sciences with translational research where we focused on physiological sciences moving from genomes to functions. Once my tasks were done, I personally enjoyed the meeting and its science and look forward to the 2009 XXXVI IUPS Congress in Kyoto, Japan. To the young members of the societies, if you are asked to serve on a liaison committee, its success or failure depends on your personal passion for your discipline, so if you have it, please take on the role of mortar between the bricks. ❖

Peter Agre, Allen Cowley, D. Neil Granger, and Virginia Huxley listen as Shu Chien addresses the Congress participants at the Opening Ceremony.

The Physiologist
Vol. 49, No. 1, 2006

Reflections on Planning the Program for the 2005 IUPS Congress

Walter F. Boron, Yale University, New Haven, CT
Chair, US Scientific Program Committee
Chair, International Scientific Program Committee

The 2005 Congress is now, thankfully, in my rear-view mirror. But before the Congress fades completely from view, Shu Chien—the Chair of the National Organizing Committee (NOC)—has asked me to share my thoughts on the scientific program for the meeting.

My first involvement with the 2005 Congress came in 1998 when, as President-Elect of the American Physiological Society, I became one of the three APS representatives on the US National Committee of the IUPS (USNC/IUPS). This group, which is the interface between the International Union of Physiological Sciences (IUPS) and the major American physiological organizations, had recently learned that it had received the bid to host the 2005 IUPS Congress. In 2000, the USNC/IUPS appointed a group of individuals, including me, to the newly formed NOC, and charged us with the multifaceted task of making local arrangements for the 2005 Congress. To me, the NOC assigned the job of chairing the US Scientific Programming Committee (USSPC), which would take the initiative in developing the scientific program for the Congress and play a key role in the execution of this program. According to the bylaws of the IUPS, the ultimate responsibility for developing the program would lie in the hands of the International Scientific Programming Committee (ISPC), which is appointed by the IUPS Council. The ISPC consists of the chairs of the IUPS Commissions as well as six representatives from the USSPC. As it turned out, in 2002 the IUPS Council, with Allen Cowley as President, appointed me chair of the ISPC as well, with Ole Peterson (Secretary General of the IUPS) as co-chair. Although it is impossible to perform the control experiment, I believe that the dual leadership role made it possible for me to do my job more effectively.

2001

The big switch. The original proposal to the IUPS called for the US to host the 2005 Congress in Washington, DC—in the heat of summer. In the spring of 2001, before the 2001 Congress in Christchurch, the Council of the APS, which would largely be responsible for funding the 2005 Congress, suggested that the 2005 IUPS Congress be moved to occupy the niche normally occupied by the APS at the annual EB Meeting, which in 2005 was scheduled to be held in San Diego. The rationale behind this shift was to minimize the odds that the 2005 Congress would be a major financial drain on the APS. There is no doubt that the proposal was bold and innovative. However, it was also controversial. The IUPS rightfully worried that it might lose its identity at an APS-style meeting. On the other hand, many in the APS were concerned because, in 2005, they would not have an annual meeting as such.

Once the IUPS approved the move to San Diego, the job of chairing of the USSPC became more complicated. From the outset, I had three goals for the scientific program: quality, quality, and quality. Because I had *carte blanche* in choosing the members of the USSPC, I was confident that my colleagues could assemble an exciting program. But could we sell this program to an ISPC with legitimate concerns about identity? And could we sell this program to APS Sections with legitimate concerns about losing their 2005 meeting? In fact, I actually had two jobs: *1*) producing a high-quality program and *2*) building trust between the IUPS and the APS Sections. The first would not be possible without the second. Thus, a major goal for me was to communicate with both groups and eventually to establish close and cordial communications between the two groups. It was my hope that we could blur the turf sufficiently that those with a stake in the 2005 Congress—the IUPS Council, the ISPC, the USSPC, and the APS Sections (whose meeting was being supplanted)—would forget which hat they were wearing and instead work together with each other to produce a successful scientific program. In the end, it worked nicely.

The APS Sections. Beginning in December 2001, I began a series of regular meetings with the APS Section Advisory Committee (SAC, which includes the chairs of each of the APS Sections), and with the APS Joint Programming Committee (JPC, which includes the programming representatives of each of the Sections). At the first meetings, I explained the mechanics of the programming process and the interaction of the USSPC with the ISPC. I also emphasized that the 2005 Congress was their opportunity to play host to their international colleagues, and that I hoped that traditional functions at the APS annual meeting (e.g., Section Dinners, Distinguished Lectures, Student Awards) would not only be retained but expanded to include international participation. Although the APS Sections had no formal standing with the IUPS, I urged them to get involved early in making suggestions for generating the scientific program within the official NOC/IUPS structure. I also pointed out that several APS representatives would be among the members of the USSPC, and at that first meeting announced the first such representative—Curt Sigmund, the incoming chair of the JPC. Finally, we agreed that it would be advantageous bringing together, as soon as possible, the IUPS Commission representatives and their counterparts in the APS Sections—establishing IUPS-APS communications. Although some misgivings remained, SAC and the JPC generally came out of those December 2001 meetings with a very positive attitude toward the 2005 Congress.

2002

I was fortunate to be able to recruit a small group of extremely talented scientists, with interests covering a wide range of physiological subdisciplines, to form the USSPC (Table 1). A small subgroup would meet at the Lansdowne in January 2003 (see below) to forge the overarching philosophy of the meeting and also serve on the ISPC, thereby serving as a vital link between the USSPC and the ISPC. Because many in the subgroup had been colleagues of mine on the Editorial Board of *Physiological Reviews*, I reasoned that a healthy esprit de corps would develop quickly and that the group would work well with each other.

In 2002 a call went out to all national physiological organizations around the

world, inviting them or their members to make specific suggestions for the scientific programming.

The APS Council. In April and again in November 2002, Shu Chien and I met with the APS Council to discuss our progress in developing the program

The APS Sections. In December 2002, I met again with the SAC and JPC.

2003

The Lansdowne Group. The small USSPC group met in January of 2003 in Lansdowne, MD. First, we decided that, in terms of meeting format (e.g., times and lengths of sessions, protected times for posters), the 2005 Congress would run like the APS portion of a typical EB meeting. The programming elements would be **symposia** (four 30-minute lecture slots), **featured topics** (one or two 30-minute lecture slots plus 10-minute presentations chosen from among the submitted abstracts), **lectures**, and **posters**. Our philosophy was that because we had only one chance to organize the meeting, we would use the program format that the APS had successfully honed over the preceding several years. Moreover, Martin Frank agreed that Linda Allen and her APS programming staff would provide the administrative support for the 2005 Congress. Without this able support, the scientific program would never have evolved as successfully as it did. We all owe a great deal of gratitude to Dr. Frank and Ms. Allen.

The USSPC Lansdowne group also decided to build the 2005 Congress around a number of **tracks**, each of which would revolve around an exciting area of physiology. A track would comprise a series of related sessions that would take the attendees on a journey that examined the scientific problem at the level of the proteins, comparative genomics, genetic manipulations, diseases, modulation or adaptation, integration at the level of the organ or whole animal, and environmental interactions. Because not all the important topics would neatly fall into a track, we estimated that perhaps 40% of the program would consist of **free-standing sessions** that were independent of the tracks.

In terms of meeting content, the USSPC Lansdowne group put considerable effort into identifying some of the most exciting areas of physiology—or that should be physiology. In addition, it generated the first iteration of a "wish list" of potential speakers for the Congress.

San Diego—The IUPS Council. In San Diego, just before the official start of EB 2003, Shu Chien, Curt Sigmund, and I met with the IUPS Council. We reassured them that the IUPS would play its proper role in organizing the scientific program for the 2005 Congress. Privately, I was counting on the blossoming of interpersonal relationships.

San Diego—The Mega-meeting. Also at the EB meeting, the ISPC (Table 2) met by itself, the USSPC met by itself, and then both groups met jointly with the IUPS Council and JPC attending as guests … perhaps 100 people in a small ballroom. It was at this joint meeting, I believe, that all parties—finally meeting face to face—established a camaraderie, took off their political hats, and began working with a single, unified purpose. Breakout groups—each consisting of ISPC, USSPC, and JPC working together members—initiated the long process of developing specific programming ideas for individual physiological disciplines. Personal relationships continued to develop as ISPC and IUPS Council members interacted with USSPC and APS members throughout EB 2003, both at scientific sessions and at Section meetings and dinners. The lines of communication were established, relations were most friendly, and at this point I was confident that we would succeed in putting together an excellent meeting.

One of the particularly refreshing aspects of the Mega-meeting was how the group decided to handle **special lectures**. The APS Sections sponsor 12 Distinguished Lectures each year, and the Society sponsors a few more, including the prestigious Cannon Lecture. The IUPS and some of its Commissions also have a tradition of sponsoring lectures, including the prestigious Fenn Lecture, at IUPS Congresses. Inasmuch as this was an IUPS Congress we were planning, the IUPS could have insisted that the APS lectures be dropped. Rather, the group decided to enrich the meeting by staging *all* but one of the APS and IUPS lectures. The lone exception revolved around August Krogh, after whom *both* the APS and IUPS had named lectures! The relevant parties decided to have a single joint Krogh lecture. For all

Table 1. Scientific Program Committee Members.

US Scientific Program Committee Members

David Altshuler
Massachusetts General Hospital, Boston
Christine Baylis
University of Florida, Gainesville
Hannah Carey
University of Wisconsin, Madison
Sue Duckles
University of California, Irvine
Brian Duling
University of Virginia, Charlottesville
Jack Feldman
Massachusetts General Hospital, Boston
Usha Raj
University of California, Los Angeles
Christine Seidman
Harvard Medical School, Boston
H. Lee Sweeney
University of Pennsylvania, Philadelphia
Ronald Terjung
Massachusetts General Hospital, Boston
David Wasserman
Vanderbilt University, Nashville

US Scientific Program Committee and the International Program Committee Joint Members

Barbara Block
Stanford University, Pacific Grove
William Chin
Eli Lilly, Indianapolis, IN
David Clapham
Harvard Medical School, Boston
Richard Lifton
Yale University School of Medicine, New Haven
Roger Nicoll
University of California, San Francisco
Curt Sigmund
University of Iowa, Iowa City
Jo Rae Wright
Duke University, Durham

of the APS Distinguished Lectures, the group decided that the lecturers would be chosen jointly by APS Sections (who would make several nominations) and their IUPS counterparts. The ISPC would make the final decisions. This process worked very smoothly.

The role of the JPC. At EB 2003, and refined at other meetings, we agreed that the JPC would play three crucial roles. First, like others worldwide, the JPC and the APS Sections that they represented would have the opportunity to make suggestions of specific scientific sessions for the 2005 Congress. The deadline for submission of these ideas would be in the late spring of 2003. Second, after these ideas had been submitted, the JPC would organize and evaluate the ideas at their annual June (2003) meeting in Bethesda. The results of their efforts, which formed the basis of much of the programming, were presented to the USSPC and the ISPC. Third, in June 2004, the JPC would "grid" the program elements, assigning each a room and a time. Finally, in December 2004, the JPC would assign the abstracts to sessions and, in consultation with the USSPC and ISPC, select from the abstracts the 10-minute presentations to be made as part of the Featured Topics.

The suggestions. Although the Mega-meeting in San Diego was a terrific start, we still did not have even the beginnings of a scientific program. In June 2003, the JPC, planned, organized and evaluated the programming suggestions that had come into the IUPS website from around the globe.

The Cluster Groups. I planned to convene a three-day meeting of the USSPC during the summer of 2003. Unfortunately, it was impossible to get even as many as half of this group together at one time, despite the expert help of Linda Allen. Therefore, rather than trying to hold a single, poorly attended meeting, we decided to hold a series of seven "Cluster" meetings—two in San Francisco, two in Chicago, two in Bethesda, and one in Boston—during the late summer and fall. The cluster groups consisted of members of the USSPC and—reaching out to the IUPS but still keeping costs under control—North American members of the ISPC. Each cluster group had, as the basis for its deliberations, a large binder that contained the suggestions that the JPC—with the skillful assistance of Ms. Allen—had so nicely organized as the result of their June meeting. However, the binder was only the beginning. At each meeting, the group began with a brainstorming session to produce a list of the hottest topics (e.g., feeding, fuel, and fat) in their particular subdiscipline (endocrinology and metabolism). The goal was to develop one or more themes around which we could build exciting track(s). In addition, we identified other important topics that would fall outside the tracks. At this stage in the planning, the groups were more interested in topics than particular speakers, although they identified a few *key* speakers. In some cases, the cluster group drew session suggestions from the binder. In others, the group merged two or even three suggestions to produce the session that it was looking for. In still other cases, the group generated sessions entirely de novo. In the end, each cluster group proposed more tracks and more free-standing sessions than we could afford to produce at the Congress. That would allow the ISPC to do some picking and choosing.

Lansdowne II: The IUPS Council & ISPC. In November, the IUPS Council and ISPC met in Lansdowne for three days to finalize the broad outline of the meeting. The most difficult job was to select the final tracks from a larger number, and to decide on the number of sessions per track. After much thought, the group reduced the number of tracks to less than ten. After second thoughts, the number ramped up to 15. The ISPC assigned one member of the ISPC, USSPC, or IUPS Council to act as the organizer for each track. With more or less six sessions per track and a limited number of Congress days and Congress meeting rooms, not to mention a non-infinite budget, the tracks put a squeeze on the number of free-standing sessions. Lansdowne II also finalized most of the special lecturers for the Congress. Of the 20 lecturers on the final program, 10 were international and at least two more had immigrated to the US.

2004

The LAX meeting. Even after Lansdowne II, our job was far from over. The tracks were set, and in some cases we had a clear idea of individual sessions. However, we needed to *1*) reduce the number of sessions in most tracks; *2*) finalize session titles; *3*) decide whether individual sessions would be produced as symposia or featured topics, *4*) select free-standing sessions (which had been

Table 2. International Scientific Program Committee Members.

International Scientific Program Committee Members	Committee Chaired
Ole H. Petersen University of Liverpool, U.K.	Vice Chair
Harold Atwood University of Toronto, Canada	Neural Control
Malcolm Gordon University of California, Los Angeles	Comparative
Peter Hunter University of Auckland, New Zealand	Physiome
Akimichi Kaneko Seijoh University, Japan	Senses
Jimmy Neill University of Alabama, Birmingham	Endocrinology
Denis Noble Oxford University, U.K.	Circulation
Edward M. Rubin Lawrence Berkeley National Lab, Berkeley	Genomics
Bengt Saltin Copenhagen Muscle Research Center, Denmark	Locomotion
Irene Schulz Universitat des Saarlandes, Germany	Secretion
Ann Sefton University of Sydney, Australia	Education
Yoshihisa Kurachi Osaka University Graduate Medical School, Japan	IUPS 2009 Representative

ignored for lack of time at Lansdowne II), and *5*) generate a list of speakers. These jobs were on the agenda of the final meeting of the USSPC, held at a hotel in the shadow of Los Angeles International Airport. We more or less completed items 1–4, although we continued to make adjustments for several months afterward.

The era of the Conference Call. With track organizers working independently, and in a seemingly endless series of conference calls, we gradually completed the work of adjusting the session titles and speakers, as well as inviting the speakers. The final program contained some sessions exactly as they appeared in the binder (i.e., as submitted by physiologists around the world), some sessions resulted from our combining two or more similar suggestions, some sessions came partly from the binder and partly from our own ideas, and some sessions that were entirely de novo. Those who submitted programming ideas—even if unrecognizable in the final program—should feel comforted that we examined them all, and that almost every one contributed something—either concrete or philosophical—to the final program.

Most of our work was completed by the end of April. However, minor changes continued for many months either because we had difficulty filling certain slots or because speakers reneged on their commitment. Some pessimistic colleagues—including one dear friend who occupies a particularly high position at the APS central office—had warned me that, because we had aimed so high in terms of speaker notoriety, we would experience a flood of "no-shows" at the Congress. This turned out *not* to be the case. To be sure, we had a few cancellations about a month before the meeting, and a few more last-minute cancellations due to illness. However, the attendance by the invited speakers was outstanding. I credit at least some of our success in this area to our outstanding USSPC—friends do not like to disappoint friends.

Our goal was to achieve a 50-50 ratio of American to International speakers, as well as a high ratio of female to male speakers. In the final analysis, we fell somewhat short of my goals on both counts, though not for lack of trying. I presume that it was because the Congress venue was far from both Europe and the Pacific Rim that we had a significantly lower success rate in convincing international invitees (vs. American invitees) to accept our invitations. We also had a lower success rate with female (vs. male) invitees.

The "gridding." In June, the JPC assigned the times and rooms for each of the Congress sessions, using an outsized checkerboard created and continuously updated by Linda Allen.

The abstracts and featured topics. In December, the JPC—in consultation with the ISPC and USSPC—programmed the abstracts and selected from the abstract submissions the speakers who would fill the 10-minute slots in the featured topics.

2005

In late 2004, we finalized the listing of the tracks and other sessions on the web, with the expert help of Linda Allen at the APS office. In the months leading up to the Congress, we also developed a "cross-linked program" that identified all sessions that might interest Congress-goers with particular interests. For example, we created a schedule of all sessions that dealt with hypoxia, and another for genomics, and so on—a total of 21 such groupings. In the weeks leading to the meeting, along with Martin Frank and Linda Allen, we made last-minute improvements in the signage, including the signage in the hallways and in front of the meeting rooms.

And then the Congress happened. After being so deeply involved in the program, I wanted to attend every session. But, alas, I could see only a tiny fraction of the exciting science that I had heard so much about in the many planning meetings. The success of the scientific program at the Congress is the fruits of the labors of a long list of people—especially those in Tables 1 and 2, but also the IUPS Council, the APS Council, SAC, and JPC—who worked tirelessly and, for the most part, anonymously. For me, it was an honor to work with them, and I am touched that they gave so freely of their precious time. To them I offer my sincerest thanks. In addition, the scientific program of the Congress owes it success to the staff of the APS, most especially Martin Frank and Linda Allen. To them I also extend my thanks. And next time you need someone to organize the scientific program of an IUPS Congress, I urge you to contact one of my younger colleagues!

Peter Agre, Fenn Lecturer and Walter F. Boron, Chair, International Scientific Program Committee.

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Hosting International Physiologists in San Diego

Frank L. Powell, University of California, San Diego

In January 2002 I was invited by Shu Chien, Chair of the NOC, to chair a Local Arrangements Committee (LAC) for the 35th IUPS Congress in San Diego. Specific charges in that first request were to identify venues for the associated social events, potential financial supporters and homes in which foreign scientists could stay during the congress.

Fortunately, I was able to recruit an enthusiastic and committed group of individuals representing the huge breadth of research institutions in San Diego. Kim Barrett, my colleague from the Department of Medicine at UC San Diego provided the APS Council's point of view. Kurt Benirschke represented not only UC San Diego, where he is a Professor of Pathology, but the "world famous San Diego Zoo," which is affiliated with the Center for Reproduction of Endangered Species. Floyd Bloom represented The Scripps Research Institute, which is the other institution awarding PhD degrees in biomedical sciences in San Diego. Stephen Flaim, formerly with Alliance Pharmaceuticals and now affiliated with the Bioengineering program at UC San Diego, provided us with additional insights to the local biotech and pharmaceutical industries. Fred (Rusty) Gage represented the Salk Institute and was a liaison to the Society for Neuroscience, which contributed to the IUPS Congress. Mary Sue Lowery represented the University of San Diego, which is growing a strong program in comparative physiology. Jeff Graham represented the Scripps Institution of Oceanography and Birch Aquarium at UC San Diego. Last but not least, my colleagues Peter Wagner and John West were extremely helpful. John knows the history of IUPS, having attended every congress since his first in Leiden in 1962, and Peter's very recent experience with the American Thoracic Society in planning their own international congress in San Diego in 2005 was invaluable.

The LAC met several times, including meetings with Marty Frank and Linda Allen during their trips to San Diego to finalize arrangements with the convention center, hotels, concert halls and other venues. Marty and Linda took our ideas and translated them into actions. With all of their experience organizing meetings in San Diego, they could have organized an outstanding program without a local committee and certainly everything we achieved depended upon their fine efforts. It quickly became clear that this IUPS Congress would differ from those we had attended in the past because of the affiliation with the Experimental Biology meeting. Not only did this provide an extremely strong scientific program, but it also provided access to the event planning expertise in the FASEB Office of Scientific Meetings. Given the history of EB meetings in San Diego, this made our job very easy—and made us very respectful of the hard work that previous hosts put into successful IUPS Congresses.

The Fundraising Committee for the NOC also made things easier for the LAC. We provided them with some names and contacts but we did not make any direct solicitations. Through the generosity of donors and APS members, there was a well-funded scholarship program to support visiting scientists from poorer countries. This eased the burden on the LAC to find housing and the Congress relied primarily on the FASEB housing office for all participants.

Thinking of ways to show off our home town was both energizing and satisfying. The LAC had lots of good ideas, some of which made it into the program and others that remain possibilities for future meetings. On March 30, in the evening before the start of the official program, Shu Chien and his wife K.C. organized a dinner party at their house for the IUPS Council, the Chairs of Commissions and Program Committees and the NOC. This provided a wonderful beginning to a week of renewing and making new friendships with colleagues from around the world. People who had collaborated by Email on special events for the Congress finally got to meet and shake hands. All of the hard preparatory work had been done. The atmosphere at the party was filled with both excitement and relief as everyone anticipated the opening of the Congress the next day.

Trying to match the cultural aspects of opening ceremonies from previous Congresses became a particular challenge, given the "melting pot" nature and huge diversity of the USA. The solution was in the musical choice for the reception after the opening remarks—jazz, which has it roots in America but is appreciated and continues to evolve around the world. At the other end of the program, we had many creative ideas for a closing ceremony as well. Probably the most fun was Marty's proposal involving a killer whale at Sea World. The orca would take the IUPS flag from Shu Chien, as chair of the USA NOC, swim a lap and then deliver it to the chair of the Japanese NOC! However, reason, and music, saved the day again and the Congress was closed with the premier performance of the symphony "Body Notes.".

Between these events, the LAC had a hand in many other scientific and social events. There were Satellite Symposia and Section functions at local institutions. Local contacts and knowledge even helped with the musical entertainment at the Friday night Beach Party. The fabulous "Mar Dels," who had people dancing to their collection of 50's to 70's rock and roll, includes the lead singer who is a former administrative assistant in the UC San Diego Physiology Division! Finally, everyone on the LAC became more familiar with our local dining and entertainment options as we scouted locations for different requests.

One idea that did not make the program, but is definitely worth considering for the future was a "Biotech Beach Tour." This was to be an auxiliary activity to showcase San Diego as one of the three largest clusters of biotech companies in the USA. It could be run by a university extension program or one of the professional companies that organizes other tours but it would be guided by a professional who speaks "our" language. Several local university professors have started successful companies and they could provide valuable insights to younger scientists trying to decide on career goals. We also anticipated the enthusiastic participation of the local biotech and pharmaceutical companies to show case their laboratories with tours. Some of the local research institutions are famous for their architecture alone, such as the original buildings at Salk, the lecture/concert hall at the Institute for Neuroscience and the central library at UC San Diego. Although this would be a city tour developed for scientists, it would probably be popular with a segment of the general public too.

It was an honor for all of the LAC to contribute to this IUPS Congress. After this experience, I know we will have even more appreciation for the special programs and touches we look forward to enjoying at future IUPS Congresses. ❖

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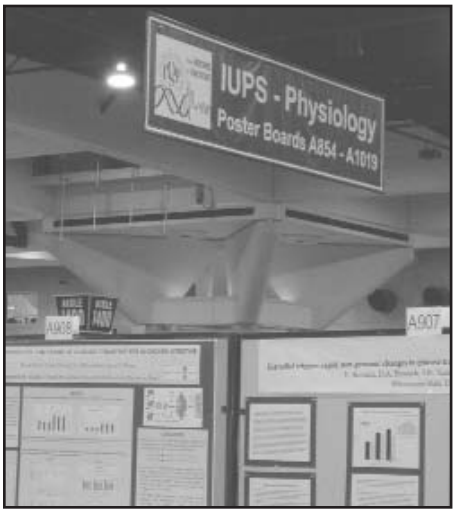
Lessons From the Home of the Buckeyes

Helen J. Cooke
Ohio State University
Member of the IUPS National Organizing Committee 2005

I was honored to be a member of the National Organizing Committee for the IUPS Meeting held in San Diego, 2005. We had approximately five years to discuss submitted plans for this meeting. Our major tasks were to review a vast array of reports of hard working committees necessary in planning a meeting the size of IUPS with its many constituencies, to oversee the development of the scientific programs and to have input on the social activities that would accompany the scientific sessions. I believe the committee did an outstanding job in overseeing all aspects of this meeting.

The IUPS was five years in the making and a wonderful program resulted from the many planning sessions by several levels of scientific programming committees. My thoughts and memories of the IUPS meeting (which are fading fast) are centered around scientific programming. No matter how far in advance we plan, there are always unpredictable changes in the scientific program by virtue of unanticipated emergencies or other circumstances that result in speakers, who had previously committed to attending the meeting and presenting, are suddenly drawn away.



While this is inevitable in any meeting of this size, my memories were of panic when I discovered that three of the four speakers in one of the symposia on the topic of my interest had medical emergencies or other unforeseen problems to tend to and would not be able to make the meeting. A colleague of mine who organized the symposium called me for "help" and with relatively short notice, I agreed to step in and give one of the talks. With his help we were able to identify two substitute speakers and a substitute chair of the session. The symposium went on as scheduled with only one of the chosen speakers, and with three new speakers and a new chair. The speakers did a superb job of pinch-hitting and the morning was saved. My stress levels were 10 on a score of 10.

In talking to other participants of the IUPS meeting, I learned of a situation that occurred in another section. In this case, a symposium that was sponsored by one of the sections turned out to have the original organizer, but the rest of the scientific session was stacked entirely with the organizer, a spouse who worked in the lab and current or past trainees all working in the same laboratory. This

was not what was originally proposed although the audience may not have recognized this.

Maybe there are lessons to be learned from being showered every weekend in the autumn with Ohio State University Football. The "Buckeyes" cannot predict when a player will be injured, but you can bet that in the event that happens, football Coach Jim Tressel has a game plan with a substitute.

For certain, you can predict there will be "no shows" at meetings, but you cannot predict where breaches in the scientific program will be. Some mechanism for identifying alternates for the speakers at the scientific planning sessions might be a good thing. That way, when the roster of speakers is approved they could also approve a potential list of alternates who might be contacted in the event speakers have dropped out. These people would be contacted only if drop outs occurred prior to the meeting. Several members of one of the scientific planning committees might serve as a subcommittee that would screen and approve the substitution when there was a cancellation.

Coach Tressel, faced with making a substitution for an injured player, might not agree to "passing the buck" to a subcommittee of his staff , but if speakers drop out the day of the meeting because of medical or other emergencies, then I would suggest the organizers of the meeting do what the "Buckeyes" do best – PUNT. ❖

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35th IUPS Congress—A Reminiscence

William H. Dantzler
University of Arizona

My first serious consideration of the 35th IUPS Congress began with my appointment to the National Organizing Committee (NOC) for the Congress. My first memories of the NOC meetings involve the choice of a theme and, with it, an appropriate logo. We all readily agreed that we wanted the theme to indicate the full range of physiology from molecular genetics to the most complex integrative studies. As I recall, the idea of "From Genomes to Functions" sprang from comments from several people (Marty Frank being prominent among them) and was readily accepted, although the discussion about whether "genomes" and "functions" should be plural or singular was quite lively. I've often thought that the chosen theme does not have a particularly melodious or memorable ring to it, but I've been unable to think of any other, more striking way of conveying the concept that everyone agreed on. In any case, it worked after all and I think that we all have tended to remember it. Agreeing on the logo took much longer and I remember several complex versions that were sent for everyone to review.

As we were just beginning to settle on the theme and logo, however, the question of the change in venue really took center stage for all of us. I remember very well when the concept was brought to our attention via email in the summer of 2000. I was in Germany doing research at the time and I tried out the idea of the change in venue on some of my colleagues. My most senior colleague, who would have to retire in 2004, was considering going to the Congress in 2005 as a last international meeting. He knows the US well and, whereas Washington, DC, would have drawn him, he felt that San Diego would not. He didn't attend. My other colleagues were indifferent to the exact venue in the US. Other factors were more important. Some attended; some didn't. I personally believed that it was important that we get a good attendance and I thought that the relationship with EB, with both the Congress and EB maintaining sufficient independence. could be worked out. As we all now know, it was and the venue worked beautifully.

Since I was not directly involved in the scientific programming (which turned out to be excellent), I remember most two non-scientific areas that provoked major NOC discussions. The first involved the very controversial idea of commissioning Hector Rasgado-Flores to write his symphonic suite, "Body Notes," for performance at the Closing Ceremony. I remember that I thought that it was an intriguing idea to have a talented composer, who was also a physiologist and APS member, write music dedicated to the beauty of physiology for the congress. It would certainly be a unique non-scientific contribution to the congress and would set it apart from any other. However, even with some preliminary excerpts, no one could say with certainty how good such a composition would be. And as the cost to perform the piece became obvious, many of us had second thoughts. If it hadn't been for Marty Frank's conviction that this would be a successful event, I don't think that the NOC would have approved it. As we all know, "Body Notes" exceeded our highest hopes and truly set the non-scientific aspects of this congress apart from all preceding Congresses. It will be hard to top and Marty really deserves plaudits for his faith in Hector and belief in the success of the performance.

The second non-scientific aspect that involved much discussion was the design of the medallion for the Congress. There were many divergent (often diametrically opposed) views on the design. Although Shu Chien guided this process and kept it moving forward, I recall that it was Ginger Huxley who suggested the pattern for the two figures on the obverse side of the medallion. In any case, we finally reached agreement on a design that came out very well (particularly in the silver version). In this process, I, for one, particularly enjoyed meeting with the engraver and discovering how medallions are created. It was a real bonus for our work on the committee.

I've dealt mainly with the run up to the congress and some deliberations of the NOC. I've also mentioned the success of the closing ceremony, which was truly memorable. What about the congress itself? There were, of course, numerous talks by scientists from many countries that would not have occurred at the usual EB meeting. I also learned a great deal from a satellite meeting in San Diego that would not have occurred without the congress. There was also a discussion with colleagues from abroad about possible collaborative work that took place only because the congress brought us together. In addition, because of the arrangement of the programming, I found myself interacting with a biomedical engineering colleague from my own university, whose poster suggested an area on which we might collaborate. We know each other well, but had not realized that specific aspects of our work might benefit from a collaborative effort. Finally, there were the interesting chance meetings, especially during the social events. I remember one discussion with a woman from New Zealand, a cell biologist who did not even consider herself a physiologist, during the "beach party." She only came to the congress because she was an invited speaker but said that she was learning a lot. I'm sure that there were many similar stories. ❖

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The Benefits of Supporting Young Investigators at International Conferences

Nora Terwilliger, University of Oregon, Charleston, OR; and
Lou Burnett, College of Charleston, Charleston, SC
IUPS 2005 National Organizing Committee, Society for Integrative and Comparative Physiology

We served on the National Organizing Committee for IUPS 2005. In response to a request from us, the Society for Integrative and Comparative Physiology (SICB) contributed $10,000 earmarked for one of the comparative physiology symposia and for travel support for young investigators. We are pleased to report that one of the people supported by the IUPS 2005 travel money is a young postdoctoral fellow from Buenos Aires, Argentina. She is very grateful for the opportunity that she was given to attend the meeting in San Diego, where she presented two posters on her research. During her poster presentations, she discussed her research with another young woman from Germany working on a similar project but in different species of fish. They have exchanged techniques and remain in contact about a potential collaboration. Another example of the benefits of encouraging our young scientists to participate in the IUPS Congress is a strong research collaboration now underway which was initiated at the San Diego meeting between a graduate student from Oregon and an assistant professor from the University of Florida. Although their individual studies are on organisms from very different habitats, the questions overlap. We look forward to hearing about the results. These contacts and collaborations will benefit all of the individuals, and travel funds from IUPS 2005 and SICB were the catalyst.

The symposium on "Functional Genomics of Macromolecular Damage Responses and Environmental Stress Adaptation" was one of the most broadly comparative symposia of IUPS. It was chaired by George Somero, director of the Hopkins Marine Station of Stanford University and a member of the National Academy of Sciences. The symposium focused on genomic and functional responses of organisms as diverse as yeasts, nematodes, and fishes. The symposium was a marvelous example of what we can learn from asking broad questions about basic functions, using an approach similar to that of August Krogh in which the different organisms serve as an experimental variable. ❖

IUPS Travel Award Program

The 35th IUPS Congress National Organizing Committee allocated funds for a travel award program to encourage the participation of young scientists in the Congress. The goal of the program was to provide travel grants to physiologists from developing countries, as well as women and under-represented minorities who were within 15 years of receiving their doctoral degrees. The IUPS received 413 applications for the travel award program and were able to make awards to 167 applicants. The awards ranged in amount from $1,500 to $500. Unfortunately, because of financial difficulties and visa problems, only 140 candidates were actually able to attend the Congress.

For those who were able to attend, their participation in the Congress was eye-opening and life changing. As noted by one award recipient, "The fruitful discussion with other participants gave us all new research ideas and new collaboration connections. The scientific sessions were simply excellent, bringing the frontier of science. The IUPS congress is one of the most important congresses I attend. I will start new projects and apply new grants based on the ideas I had in the congress. I also got some personal feedback from my presentation." Another award recipient commented "This experience of participation in the 35th IUPS Congress opened a new window for me. It helped me to get a new understanding of America and science. I got to know so many excellent scientists and what they were doing. At the same time I was moved by warm-hearted Americans."

After the Congress, award recipients were asked to complete a survey to help the National Organizing Committee to assess the value of the travel award program. Of the 119 respondents to a Post-Congress Travel Award Recipient Survey, 56 award recipients were graduate students and 37 received their doctoral degrees between 2000 and 2004. The respondents were asked how they would rate the 35th IUPS Congress, 87% or 104 rated the Congress as an 8 or higher (with 10 being best). While only 37% of the awardees combined their attendance at the Congress with a visit to a research laboratory or attendance at a satellite meeting, over 78% used the Congress as an opportunity to develop collaborative research projects with colleagues. Similarly, 70% used the Congress as a means of identifying opportunities to work in another laboratory.

Table 1. Distribution of IUPS Travel Applications and Awards.

	Applications	Awards
Africa	56	26
Latin America	36	18
Asian	135	53
Europe	104	44
Canada	16	5
United States	66	21
Total	413	167

As noted in Table 1, the largest group of applications came from the Asian/Oceanan region which includes India (31 applications), Pakistan (8 applications), China (29 applications), Japan (7 applications), and Australia (13 applications). From Europe, the participation was greatest from the United Kingdom (13 applications), Russia (14 applications), and Hungary (9 applications). From Africa, Nigerian physiologist submitted 26 applications and 9 were submitted by Egyptian scientists. Mexico (7 applications), Venezuela (6 applications), Brazil (10 applications) and Argentina (4 applications) contributed the most applications from Latin America. Overall, 40% of 413 award applicants received awards to attend the Congress. ❖

Travel Award Recipient Recounts IUPS Experience

Volodymyr and Olena Bogdanov
Taras Shevchenko Kyiv National University, Kyiv, Ukraine

Our participation in the International Union of Physiological Sciences and Experimental Biology in San Diego, CA, USA, March 31–April 5, 2005 meeting was possible because of the XXXV IUPS Congress Travel Grant Program, and an affiliate travel grant program of The Physiological Society of Great Britain. We want to express our deep gratitude for supporting both my wife and myself. We both won travel grants ($1,500 each), and used them for both travel (it was rather long–approximately 15 hours flight), and accommodations in San Diego during the Congress.

Unfortunately, the economics of our country is unable to cover travel expenses for young scientists, as we are, so grants were the only source of funding for our trip to the USA. The spirit of nobility has nearly started to become extinct among scientific professionals, and, as we were able to learn, our task is to bring the best experience from the most developed and powerful countries to support building a progressive and democratic society in the Ukraine.

Participation in the XXXV IUPS Congress brought us a number of benefits. First of all, we presented theses of our scientific work. It is of great importance for us to display our results and discuss them with scientists from the entire world during this type of meeting.

My poster was "Individual Typological Aspect Of Human Psychophysiological, Psychophysical, Psychological And Autonomic Functions." My studies have one principal aim—to improve the level of life by making deeper our understanding of the mechanisms underlying individual behavior properties. This meeting has brought to us a fresh view of our results and made us more critical in estimating the quality of our conclusions.

The conversations with both internationally known scientists and junior investigators were unexpected and highly stimulating. Discovering numerous mistakes in my speculations surprised me, but it was really useful for writing my PhD thesis. Also, I met some interesting, nice people and had discussions with them. They were: Virginia Huxley, Karen Sogaard, Bikash Medhi, Vladimir A. Golovko, Heidi L. Shafford, W. Michael Panneton, Dmitri Zaretsky, Wesley Miner, Manuhina Evgenia Borisovna; Fred Downey, H.D. Critchley. I collected copies of their scientific papers and planned to use them in my future studies.

My wife's poster was "Effect Of Various Drugs Administration On Signal Transduction Enzymes In Lymphoid Cells Under Conditions Of Different Pathological States Development." This problem is very interesting, and we hope that solving it will help us to know the mechanism of pathological function changes of molecules, which are closely linked to physiology of lymphoid tissue; this knowledge may be used in searching for prophylactic and healing methods. During her poster presentation, she met A. A. Gashev. We had a very interesting conversation and we keep in touch with Dr. Gashev to this day. We both met with Dmitriy Ostanin. We spent a great deal of time together and became good friends.

Lecture attendance brought us new knowledge in various areas and enlarged our scientific understanding of problems discussed.

The oral communications gave us new ideas, which we planned to use in our future work. We learned some new experimental approaches and hope they can be used in our studies. Especially, we want to share our impressions from several symposia, which were very interesting, knowledgeable and understandable. The following is a list: "Sex and Gender Differences in Pain and Analgesia," Chaired: Karen J. Berkley); "International Collaboration: Science Knows No Boundaries," Chaired: Melinda R. Dwinell and Francisco H. Andrade); "How Do Emotions and Motivations Interact with Autonomic Functions?" Chaired: Ruud M. Buijs;, and especially interesting for us was visiting NIH Grant Seminar Workshops: Grants (Part Two, Grant Writing for Success).

Sexual differences, locomotor, sensory and autonomic functions, as well as emotional features should also be getting consideration. Our simple measurements of reaction time, skin potential level, sensory thresholds should be enriched by such modern technologies as transcranial magnitostimulation with evoked potentials; FMRI, in addition to the most advanced, in our opinion, field of American science—scientific management. So we still have much to learn from our colleagues from APS.

Visiting exhibitions, we noticed some new methodological approaches and recent technical equipment in the field of biochemical analysis, electrophysiology and microscopy. We are encouraged to produce biochemical and behavioral investigations of stress reaction of laboratory animals, and their effect on the digestive system in our labs. It is clear, that we should develop a series of scientific projects in the specific mentioned direction that could be useful for our institution, as they have been for some American organizations. Only in such cases will our ideas be successfully realized.

With this experience, we have received an opportunity to see the sights of San Diego, a wonderful town of a wonderful country. Our housing was good and comfortable, with a friendly, international atmosphere. Sunny and delightful weather allowed us to see this nice cultural and harbor city with large streets, new impressive buildings, historical center and quay and, I believe, the world's best, the San Diego Zoo; we were breathing oceanic air of the Pacific Beach, that was really full of romance in the sunset. So attractive were the San Diego trolleys, not only clean and comfortable, but also providing exciting travel and a beautiful view of the harbor. Without exaggeration, your public transportation system commands respect.

I was impressed by the variety of Mexican cultural features, from picturesque red-tiled houses to authentic Mexican food that we tried for the first time in our lives. In the first day of our stay, it was really difficult to understand the terminology of all those "burritos," "tacos," and "tortillas."

We want to express our thanks to APS and IUPS for our participation in this interesting and cognitive meeting, especially to APS President, Neil Granger, APS Executive Director, Martin Frank, and Meetings Assistant, Sarah George who helped us. ❖

Martin Frank, Olena Bogdanov, Neil Granger, Volodymyr Bogdanov, Sarah George.

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Experience, Thought and Impact From Attendance at the XXXV IUPS Congress, San Diego, California, USA

Christopher Ladipo
University of Lagos
Lagos, Nigeria

Preamble

I am a graduate student and a junior faculty staff member at the College of Medicine, University of Lagos, Lagos, Nigeria. I was privileged to be one of the recipients of the XXXV International Union of Physiological Sciences Travel Award for a Congress which took place at San Diego from March 31-April 7, 2005. Also, I was lucky to secure a visa to attend the Congress. Hence, my expectation before the Congress was to make the best use of a rare opportunity. This is pertinent because the conference came at a time when I, like many other young researchers in developing countries, was yearning for exposure to new areas of interests in modern research and the techniques involved. This experience is necessary to be able to compete for slots in international journals. It was also an opportunity to be able to interact with other researchers, do a personal assessment, and plan for the future.

Impression

No doubt, much preparation went into the hosting of this Congress. This was evidenced by the apparent ease in which the organizers catered to thousands of participants at the event. Programs went on smoothly and on schedule, too. There were many activities going on at the same time, and for one to get the best out of all these, a daily guide was needed. Even with this, it is always a difficult task drawing up a guide because choices have to be made between two or more competing events.

The atmosphere was set right with the opening lecture and dinner. The lecture, which addressed the theme of the congress ("From Genomes to Functions"), was very educational and thought provoking. This lecture gave insights into what to expect during most of the symposia. The dinner was a memorable occasion, filled with lots of fun. There were nice meals, drinks and games, and a wonderful band that sang famous tracks from every part of the globe. A comic life-portrayal of participants by the San Diego Artists Association is a wonderful souvenir that depicts the fun of the day. Indeed, the dinner gave participants an enabling environment to interact with each other and exchange ideas. Even language differences were no barrier on that night and a breathtaking display of fireworks ended the day.

The role and participation of the City of San Diego is also commendable. Not only was a day declared in honor of the International Union of Physiological Sciences, every establishment and outlet made provisions to warmly welcome guests to the city for the event. It was a first hand experience of attributes that made San Diego and the whole of California one of the leading tourist locations of the world.

Programs Benefited From

The APS/FASEB had in place symposia on various fields, and researchers with meritorious findings were given the opportunities to present their works. Notable scientists presented oral reports; explanations and paradigms were given for new concepts, and perceptive views on various areas were provided. The posters of interest were visited, explanations to some unfamiliar concepts and methods were presented, and it was also an avenue of creating contacts for possible networking.

Pre- and post-symposia were organized during the congress to address focused issues. One of them was the IUPS Teaching Workshop at Pali Mountain which I attended. Issues bordering on Laboratory Resource Manual, Curriculum Planning and Design, Information Technology, and Issues in Classroom Teaching of Physiology were discussed. Distinguished teachers of physiology were in attendance, and it was a tremendous learning experience. This translated to a better personal development which will also be beneficial to my students. In addition, some instructional materials were given by APS to participants, especially those from developing countries.

There was a Placement Service (Career Center) provided at the San Diego Convention Center (the venue of the congress). This offered a unique opportunity for graduate students and young researchers to know about various opportunities available, and how they can prepare for and sustain a successful career. I attended some seminars on personal developmental issues and had my resume critiqued by an expert. Various scientific industries exhibited their new products; there were demonstrations on how they work, and some free sample software, journals, books, etc., were given to participants.

Lesson Learned/ Potential Impact of My Attendance:

I learned from my attendance at the conference that the focus is more on molecular or cellular mechanism of various concepts/mechanism of actions. However, there is the need to integrate these molecular studies with whole animal data, hence, the importance of animal research. Also the need for networking among scientists was stressed, and there is much effort in this direction.

There is a wide difference in the sophistication of research from the developed country and developing countries, especially Africa. This is mainly due to a lack of funds and equipment.

Most of the equipment on sale at the exhibition was way-out of the reach of most universities in my country. In fact, the price of some single equipment was more than the yearly budget of a college or university. My view of the situation is that this gap was created over a long period of educational neglect in developing countries. I also couldn't help but wonder where most of the equipment used in developed countries went to after they were replaced. Couldn't it be possible to get them to developing countries that are interested, even if they had to pay a small price? The world is not only a global village economically or politically, but also educationally. Developed countries have many restrictions on the use of laboratory animals; this is getting increasingly severe, while the obedience of basic guide and rule on care and usage of animals is required in developing countries. Definitely, there are many areas of possible networking between developing and developed countries. This will only be possible if discrepancy in research quality is not too much.

The use of information technology provides a very good opportunity for the developing country to close the gap and correct the deficiencies in the teaching methods due to funds or equipment. The restrictions placed on animal usage have led to the development of practical stimulators in place of animal experiments. Also, online tutorials (e.g., lectures, integrative and animation), provide access to up to date information on various concepts. My university now has a CD-ROM Committee (which I am a member), to tap into this. However, there is the need for educators/instructors to know where these instructional materials are available. Information technology if properly used, will provide a meeting point. In addition, there might be the need to gradually change curriculum to fit each particular situation.

I have acquired more knowledge about the field of physiology after the congress than I could have ever imagined. I am very grateful to APS for the Travel Grant and opportunity to present my research work at the congress. It has led to tremendous career development; my university has benefited from this, and my students are the better for it. ❖

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The XXXV IUPS Congress in San Diego: My Impressions

Andrei. A. Gruzdkov
I.P. Pavlov Institute of Physiology of the Russian Academy of Sciences (RAS)
St. Petersburg, Russia

The XXXV International Congress of Physiological Sciences in San Diego was the second congress which I attended. The first one had been eight years ago in St. Petersburg, but, I think, it is hardly reasonable to compare these meetings. Certainly, St. Petersburg is a very beautiful city with great intellectual potency, referred by many scientists as the so called "capitol" of Russian physiology. However, there were rather hard times in Russia in 1997, both politically and economically. That could not but reflect on the work of the XXXIII IUPS Congress. On the contrary, the organization of the IUPS congress in San Diego was, in my opinion, excellent in many respects.

It was a good idea, I think, to combine the EB 2005 and the IUPS Congresses and to rent the beautiful building, the San Diego Convention Center. This made it possible to locate all functions of the meetings (lectures, symposiums, featured topics, and poster sessions), in one place and to supply them with efficient, modern equipment.

I was deeply impressed by the hospitality of the organizing staff of the congress. Every question for help was readily answered. I felt I was welcomed, both in the congress, and in the USA.

First of all, I am thankful, of course, to the authorities of the IUPS Travel Award Program. The financial support, I received, made it possible for me to attend the congress. And I am thankful, also, to Sarah George, Meetings Assistant of the American Physiological Society. She helped me with my accommodations in San Diego which were rather comfortable and modestly priced. This was vital for me.

Surely, the most important part of the congress was the science. In October 2004, Professor Ronaldo P. Ferraris of (the New Jersey Medical School, Newark), having been informed about my previous published works, kindly proposed that I participate in the XXXV IUPS Congress and take part in the Featured Topic "The Nature of Intestinal Adaptations: Cellular Diversity and Versatility." This occurred to be a right choice for me and L. V. Gromova, my colleague and a co-author. We presented our report "Short-term Adaptation of the Gut to High Glucose Loads" as poster and oral presentations. In particular, we have shown that under normal conditions, the short-term of adaptation of glucose absorption in the small intestine is mainly achieved due to high efficiency of the glucose active transport (rather than the facilitated diffusion via GLUT2), and adequate regulation of gastrointestinal motility including "ileal brake" mechanism. It was very pleasant for us to see that some of our results and assumptions were in good agreement with the modern views presented by E. M. Wright (USA), in his excellent report "Glucose Sensors and Transporters in the Small Intestine." C. Cheeseman had reported very interesting data concerning dietary regulation of two novel facilitated glucose transporter proteins in the rat intestine. The other speakers on the Featured Topics (T.J. McWhorter, D.M. Casirola, M. Merit, and I. Sukhotnik), also introduced quite useful information about various aspects of intestinal adaptation.

It was very interesting for me to meet once again those physiologists whom I got to know in St. Petersburg eight years ago: C. Cheeseman (Canada), R.K. Buddington (USA), and J.M. Planas (Spain). This time we met during the Poster Session as old friends, and we had (especially with Cheeseman), rather long discussions. I am sure that these personal contacts will be useful in our future research, because the fresh information exchange is one of the important parts of scientific work.

Needless to say, I have unforgettable impressions from this beautiful place, San Diego, and, of course, from the Philharmonic Concert.

Unfortunately, only a few participants of the XXXV IUPS Congress arrived from Russia. The main reason, I think, is quite clear: a rather long distance. It was most valuable, that two representatives of the I.P. Pavlov Institute of Physiology RAS in St. Petersburg (Yu. P. Gerasimenko and myself), attended the Congress. We have brought with us to the Institute the CDs with the abstracts and other materials of the congress. And we reported to our colleagues our impressions of the congress.

Unforgettable was my brief visit to J.R. Pappenheimer in Cambridge on my way to San Diego. I got to know him ten years ago, when he responded to a letter with a reprint of our paper published in Doklady RAN in 1995. Since then, we have corresponded via letters and Emails and discussed many disputable problems of the membrane digestion and absorption of nutrients. Being 90 years old, he has preserved a splendid intellect, a vital interest in life (especially in science), and a good humor. It is my good luck to be acquainted with this outstanding scientist on the world scale. And I was happy to meet him. ❖

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An Unforgettable Experience From the IUPS Congress

Jianliang Zhang
Hong Kong Baptist University, Kowloon Tong, Hong Kong;
China Academy of Traditional Chinese Medicine, Beijing 100700, China

Thanks to the Travel Award from the American Physiological Society (APS), and the International Union of Physiological Sciences, I attended the 35th International Congress of Physiological Sciences, held in San Diego, California, USA, from March 31 to April 5, 2005. Prior to the general congress, I participated in the symposium on "Acupuncture Mechanism in the Treatment of Diseases," chaired by J. C. Longhurst, P. Li, and T. Lundeberg, of the University of California, Irvine. Though it was a short stay, I was rewarded much more than I had expected, and this, in turn, produced a strong impetus on both my current study and future undertakings.

The points which deeply impressed me are as follows:

Perfect organization. Unlike other large scale conferences I have attended before, one thing which was very special about this congress, at least in my opinion, was the joint organization with other guest societies. This keeps in harmony with the title of the Conference, "From Genomes to Functions," not in words but in actions. I have introduced, in detail, to my colleagues and administration officers in Hong Kong and Beijing about this unique format and aroused very good responses, which acknowledged the opportunities for interdisciplinary exchanges were the primary objectives, and not the objective to save resources.

Funds and posts. As we know, funds are crucial for all scholars to carry out their studies. How to get the financial support, however, is really a difficult achievement. Owning to the vivid and detailed introduction by APS lecturers, I acquired some techniques in applying for the grants. In addition, for young scholars, work posts and opportunities for further study are constantly welcomed. Fortunately, I grasped important information from the post board at the conference.

The acupuncture symposium made me understand the current status concerning the acupuncture mechanisms research worldwide, particularly from peers outside of China. I was especially impressed by the thorough and systematic studies by Longhurst's team on the central mechanisms underlying acupuncture treatment of cardiovascular diseases, such as acute myocardial ischemia, hypertension, etc. The prolong inhibition by electroacupuncture (EA) as they reported, an important phenomenon manifested in almost all acupuncture treatments, is an attractive problem waiting for further investigation. Since my PhD study is focusing on the acupuncture relieving epilepsy, I grew strongly interested in this topic, as both hypertension and epilepsy management are beneficial from the same or similar mechanism.

All in all, the US trip broadened my vision and enriched my knowledge related to research. Through this academic activity, I have established several international channels of communication with peers in other countries, and, this in turn, helps me keep abreast with what is new in science worldwide. ❖

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Science and Music; Music and Science; The Science of Music; The Music of Science (and the making of "Body Notes," a Symphonic Suite About Human Physiology).

Héctor Rasgado-Flores1, Marc S. Abel1, Maria Cristina Galvez Correa2, Cecilia Peña-Rasgado1 and Victor Rasgado3

1Rosalind Franklin University of Medicine and Science, IL

2Universidad de los Andes, Colombia.

3Center for Research and Musical Studies, Tlamatinime. Mexico D.F.

Prologue

Let's face it: we are immersed in a great mystery. Thus, the single most important purpose of our brain is to make understandable sense of the extreme complexities that constitute us and our universe. This is accomplished for three basic purposes: to adapt, to survive, and to grow. To fulfill these goals, our brain—via our senses—picks amongst the ever-changing myriad of information impinging upon us, analyzes only the essence that is pertinent, and manages it to make it appear stable and meaningful. With this information, it creates an image of ourselves and our surroundings which is artificial and limited, but sufficient to allow us to interact with each other and to modify our environment to better accomplish the aforementioned three basic purposes.

In this context, how does the apparent luxury of conducting science and making music fit with our brain's essential purposes?; and what are the possible relationships between these two seemingly very different human activities?

Discovery

Curiosity is an essential component of our survival, adaptation and growth, addressing our need to unveil the laws, the forces and the mechanisms that make everything happen. This information empowers us not only to understand, but to manipulate nature to better accomplish our goals. To rob nature of its many secrets, we first ask pertinent questions, propose likely answers (hypothesis), develop methodologies to test the predictions of the proposed hypothesis, and establish the best answer as the leading interpretation of the underpinnings of a particular phenomenon. This explanation remains valid until challenged by a newer better one. This process—the scientific method—is the best tool at our disposal to uncover the laws that govern us and our environment and to explain how everything works. Thus, the end goal of the scientific method is to discover.

Creativity

To catalyze the process of adaptation, survival and growth, our brains are also endowed with a supplemental but different capacity than our ability to discover: our power to create. Creativity plays a significant role in the discovery process during the generation of hypotheses, the design of experiments, and the invention of novel methodologies for testing the hypotheses, and for interpreting the experimental results. However, there are clear-cut differences between the processes of discovering and creating. Since the essence of discovering is to unveil either information or a mechanism ever present in nature waiting to be unveiled, it can be accomplished simultaneously by numerous individuals in different environments seeking to answer the same question and using either similar or different methodologies. In contrast, creativity is our capacity to generate a product that only an individual, as a result of his/her particular experiences, knowledge, sensitivity, and interpretation of life, can produce. A creation results from the irrepressible need that a creator has to produce a reflection of the assertion of being alive, relevant, and unique. The creative experience is enhanced when other humans engage the creative object, and their own feelings and life experiences resonate with those of the creators. This is often reflected, for example, during the improvisational moments of jazz performance. At those moments, the spectator becomes an accomplice of the creator and enriches his/her life with the experience of the creator as revealed by his/her creation. Thus, the same creative product cannot be generated simultaneously by different individuals; it is a personal and intimate assertion of the life of a creator. Dmitri Shostakovich's "Leningrad" symphony (1941) could only be created by him while serving as a fireman during the siege of Leningrad having lived 35 years, suffering his pains, experiencing his joys and anguishing through the second world war. Shostakovich, packs all this information in 85 minutes of symphonic music, and delivers it to us driven by an unstoppable need to ascertain his survival of a war and of life itself.

The Link Between Creativity and Survival

Since creativity results from the need of a creator to share with his/her fellow humans his/her assertion of being alive, it is no surprise that many of the most significant breakthroughs in creativity have been accomplished during serious personal crisis of the creators; they have been attained in situations under which their own existence has been threatened. A few examples follow:

The first modern novel, *Don Quixote de la Mancha*, introduces for the first time everyday speech to a literary context. It was written in a prison in La Mancha (1605) by Miguel de Cervantes after having experienced a thorny life which included losing in battle his left arm and being a slave of the Turks for five years.

Beethoven began breaking the rigid structures of the classical style of composition and started composing in new musical forms with novel harmonies as he learned that Napoleon betrayed the French Revolution by declaring himself emperor (1804) and as he began to confront his ever increasing deafness.

The traumatic experience of the premature death of his lover, Duchess Cayetana de Alba (1802), and the invasion of Spain by the Napoleonic army (1807) deeply affected the physical and mental health of Francisco de Goya. As a response, he began painting very dark images (Los Caprichos and Los desastres de la Guerra) and arguably became

the first impressionistic painter in history.

While being unjustly imprisoned in Peru, Cesar Vallejo wrote Trilce (1921), a book of poems which changed the course of poetry writing in the Spanish language. The poems break with the norms of depictions of time and grammatical structures and constituted a prelude to the surrealistic revolution.

An appalled and enraged Pablo Picasso revolutionized mural painting when he composed his masterpiece, *Guernica* (1937), a depiction of the first airplane-driven bombardment on a civilian population in history. He painted the mural when he learned that the Basque town of Guernica was destroyed by Nazi planes training for the Second World War with the blessing of Fascist General Francisco Franco.

In sum, some of the most intense expressions of creativity arise as a response, as a fight against set-backs, pain, anguish, death and dying. Creativity, therefore, is at its best, a defense mechanism by which our brain protects itself of losing its sensible and stable interpretation of our reality. It is an essential tool for conveying a sense and purpose for living, especially when our well being or survival is being threatened.

When Discovery Appears as Creativity

The object of science is to discover; the object of creativity is to share with our fellow humans the joy of enduring life. At the end, both processes share the same three basic goals mentioned above: adaptation, survival, and growth. Although both activities are in essence quite different, they are so closely intertwined that sometimes it is difficult to differentiate them. Three examples follow:

First. A few years ago, a bitter international fight arose between two Origami masters participating in an international competition working in different parts of the world. The dispute arose when they both presented to the jury exactly identical intricate paper structures. Investigation of claimed international espionage revealed that both masters attained the same structures while working completely independently. Thus, both masters simultaneously discovered the geometric arrangements necessary to make the same figure. Thus, origami production results from a discovery process.

Second. In the early 20th century, Pablo Picasso and his good friend Georges Braque realized that, independently and simultaneously, both arrived to an identical novel style of painting: Cubism, a style in which natural forms are reduced into geometrical shapes. Therefore, this style of painting is also the result of discovery.

"The object of science is to discover; the object of creativity is to share with our fellow humans the joy of enduring life."

Third, Anton Webern (1883-1945) discovered that the 12-tone method of music composition (see below) can be used to create sonic geometric patterns which can be appreciated by the brain as beautiful. This finding influenced Pierre Boulez (1925-) to discover that precise control of each of the musical parameters (frequency, amplitude and harmonics) by the composer can lead to music of great interest.

The Science of Music

A musical composition can lie anywhere between being an exclusive exercise in discovery or a true creative product as the case of Shostakovich mentioned above. The strong component of discovery in music originates from two main reasons: *1)* sound production is governed by physical laws described by mathematics; and *2)* music, being a language conveyed by our sense of hearing, is appreciated and interpreted by our brain subject to its rules, mechanics and purposes and, as will be discussed below, is intimately related to speech.

Until the end of the baroque period, music was strictly considered a science pertaining to mathematics. Pythagoras discovered that plucking a string makes it vibrate in its entirety as well as in halves, thirds, and so on. The lowest vibration (fundamental) is generated by the vibration of the whole string and conveys the pitch of the sound; the other vibrations are its harmonics. Pythagoras established the mathematical relations of how different pitches can be attained by varying the length, width and tension of the cord. Further, he discovered that, by dividing the cord in certain proportions it produced musical intervals some of which were pleasant to be heard while others were not. Thus, he performed the remarkable breakthrough of relating numbers with the appreciation of beauty. During the middle ages, musicians became highly skilled and were required to study mathematics, geometry and astronomy. In 1631, Athanasius Kircher (1602-1680) published *Musurgia Universalis*. In this book he explains the possibilities of creating music by establishing relationships between different notes (counter-point) from a mathematical perspective and established the numeric patterns of music intervals, scales, and harmonies. Further, he invented a numerical "machine" to make music (Musarithmica Mirifica) which can be used by non-composers to make music which follows all the counterpoint rules of the style of his time. He also invented new musical instruments and scored the songs of birds. The mathematical basis for music making was further explored by the members of the Societat der Musikalischen Wissenschaften (founded by Lorenz Christoph Mizler in 1738) which included GP Telemann, GF Handel and JS Bach. Research of the latter composer in this society led him to write several pieces whose structure are almost entirely based on mathematical proportions of sounds, including "A Musical Offering" and the "Art of the Fugue." The development of the former piece, for example, is entirely based on a few measures which are played by the musicians backwards, inverted, doubling the timing, changing the key or starting at a different place in the score. This approach to music by Bach explains why he considered art making as a rational construction process. Subsequently, in 1757 a disciple of Bach, Johan Phillip Kirnberger published his *Ever-Ready Composer of Polonaises and Minuets*, a practical guide to write music based on mathematics and chance in which musical decisions were made by the throwing of a dice.

Music making as a discovery process has intensely been expanded by contemporary composers. Bela Bartok (1881-1945), developed a numeric series (Fibonacci scale) in which tones are given numbers and the series is formed by summing up the values of the previous two numbers (i.e., 1, 1, 2, 3, 5, 8, 13, 21,. .). He used this technique to write

numerous compositions including his "Music for Strings, Percussion and Celesta." Likewise, he used the geometric proportion ratio known as Aurea system to derive the construction of his melodies and harmonies (1). Arnold Schoenberg (1874-1951) developed a system in which all 12 tones of the western music scale have the same importance as established by a number of tone series (dodecaphonic scale, see Figure 1). In 1940, Joseph Schillinger published a mathematical system to compose music ("Kaleidophone") which was used by George Gershwin (1898-1937) to write some sections of Porgy and Bess and by Heitor Villalobos (1887-1959) to make piano music. In 1955, Lejaren Hiller published the suite Illiac, the first musical composition entirely made by a computer using Markov chains. Iannis Xenakis (1922-2001) founded in 1966 the School of Mathematical and Automated Music. He developed a new style of composition in which clouds of sounds are produced and are subsequently analyzed using stochastic statistics. He applied several mathematical models to generate clusters of sounds. (e.g., Maxwell-Boltzmann distributions and Markov chains).

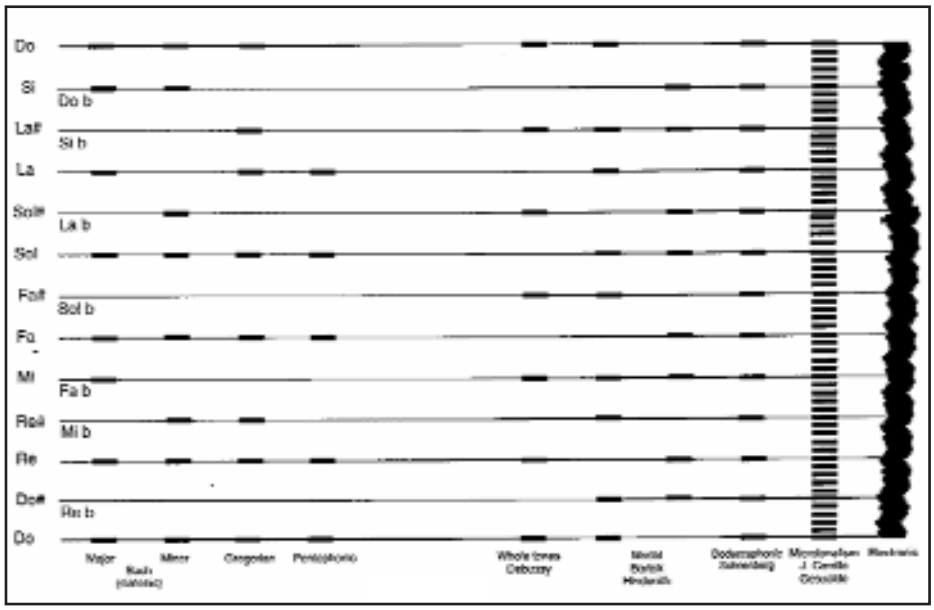
The Music of Science

Perhaps like no other art, music is capable of eliciting strong human emotional reactions and has played a key role in the development of civilization. Confucius (500 BC) reasoned that music possesses a moral force able to generate goodwill and harmony between families and communities. Plato in his Republic states that music can either make better or worse citizens, and in classic Greece, the adjective "musical person" was reserved for highly educated and kind individuals. The reason why music can be so influential on human behavior and feelings lies in the fact that it is constituted by three components deeply enrooted in human physiology: rhythm, pitch, and harmony.

Rhythm: The philosopher Henri Bergson (1859-1941) did not need to be a scientist to realize that our brain searches and finds pleasure in discovering patterns since the discovery of regularity provides us with a sense of stability and well being. Desmond Morris (1928-) reported that people unconsciously often counteract nervousness by producing rhythmic movements of body parts. Bergson also realized that an additional component of our attraction to rhythms and patterns is that they empower us to predict events in time. When the predictions are fulfilled, like when the arm of a ballerina comes down after having been raised, it produces pleasure; when the predictions are unfulfilled, it produces an array of reactions ranging from surprise or instability, to plain laughter, as when a walking man suddenly falls down in a comic film. The component of rhythm in music provides it with a sense of continuity and steadiness. It is reported that the great success of Reggae music resulted from the fact that its rhythm is identical to that of a healthy adult heart at rest. When the rhythm in music is complex and/or broken, as in Stravinsky's "Rite of Spring," it generates a sense of unsteadiness and awakening.

Pitch: Pitch is physically determined by sound waves which posses basic (fundamental) frequency and periodic (harmonic) frequencies. Thus, sounds lacking periodicity (e.g., thunder or a cascade) have no pitch. Interestingly, pitch-containing sounds are almost exclusively produced in nature by animals. Hence, pitch perception is very relevant for survival and communication, and the brain must possess mechanisms to differentiate sounds with pitch from those lacking it (i.e., noise, see Ref. 2). Perhaps for this reason pitch perception is subjective and not strictly determined by physical parameters. Two examples illustrate this fact. First, changes in the intensity of a pure tone elicit in a listener the appearance of a change in pitch. Second, primates (3) can identify the pitch of sounds in which the fundamental frequency has been artificially removed and only the higher harmonics are present. Thus, even if there are no spectral similarities between the two sounds, both are similarly recognized by the brain. This property, known as finding the missing fundamental, demonstrates that pitch-perception is an abstract perceptual property derived from, but not physically identical to the characteristics of the perceived sound. Two additional examples illustrate the subjective nature of sound perception: *1*) changes in the frequency of a sound of constant intensity elicit the appearance of a change in intensity; and *2*) identification of the timbre in a sound (e.g., whether a tone with the same frequency and intensity is either produced by a piano or a violin), involves deciphering of the envelop of the multiple sound waves implicated in the onset of the given sound (i.e., starting transient). This is easily demonstrated by listening to an audio tape of a piano played backwards. Because the onset of an organ sound involves some similar characteristics to the sound waves involved during the offset of a piano sound, the sound perceived while listening to the piano tape played backwards is perceived as an organ. Likewise, when the very brief attack of one instrument is electronically cut-off and is then attached to the sustained sound of a different instrument, it is the attack that dictates the perception of which instrument is being played. For example, a listener perceives a trumpet when a few milliseconds of a

Figure 1. Music Scales.



trumpet attack (splat) precede the sustained tone of a piano. Therefore, the appreciation of pitch and timbre at the auditory temporal cortex is rather complex and must be subjected to influences and regulation from other parts of the brain involving training and experience.

For some scholars the history of music making corresponds to that of how composers use pitch to produce scales. Figure 1 shows the arrangements of some of the key scales used in music. The diatonic major and minor scales involve seven sounds and were definitely established by Bach with his writing of the "Well Tempered Clavier." Interestingly, the major scale is the closest to the natural harmonics of a given tone since it appears as such from harmonics 8 to 16. Further, the accidentals (sharps, flats or naturals) of the keys closest to a major scale (subdominant and dominant) also appear in the harmonics of a tone. Various cultures in history have used different scales including the pentaphonic and modal. C. Debussy (1862-1918) and A. Schoenberg revolutionized music writing by introducing their whole tones and dodecaphonic scales, respectively. Some cultures (e.g., India) have traditionally used microtones (i.e., quarter, thirds, eights of a whole tone) to make music. This technique has also been applied in western music by the middle-ages composer C. Gesualdo (1566-1613) and more recently by J. Carrillo (1875-1965). Contemporary composers use synthesizers to generate and manipulate all of the sound frequencies that our brain can perceive (20 to 20,000 Hz), but it is pertinent to note that the pitch uncertainty for human perception is a function of the frequency of the sound being higher at low frequencies. e.g., it is of a ¼ of a tone for a middle La (430-450 Hz) and of a whole tone for a low Sol (89-109 Hz).

The seminal work of Dr. Diana Deutch has revealed the desperate need that our brains have to make sense of pitch-containing sounds. Influenced by the hemispheric side predominance and by the language and accents used while growing up, our brains fabricate order where there is none. This is illustrated by the following three examples (4):

Octave Illusion: listening through stereo headphones on the right ear to a note pattern of an octave (e.g., high Sol→low Sol) while simultaneously listening on the other ear to the inverted pattern (i.e., low Sol→high Sol) produces in the great majority of listeners a simplified pattern in which one ear hears: low Sol→silence→low Sol; while the other hears: silence→high Sol→silence. Thus, the subject perceives a high and a low Sol alternating from one ear to the other. Regardless of the position of the earphones, right-handed individuals hear the opposite pattern than left-handed ones.

Scale Illusion: if different note patterns are presented simultaneously to each ear and neither of them contains a scale, but if a combination of alternate notes from the patterns presented to each ear does constitute either an ascending or descending scale (diatonic or chromatic), the brain of the subject will rearrange the perception of the notes leading to the actual "hearing" of a scale in each ear.

Tritone Paradox: dividing an octave in half produces an interval of three whole tones (tritone). With a computer it is possible to generate tones whose pitch are clearly identifiable (e.g., Do) but their position in the scale is uncertain (e.g., middle Do or low or high Do). When such a tone is presented to a subject followed by its tritone (e.g., Do→Fa#), he/she clearly reports hearing either an ascending or descending interval. Interestingly, the perception of the interval is not determined by musical training since professional musicians can report opposite patterns, but is determined instead by the maternal language and specific accents to which the individual has been exposed while growing up. This is supported by the fact that identical patterns are reported by individuals having grown up in similar regions of a given country and hence sharing the same accent.

In sum, connections between language and music perception are so strong that some scholars consider music as a natural evolution of speech. Language and musicality develop simultaneously in the brain and can in fact compete with each other. Two month old babies can imitate the pitch, volume and melody of their mother's songs; at four months of age, they can also imitate their rhythm. Furthermore, when they reach two and a half years of age, they explore with novel intervals and begin creating their own songs mixed with those of their mothers. But when they reach three to four years old, at the time when the ability to speak flourishes, the melodies of the songs in their respective cultures predominate and the creation of their own songs disappears (5). Many pianists and violinists, as are any non musicians, can simultaneously talk and perform numerous other activities. However, it is very difficult for them to talk while playing their instrument. The similarities and competencies between speech and music may result from the fact that both use pitch as one of their primary components. Hence both partially function by using similar brain structures, neuronal pathways and regulatory mechanisms.

Harmony: In music, harmony is the simultaneous combination in a chord of two or more different notes. As mentioned above, Pythagoras established that the frequency ratios of pleasant pairs of sounds played simultaneously are uncomplicated (e.g., 1:1; 1:2; 2:3; 4:5, etc) while the unpleasant ones are complex (e.g., 15:16; 30:59). We now know that the oscilloscope traces of pleasant

Conductor Nuvi Mehta leads the San Diego Chamber Orchestra in the performance of *Body Notes*.

Cecilia and Hector Rasgado-Flores.

pairs of sounds are much simpler (i.e., their waves repeat exactly after a very short interval) than the unpleasant ones (i.e., it takes a long time for their waves to repeat). Furthermore, a rather interesting pattern is found if a diagram is built of all the series of harmonics naturally produced when two pure tones are simultaneously played when one is maintained stationary while the other is changed from the frequency of the stationary one to the double of that frequency (i.e., one octave higher) passing by all the intervals in between (Figure 2). The Figure shows that when the ratios of the two sounds are simple, thus producing a pleasant sound (as in points a, c, d and g), the pattern of harmonics is also simple. In contrast, when the ratio is complicated (as in points b, e and f), the harmonics pattern is also complex. These observations suggest that our brains find it easier to deal with simpler sound ratios as compared to complex ones. However, as mentioned above, when dealing with the perception of pitch, there is no strict direct physical relationship between the sound waves and the perception which they elicit. An example of this is that we can understand the same word pronounced by different people in spite of the fact that each person produces very different sound patterns. Likewise, our brain can be trained to understand people talking with strong accents. Thus, it should come as no surprise that looking at the oscilloscope recordings of sounds produced during a performance of the second movement of Beethoven's fifth symphony and of the noise of the audience before the performance, it is virtually impossible to differentiate them. Hence, our brain has the capability of selecting sounds from the environment and conferring upon them meaning because they contain pitch and because they are compared with our memories of sounds of instruments, chords and previously elicited sensations. These considerations may help to explain why our brain reacts emotionally to a very limited number of sound frequency combinations. These combinations may elicit emotions of joy (major keys), elation (consonant intervals), sadness (minor keys), intrigue (difficulty in identifying the key), unsettledness (lack of harmonic resolution), or repulsion (discordant sounds).

Western music can be divided into two major types: tonal and atonal. Tonal music is constructed based either on a major, minor or modal scale in which only a given number of intervals can be used as determined by the key of the piece (e.g., Do major, la minor). Thus, the key of the composition determines which tone serves as the center of gravity and makes all other tones its subordinates. Most of all occidental music written until the post-romantic era is tonal. Wagner (1813-1883) revolutionized music writing by introducing compositions (e.g., Tristan und Isolde) in which there are no precise tonality. Schoenberg broke the barriers of tonal music by writing music in which all 12 notes in a chromatic scale have the same importance. The structure of this music is so different than all the music previously written, that its appreciation requires significant motivation and training from the listener. The contemporary composer Alan Hovhaness (1911-2000) argued against atonal music stating: "To me, atonality is against nature. There is a center to everything that exists. The planets have the sun." An illustrative experiment dealing with this issue consisted of alternately exposing six-month old human babies to tonal (e.g., Mozart) and atonal music (e.g., Stockhausen) and analyzing their responses. The results showed that the babies paid significantly more attention to the music of the former and disregarded the second composer. This suggests that early in our lives our brains are wired to recognize tonal music as pleasant and/or that they learn to recognize as enjoyable the harmonies and melodies to which they have been exposed via their maternal language and songs.

Very recently, however, Victor Rasgado wrote a children's opera entitled "El Conejo y el Coyote" (The Rabbit and the Coyote, 2003). This piece is constructed using atonal music but is based on sonic geometric symmetric designs. This arrangement allows the children to subconsciously discover logic in the harmonies and sonic sequences leading them to enjoy the composition without sophisticated training.

Summary

There are numerous and intricate links between music and science. One of the most relevant is that music writing

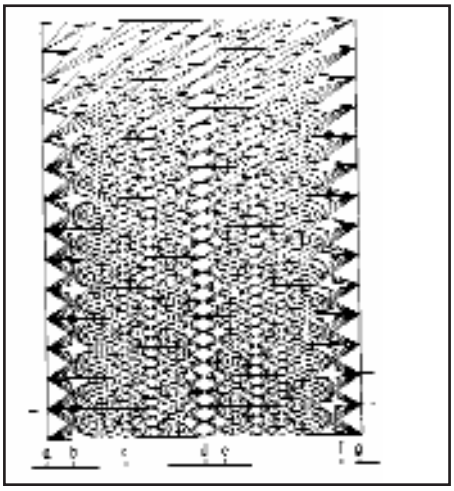


Figure 2. Diagram illustrating the harmonic sound frequencies elicited when a pure tone is maintained constant (horizontal dark line) while another tone is changed in frequency starting at the same frequency of the stationary tone until reaching one octave higher (dark inclined line). Both the abscissa and ordinate are sound frequencies. The ratio of the sound frequencies at the various points indicated with letters are: a=1:1; b=15:16; c=4:5; d=2:3; e=20:31; f=30:59; g=1:2. (From Ref.6).

implies a strong component of discovery. The fact that music plays such a relevant social, cultural, and emotional role may be because it uses similar means and is interpreted by related mechanisms and neuronal structures as language, and language is critical for our survival, adaptation and growth. For this reason, music can also elicit profound and immediate emotional responses from the listener. In so doing, it empowers its creator with a compelling means for manifesting his/her survival and helps us all adapt better. After all, what better form of adaptation and survival could there be than enjoying our being alive? Further, there is a complicated balance for music appreciation and enjoyment between nature and nurturing, which remains to be fully established. Numerous contemporary academic composers are aiming to discover how atonal music can be appreciated and enjoyed as it is being built using a logical and coherent system based on the physical and mathematical nature of music sound. Another main challenge ahead of us lies on identifying the mechanisms and pathways by which our brain interprets sounds and attributes to them an emotional content.

...And the Making of "Body Notes," A Symphonic Suite About Human Physiology

In the summer of 2002, the recently renamed Rosalind Franklin University of Medicine and Science hosted the Midwest section of the American Physiological Society meeting. The organizer of that symposium, Celia Sladek asked Héctor Rasgado-Flores to perform a concert for the closing event. He accepted and performed several of his compositions for piano and for piano and cello accompanied by an excellent medical student cellist. Among the people in the audience were Martin Frank (Executive Director of the American Physiological Society, APS) and Allen Cowley Jr. (President of the International Union of Physiological Sciences, IUPS). After the concert and a brief chat between them, they approached the composer and asked him whether he would write a symphonic piece for the XXXV Congress which, after nearly 40 years, was going to be held in 2005 in the US. The composer consulted with his wife, and the following day he agreed to carry out the project. At that time, he had already written about 50 pieces since he began composing for a small chorus and orchestra which he conducted in Mexico City when he was 15 years old. He had even won, on several occasions, the music composition contests of the National School of Music in Mexico, but he never dreamed of writing a piece of the magnitude of a symphonic suite.

Being a scientist and musician, the composer had crossed on several occasions the thin boundaries that separate both endeavors. He taught for several years the section on sensory processing to medical students and followed the literature about the neurosciences of music listening and music making, and in fact, in 1996, he gave a lecture for the Sigma Xi Scientific Society at his Institution entitled "Music and Physiology: Interrelationships and Enigmas." On that occasion he presented a summary of the current knowledge of how our brains interpret language and music, gave several examples using a small musical ensemble, and even carried out an experiment with the audience about musical perception.

Once the composer accepted the offer to write the piece for the IUPS Congress, he thought that it would make sense to combine music and physiology into a single project. Physiology is the science that poses the questions of how organisms work: how do we hear music? How do we create it? How do we play an instrument? How do we dance? etc. In consequence, it is the discipline that lends itself best to create links between science and creativity. He thought that physiologists would appreciate and enjoy such a concept. Furthermore, he wanted to think of this project, together with his scientific publications, as his legacy as a physiologist. So the project grew to become "Body Notes: A Symphonic Suite about Human Physiology."

Realization of the project involved several critical issues. The support of his wife and his three children, the support of his Chairman and of the President of his Institution, the support of the senior administrators and staff of the American Physiological Society, the inspiration of his family, friends and colleagues to whom each movement was dedicated, and the collaboration with his brother, Victor Rasgado, one of the most distinguished and accomplished young contemporary composers. They both had previously collaborated in family concerts with their father, Rodrigo Rasgado (a noted violinist and plastic surgeon), as well as in professional concerts in Mexico, but they had never worked on anything of this magnitude together.

Completion of the project required three years. The series of events involved in the process was as follows: Hector developed the musical ideas which occupied his mind as a kind of "damnation" since it was impossible to be rid of them until they were written down as a piano version. Subsequently he gave the scores to the wife of his brother, Cristina Galvez Correa, who edited and wrote them for a computer program. Victor then proceeded to orchestrate them. On numerous occasions the two brothers and their wives met in Mexico and Chicago to discuss and modify the orchestration. The wife of the composer served as the final judge of how an audience of scientists would appreciate the translation of the physiological ideas to the orchestral version.

The suite is composed of 13 movements and lasts for about 1 hour. The movements are:

Negentropy: A depiction of the ensemble of biomolecules into forming cells.

Beating: The activity of a human

The Rasgado-Flores family.

heart in a fetus while the tissues are formed.

Loving: The dance and angst of an adult heart as it tries to find reciprocation in love.

Working: The action of a heart while performing strenuous exercise.

Movement's Movement: The control and beauty of skeletal muscle performance.

Right Connections: The frantic communication between neurons.

Saraband 1: The dance of hormones released during a sensation elation.

With you: The feeling of happiness of sharing time with loved ones.

Saraband 2: The release of hormones involved in the response of anger.

Injustice: The inner dialog and justification of feeling angry.

Saraband 3: The indifference of hormones in the blood stream which are involved in the feelings of frustration and sadness.

Without You: The mood of longing and quietness while being lonely.

Apoptosis: A dramatic dialog between a brain who wants to live and the body it controls which is ready for closure as they face the programmed closing of a life.

The style of the composition was thought to be pleasant to the scientific audience. Therefore, it encompasses several composition styles from the baroque to post-impressionism. The most modern movements are the ones describing the interaction between neurons (Right Connections) and the release of some hormones (Saraband 3). In this Suite the composer did not try to challenge the audience to listen to the music but to think instead of the physiological ideas being described.

The suite had its world premiere during the closing ceremony of the IUPS meeting in the city of San Diego on April 5, 2005 performed by the San Diego Chamber Orchestra conducted under maestro Nuvi Mehta.

The booklet accompanying the CD contains a detailed description of the ideas behind each movement. The CD can be purchased at the American Physiological Society web site.

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A Medal for the IUPS 2005 Congress

Ralph R. Sonnenschein, Professor Emeritus, University of California, Los Angeles

For the 35th International Congress of Physiological Sciences held in San Diego March 31-April 5, 2005, a medal commemorating this auspicious occasion was designed and minted. Why a medal for the congress? Such an item can stand now and for the future as a commemoration of the spirit, as well as the content, of a gathering of people from around the globe, together for formal and informal discussions of new ideas and scientific findings, as well as strengthening of personal friendships. With this in mind, sponsoring of such commemorative medals was decided by organizers of several of the earlier IUPS Congresses, and their predecessors, the International Physiological Congresses (1).

I have had a long-time interest in, and collection of, medals commemorating people and events in physiology and related medical and natural sciences, including all of the previous Physiology Congress medals. So, I naturally thought of such a memento for the congress to be held in our backyard, San Diego. About two years before the Congress, I first broached this idea to Shu Chien, Professor at the San Diego campus of the University of California, who was Chairman of the Planning Committee for the Congress. I showed him my collection of previous congress medals. He became quite enthusiastic about the prospect of such a medal for the San Diego Congress, and in due time presented this proposal to the Planning Committee, including Martin Frank. I also had recommended Alex Shagin as designer of the medal.

Shagin, a Santa Monica resident, has won highest honors as a medallic artist. The proposal was accepted by the Committee, and at one of its meetings in Los Angeles, Shagin presented his initial design of the medal, based largely on the already accepted logo of the Congress. Much discussion ensued, including several suggestions for altering the design. These were accepted, and the Committee decided that final approval would depend on their seeing the revised design. Pictures of this were circulated to the Committee which gave its approval. The medals were produced at The Golden State Mint (San Bernardino, CA) and were then made available to participants at the congress and later, through the American Physiological Society, to any interested persons.


1901, Torino (front and back)


1910, Vienna (front and back)


1913, Groningen (front and back)


1904, Brussels (front and back)


1920, Paris (front and back)


1907, Heidelberg (front and back)


1923, Edinburgh (front and back)


1926, Stockholm (front and back)


1929, Boston (front and back)


1932, Rome (front and back)


1935, Leningrad-Moscow (front and back)

1956, Brussels



1965, Tokyo (front and back)



1980, Budapest (front and back)



1993, Glasgow (front and back)



1977, Paris (front and back)



1989, Helsinki (front and back)

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(Almost) a Week in the Life of an IUPS Delegate

Peter Brown, University of Manchester, UK

88 hours in San Diego and reflecting on a meeting that was all positive and threatened to swamp Experimental Biology

Saturday

Arrive in San Diego appropriately jet-lagged after 16 hour journey. Another one of those "good news ... bad news" scenarios. The good news: an upgrade to business class on the transatlantic leg—only my second upgrade in 25-odd years of air travel. The bad news: on arrival in Atlanta, rumours of shoe X-rays, strip searches and four hour lines at the airport prove only slightly exaggerated.

After 90 min wait at Immigration miss connecting flight to San Diego and arrive cursing three hours late. (It could have been worse, though. I later find out about a Manchester colleague who found the US visa procedure so convoluted and timeconsuming that, when it emerged the only way to get a visa would be to turn up at the US Embassy in London at 7 a.m. and stand in a five hour queue, he simply gave up. The whole thing makes me rather doubtful about 'biometric passports' and ID cards, but that's another story).

Sunday

Emerge jet-lagged and struggle down to registration. I did mean to get here for the 8 AM talks (honestly), but by the time I have navigated my way around the conference centre a couple of times to reach registration, abstract book collection etc. etc. I find my first talk is in David Sheppard's 10.30 a.m. session on "The Molecular Basis of Epithelial Disease." As with all the sessions I check out during the meeting, the talks are nicely presented and well-attended. Pity a few more Brits hadn't made the effort to be here, though.

Sunday evening meal out with some friends from my LA days—a curry. Eating out in Southern California has a lot of good points, including restaurants with terraces overlooking the sea and the climate to make use of them, but they still don't seem to have got the hang of cooking a really decent curry. When it comes to chicken Dhansak, South Manchester beats Southern California every time.

Monday

Browse round the poster session. San Diego's evening attractions have been keeping some of the delegates busy and a few look pretty shaky today. One colleague (name deleted in return for a mixed case of wine) appears late, looking particularly pale. He defends himself by claiming his attendance is, in fact, an example of heroic endurance—apparently the people he was partying with last night haven't made it to present their posters at all. Score one for the British constitution. No, not that British constitution, the other one.

At the coffee break, a friend who has been meeting non-science acquaintances in San Diego tells me he has witnessed a key West Coast ritual—'waiting for the green flash'. To experience this, you stand on the beach staring out to the Pacific and watch the sun go right down. The idea is that, as it dips completely below the horizon, the last sunlight is shining through water to reach the observer and it looks like a flash of green light. My informant swears there were several dozen people standing waiting, many of whom were veteran flash-watchers, and insists he heard one surfer type say: "Totally awesome flash, dude." Decide he has been watching too many episodes of *The OC*.

For someone who spent two years in LA as a postdoc in the 1980s, and has holidayed in California several times, this surprisingly is my first visit to San Diego. To be honest, no one in LA ever mentioned the place: San Francisco, Yosemite, Death Valley, King's Canyon, Monterey… but never San Diego! My first impressions are that, while maybe not the most exciting place in the world, it is well-appointed for a large conference: excellent conference center, plenty of bars, restaurants and hotels all within walking distance, and a wonderful climate.

San Diego also seems to celebrate its Spanish/Mexican heritage more than LA although, of course, parts of LA are heavily Spanish-influenced. I particularly remember going to the wedding of an English friend of mine called Nigel in Downtown LA in the 80s, where the official in charge insisted on calling him "Miguel" throughout the ceremony! Although, on reflection, that tells you more about how few Nigels there are in the US than about anything else. Anyway, the Mexican-American cuisine here is first rate, and I sample it a couple of times during the meeting.

Tuesday

The day of the symposium I am coorganising. Have never quite figured out the etiquette of being a symposium organiser. The million dollar question: to be a speaker—or not to be? I was always taught not to invite myself to speak, on the basis that it makes you look self-important. On the other hand, a former Head of Department of mine once told me firmly that I was a fool NOT to be a speaker in any symposium I was organising. 'Get those b*!*dy Esteem Indicators stacked up,' he said. 'If you don't think you're good enough, who the *!!* else will?' Have reached a personal compromise solution—speaker last time I was organiser, chairman (but not speaker) this time.

The symposium draws a decent audience of around 60 or so—not bad for the final day of a meeting. Having missed a big chunk of the meeting it is difficult to say what the highlights were, but I get the feeling that the organisers have saved the best for last: *The Journal of Physiology* sponsored session on *TRP channels* onTuesday afternoon is excellent for the most part: innovative sciences with well-paced and witty presentations.

Wednesday

Take-off at lunchtime. Have been here exactly 88 hours. Since the journey out here took 16 hours, and the journey back will be another 12, this means a stay-to-transit time ratio of 3.14. Shouldn't complain about this, though—my choice.

Like most people, I used to take more extended conference trips when I was in my 20s and early 30s, with no family to get back to and a budget that didn't stretch to long-haul holidays other than ones that were "conference-assisted." But these last few years 4-5 days is my usual limit. There is a tricky balancing act to accomplish here, though. I remember sniggering at one (now ex-) Manchester professor who told me he flew annually to Florida for only two days for a high-powered American meeting and had mastered the routine. "I've figured out how to beat the jet-lag," he said. 'What I do is stay in the lecture theatres all day, never go out in the daylight, and go to bed straight after sup-

per. That way I can stay on UK time and never start to adapt. And it means I wake up at 4 a.m. so I have lots of time to read the abstract book." I tell myself that, as long as my stay-to-transit time ratio never gets below 2.0, I can keep believing I haven't reached that point.

The flight home gives time to reflect on some general points about the meeting—all positive. The organisation was good, as was the science. I don't usually like huge meetings, but any fears that IUPS would be swamped by Experimental Biology/FASEB failed to materialize. If anything, IUPS seemed to be swamping EB! Finally, it was great to see that many of the "Big Players" in structure-function have returned to their physiological roots and want to study the function of proteins in real cells/organs/animals.

Thursday

9 AM Manchester time—touch-down. Good to be home, though the drizzle provokes a slight lingering hankeringfor California sun! May see you in Kyoto for IUPS 2009…❖

The XXXVth IUPS and Physiology Discipline

Hiroko Nishimura
University of Tennessee Health Science Center

My major contribution to the XXXVth International Congress of Physiological Sciences (IUPS) was to organize a symposium with Kenneth Gross, Roswell Park, Cancer Institute, Buffalo, NY, entitled "Phylogeny and Ontogeny of the Renin-Angiotensin System (RAS)." The aim of the symposium was to determine whether the molecular and functional evolution of the RAS coincides with the structural advancement of the kidney during these two time-dependent processes. The symposium comprised speakers from Japan, France, and the USA and an audience representing various countries. We had superlative presentations and fruitful discussions. There were a number of excellent sessions on comparative and evolutionary physiology at the XXXVth IUPS, attended by physiologists from both nonmammalian and mammalian fields. The major aims of comparative physiology, I believe, are to determine the evolution of physiological functions and processes and their adaptation to changing environments, and to find unique and sophisticated experimental models with conservative traits that provide insight into underlying mechanisms. Indeed, many experimental models using invertebrates and vertebrates, including crustacean neuronal systems, insect Malpighian tubules, aglomerular kidneys, frog skins, and toad bladders have contributed to the discovery of new physiological concepts. Thus, the IUPS meetings provide ideal occasions for scientists from a variety of physiological/biological disciplines to interact and exchange information. Likewise, comparative physiologists/biologists can learn many advanced technological techniques from studies done in mammalian species. I myself learned in the early 1970s from Dr. Shu Chien, the President of the XXXVth IUPS, who was at that time a professor of physiology at Columbia University College of Physicians and Surgeons, how to measure blood volume using ^{131}I as a marker. Although application of the technique he was using in rats to the measurement of blood volume in eels somewhat puzzled him, the method worked beautifully.

We are lucky, and grateful to the program committee, to have had this opportunity to express our thoughts on phylogenic and ontogenetic development of the RAS. I was also very lucky because, in spite of the change to daylight savings time on the day of our symposium, all the speakers gathered on time! Indeed, I and another foreign speaker did not know about the time change; but thanks to some unknown inspiration, we went to the meeting room one hour earlier than the scheduled time. In this regard, it would have been very helpful if a large notice had been placed on the front entrance door, or if the security guards who were checking our name tags had reminded us of the start of daylight savings time.

The XXXVth IUPS was a well organized and carefully thought-out meeting. The program contained diverse subjects and yet was well integrated into the aim of this congress, "from genomes to function." For the last 30 years, research in physiology disciplines has been significantly changing. Due to the rapid introduction of molecular and cellular techniques into physiology, due to increasing difficulty in undertaking whole animal/organ studies because of the animal rights movement, and perhaps due to a tendency to award more research grants for molecular/cellular mechanistic studies, the direction and focus of our research have tended to shift to intracellular signal transduction mechanisms, cell interactions, and gene regulation, rather than studies on the control of complex biological systems. More recently, however, the importance of integrated organ physiology and physiological and pathological phenotypes linked to genetic information has become the focus of attention. This rediscovery appears to be a consequence of the facts that: 1) physiologists and physicians interested in the regulation of bodily functions understand the critical role of genes and their products in unraveling the underlying mechanisms of disease, and 2) functional genomics elaborate a new understanding of the roles of genes in cell and organ biology, and in disease processes. Such linkage of genomes and gene products to proteomes and further linkage to "metabolomes" and "physiomes" may be themes in the next IUPS meetings. In this context, it would be important to identify global strategies to facilitate and link functional genomics and proteomics to integrated physiology by organizing national and international systems for research informatics and intercommunication in terms of available resources, a standardized methodology and terminology, and unified data acquisition and analyses. ❖

XXXV International Congress of Physiological Sciences

Geri Swindle, FASEB, OSMC, Bethesda, MD
March 31-April 5, 2005
San Diego, CA

The XXXV International Congress of Physiological Sciences was held in San Diego in 2005 as a joint meeting with the annual meeting of Experimental Biology, a multi-society interdisciplinary, scientific meeting with an attendance of over 14,000 scientists. Although the planning process for any annual meeting is complex, an international congress requires three to four years of preparation under the auspices of an international body. Organization for this Congress was particularly challenging since it would be held as part of a larger meeting that had already been booked in San Diego. In addition to renegotiating contracts with the convention center and hotels to accommodate the increased attendance and space requirements it was necessary to plan a "congress within a meeting." It was also essential that the identity of the Congress not get lost in the large Experimental Biology Meeting. To accomplish this, the Congress was promoted as a joint meeting with Experi-mental Biology. Scientific session rooms, poster area and an exhibit area were set aside and identified with signage specifically for the Congress.

The International Congress of Physiological Sciences was developed to ensure that participants had an educational forum for the exchange of scientific information, to learn of recent advances in both broad and specialized areas, and to make personal contact with scientists from all over the world. There were many detailed steps that needed to be completed and decisions made to assure the success of the Congress. These required the utilization of specialized systems, tools, techniques, and the dedication of the staff members of the American Physiological Society and the FASEB Departments. The offices worked together to develop a timeline and budget for the Congress as well as contracting and finalizing all logistical arrangements for oral and poster presentations, exhibits, registration, and accommodations.

Complete advance information was provided to participants about the Congress activities and deadline dates, submission of abstracts, payment of registration fees, hotel reservations, visa regulations for entry into the country, transportation from airports, exchange of currency, location and hours of registration and other details to ensure the success of the Congress.

As plans for the Congress were being finalized, it came to our attention that there was a strong possibility that animal rights activists would attempt to disrupt the meeting specifically targeting the IUPS. Since they often use tactics that involve intimidation, harassment, property damage and physical attack a plan to deal with a disruption was developed. The convention center, hotels, and all participants were notified of the potential for demonstrations and given suggestions on how to avoid conflict. Additional security was provided both outside and inside the convention center.

In addition to a superb scientific program, the social activities were an integral part of the Congress schedule and provided a total experience combining professional and personal interests for all those who attended. The social program included:

Opening Ceremony

The evening session opened with the presentation of colors by the University of San Diego ROTC. Greetings were provided to Congress attendees by the Chair, IUPS 2005 National Organizing Committee, President of the American Physiological Society, and the President of the International Union of Physiological Sciences. Following the opening welcome, Peter Agre, 2003 Nobel Laureate presented the Wallace O. Fenn Lecture. A dinner reception followed the Fenn Lecture on the San Diego Convention Center Terrace overlooking San Diego Harbor.

Beach Party

The IUPS Beach Party featured typical Southern California beach music and games, a picnic that included hamburgers, hot dogs, chicken and more. The grand finale was a magnificent fire works display.

Closing Ceremony

IUPS participants enjoyed a very memorable evening. A reception and dinner was held at the Convention Center following the final session of the Congress. Participants were then transported to the Copley Symphony Hall for the transfer of the IUPS flag from the United States to Japan, the 2009 host country. Following the flag ceremony, the San Diego Chamber Orchestra with Maestro Nuvi Mehta performed the works of Samuel Barber, Aaron Copland and Hector Rasgado-Flores. In commemoration of the XXXV International Congress of Physiological Sciences in the United States, the American Physiological Society (APS) commissioned Hector Rasgado-Flores, Ph.D. to compose a symphonic suite entitled "Body Notes" which describes some aspects of human physiology. The piece is entirely original, is written for a full orchestra and had its world premiere during the closing ceremony of the International Congress. ❖

The Mar Dels entertain at the IUPS Beach Party.

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The IUPS Congress and Experimental Biology: An Experiment That Worked!

Paul A Insel
Chair, Experimental Biology Board, 2005
University of California, San Diego

Although most attendees at the Experimental Biology meeting (also called "EB" or "FASEB," the latter term preferred by those with [fond] memories of meetings from the last millennium) are blissfully unaware, the official oversight of this meeting is performed by representatives of each of the scientific societies that participate. These individuals, who include both the Executive Secretaries and volunteer representatives of each of the major participating scientific societies, constitute the Experimental Biology Board. This Board approves and oversees organizational, financial and certain programmatic aspects of the Experimental Biology meeting. Each of the major societies participating in the EB Board often invites the participation of smaller societies with complementary interests, thereby increasing the breadth and depth of information presented at the meeting, as well as increasing the number of participants. Much of the EB Board's official responsibilities involve discussions and decisions regarding location of the annual meeting and financial issues since this entity is empowered to approve both prospective and retrospective budgets for the meeting. Thus the EB board devotes much of its efforts to topics that include fee structures for abstract submissions, registration, exhibitors, etc., and the distribution of income (assuming such exists) among the participating societies.

This background provides a framework in which to appreciate the "shock to the system" that occurred when representatives of the IUPS 2005 Congress approached the EB Board in 2001, requesting a face-to-face meeting to propose that the EB Meeting in 2005 partially overlap chronologically and interact in a major way scientifically (in particular, by co-sponsoring joint scientific sessions) with the Congress. The original request to the EB Board stated that "the proposed plan will increase the attendance in San Diego in 2005, but the number will not be so large as to change the character of the EB meeting." Representatives of the IUPS Congress, in particular Shu Chien, Chair of the National Organizing Committee of the IUPS Congress 2005, met with EB Board and presented a cogent rationale and series of ways in which attendees to both meetings would profit from this novel arrangement, which could be described as akin to two partially overlapping Boolean circles (an image particularly attractive to the more mathematically minded members of the EB Board). The initial meeting was very cordial but as diplomats sometimes say, it was also "frank" because certain issues were raised that required revision of initial plans by the IUPS Congress representatives. In spite of these minor kinks, the EB Board was highly enthusiastic about the proposed arrangement but there being no precedent, in true scientific spirit, it was labeled "an experiment." The EB Board thus worked with the IUPS Congress officials to create a schedule that accommodated the needs of all participants, in part by tweaking the Boolean (chronologic) relationships.

Did the experiment work? From my personal point of view and that of those with whom I have spoken, including scientists who have interests that focus on either EB or IUPS, the answer is unquestionably "yes." Most importantly, the scientific content was of high quality, providing meeting participants with an expanded profile of presentations as well as increased opportunities for interactions with colleagues from outside the United States. The American scientific societies have prided themselves, especially in recent years, in having increased participation of non-US scientists in the EB meeting but the incorporation of the IUPS Congress dramatically increased the international "feeling" of the EB meeting. In effect, and highly appropriate for the location in San Diego, the rising tide of science lifted all boats. Although only an n=1, the experiment seems to have been a success. I hope that this success encourages other international scientific congresses to consider joint meetings with Experimental Biology—perhaps even IUPS at some future time!. ❖

D. Neil Granger, Allen W. Cowley, Jr., Peter Agre, Virginia Huxley, and Shu Chien at the Opening Ceremony.

The Physiologist
Vol. 49, No. 1, 2006

Computational Physiology: From Genome to Physiome

Andrew McCulloch[1], Peter Arzberger[1] and Peter Hunter[2]
University of California San Diego[1], La Jolla, CA and the University of Auckland[2], Auckland, NZ

As databases of biological structure and function grow, there is an increasing demand for computational methods that integrate information from diverse sources, reconstruct biological networks, predict the physiological functions of cellular networks, and integrate structurally across scales of biological organization from molecule to organism.

On March 28-30, 2005 at the Catamaran Hotel in San Diego's Mission Bay, we hosted a two-day satellite meeting to the 2005 International Congress of Physiological Sciences. The meeting, entitled, "Computational Physiology: From Genome to Physiome," was organized under the auspices of the National Biomedical Computation Resource and the Physiome and Bioengineering Committee of the IUPS. Major sponsorship was provided by the NIH through the National Center for Research Resources, and additional funding was received through generous educational grants from Dell, IBM (USA and NZ) and Pfizer Global Research and Development.

The meeting was attended by over 80 scientists from 10 countries in the Americas, Asia, the Pacific and Europe including a strong representation of graduate studies and postdoctoral trainees. Twenty-three invited speakers and over 20 posters spanned a range of topics from bioinformatics, systems biology, metabolic engineering and computational cell biology to multi-scale imaging and modeling of tissue, organ and system physiology in health and diseases.

The satellite marks the latest in a series of international workshops on the theme of the "Physiome Project," a concept that was first presented in a report from the Commission on Bioengineering in Physiology to the IUPS Council at the 32nd International Congress in Glasgow in 1993. The term "physiome" comes from "physio" (life) + "ome" (as a whole), and is intended to provide a "quantitative description of physiological dynamics and functional behavior of the intact organism"[1]. A satellite workshop "On designing the Physiome Project," organized by James Bassingthwaighte, Chair of the then IUPS Commission on Bioengineering in Physiology, was held in Petrodvoretz, Russia, following the 33rd International Congress in St Petersburg in 1997. A synthesium on the Physiome Project was held at the 34th International Congress of the IUPS in Christchurch, New Zealand, in August 2001, and the Physiome Project was designated by the IUPS executive as a major focus for IUPS during this decade. The Physiome Commission of the IUPS was created in 2000 and later combined with the Bioengineering Commission into the IUPS Physiome and Bioengineering Committee, co-chair by Peter Hunter and Aleksander Popel. Since the Physiome Project was launched by IUPS, many of the annual meetings of bioengineering societies have included physiome tracks in their programs.

The satellite meeting in Mission Bay continued to advance the physiome concept and its goals by exploring the interface between *in-silico* systems biology and multi-scale computational biology. During the first day of the meeting, Shankar Subramaniam (UCSD) and Giovanni Paternostro (The Burnham Institute) described new progress in the systems biology of complex phenotypes including diabetes and aging using bioinformatic and genome-scale phenotyping methods. Jeffrey Hasty (UCSD), Jeremy Rice (IBM Research) and Trey Ideker (UCSD) described the reconstruction and modeling of networks of protein-DNA and protein-protein interactions. Bernhard Palsson (UCSD)

Attendees at the IUPS Satellite on Computational Physiology enjoyed lunch outside by the beach in San Diego's Mission Bay.

introduced a comprehensive reconstruction of the human mitochondrial metabolic network and the use of constraint-based models to analyze metabolite fluxes in genome-scale models. This set the stage for presentations by James Bassingthwaighte (University of Washington), Satoshi Matsuoka (Osaka University), and Nicolas Smith (University of Auckland) on kinetic models of mitochondrial energy metabolism and myocardial ischemia. The day ended with a dinner cruise on Mission Bay.

Peter Hunter (University of Auckland) introduced the second day with an update on the progress of the Physiome project with special emphasis on the development of XML-based "markup languages" such as CellML as standardized encodings of cell systems models and the growing databases of models[3] available using these languages. Dan Cook (University of Washington) and Brian Athey (University of Michigan) expanded on this theme discussing ontologies and frameworks for integrative modeling and infrastructure and strategies for team science.

Leslie Loew (University of Connecticut), Maryann Martone (USCD) and Tom Bartol (The Salk Institute) spoke in a session on multi-scale models of single cells in which they described community software and data resources such a Virtual Cell[4], the Cell-Centered Database[5] and MCell[6].

Denis Noble (Oxford University) led the session on cardiac cell modeling with a survey of computational models of cardiac myocyte ion currents and their application to unraveling arrhythmia mechanisms. He was followed by Donald Bers (Loyola of Chicago) and Jeffrey Saucerman (UCSD) who focused on modeling cardiac myocyte excitation-contraction coupling, intracellular Ca handling and the signaling pathways that regulate them.

Multi-scale analyses at the tissue, organ and whole body scales, their application to diagnosis and therapeutic mechanisms and the power of visualization in these settings were discussed by Craig Henriquez (Duke University), Alan Garfinkel (UCLA), Natalia Trayanova (Tulane), Yoram Rudy (Washington University) and Christopher Johnson (University of Utah).

The satellite succeeded in demonstrating the new degree of integrative physiological understanding that is becoming possible with the latest advances in computational biology from genome to physiome. A special issue of *Experimental Physiology* with selected papers from the meeting will be published soon. The goal of predicting phenotype from the combination of genotype and environmental influences is closer than ever before, and future meetings should be encouraged. More information on the satellite, including abstracts of presentations and posters, can be found at http://nbcr.net/physiome/.

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Shu Chien taking first place in the keg race with Martin Frank during the IUPS Beach Party.

Animal rights demonstrators protesting the presence of the IUPS Congress in San Diego.

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Vol. 49, No. 1, 2006

Biophysical and Biomechanical Adaptation and Bioinspired Engineering: A Satellite Symposium

Malcolm S. Gordon, University of California, Los Angeles, and

Morteza Gharib, California Institute of Technology, Pasadena, CA

Introduction

A satellite symposium having the same title as this article surveyed recent important developments in the comparative, environmental, ecological, and evolutionary aspects of biophysics, biomechanics, and bioengineering (exclusive of genetic engineering and nanotechnology) as part of the scientific program of the 35th International Congress of Physiological Sciences of IUPS. The symposium took place March 28-30, 2005 on the campus of the California Institute of Technology (Caltech), Pasadena, CA. About 60 people participated, including a substantial number of graduate students and recent postdoctoral researchers.

The 23 invited speakers included in the scientific program were divided into four groups, each of which considered aspects of one of the symposium's four main themes: Locomotion and Motility; Muscle; Internal Flows, and Materials. There was also a group of 10 contributed papers (presented as posters) that discussed other aspects of these thematic areas.

This article summarizes major features of the organization and scientific program of the symposium.

Goals and Objectives

The evolutionarily developed adaptive properties of organisms, both plants and animals, are based upon physical principles and properties as well as upon chemical principles and properties. Studies of these biophysical and biomechanical adaptations form the evolutionarily based, ecologically relevant subfields of biophysics and bioengineering.

There is much that is useful that we can learn from nature. Organisms form a huge natural library of well-tested, sophisticated approaches and, sometimes, solutions to many of the design and process problems faced by human engineers. Reverse engineering of natural systems can be highly instructive and informative.

The full development of these parts of bioengineering requires active study in both subfields. Both subfields contribute importantly to understanding how organisms work in their own environments and how organisms may be used as model systems valuable in a range of other contexts.

The symposium was innovative in that it explicitly brought together these aspects of biophysics and bioengineering, which are usually separate from each other. The scientific program presented a sampling of important recent results from a variety of cutting edge research programs in both subfields. There were both invited papers and contributed posters. Invited speakers were asked to make presentations that highlighted both the interdisciplinary aspects of their work and the opportunities for new and stronger research synergies that derive from their results.

Participants in the symposium had many informal opportunities to meet and confer with colleagues, fellow students, and others from a wide variety of teaching and research institutions both domestic and international. These networking opportunities were among the most important contributions that the conference made to enhancing and improving scientific, engineering, and educational activities.

Organization and Agenda

1) When: three days, March 28 - 30, 2005.

2) Where: California Institute of Technology (Caltech), Pasadena, CA.

3) Number of attendees: approximately 60 people.

4) Target audiences: active research and teaching personnel in the areas of biophysics, bioengineering, comparative and biomedical physiology, functional morphology, and anatomy; undergraduate and graduate students and postdoctoral researchers in these areas; interested media people.

5) Organizing Committee: Malcolm S. Gordon (UCLA) and Morteza Gharib (Caltech), co-chairs; Michael Dickinson (Caltech), Jay R. Hove (University of Cincinnati), Geoffrey Spedding (University of Southern California), Richard Zimmer (UCLA). Staff support: Option of Bioengineering, Caltech. Logistics support: Conference Services, Caltech.

6) Cosponsoring organizations: Commission on Comparative and Evolutionary Physiology (IUPS); National Science Foundation (US); Office of Naval Research (US); American Physiological Society (US); and Company of Biologists (UK). The organizers thank each of these organizations for their generous support.

7) Agenda: 23 invited papers presented in four single sessions, morning and afternoon each of two full days. Poster session for 10 contributed papers first afternoon.

8) Themes for invited paper sessions: Locomotion and Motility; Muscle; Internal Flows; Materials.

9) Publication: scientific program is summarized here. Abstracts are posted on the symposium website (http://www.its.caltech.edu/~iupscit; website to be maintained for one year after conclusion of the conference); they are also included on a CD-ROM provided to all participants. Copies of the CD-ROM may be available for interested people. Please make a request by email to the Conference Coordinator, Martha Salcedo: msalcedo@caltech.edu.

Invited Speakers and Titles of Their Presentations

This list is arranged according to the four themes for sessions. Names are in the order in which presentations were made.

Locomotion and Motility

Daniel Grunbaum (Biological Oceanography, University of Washington): "Ecological consequences of biomechanical constraints on swimming and sensing in protists;"

John Dabiri (Aeronautics and Bioengineering, Caltech): "Jellyfish swimming and the dynamics of animal vortex wakes, revisited;"

Michael Dickinson (Option of

Bioengineering, Caltech): "The control of aerodynamic maneuvers in fruit flies;"

Z. Jane Wang (Theoretical and Applied Mechanics, Cornell University): "Fore and hind wing interactions in dragonfly flight;"

Geoffrey Spedding (Aerospace and Mechanical Engineering, University of Southern California): "The aerodynamics of small wings: performance measurements and analysis;"

Naomi Kato (Marine Design and Engineering, Tokai University): "Median and paired fin controllers for biomimetic marine vehicles;"

Muscle

Andrew Biewener (Concord Field Station, Harvard University): "Muscle dynamics during locomotion: from active power modulation and force economy to passive dynamics;"

Graham Askew (Biology, University of Leeds): "Power modulation in bird flight muscles;"

Hans Hoppeler (Anatomy, University of Berne): "Functional, structural and molecular consequences of eccentric muscle work;"

Robert Full (Integrative Biology, University of California, Berkeley): "Biological inspiration: artificial muscles and robotics;"

Douglas Swank (Biology, Rensselaer Polytechnic Institute): "Designing molecular motors: myosin structural regions that determine muscle mechanical properties;"

V. Reggie Edgerton (Physiological Sciences, University of California, Los Angeles): "Elements of recovery of locomotion following spinal cord injury."

Internal flows

N. Michele Holbrook (Organismic and Evolutionary Biology, Harvard University): "Masters of microfluidics: hydrodynamics of fluid transport in trees;"

Keith A. Mott (Biology, Utah State University): "Information processing by stomatal networks;"

S. Laurie Sanderson (Biology, College of William and Mary): "Biological vs. industrial crossflow filtration: ways to avoid a dead end;"

Jay Hove (Integrative Genomics, University of Cincinnati): "Flow-induced cardiac development;"

Ghassan Kassab (Biomedical Engineering, University of California, Irvine): "A bioengineering model of coronary circulation."

Materials

Stanislav Gorb (Biological Microtribology, Max Planck Institute of Developmental Biology): "Bioinspired attachment devices: what we can learn from evolution;"

Cheryl Hayashi (Biology, University of California, Riverside): "Spider silk: design, performance, and evolution;"

John Gosline (Zoology, University of British Columbia): "Spider silk or hagfish silk, that is the question: alternate routes to the production of high performance protein fibers;"

Margaret McFall-Ngai (Medical Microbiology and Immunology, University of Wisconsin, Madison): Fiat lux: convergence in the biochemical and molecular design of eyes and photophores;"

Adam Summers (Ecology and Evolutionary Biology, University of California, Irvine): "Building for strength and stiffness with a viscoelastic material - secrets of the cartilaginous skeleton;"

David A. Tirrell (Chemistry and Chemical Engineering, Caltech): "A bioengineering approach to materials synthesis and design."

Contributed Papers

These papers are listed alphabetically by names of first authors.

A. Cammarato, J.A. Suggs, C.M. Dambacher, and S.I. Bernstein (San Diego State University): "Alternative versions of the myosin S2 hinge affect the functional and structural properties of indirect flight muscle;"

W.J. Crookes-Goodson, L. Ding, J. Horwitz, and M.J. McFall-Ngai (University of Wisconsin, Madison and University of California, Los Angeles): "Reflection in the squid *Euprymna scolopes* is achieved by structural platelets composed of a highly unusual family of proteins called reflectins;"

M.N. Dean and A.P. Summers (University of California, Irvine): "Uniform strain in broad muscles: a new twist on tendons;"

A. Garza-Gossett, C.Y. Li, and V.A. Ravi (California Polytechnic Institute, Pomona): "Spider silk-moisture interactions;"

D.I. Goldman, J.C. Spagna, R.J. Full, P.C. Lin, and D.E. Koditschek (University of California, Berkeley and University of Pennsylvania): "Arthropod locomotion on a challenging substrate using a distributed foot;"

L.K. Jordan (University of California, Los Angeles): "Batoid feeding behavior: prey preference, detection, and capture mechanics;"

B.W. Kot (University of California, Los Angeles): "Bolus rebound kinematics during engulfment feeding in the rorqual whales;"

D.V. Lauritzen, M.S. Gordon, and A.M. Wiktorowicz (University of California, Los Angeles): "Swimming biomechanics and kinematics in aracanin boxfishes;"

G. Ribak, D. Weihs, and Z. Arad (Technion-Israel Institute of Technology): "Dynamic control of thrust in the paddling of cormorants during horizontal submerged swimming"

A.M. Wiktorowicz and M.S. Gordon (University of California, Los Angeles): "Biomechanics and kinematics of swimming in two species of pufferfish, *Diodon holocanthus* and *Arothron hispidus*." ❖

Activity at the APS booth at the IUPS Congress.

The Physiologist
Vol. 49, No. 1, 2006

Report on a Satellite Symposium to the XXXV International Congress of Physiological Sciences

Scott Thomson, University of California and VASDHS

> "Science is built up of facts, as a house is with stones. But a collection of facts is no more a science than a heap of stones is a house."
> *Henri Poincare*

The kidney guards the volume and the composition of the body fluids against outside influences that would otherwise make life untenable. The machinery for this is complex and links together vascular function, cellular metabolism, epithelial transport, diffusive and osmotic fluxes, special membrane permeabilities, and countercurrent anatomy. Much information about these components has been catalogued through efforts at dissecting them into smaller and smaller parts. However, the critical emergent behaviors of the kidney that govern the body fluids are not apparent from looking at these individual parts. To achieve the ultimate goal, which is to understand the human organism, its physiology, and pathophysiology and to use this understanding to improve human health requires that we explain the relationships between the parts. In this spirit, a satellite symposium to the XXXV International Congress of Physiological Sciences convened for two days in March 2005 on campus at the University of California, San Diego.

The symposium, titled "Coordinating Hemodynamic, Filtration, and Reabsorptive Functions of the Kidney," was attended by nearly 100 academicians and post-doctoral fellows, and included formal presentations from 26 international experts in the fields of kidney hemodynamics, mathematical modeling, epithelial transport, urinary concentration, tubuloglomerular feedback (TGF), and blood pressure.

The opening presentation by Peter Harris (Melbourne) addressed a modeling perspective on reconciling integrative concepts with quantitative data and demonstrated some early work on the Kidney Simulation Project under development in Melbourne as a teaching tool.

This was followed by a series of presentations relating to the relationship between filtered load and proximal tubular reabsorption. NaCl reabsorption by the proximal tubule involves passive and active transport. The passive component is driven by a local decrease in mixing entropy achieved through active removal of glucose and bicarbonate from the tubular fluid. The active component employs apical anion exchange to raise intracellular chloride above its equilibrium potential. Peter Aronson (Yale) presented an update on the apical and ion exchangers responsible for the active component of proximal chloride reabsorption. Recent evidence is that the "chloride-formate exchanger" (CFEX), through which apical entry of chloride occurs, operates in various "modes" allowing chloride uptake in exchange for either formate or oxalate. Chloride-formate exchange operates in parallel with NHE3, which provides a pH gradient necessary to recycle formate from lumen to cell. Chloride-oxalate exchange operates in parallel with a sulfate-oxalate exchanger and sodium-sulfate co-transporter that don't require sodium-hydrogen exchange. A problem remains in that a high basal rate active chloride transport seems to persist in CFEX knockouts.

Sodium-linked glucose transport is electrogenic. Volker Vallon (UC San Diego) presented a hypothesis that outward potassium flux through apical KCNQ1 potassium channels in the proximal tubule serve to offset the negative lumen voltage that would otherwise accrue and dissipate the free energy available for additional glucose transport. Supporting evidence was presented in the form of micropuncture data in mice lacking KCNE1.

Apical sodium-hydrogen exchange (NHE3) is an essential part of the machinery for active bicarbonate and chloride reabsorption. Since the free energy for passive chloride reabsorption is derived from active reabsorption of bicarbonate, NHE3 is also necessary for this. Therefore, an economical way to tune overall proximal reabsorption is to regulate the abundance and activity of NHE3. Alicia McDonough (USC) discussed the regulation of proximal reabsorption by angiotensin II using data obtained during captopril treatment to show that angiotensin II tonically coaxes NHE3 and NHE3-associated proteins and cytoskeletal associated proteins away from the base and toward the tip of apical microvilli.

Glomerulotubular balance (GTB) is a process through which proximal reabsorption tracks the glomerular filtration rate. Historically, proximal GTB has been ascribed to physical factors affecting Starling forces or hydraulic permeabilities and to limited availability of some filtered solutes such as glucose. But new evidence reveals that changes in tubular flow velocity, per se, elicit parallel changes in proximal reabsorption by a mechanosensory mechanism. Increasing the tubular flow velocity applies a torque to the tips of microvilli, which have long moment arms. This torque is transduced through the cytoskeleton to increase the activity of NHE3 and proton ATPase which, in turn, drive sodium bicarbonate reabsorption. This was discussed by Tong Wang (Yale).

Some have espoused that the traditional approach to describing complex processes with systems of partial differential equations will be of limited usefulness to systems biology. Meanwhile, others forge ahead using this approach. Alan Weinstein (Cornell) discussed his recent success at modeling epithelial cell homeostasis in the proximal tubule as a linear dynamical system incorporating 31 variables (concentrations, volumes, pressures) and 24 parameters of interest.

The next series of presentations related to flow and transport beyond the proximal tubule. One of the discussants, Alan Yu (USC), described the pore-barrier function of the various claudins, which are essential components of tight junctions along the nephron.

Several others spoke on matters pertaining to the concentrating mechanism. It has been 60 years since Henle's loop was proposed to function as a countercurrent multiplier. Yet controversy persists over the source of free energy to run the inner medullary portion. Harold Layton (Duke University) briefly reviewed several of the hypotheses that have been advanced over the years and discussed the functional significance of computer-assisted 3-D reconstructions

of the inner medulla based on immunohistochemical labeling of transport proteins. Mark Knepper (NIH) showed that urine volume becomes a slave to dietary protein in mice lacking urea transporters in the inner medullary collecting duct. He also discussed the Schmidt-Nielsen peristaltic theory of urinary concentration and proposed interstitial hyaluronan as a mechano-osmotic transducer to store free energy that is supplied to the papilla by peristaltic contraction of the ureteral pelvic wall.

Leon Moore (SUNY Stony Brook) began with a rhetorical question: "What is the purpose of modeling the thick ascending limb?" He answered by using a basic model of TAL transport and backleak combined with TGF to explain complex features of renal hemodynamics, then noted that these insights could not be obtained by experimentation alone.

Susan Wall (Emory) pointed out the importance of dietary chloride to salt-dependent hypertension and showed that non-A type intercalated cells in the cortical collecting duct reabsorb chloride in response to mineralocorticoid via upregulation of the apical anion exchanger, pendrin (Slc26a4). As proof of the importance of this system to homeostasis, the pendrin deficient mouse is resistant to DOCP-salt hypertension. By contrast, type A intercalated cells, which predominate in the outer medullary collecting duct express chloride-bicarbonate exchangers on the basolateral side and actually secrete chloride when stimulated with mineralocorticoid. Qualitatively, this latter mechanism must work against chloride homeostasis, but its effect on blood pressure is too small to detect.

It has been difficult to fully understand the role of endothelin in salt and water homeostasis because its vascular and tubular effects can't be affected one at a time by pharmacology. Donald Kohan (Utah) solved a big part of the problem by demonstrating salt-sensitive hypertension in a collecting-duct specific knockout of endothelin-1 (ET-1). Collecting duct ET-1 is thereby shown to contribute to negative feedback control of the total body salt and blood pressure, presumably by a paracrine mechanism.

Several talks pertained to the control of renal function, most with emphasis on the juxtaglomerular apparatus. Laszlo Rosivall (Semmelweis University) discussed interstitial fluid balance in the extraglomerular mesangium, a region that has traditionally been viewed as closed-off from the tubule, vasculature, and lymphatics. The distal afferent arteriole is now shown to contain fenestrations facing into this area. These provide a pathway for substances to pass directly between the lumen of the afferent arteriole and the basolateral side of the macula densa. This opens up the possibility of bypassing the traditional TGF mechanism for passing information from the glomerulus to the macula densa by way of Henle's loop. Armin Kurtz (Regensburg) discussed the balance between activators and inhibitors of renin release. Pamela Carmines (Nebraska) discussed the role of tyrosine kinases in renal arteriolar vasoconstriction.

Warwick Anderson (Monash University) described differential innervation of renal structures by different subtypes of sympathetic noradrenergic nerves and hypothesized that differential subtype innervation of pre- and post-glomerular arterioles could explain why RBF declines during low-grade hypoxia but glomerular capillary pressure only declines during a severe hypoxia.

Janos Peti-Peterdi (USC) described an intraglomerular precapillary sphincter which is controlled by the macula densa and which may fatigue to account for the resetting of TGF during a prolonged stimulus. The traditional way to describe dynamic autoregulation in the frequency domain is by short-term Fourier transform. This method lacks resolution, but working with longer time series doesn't work because the dynamic properties of physiologic systems tend to be non-stationary. Ki Chon (SUNY Stony Brook) described a method for overcoming this problem by defining coherence as a function of both time and frequency and combining feed-forward and feedback time-variant coherence functions to describe dynamic RBF autoregulation in the rat. Jurgen Schnermann (NIH) reviewed several theories about the role of TGF in salt balance and discussed the merits and shortcomings of several models in which these theories might be, or have been, tested.

A final session was devoted to a discussion of homeostasis, blood pressure, and pathophysiology.

P. Darwin Bell (Alabama) described how a single amino acid difference in the ubiquitous sodium-calcium exchanger affects regulation of the exchanger by PKC and contributes to the blood pressure phenotype in Dahl SS/SR rats. John Lorenz (Cincinnati) described a phenomenon of anticipatory salt excretion, which is mediated by guanylin peptides secreted by the gut as hormones. Rodger Loutzenhiser (Calgary) described a novel role for myogenic vasoconstriction in the kidney. The time course of the myogenic response has led us to think of it as protection against blood pressure disturbances below 100 mHz. In contrast, Loutzenhiser observed that, while the response might take 10 seconds to reach steady state, it gets underway within the time frame of a single cardiac cycle. Furthermore, the response to a fall in blood pressure is subtly slower than the response to a rise in blood pressure. As a result, the overall renal vascular resistance will increase when the pulse pressure increases, irrespective of the mean arterial blood pressure. This will serve to protect the glomerular capillary against systolic hypertension, but could also have the deleterious effect of shifting the renal function curve rightward in those with stiff arteries. Jane Reckelhoff (Jackson, MS) discussed potential mechanisms for the rightward shift in the pressure-natriuresis curve after menopause. Kate Denton (Monash University) discussed the programming of blood pressure in utero. Judith Miller (Toronto) discussed findings related to renal hemodynamics and diurnal blood pressure variability in human subjects with early type I diabetes.

The meeting was closed by Gabby Navar (Tulane) with a theory to reconcile the mutual culpability of angiotensin and hypertension in injurious renal remodeling. Reconciliation is required because angiotensin normally varies as the inverse of blood pressure. According to the theory, deleterious remodeling occurs when intrarenal angiotensin persists in spite of high blood pressure. Hypertrophy/proliferation results from additive or synergistic hypertrophic/proliferative effects of angiotensin and ATP, the latter being released into the renal interstitium as part of the RBF autoregulatory mechanism to protect the glomerulus against barotrauma. ❖

The Physiologist
Vol. 49, No. 1, 2006

Reflections on Satellite Symposium of XXXV IUPS Mechanisms of Acupuncture Treatment in Disease

John Longhurst
University of California, Irvine

Integrative medicine (IM) concerns those areas of medicine that are not traditionally taught in western medical schools. While there is a long history extending back for literally thousands of years as an empirical science, only in the last 20-30 years have investigators begun to separate fact from fable, actual modality-related response from placebo or biological mechanism from psychological response using modern technological advancements. The National Center for Complementary and Alternative Medicine (NCCAM) has grouped the many areas of integrative medicine into seven categories, including:

1. Mind-body intervention
2. Alternative systems of medical practice
3. Manual healing methods
4. Pharmacological and biological treatments
5. Bioelectromagnetic applications
6. Herbal medicine
7. Diet and nutrition

The science behind each of these practices is still very much in its infancy. Although this situation has been improving slowly, in part due to increasing interest from the medical and scientific communities, as well as from funding provided by NCCAM and the more traditional institutes at NIH, and other funding agencies in the US and abroad, there is still much that is not known and much skepticism that exists throughout the established scientific communities. This is, in part, due to the low quality of much of the science that has been conducted in these non-traditional areas of medicine, including absence of adequate controls, use of outdated methods, non-randomized studies, lack of hypothesis testing, inadequate statistical analyses, unblinded or partially blinded studies, retrospective analyses and the tendency for the results of so many investigations to be positive, even in the absence of supporting data. Funding agencies, such as NCCAM, while providing helpful funding to fuel research in many areas of IM, have not always funded the best science or conferences. This problem exists partially because there is a lack of a sufficient cadre of scientists capable or willing to provide adequate peer review. Thus, CAM or IM can be best viewed as an area that is truly in an immature stage of development with respect to our understanding of its clinical role and mechanisms of action and one that has been only modestly embraced by the western medical/scientific communities. One remedy for the lack of sophistication and acceptance of IM is to bring the best minds together to address the current status of our knowledge and to suggest future productive avenues for research. Such conferences can go a long way towards providing a prescription that will begin to assuage doubts and to introduce our students and post-doctoral trainees to this discipline in a thoughtful manner.

The Susan Samueli Center at the University of California, Irvine, was created by a gift from Susan and Henry Samueli in 1999. Henry Samueli, a resident of Orange County California, is one of the co-founders of Broadcom, a chip manufacturing company. He and his wife, Susan, are extremely philanthropic, having provided gifts to many charities and non-profit organizations. Susan Samueli has a degree in holistic nutrition and practiced homeopathy for many years. The Susan Samueli Center for Integrative Medicine has three major missions, including:

1. education to students, faculty, practitioners and the lay public;
2. research focused at the mechanistic level;
3. clinical service in integrative medicine.

While the center conducts research in several areas of IM, its focus is in the area of Traditional Chinese Medicine, particularly in the area of acupuncture. Investigators in the center are supported by grants from the NIH and voluntary health organization as well as funding from private organizations. The group conducting research includes a mix of physicians, scientists, practitioners, students and postdoctoral fellows from the US, China, Japan, and Korea with a strong background of training in medicine and neuroscience, each of whom are dedicated to the careful application of the scientific method. The center uses its educational and clinical activities to further its research mission. Thus, in addition to international scientific conferences, the center provides courses in evidence-based integrative medical practice, for example in acupuncture and herbal medicine for allopathic and CAM practitioners and sponsors clinical research protocols in its integrative medicine clinic, that features acupuncture.

On March 30, 2005 the Susan Samueli Center for Integrative Medicine at the University of California, Irvine sponsored a satellite symposium for the 35th meeting of the International Union of Physiological Sciences (IUPS). This was the third such conference sponsored by the Samueli Center, with the second held as a satellite meeting of the IUPS, four years ago in Auckland, New Zealand and the first two years before that in Irvine, California.

The planning committee consisted of Peng Li (UCI, USA), Thomas Lundeberg, (Karolinska Institute, Sweden) and myself. Because of our past experience with previous conferences, our knowledge of the field of acupuncture and our scientific contacts throughout the world in this area of research, we were able to select a group of 12 speakers with an interest in research on the mechanisms underlying acupuncture. In addition, we offered an engaging and interactive poster session during which junior faculty, fellows and students had an opportunity to present their research. Faculty from Fudan University, China; Nagasaki University, Japan; Tokyo Metropolitan Institute of Gerontology, Japan; Showa University, Japan; Karolinska Institute, Sweden; Göteborg University, Sweden; Massachusetts General Hospital, USA and the University of California, Irvine, USA, presented a wide range of topics.

Hui discussed the latest research using functional magnetic resonance imaging to detect cerebro-cerebellar and limbic regions of the brain influenced by acupuncture. Lundeberg discussed the influence of acupuncture on pain and anxiety. Hisamitsu presented research on acupuncture and moxibustion in treatment of collagen-induced arthritis. Toda provided his understanding of the antinociceptive action of acupuncture in the spinal trigeminal nucleus. Chen discussed the mechanism of acupuncture

treatment of the perimenopausal syndrome. Stener-Victorin provided her results on the response of the polycystic ovarian syndrome to electroacupuncture. Uchida discussed the influence of stimulating somatic afferents on uterine and ovarian function. Li talked about the role of the hypothalamus and midbrain in electroacupuncture-cardiovascular responses. Tjen-A-Looi provided an understanding of acupuncture's point specific action on the cardiovascular system. Jafari discussed herbals, acupuncture and longevity. Cho discussed his imaging based data on the neurological mechanism of acupuncture in inflammation. I discussed the role of the medulla, specifically the rostral ventrolateral medulla, in regulation of blood pressure by electroacupuncture.

Posters presented a wide range of topics, including evaluation of inflammatory cytokine mRNAs in the ischemic rat brain after acupuncture, the induction by acupuncture of c-Fos expression in the medulla and midbrain and the relationship of these neurons to enkephalins and endorphins, the influence of acupuncture in epilepsy with respect to its action on excitatory and inhibitory neurotransmitters, behavior changes caused by electroacupuncture in combination with antidepressants, inhibition of thalamic neuronal responses to visceral nociception by electroacupuncture, somatic afferent and medullary neuronal mechanisms underlying acupuncture modality and frequency-dependent cardiovascular responses and the effect of acupuncture on glutamate-related excitation in the medulla and the resulting cardiovascular responses.

During the day and evening of this symposium, discussion was lively and probing. Thoughtful criticism was raised, some ideas were put to rest but many new and potentially productive areas were considered. I think the students were exposed to a level of science that set the stage not only for an understanding of the current state of our knowledge but also for a belief that science still has a long way to go to fully understand the neurophysiological mechanisms underlying acupuncture. I hope that productive collaborations will result and that we will have an opportunity to re-engage in four years to evaluate new knowledge and future directions. ❖

Group photograph of conference attendees. Those clearly identifiable in the picture are (listed alphabetically): Ella Ashabi, Stanley Behrens, Bo-Ying Chen, Zang-hee Cho, Debra Clydesdale, Liang-Wu Fu, Zhi-ling Guo, Tadashi Hisamitsu, An-Fu Hsiao, Lonela Hubbard, Kathleen Hui, Mahtab Jafari, Yu Jin, Mari Kimoto, An York Lee, Peng Li, John Longhurst, Thomas Lundeberg, Shulami Park, Yihong Peng, Heather Rice, Elisabet Stener-Victorin, Stephanie Tjen-A-Looi, Kazuo Toda, Sae Uchida, Angela Wang, Hiromi Yamamoto, Ru Yang, Jianliang Zhang, Hong Zhao and Wei Zhou.

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International Teaching Workshop

Ann Sefton, University of Sydney, Australia
Co-Chair, Education Committee, IUPS

For many physiologists, teaching is the major focus of their activities. Indeed, from a global perspective, probably most would fall into that group. Opportunities for research are not available to all, so many academic staff members focus on their educational roles. Most will attempt to keep current by reading new textbooks, journals and the increasing numbers of online resources. Teaching well is not just a matter of being up to date with the content. Educational research is growing rapidly; it is providing us with a clearer understanding of effective strategies and approaches. Newer methods focus on teaching for understanding, recognizing that active learning—not passive memorization—is one of the keys.

Workshop

An international workshop on teaching had become a feature of IUPS Congresses. The tradition started in Jenolan (Australia) in 1983; in 1986 in Vancouver one conference session was included. Keith Cooper and later George Somjen both worked actively to ensure that the international educational momentum was not lost. Thus, there were workshops in Kuopio (Finland) in 1989, Inverness (Scotland) in 1993, Repino (Russia) 1997. The leadership of the Education Commission (now Committee) then passed to Ann Sefton and Penny Hansen, and very successful workshops were held in 2001 at Lincoln (near Christchurch, New Zealand) and in Pali Mountain, an idyllic location in the mountains behind Los Angeles and San Diego in 2005. One feature of the tradition has been the faithful attendance by a small but increasing group. Indeed, at the recent workshop an impressive series of photographs recorded the increasing numbers of "survivors" from each of the previous workshops. We were particularly pleased to welcome two colleagues from Japan where the next congress and teaching workshop will be held.

At the workshop four groups discussed a range of issues in teaching physiology. Each prepared formal reports that are included in the full account of the most recent teaching workshop. It is currently in press and will appear in the next edition of *Advances in Physiology Education*. It is available free online. In summary, there were four plenary sessions: "Inquiry Laboratories," Marsha Matyas (USA); "Are your students prepared to learn physiology?," Rob Carroll (USA); "Evidence-based education," Ann Sefton (Australia); "Integrative vs. disciplinary curricula: a debate," Joel Michael (USA) and Arif Siddiqui (Pakistan). Posters were also displayed, but most of the activity was concentrated into ten intensive hours of small group work. The four "tracks" were:

Participants in the IUPS Teaching Workshop.

"Laboratory resources," was led by Dee Silverthorn and Joel Michael (USA). The group initiated a major project to develop online access to a database of good quality experiments that require only simple equipment and resources. It updates an earlier book of "Simple Experiments" which is now dated and unobtainable;

"The use of information technology in teaching physiology" is a challenging issue for most teachers. The group was facilitated by Tom Nosek (USA) and Usha Nayar (Bahrein);

"Curriculum planning and design" was led by Bill Galey (USA) and Beatriz Ramirez (Chile). The discussion focused on effective strategies for developing educationally effective curricula; and

"Issues in classroom teaching" was facilitated by Barb Goodman (USA) and Kirsten Farrand (Australia). They produced many practical ideas to assist teachers in face-to-face encounters.

Informal sessions in the evenings included a memorable final event in which the wearing of national dress was encouraged. (That always poses something of a challenge for the Americans and the Australians!) It was a colorful affair, with a wonderful variety of costumes. In particular, those present will never forget the Sumo wrestler facing up to his much more formidable Turkish friend.

The overall response from the participants was that the workshop was very effective in stimulating their thinking about educational ideas. They valued the truly international nature of the event; many new links were made and older relationships renewed. Undoubtedly the discussions led to a greater understanding of aspects of teaching physiology in different environments across the world, and new links were forged. The ratings from participants were exceptionally good. Perhaps the high point, however, came when we awoke one morning to find the site blanketed in snow (new to some of the participants from tropical areas), with bear prints clearly visible close to the lodge.

Many of the previous workshops had been held prior to the congress, allowing participants to meet in a smaller setting. Those present often developed mutual support, since the main con-

gresses can be overwhelming to newcomers and those with few local or national colleagues present. Participants, however, considered that the format worked well and it is likely that the same pattern will be used at the next congress. Perhaps our Japanese hosts might like to think about providing a specially colored name tag, a bright dot or some similar device to identify those at the main congress who will be going on to the workshop. The inclusion of some educational sessions in the program will also assist newcomers.

At the Congress

For the first time, a series of sessions at the main Congress provided opportunities for those interested in aspects of education to participate. We hope that the tradition will be continued into future congresses, as the quality of the sessions was high, and they attracted lively and interactive audiences. The pattern was similar to that well established at Experimental Biology meetings, and it is certainly a tradition that should continue into future congresses.

Many individuals were, therefore, able to submit abstracts into an "education" section, and to display their posters at the main Congress before taking them on to the workshop, something that had happened only for the first time in Christchurch. Previously, posters had been shown and discussed only at the workshop. Some used a "table-top" presentation from their own computers, again something that should be encouraged in future congresses. We would certainly recommend including an "education section" for all future congresses.

The symposia and featured topics at the main congress were very well attended; discussion was both lively and well-informed at all sessions. We urge the inclusion at future congresses of similar opportunities for general discussions of important questions in physiology education.

The first event from the education section was a refresher course on genomics led by Dan Lemmon and Anna Kwitek (USA); other speakers came from UK and Germany. The course was particularly well received and much praised by those who attended.

Two educational symposia were held at the main congress: "Effective uses of information technologies in education," with Simon Carlile (Australia), Thomas Nosek (USA) and David Dewhust (UK) and "Research in physiology education from the classroom to the teaching community," led by Harold Modell, with speakers Mary Pat Wenderoth, Stephen DiCarlo and Joel Michael (all USA). The audience was very keen to participate in both sessions; the discussion was particularly lively and stimulating.

Two featured topics were programmed, both again well-attended. The first was "The many faces of problem-based learning: A framework for integrative physiology education," with Usha Nayar (Bahrein) and Antonio Rendas (Portugal), chaired by Penny Hansen (Canada). The second was chaired by Dee Silverthorn (USA) and Maria Jose Alves da Rocha (Brazil): "The role of student practical laboratories in teaching physiology." The speakers were Dee Silverthorn and Norberto Garcia-Cairasco (Portugal). Both topics generated interest and lively discussion.

I was delighted and honored to be offered the opportunity to deliver the Claude Bernard Distinguished Lecture on the topic "Charting a global future for teaching physiology."

My overall impression of the joint meeting is that despite some earlier anxieties, the program came together very well. Of course some who suggested topics or issues that were not included will inevitably be disappointed, but, after a somewhat tense start to the planning discussions, the overall program was outstanding. It included something of interest to all, but of course it is very frustrating when an individual cannot be in two sessions at once. The venue is excellent, if a bit dauntingly large to someone from a smaller population base. Having the IUPS activities clustered made it easier to move between sessions and helped to retain a sense of identity. Certainly I met few who were disappointed in any aspect, and that was usually because of a serious clash in personal interests or an inability to take in simultaneous oral and poster sessions, given the richness on offer. There had been some concerns that IUPS might be lost in the larger environment of EB, but to me the international flavour came though very clearly. It is the people who make these events, and the opportunity to meet so many from all over the world remains a great privilege.

The social program and the hospitality were almost as daunting as the congress itself! Those events were very well organized and memorable, from the beach party to the symphony. The sense of international friendship and mutual support was very clear. It is always wonderful to catch up with friends and colleagues from so many countries in a stimulating intellectual environment. San Diego is a wonderful location, and the weather obliged us nicely. ❖

D. Neil Granger presenting plaque to Bodil Schmidt-Nielsen Award recipient Christin Carter-Su.

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Breathless in San Diego

**Andrew Binks & Robert Banzett, Harvard School of Public Health, Boston, MA;
Robert Lansing, University of Arizona**

The satellite meeting "Dyspnea: Mechanisms and Management" was held at the Joan Kroc Peace and Justice Center at University of San Diego the two days prior to the main IUPS meeting. The meeting was held not only to address the latest research investigating dyspnea, but also to discuss the prevailing problems for research in this field and the problems faced by patients who suffer this debilitating symptom. The beautiful campus setting at USD gave us a panoramic view of San Diego and the staff there did everything needed to make the meeting run smoothly.

"Shortness of breath" or "Dyspnea" is a prominent symptom of serious diseases of the lungs and heart. Dyspnea is a powerful, very uncomfortable, and sometimes frightening sensation. Many people with chronic lung or heart disease become "respiratory cripples" because they alter their lives to avoid experiencing dyspnea, others cannot even escape dyspnea at rest, one of the worst problems for many people in the last weeks of their lives. Chronic lung and heart diseases are increasing in our society and half of the patients admitted to major hospitals report dyspnea—–that's equal to the number reporting pain. Dyspnea is reported by about 25% of the general public over 40 years old making it one of the most common symptoms that cause people to seek medical care. The presence of dyspnea predicts mortality with a relative risk of 2, equal to chest pain. Failure to adequately perceive dyspnea has been implicated in the risk of asthma death. Despite the strong association of dyspnea with distress and mortality, understanding of the neurophysiology of dyspnea has lagged far behind the understanding of pain, with a consequent lag in treatment options. To stimulate interdisciplinary thinking and collaboration about dyspnea we brought physiologists together with nurses, physicians, therapists, and patients, many of whom had not met together before. We had nearly 60 attendees, with a wide range of scientific backgrounds and countries represented.

The symposium covered physiology, psychology, and clinical issues in four speaker sessions and three discussion workshops. In addition to invited speakers we enjoyed both short talks and posters of volunteer presentations as well as an historical after-dinner talk by one of the pioneers in the field, Abe Guz (Charing Cross Hospital, UK). Guz pointed out that this was the first two-day symposium focused entirely on dyspnea since 1965, and that he was delighted to have attended both (along with John Severinghaus). We shared all meals during the symposium, and the evening reception and dinner on the first day ensured that our meeting was in accord with the etymology of the word "symposium."

The symposium was opened by lead organizer Andrew Binks (Harvard School of Public Health, USA), who explained that the first three speaker sessions were organized to cover the distinct physiological mechanisms underlying the three currently identified distinct sensations of dyspnea: the perception of the urge to breathe (air hunger), the perception of increased work/effort of breathing, and the perception of asthmatic tightness; the fourth speaker session and two of the workshops were devoted to clinical issues.

In the session on physiology of air hunger, the first speaker, Bob Banzett (Harvard School of Public Health, USA) made several key points: first, that although air hunger is only one of several sensations that can contribute to dyspnea, it is perhaps the most unpleasant and frightening one. He then discussed the probable neural origin of air hunger in a corollary copy of respiratory center motor activity projecting to the cerebral cortex. He presented several lines of evidence showing that air hunger is distinct from work/effort—-including data showing that ratings of work/effort are greatly increased during voluntary hyperpnea under partial neuromuscular block, while air hunger remains at zero. Finally he discussed the profound reduction of air hunger produced by tidal volume stimulation of pulmonary stretch receptors. Takashi Nishino (Chiba University, Japan) then spoke about the effect on dyspnea of inhaled aerosol furosemide, which stimulates slowly adapting pulmonary stretch receptors. He presented evidence that furosemide reduces air hunger during breath hold in humans, and reduces behavioral escape responses during airway occlusion in lightly anesthetized cats. He went on to show exciting evidence of beneficial effects on intractable dyspnea in selected clinical cases. In addition to further informing us about the neural mechanism of air hunger relief, his presentation offered a possibility for an animal behavioral model of dyspnea, which we currently lack. Julie Wenninger took up the theme of animal models in her subsequent volunteer presentation on ablation of the Pre-Boetzinger complex in goats..

The second session was intended to cover the mechanisms of sensations of work and effort to breathe. Paul Davenport (University of Florida, USA) pointed out that obstruction of the airways and the consequent increased mechanical work of breathing is one common cause of respiratory discomfort, but that ordinarily the load faced by the respiratory muscles is not consciously perceived. He hypothesized that the transition from unconscious to conscious perception of breathing is gated, and provided evidence using measurement of evoked potentials during external respiratory loads. He described a model for neural gating of afferent information from the lungs and respiratory muscles. Simon Gandevia (University of New South Wales, Australia) spoke of the role of motor command, and the possibility that the disparity of mechanoreceptor feedback and motor command gives rise to breathlessness. He also discussed the potential of C-fiber afferents innervating the pulmonary parenchyma to give rise to respiratory sensations—-further investigation in this important area could lead to identification of a distinct, fourth form of dyspnea.

The third session on mechanism covered a more controversial area, the sensations of asthma and their mechanisms. Two leaders in this field shared different views on the origins of sensations experienced during an asthma attack. Richard Schwartzstein (Harvard Medical School, USA) described the sensations involved with asthma and how he uses questionnaires to overcome patient's communication problems in accurately describing the sensations they experience during an asthma attack. "Tightness" is prevalent sensa-

tion in asthma and is unique to asthma. Schwartzstein spoke about the possible relationship between tightness and hyperinflation during bronchoconstriction. He pointed out the different interpretations that may arise depending on whether investigators ask patients or subjects to focus on "tightness" or on more general terms such as breathing discomfort or breathing difficulty. Schwartzstein presented evidence from both clinic and lab showing that "tightness" can occur in the absence of hyperinflation. He went on to give evidence that the sensation of "tightness" is derived from intrapulmonary receptors, rather than from respiratory muscles afferents. Denis O'Donnell (Queen's University, Canada) described a role for lung hyperinflation and modified respiratory muscle activity in generating discomfort in asthmatics. He discussed the increased load on inspiratory muscles at high lung volumes, and their reduced effectiveness at shorter working length. He showed evidence that the increase in lung volume (or more specifically, the resultant decrease in inspiratory capacity) is the best predictor for increases in dyspnea in obstructive disease. More specifically, O'Donnell showed "tightness" increases with worsening hyperinflation, and that tightness can occur with hyperinflation in the absence of bronchoconstriction. He posited that the sensation arises from neuro-mechanical dissociation, or the discrepancy between motor command and resultant afferent feedback. Clearly, these apparently conflicting views need to be resolved with data obtained in mutually agreeable experiments.

Recent advances in the understanding of the central mechanisms of dyspnea have been made using functional brain imaging techniques (fMRI and PET). However, brain imaging studies pose challenges for those investigating respiratory physiology and psychophysics. Changes in blood oxygen and carbon dioxide are common interventions for the respiratory physiologist, but these changes also cause fluctuations in cerebral blood flow unrelated to neural activity; therefore, they have the potential to produced artifacts. Karl Evans (Harvard Medical School, USA) is a psychiatrist and physiologist who is fully aware of these problems after addressing them in several studies investigating neural correlates of dyspnea. Evans explained some fundamental principles, problems and solutions of brain imaging and then described some of the recent findings. The data revealed neural activations associated with air hunger in the cingulate cortex, amygdala, thalamus and hypothalamus, evolutionarily old areas of the cortex important in behavioral responses. Evans went on to relate these activations to similar activations caused by pain and by anxiety.

Lewis Adams (Griffith University, Australia) led a workshop on measurement of dyspnea, and covered a wide range of issues relating to measurement of clinical dyspnea, laboratory dyspnea, how to compare the two, and what measures might best assess the outcome of treatments. The first important theme to emerge was the desirability of measuring dyspnea by the report of the patient or subject, rather than inferring dyspnea from functional outcomes such as FEV_1 or six-minute walk distance (as one discussant put it, a defining moment in pain care was the acceptance of the concept that "pain is what the patient says it is"). From this arose a conversation regarding how to better measure what the patient or subject feels, including the need to measure the several distinct sensations covered in the first portion of the symposium, and in addition, the relatively unexplored concept that quasi-independent dimensions of sensory intensity and aversive emotional response of dyspnea should be measured. Bob Lansing (University of Arizona, USA) led discussion on developing behavioral measures that could be used to measure the aversiveness of dyspnea in both humans and animals, such as those that have been used in the fields of pain, thirst, and hunger. It was clear from the comments during this session that we need to be cognizant of the difference between clinical dyspnea and laboratory dyspnea, but there was also hope expressed that, by continuing to interact in meetings such as this one, clinical and laboratory scientists would create and use measures that better translate findings between the lab and clinic.

A problem faced by pulmonary physicians is the treatment of patients who report dyspnea without any apparent underlying disease or condition to explain the symptom, i.e., "idiopathic dyspnea," the topic of the second workshop. Schwartzstein opened this session with a description of the gray area between physiological and psychological origin of dyspnea, pointing out that although presence of any lung disease usually rules out the label idiopathic dyspnea, many pulmonary patients seems to suffer dyspnea disproportionate to their physiological deficit. The discussion considered the possible distinctions and similarities among idiopathic dyspnea, hyperventilation syndrome, and panic disorder. Several participating clinicians reported that patients with idiopathic dyspnea commonly describe it as "unable to get satisfying breaths." Although it seems likely that purely "neurogenic" dyspnea exists, discussants pointed out that there is a lack of data on how much dyspnea someone should feel for a given deficit in lung function, and that many patients probably experience disproportionate dyspnea. The patients in the audience described the role of situation or environment in modulating their dyspnea; how the sense of lost control in some situations may induce a sense of panic that exacerbates dyspnea. Several participants discussed evidence that pulmonary rehabilitation can desensitize a patient to dyspnea such that the same intensity of reported dyspnea causes less anxiety or panic. The patient advocates reported enthusiasm of COPD patients for rehabilitation programs, and the difficulty of obtaining health insurance coverage for them.

The latter part of the second day was mainly occupied with clinical issues, and how they related to the foregoing physiology. Jessica Corner (Southampton University, UK), an expert in palliative care, began the session on "Quality of Life and Palliative Care" by emphasizing the need for a broader approach to symptom management that includes non-pharmacological intervention. She described the efforts of her group and others to explore other therapeutic strategies particularly those that recognize the emotional, social and financial impact of severe breathlessness that occurs in late stage disease: family disruption, isolation, loss of employment, depression, and anxiety. Corner reviewed recent research that demonstrates the value of integrated interventions including psychotherapy, pulmonary rehabilitation, and nurse management techniques. She reported success in establishing a dyspnea management protocol as recognized standard of care in the UK. Research is needed to independently evaluate the efficacy and mechanisms of these and other forms of intervention and developing models for combining them with pharmacological

interventions over the escalating course of disease. Paula Meek (University of New Mexico, USA) presented arguments in favor of different dyspnea measures for assessing the treatment of dyspnea and its clinical impact. She outlined some of the difficulties in combining and relating measures of immediate perception, common in laboratory studies using visual analog or Borg scales, and the secondary effects commonly measured by life-impact scales. For example, as impairment worsens over time a patient may maintain a low level of dyspnea, but at the expense of progressively reducing their daily activities. In future studies there is a need to develop measures of the emotional or distressing dimensions of dyspnea particularly as they relates to symptom severity and the motivation to seek care.

John Hansen-Flaschen (University of Pennsylvania, USA) led the final workshop on dyspnea in critical care and palliative care. One of the key themes of this workshop was using the patient's level of comfort as an outcome criterion for adjusting mechanical ventilation. It was posited that "patient-centered ventilation" might reduce required sedation. Although some expressed doubts about the ability of such patients to communicate what they feel, several clinicians in the group reported success using yes-no questions or graphic indicators the patient could point to. Arguments against patient-centered ventilation included the difficulty of properly controlling increasingly complex ventilators, and the possibility of lung damage in a subset of patients at risk for such problems. Another theme of this session was improvement of dyspnea in palliative care situations, which the moderator categorized as threee kinds: dyspnea only during exertion that severely limits a person's capacity to engage in daily life; paroxysmal dyspnea that causes brief but very frightening episodic discomfort; and sustained dyspnea that cannot be escaped even at rest. The clinicians present agreed that current treatment options are limited, but that verbal counseling, breathing training, and relaxation techniques could be very useful in many circumstances if they are tailored to fit the case. In addition, reconditioning may help those with dyspnea only on exertion, and that opiates are a useful tool for sustained dyspnea, especially in the final weeks of life. There was practical discussion about what can be done to treat dyspnea when the ICU becomes a defacto palliative care unit, and philosophical discussion about increasing priority on addressing the dyspnea the patient feels, rather than fixating only on attempts to reverse the pathophysiology.

One of the most important outcomes of this meeting was to foster conversation between scientists who had very different orientations and approaches to the study dyspnea. There was wide agreement that the group should continue to meet periodically, and should open other channels of communication as well. We have established a dyspnea interest group mailing list that one can join by emailing dyspnea@hsph.harvard.edu. We profusely thank our host: Sue Lowery, of the Biology Dept. at USD; and our sponsors: IUPS, The Physiological Society, and especially Boehringer-Ingelheim Pharmaceuticals who provided the bulk of the funding. ❖

Research Priorities in Urothelial Cell Physiology: A Report on the IUPS Satellite Meeting

Lori Birder[1], Anthony Kanai[1], Monica Liebert[2], and Ricardo Saban[3]
[1]University of Pittsburgh School of Medicine, Department of Medicine
[2]American Urological Association, Inc.
[3]University of Oklahoma College of Medicine

"Urothelial Cell Physiology in Normal and Disease States" http://www.urothelium2005.com a Satellite Symposium to the International Physiology, 2005 (San Diego- March 29-30, 2005).

This was a well-balanced group of outstanding speakers who addressed key issues of lower urinary tract physiology and dysfunction. Thirty five speakers (21 males and 14 females) have participated. Among those, 40 percent were from abroad (Australia, Denmark, France, Italy, Netherlands, Sweden, and UK).

The symposium specific objectives were to review bladder physiology and to discuss the principal aspects of lower urinary tract dysfunction, including: detrusor instability, stress incontinence, interstitial cystitis, bladder cancer, infection, inflammation, and immunity. In addition, the participants sought to identify new post-genomic research approaches.

The symposium specific goals were to attract new scientists to this important area of research and to stimulate the participation of postdoctoral fellows and graduate students by providing travel awards for selected poster presentations. More than 100 attendees, mostly young investigators, participated in this meeting and 43 posters were presented.

A sensory role for the urothelium. **A sensory role for the urothelium.** Lori Birder (University of Pittsburgh) presented data demonstrating a sensory function for the urothelium. Although the urinary bladder urothelium has classically been thought of as a passive barrier to ions/solutes, a number of novel properties have been recently attributed to these cells. Studies have revealed that the urothelium is involved in sensory mechanisms (i.e., ability to express a number of sensor molecules including TRPV1 or respond to thermal, mechanical, and chemical stimuli) and can release chemical mediators (nitric oxide; ATP). Localization of afferent nerves next to the urothelium suggests these cells may be targets for transmitters released from bladder nerves or that chemicals released by urothelial cells may alter afferent excitability.

Research priorities: elucidation of mechanisms impacting on urothelial function may provide insights into the pathology

of bladder dysfunction.

Role of the bladder urothelial cell in sensory signal transduction using interstitial cystitis as a human model. Toby Chai (University of Maryland) presented results indicating that human interstitial cystitis (IC) urothelial cells persist with an abnormal phenotype within a cultured *in vitro* system. The theory of augmented purinergic signal transduction in IC bladder urothelial cells has been supported by several observations including augmented ATP release and increased expression of P2X3/P2X2 receptors. Patch-clamp electrophysiological studies of both normal and IC urothelial cells revealed a persistent altered phenotype in IC urothelial cells with decreased activity of Kir2.1 inward rectifying potassium current in the IC cells. *Research priorities:* to determine whether the altered phenotype in ion-channel function relates to increased bladder sensory signaling.

P2X receptors and ATP regulation of urinary bladder function. Debra Cockayne (Roche Bioscience) presented results indicating that distension of the urinary bladder results in release of ATP from the urothelium and excitation of $P2X_3$ receptors on adjacent primary sensory neurons. More recently, the role of $P2X_3$ and $P2X_{2/3}$ receptors in urinary bladder function was defined by using $P2X_3$ KO, $P2X_2$ KO and $P2X_2/P2X_3$ double KO mice. Activation of $P2X_3$ and/or $P2X_{2/3}$ receptors on bladder afferent terminals are important in mechanosensation and represent a critical step in sensing bladder filling information under anesthesia, or following capsaicin or inflammation, suggesting an important action of ATP acting via a c-fiber mediated reflex pathway. *Research priorities:* defining the role of $P2X_3$ and $P2X_{2/3}$ receptors in mediating sensory fiber dependent responses in models of bladder function and pain transmission. Lastly, significant advances must be made in developing safe and effective small molecule antagonists to $P2X_3$ receptors if preclinical research in this area is to advance to the clinic.

Cystitis-Induced Plasticity of Micturition Reflexes. Margaret Vizzard (University of Vermont) described effects of cyclophosphamide (CYP)-induced cystitis on two downstream transcription factors, CREB and c-Jun in dorsal root ganglia (DRG). Also discussed were the effects of a recombinant NGF sequestering protein (REN1820) on lower urinary tract reflexes with cystitis. *Research priorities: 1*) Additional characterization of NGF and BDNF in sensory innervation (afferent and urothelium) to the bladder in the context of cystitis; *2*) Additional characterization of NGF and BDNF effects on the efferent limb of the micturition reflex; *3*) Development of additional tools directed at neurotrophins and neurotrophin receptors.

Plasticity of bladder sensory and motor nerves: the role of neurotrophins and steroids. Janet Keast (University of Sydney, Australia) emphasized that in adult female rats many bladder afferent neurons express estrogen receptors (ERs) co-localized with TRPV1. This raises the possibility that estrogens affect bladder pain by influencing sensory transduction. She presented results indicating that neurturin, a member of the GDNF family, plays a role in maintaining these neurons in adult mice. *Research priorities:* to reveal new drug targets for modulating responses of bladder afferent and efferent neurons to tissue damage, inflammation or nerve injury.

Central processing of nociceptive input from the urinary bladder. Robert D. Foreman (University of Oklahoma) recorded extracellular action potentials of lumbosacral spinal neurons to determine their responses to urinary bladder distension in pentobarbital anesthetized rats with an inflamed or normal colon. His results show that colitis caused an increase in the sensitization of lumbosacral spinal neurons receiving input from a "normal urinary bladder." *Research priorities:* to determine the basic neural and humoral mechanisms involved in visceral cross-sensitization and whether humoral mechanisms may also have secondary effects on smooth muscle function.

Detrusor Instability–Clinical Perspective. Karl-Erik Andersson (Institute of Laboratory Medicine, Sweden) discussed the fact that detrusor overactivity (DO) is an urodynamic diagnosis that may or may not be associated with the overactive bladder (OAB). DO is defined as "a urodynamic observation characterized by involuntary detrusor contractions during the filling phase which may be spontaneous or provoked. DO may be neurogenic (previously hyperreflexia)—when there is a relevant neurological condition—or idiopathic—when there is no defined cause. Idiopathic detrusor overactivity now replaces the term detrusor instability. Treatment options include conservative bladder retraining, biofeedback, electrical stimulation, neuromodulation, pharmacotherapy, and, as a last resort, surgery. Pharmacotherapy is based on blocking bladder muscarinic receptors, but unfortunately, antimuscarinic treatment is far from optimal. *Research priorities:* to define targets and mechanisms for effective therapeutic interventions.

The cellular basis of contraction in human detrusor smooth muscle from patients with stable and overactive bladders. Chris Fry (U. College London, UK) reviewed the role of Ca^{2+} channels, intracellular Ca-stores, purinergic mechanisms, and interstitial cells in the over-active bladder. *Research priorities:* the identification and characterization of changes to human detrusor function associated with bladder over-activity including: *1*) Characterization of the control of transmitter function on the detrusor by pre- and post-synaptic mechanisms; *2*) The mechanisms regulating intracellular Ca^{2+} homeostasis; *3*) The interplay between electrophysiological and chemical signaling pathways in regulating cellular and intercellular mechanisms controlling detrusor contractility; and *4*) The regulation of quantal Ca^{2+} release from intracellular stores.

Overactive bladder and incontinence in the absence of the large conductance calcium activated potassium (BK) channel. Matthias Werner (University of Vermont) studied the large conductance and calcium-activated potassium (BK) channels in the urinary bladder smooth muscle cells of $Slo^{-/-}$ mice; these mice lack calcium-activated BK currents, but exhibit normal calcium transients and voltage-dependent potassium currents. In the absence of BK channels, spontaneous and nerve-evoked contractions of the urinary bladder were significantly enhanced. Consistent with this increased bladder contractility, $Slo^{-/-}$ mice demonstrated a marked increase in voiding frequency coupled with reduced bladder capacity. Furthermore the average bladder pressure was increased in $Slo^{-/-}$ mice compared to controls, as well as the frequency of oscillations in bladder pressure.

These results revealed a central role for BK channels in urinary bladder function, and indicated that BK channel dysfunction leads to overactive bladder and urinary incontinence. *Research priorities:* in addition to electrophysiological studies on isolated myocytes and monitoring of intracellular Ca^{2+} dynamics, *in vitro* and *in vivo* approaches should be applied on transgenic mice lacking the BK channel to clarify its role in the urogenital tract.

Functional genomics of detrusor smooth muscle. George J. Christ, (Wake Forest University) emphasized that functional Genomics provides an important cornerstone for the new age of molecular medicine, and lends itself to identifying small molecules and genes that may be of therapeutic utility. This approach was successfully used to identify targets for gene transfer of erectile dysfunction and a similar strategy for the treatment of bladder overactivity is now being pursued. However, in severely diseased tissues, pharmacological and gene transfer approaches may no longer be feasible, as the tissue damage is too extensive to permit pharmacological or genetic manipulation. In such cases, tissue-engineering approaches are utilized for total tissue/organ replacement. *Research priorities:* identification of the mechanistic basis of changes critical to the improved understanding, diagnosis and treatment of bladder dysfunction leading to urinary incontinence. Multidisciplinary, translational research approaches are required to identify, develop and distribute the required technologies. In this scenario, microarray (gene chip) technologies can be used to identify the genetic changes in smooth muscle cells that are associated with bladder dysfunction.

Urothelial-Smooth Muscle Communication as Revealed by Optical Imaging. Anthony J. Kanai (University of Pittsburgh) described the use of optical imaging techniques to study detrusor spontaneous activity. A dual photodiode array system was developed to simultaneously record action potentials and Ca^{2+} transients from 256 sites across the bladder wall. In adult mice, spontaneous Ca^{2+} transients are disorganized, arising at multiple sites and resulting in low amplitude (2-5 cm H_2O) contractions. In spinal cord transected or partially obstructed animals however, pacemaker-like activity at the dome initiates Ca^{2+} waves that spread uniformly through the detrusor resulting in large amplitude (15-25 cm H_2O) contractions. Gap junction blockade (10 mM glycyrrhetinic acid) abolished spontaneous activity in transected and obstructed mice, but not in adults. IHC revealed that connexin 43 is localized to lamina propria myofibroblasts (LPM) and connexin 45 to detrusor smooth muscle cells. In transected and obstructed mice, only connexin 43 was elevated. This suggests that in the pathological bladder, organized spontaneous activity spreads through gap junctions interconnecting the LPM and not the smooth muscle cells. The LPM in turn may communicate with urothelial cells or nerves with which they are in close contact. *Research priorities:* to better understand the mechanisms underlying detrusor overactivity: *1*) The involvement of the urothelium, afferent nerves and smooth muscle cells; *2*) The importance of gap junctions and their site of expression; and *3*) The role of lamina propria myofibroblasts and spontaneous bladder activity.

Functional and Disease Implications of Uroplakins: Lessons from Knockout Studies. Tung-Tien Sun (New York University) described the apical surface of the mammalian urothelium which is covered by 16 nm protein particles packed hexagonally to form 2D crystals of asymmetric unit membranes (AUM); this structure contributes to the remarkable permeability barrier function of the urinary bladder. He has previously shown that bovine AUMs contain four major integral membrane proteins, i.e., uroplakins Ia, Ib, II and III, and that UPIa and Ib form heterodimers with UPII and III, respectively. Using a panel of antibodies recognizing different conformational states of uroplakins, this demonstrates that the UPIa-dependent, furin-mediated cleavage of the prosequence of UPII leads to global conformational changes in mature UPII, and that UPIb also induces conformational changes in its partner UPIII. These results indicate that tetraspanin uroplakins, and possibly other tetraspanin CD molecules, can induce conformational changes leading to the ER exit, stabilization and cell-surface expression of their associated, single-pass partner proteins. A model of AUM assembly was proposed in which conformational alterations of integral membrane proteins induced by differentiation-dependent glycosylation and the removal of the prosequence of UPII play a key role in regulating the assembly of uroplakins to form AUM.

Urothelial permeability. Simon Lewis (University of Texas at Galveston) emphasized that the prime function of the bladder epithelium is to act as a barrier between the urine and plasma. The key players in maintaining this barrier and those candidates that alter this function such as reactive oxygen species (ROS) were reviewed. Although a number of transgenic animals are available, methods for studying the urothelial physiology of these animals is lacking. *Research Priorities:* what is the molecular basis for the low permeability of the luminal membrane and tight junctions of the urothelium? Does the urothelium facilitate communication between the luminal compartment and the serosal compartment? What receptor families are present in the urothelium and what is their distribution? How does the urothelium deal with the leak of urinary constituents into the interstitial space? What is the response of and the consequences to the urothelium of bladder inflammation?

ATP and Purinergic Receptor-Dependent Membrane Traffic in Bladder Umbrella Cells. Gerard Apodaca (University of Pittsburgh) described the umbrella cells lining the urinary bladder as mechanosensors which participate in the augmentation of the apical surface area during bladder filling. His data indicated that increased hydrostatic pressure stimulates the release of ATP from the uroepithelium, and that upon binding to P2X and possibly P2Y receptors on the umbrella cells, mobilizes downstream Ca^{2+} and activates protein kinase A. This promotes membrane insertion at the apical pole of umbrella cells. *Research Priorities:* to better understand membrane trafficking pathways in polarized epithelial cells, it is necessary to determine how umbrella cells sense changes in pressure and how these changes are translated through secondary messenger cascades into vesicle fusion events followed by membrane recovery through endocytosis.

Signal Transduction in the Bladder. Michael R. Freeman (Harvard University) identified heparin-binding epidermal growth factor-like growth factor (HB-EGF) as an urothelial cell and bladder smooth muscle cell (SMC) mitogen that is synthesized in both the bladder epithelial and muscle tissue compartments. In pub-

lished studies it has been shown that following a mechanical stimulus, HB-EGF gene is upregulated by a mechanism involving angiotensin-, receptor tyrosine kinase- and mitogen activated protein kinase- (MAPK-) dependent pathways. HB-EGF localizes to the cell nuclei of transitional cell carcinoma (TCC); this histologic feature is an indicator of poor prognosis in human bladder cancer. Recent studies have employed DNA microarray, proteomics, and organ culture approaches to further understand the signaling processes that drive pathologic cell and tissue growth in the bladder. Nuclear-localized HB-EGF can be mobilized into an EGF receptor-dependent autocrine loop in response to the intracellular production of reactive oxygen species in TCC cells. Collectively, these studies have shown that HB-EGF is an important signaling peptide in the bladder in multiple physiologic and pathophysiologic contexts.

Antiproliferative factor, heparin-binding epidermal growth factor-like growth factor, and epidermal growth factor in interstitial cystitis. Susan Keay (University of Maryland) identified an antiproliferative factor in the urine of interstitial cystitis patients. APF is a small sialylated glycopeptide whose backbone peptide sequence bears 100% homology to the sixth transmembrane segment of frizzled 8. It is hypothesized that APF may cause the bladder epithelial abnormalities associated with IC. It is propose that APF may be useful as a noninvasive diagnostic biomarker for this disorder. *Research priorities:* identification or development of agents that inhibit the production or activity of APF.

Role of sensory peptides on the physiology of the lower urinary tract. Karl-Erik Andersson (Institute of Laboratory Medicine, Sweden) discussed the functional roles of many of the neuropeptides that have been demonstrated to be synthetized, stored, and released in the human lower urinary tract. Defining sensory peptides as the peptides found in sensory nerves, the functional effects of substance P (SP) and other tachykinins, calcitonin gene-related peptide (CGRP), vasoactive intestinal polypeptide (VIP), and pituitary adenylyl cyclase activating peptide (PACAP), have been the most widely investigated. However, the importance of VIP and also of PACAP, which is often co-localized with VIP, for normal and /or disturbed detrusor function, remains to be established. It is well known that both the expression and functional importance of sensory peptides may change by disease. Future studies of such changes in animal models of, and in patients with lower urinary tract disorders, are necessary to reveal their roles in the pathogenesis of disturbances of bladder function, and for identifying targets for possible therapeutic interventions.

The role of cysteinyl-leukotrienes in cystitis. Kirsten Bouchelouche (University of Copenhagen, Denmark) presented evidence for the existence of specific leukotriene D_4 (LTD_4) receptors in human detrusor smooth muscle cells. A role of cysteinyl-leukotrienes is supported by the increase in urinary excretion of LTE_4 in patients with interstitial cystitis and detrusor mastocytosis compared to healthy controls. A pilot study using the specific LTD_4 receptor antagonist SingulairÒ in IC patients with detrusor mastocytosis, resulted in a significant decrease in voiding frequency and pain. Future studies should be focused on the role of these factors in mast cell recruitment and survival in interstitial cystitis.

Urothelium-derived inhibitory factor. Russ Chess-Williams (The Royal Hallamshire Hospital, UK) presented evidence for an urothelium derived inhibitory factor (UDIF). Using selective antagonists, it was shown that the inhibition by UDIF is prevented in the presence of selective M2 but not M3 muscarinic receptor antagonists. This confirms the importance of the M2 receptor subtype in mediating UDIF release. *Research Priorities:* to identify the UDIF, to investigate whether its release is altered in the overactive bladder, and to identify the cells types responsible for producing the factor.

Tachykinin and vanilloid receptors in human urinary bladder. Elizabeth Burcher (University of New South Wales, Australia) presented results on the density of capsaicin (TRPV1) and substance P (neurokinin) receptors in the bladders of control and sensory urgency (SU) patients. In control patients, there was a higher expression of TRPV1 in the mucosa compared with the detrusor. In sensory urgency (SU) patients, there was a higher expression in the trigone (mucosa) compared with the body (mucosa). As the trigone is embryologically different from the bladder body, it is hypothesized that excessive afferent signaling from the trigonal mucosa may be related to an early first desire to void. The presence of tachykinin NK2 receptor mRNA in detrusor is in accordance with previous reports of high levels of the receptor protein.

Tachykinins as modulators of the micturition reflex in the central and peripheral nervous system. Alessandro Lecci (Menarini Ricerche Firenze, Italy) presented evidence indicating that tachykinins (TKs) modulate the afferent arm of the micturition reflex by acting at the peripheral and spinal cord level. The target of supraspinal modulation remains to be determined. In addition, clinical studies with TK receptor antagonists indicate that blockade of this modulation is a suitable therapeutic approach for the treatment of bladder overactivity.

Interplay between tachykinin, muscarinic and purinergic receptors. Kate Moore (University of New South Wales, Australia) presented an overview on idiopathic detrusor overactivity, the second most common cause of urinary incontinence in women. Integrating the changes that occur in tachykinin, purinergic, and muscarinic receptor expression in the urothelium and detrusor of IDO patients will lead to careful characterization of the clinical and urodynamic features. In addition, it will permit the classification of patients with predominantly afferent deficit or efferent deficit.

Visualization of lymphatic vessels through NF-kB activity. Ricardo Saban (University of Oklahoma) using a transgenic mice with a reporter gene for NF-kB activity (kB-*lacZ*) in combination with immunohistochemical staining with a specific lymphatic marker (LYVE-1), showed, for the first time, that NF-kB is constitutively active in the lymphatic endothelium of the urinary bladder (*Blood* 104: 3228-3230, 2004). This new mouse model permits the visualization of lymphatics and the definition of the following research priorities: *1*) Determination of the mechanisms involved in lymphatic vessel proliferation, *2*) Characterization of specific pro- and anti-lymphangiogenic factors, and *3*) Determination of the role of lymphatics in bladder obstruction, inflammation, and cancer.

Functional analysis of the role of NF-kB *in vivo* using transgenic mice. Sylvie Memet (Pasteur Institute, France) described NF-kappab as a crucial transcription factor mainly involved

in immune and inflammatory responses, cell growth and proliferation. This factor is upregulated in a number of human cancers and diseases. To analyze basal and inducible NF-kB activity and to understand the impact of its modulation on immune and brain functions *in vivo*, several transgenic mouse models has been developed. These various models, mice with a *lacZ* reporter gene under the control of kB sites, knock-out mice for one or several IkBs, or mice over-expressing in a conditional fashion a transdominant negative mutant of NF-kB (super-repressor) were presented. *Research Priorities:* conditional tissue-specific expression of super-repressor molecules will permit the elucidation of the role of NF-kB in bladder cancer and inflammation. For this purpose, we urgently need to develop new transgenic mouse models with a urothelial-targeted inducible super-repressor.

Cellular Hypoxia-Response Signaling Pathway and its Implications for Human Bladder Function in Disease States. Ralph Buttyan (Columbia University) discussed the role of hypoxia-inducible factor (HIF) with regards to the obstructed bladder, presenting evidence linking activation of the bladder's hypoxia response with the hypertrophy. It was shown that this early hypertrophy is associated with increased bladder vasculogenesis. A follow-up at longer periods after outlet obstruction shows that the pro-angiogenic activity associated with the early bladder response to obstruction is replaced by progressively increased expression of anti-angiogenic substances that might drive the bladder into the decompensated state. *Research Priorities:* to determine whether bladder decompensation might be prevented by blocking the expression of anti-angiogenic substances and on the potential long term effects of hypoxia on the differentiated state of various bladder cell components.

Caught in a storm but not without an umbrella: uropathogenic Escherichia coli and cystitis. Patrick Seed (Washington University) discussed the relationship of uropathogenic Escherichia coli (UPEC) with the bladder epithelium. This represents an outstanding model for understanding acute pathogen-mucosal interactions. It was also revealed that UPEC has the capacity to invade the bladder superficial umbrella cells and reinitiate a cyclical pattern of infection.

Transgenic Models of Urothelial Transformation. Xue-Ru Wu (New York University) presented research on the development and characterization of several transgenic and knockout mouse models of bladder cancer. These included mice with specific urothelial expression of Ha-ras, epidermal growth factor, or Simian virus 40 large T antigen. *Research Priorities:* in the next few years, the urothelial field will likely see a significant increase in the utilization of transgenic and knockout approaches to study gene function and disease pathogenesis. The focus of genes to be targeted will be shifted from globally acting to pathway-specific ones. Newer models that allow not only urothelium-specific, but also temporally controlled gene expression and inactivation need to be developed, so that they more closely simulate the somatic events in humans. Compound mice harboring multiple genetic alterations will be extremely useful for elucidating gene synergy and factors controlling cancer progression. Finally, the mouse models will serve as invaluable *in vivo* tools for identifying and validating drug targets and evaluating chemoprevention strategies.

***In vitro* models of human urothelium: differentiation and function.** Jenny Southgate (University of York, UK) presented procedures to isolate and propagate normal human urothelial (NHU) cells. While normal urothelium *in situ* is mitotically quiescent and displays stratification into basal, intermediate and specialized superficial cell zones, monocultures of urothelial cells are highly proliferative and show little evidence of differentiation. A critical aim has been to determine whether disruption of urothelial tissue architecture and/or removal of cells from the *in vivo* environment irreversibly compromises the differentiation and functional potential of urothelial cells. Results suggest that *in vitro*-propagated NHU cells show a normal and reversible adaptive response to culture, adopting a proliferative and migratory "wound-healing" phenotype. Furthermore, the cells retain the capacity to undergo urothelium-specific differentiation and to form a functional barrier urothelium. The NHU cell culture system can, therefore, be used to study normal physiological mechanisms, such as the regulation of proliferation and cytodifferentiation, and may be adapted to study pathogenic processes, including interstitial cystitis and cancer. In conclusion, the NHU cell culture phenotype appears to reflect a 'normal' response to an artificial *in vitro* environment, but the cells remain responsive to exogenous regulatory factors. This has important implications, both for the use of *in vitro* systems as models of normal human urothelial physiology, function and pathogenesis, and ultimately for using tissue engineering strategies to restore urinary bladder function.

Genomic approach in bladder cancer biology. Robert E. Hurst (University of Oklahoma) studied the three-dimensional growth of normal and abnormal urothelial cells. The contributions of inherent malignancy and the effect of extracellular matrix on phenotype in culture on gene expression were also studied by combining modern genomics with bioinformatics. This approach can be used to make sense of the almost bewildering richness of potential genes and pathways by identifying key promoter motifs and transcription factors that may be active in a process. These regulatory motifs are compared to the correlational clusters with the finding that a significant fraction of genes whose expression is correlated share one or more regulatory motifs. *Research Priorities:* the key problems of the 21st century will revolve around integration of the huge amount of experimental data and the development of system-level models that can be used to understand diseases such as cancer, interstitial cystitis, susceptibility to infection, developmental defects, regeneration, and the adverse effects of aging processes and trauma. For the urothelium, learning how urothelial growth and differentiation are regulated is important to the effective cure or management of interstitial cystitis, recurrent UTI and incontinence. Building more realistic models of carcinogenesis and progression that take into account genetic instability and selection and the interactions between cells and stroma seems important to controlling bladder cancer.

Genomic and expression alterations in bladder cancer. Dr. Frederic Waldman (University of California at San Francisco) used Array-based comparative genomic hybridization (CGH) and cDNA expression arrays to analyze a single sample set of bladder tumors. A total of 97 tumors were analyzed by CGH, and 80 tumors by expression arrays, including both TCC and SCC histology and all stages of superficial and muscle-invasive disease. Both

unsupervised and supervised approaches were used to separate tumor subgroups and identify gene loci. Array CGH showed clear differences among pTa, pT1 and muscle-invasive tumors. Expression analysis showed a separation of the tumors into superficial versus muscle-invasive groups using unsupervised hierarchical clustering and also using Prediction Analysis of Microarrays. There was excellent correlation between frequent copy number alterations and expression at the level of the whole genome as well as at individual gene levels. The combination of the two array technologies has the power to highlight candidate genes implicated in bladder cancer development and progression. Genes showing altered copy number and/or expression have the potential to be developed as biomarkers leading to the development of new approaches to clinical management of bladder cancer.

Immunohistochemical expression of TRPV1 receptors in normal urothelium. Dr. Massimo Lazzeri (Ferrara University, Italy) presented results indicating the presence of TRPV1 on normal human urothelium and showed a progressive loss of the expression of this receptor as the tumoral stage increased. The value of this finding remains unknown, and further studies are mandatory in order to confirm the results and suggest a hypothesis on the role of TRPV1 as a potential target for chemotherapy or tumoral chemoprevention. ❖

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