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Experimental Biology and NASA in the Twenty-First Century

Daniel S. Goldin, NASA Administrator

As I talk about experimental biology, I would like to tell a story. Out of the dark nothingness, the universe exploded. There was force and fury, and in minutes the first nuclei formed out of the plasma. It took about 200,000 years of expansion and continual cooling until the temperature dropped to 4,000°K and hydrogen and helium atoms began to form. All of a sudden, once they formed, the universe became transparent. It had been opaque; it was literally optically opaque. The cooling continued. There were some slight perturbations we have picked up with the Cosmic Background Explorer spacecraft, but we cannot correlate the level of fluctuations we have seen with the fact that condensation started and galaxies and stars formed. That is to be left to further exercises. We have a lot of work to do on that.

At this point, stars ignited and began to form fusion factories. They aged, and the more they aged, the higher the temperatures got. We began to get heavier elements. We had massive explosions, with these aging stars exploding on themselves, and it threw this material out. They condensed again in a new gravity well, and this was a cyclical process, almost like a yo-yo. Finally, in these fusion factories we started building the elements of life — carbon, nitrogen, oxygen, phosphorus, and sulfur — but we still had not made complex molecules.

Then, red giant stars began to form, and in the cooler outer atmosphere of these stars we got our first simple molecules: carbon and hydrogen, carbon and oxygen, and carbon and sulfur. These red

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Daniel S. Goldin

giant stars blew up, and the interstellar medium became richer and richer. With our advanced telescopes over the last decade, we have picked up more than a hundred different chemical compounds. We have hydrogen cyanide, methane, ammonia, and even a combination of little dust particles. Now, the temperature is even lower, and with ultraviolet radiation one could begin to ionize and have catalytic combinations. Our knowledge is growing by leaps and bounds as we continue to operate the Hubble and develop new telescopes.

However, somewhere around 4.6 billion years ago, a protoplanetary disk formed around a newly ignited star, our own star, and a whole condensation process on a lower level began, as

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comets and asteroids bombarded the protoplanetary masses of Venus, Earth, and Mars. What we had was an enormous input of material and energy. We know some of these comets have water and some very complex organic materials. So they are banging into the Earth, and this energy caused the Earth to glow with a boiling lava surface. It went on for about a half billion years, as all the material started getting used up.

Somewhere about 3.9 billion years ago, the impacts faded, and there was an occasional splashdown of an asteroid, comet, or planetesimal. However, somewhere in that time frame, rain started because we cooled below the boiling point of water. So it was raining on Earth like crazy. The water came out, so it left us with a very rich atmosphere in carbon dioxide and nitrogen. Oxygen had not appeared yet.

From the Prebiotic Soup

At this point in time, Venus, Mars, and Earth were almost exactly alike: warm, wet, and with rich atmospheres in carbon dioxide and nitrogen and oceans that began to sustain an increasingly complex chemistry. We were on the cusp, about 3.9 billion years ago, of prebiotic to biotic transition. There was a recycling in this chemical process that was ongoing. We have found evidence of early life on Earth — it was last year — that is 3.85 billion years old. On a geological time scale, we are now finding fossilized lifeforms on Earth at almost the instant you had liquid water. This chemical soup had an energy transport mechanism, so a lifeform was created that was a nonequilibrium condition. The lifeform forced this nonequilibrium to take place.

If we want to understand the beginning of life on Earth, we have a problem. On Earth, we have a conveyor belt. It is called tectonic activity. The Earth's crust moves. It takes material out of the atmosphere and drops it into the mantle, and it then comes spewing out of volcanoes. This is what happens on Earth, so the atmosphere refreshes itself. Places like Mars and Venus are not large enough to have the energy to support this tectonic activity. There was not this replenishment, so carbon dioxide would go into solution. Atmospheres just got sucked up, at least on Mars. The other problem with Earth is we were very lucky to find this preserved carbon indicating life, 3.85 billion years old, because most of the history of Earth has been recycled. You have to go to some very special places to find it.

So if we want to understand the formation of life — which is crucial for a very, very similar, probably for a half billion years. If we found life that formed on Earth 3.85 billion years ago, we may find a fossil from Mars that is three-and-a-half billion years old. There are some real fruitful possibilities. This is one of the reasons we want to go to Mars now, coupled with another finding we made. Less than a year ago, we think we may have found frozen comet water in a huge crater on the South Pole of the Moon. There is no atmosphere, but as comets come whacking into this huge crater — or if they made the

the space program, if it is to achieve its vision of explaining all these forces taking place around us, must reconstruct itself.

total understanding of biology - we must look elsewhere. We are looking out at Pluto and the comets. Beyond the orbit of Pluto is something called the Kuiper belt, and beyond that is the Ort cloud, going out a distance of thousands of astronomical units, an astronomical unit being the distance from the sun to the Earth. Out there are materials that have the secrets that have been locked up for four billion years. This is why we want to go out there. As we examine comets, we get some hints of organic material. We have seen some material from micrometeoroids that polarizes light to the left. Usually, there are equal amounts of left and right polarization. Life on Earth is left. All these things I am telling you happened in the last year or two.

We also want to look at the frozen prebiotic chemistry on Titan, the moon of Saturn. There are organic reactions and photochemistry going on there. There is an orange atmosphere of methane and ammonia, and it is locked in time. It is four billion years old, and there is what we think might be the first prebiotic soup. Next year, we will launch a spacecraft off to Titan. It will actually land in that prebiotic soup.

Now, Mars might be the perfect place because, remember, it did not have this conveyor belt action. Earth and Mars were crater in the first place — this crater is completely shadowed. So any water that comes in there from comets gets trapped, and inside those comets might be the remnants of some prebiotic process.

Amazing Things Are Happening

Within the last six months, we have seen pictures of Europa, one of Jupiter's moons, with a resolution of 30 feet out at a half billion miles. It appears that Europa might have a liquid water ocean. It is an unbelievable time to be alive. In the last year, we found eight planets around stars that are not our own sun, and the human species has been on this surface for thousands of years, always wondering just that. Later, I will talk a little bit about how we are going to find Earthsized planets pretty soon.

Amazing things are happening, and the space program, if it is to achieve its vision of explaining all these forces taking place around us, must reconstruct itself. For the last 35 or 36 years, biology has come a long way, and what I am worried about is that the biological revolution is passing NASA by. In 1976, we sent a probe to Mars. It was called the Viking Life Detection Experiment. I worked on it, but not from the direction of biology. I thought it was a great experiment to do, taking a whole laboratory and putting it into a cube one foot-by-one foot-by-one foot. It fascinated me. What happened was NASA got scared away because we had physicists and chemists designing that system, and they were running experiments in the Antarctic. It was clear after we launched it that we were going to a desert. Why? Because it was easy to land. But when you want to do fundamental science, you have to be driven by requirements, not by the desire to make an engineering temple in search of a question. NASA got very, very scared, and the word biology, after Viking, became a very bad word.

I will digress for a minute and then get back to the main thrust of what I want to say. After all these great findings, we held a Mars working group. These were the best minds in the country who came

Questions NASA Seeks to Answer

Now, let me tell you a little bit about NASA, if you do not know already. We want to harness the energy of the nation and the world, for that matter, to answer seven basic questions. The first five are driven by scientific knowledge. I will leave it to you — it is left to the students — to figure out where biology comes in.

Question 1: How did the universe, galaxies, stars, and planets form and evolve? How can our exploration of the universe and our solar system revolutionize our understanding of physics, chemistry, and biology?

Question 2: Does life in any form, however simple or complex, carbonbased or other, exist elsewhere than on planet Earth? Are these Earth-like planets beyond our solar system?

Now, If we are going to answer questions like these, do we have the right mix of people at NASA? That is my question.

together, not just NASA employees, to advise us on how to send our missions to Mars. We have two missions every launch window, and in the next 10 years there are 10 missions to Mars. So I said, "You know what? Before we start this meeting, all the biologists and life scientists in the room, raise your hands." There were 50 people around the table. Two people meekly raised their hands. Now, if we are going to answer questions like these, do we have the right mix of people at NASA? That is my question. The interest of the biological community in NASA is not too great, either. When I talk in the space community, thousands of people show up. So what I am here to tell you today, and you can tell all your compatriots, is that it is safe for biologists to come to NASA. We want you.

Question 3: How can we utilize the knowledge of the Sun, Earth, and other planetary bodies to develop predictive environmental, climate, natural disaster, and natural resource models to help ensure sustainable development and improve the quality of life on Earth?

Question 4: What is the fundamental role of gravity and cosmic radiation in vital biological, physical, and chemical systems in space, on other planetary bodies, and on Earth? How do we apply this fundamental knowledge to the establishment of a permanent human presence in space and improve life on Earth?

Question 5: How can we enable revolutionary technological advances to provide air and space travel for anyone, anytime, anywhere in the world more safely, more affordably, and with less impact on the environment? How can we improve business opportunities and global security? **Question 6:** What cutting-edge technologies, processes, techniques, and engineering capabilities must we develop to enable our research agenda in the most productive, economical, and timely manner? How can we most effectively transfer the knowledge we gain from our research and discoveries to commercial ventures in the air, in space, and on Earth?

Question 7: How do we effectively communicate consistent information regarding the relevancy, results, and excitement of NASA's missions? How can we involve other nations of the world in our journeys of discovery, combining that which makes us strong and preserving that which makes each of us unique, to improve the productivity of the space program?

Those are the seven questions we are trying to answer. I do not know the exact number, but I would guess out of a workforce of 20,000, we may have a few hundred life scientists and biologists, at most.

So here is the problem: the NASA budget is not going to expand. I fought that battle, and I declared victory because now the budget is stable and not going down. This is victory for science in America because they were going to lop off some more, and we said enough is enough. America needs to decide: are we going to answer these kind of questions? Or are we going to fill our bellies and try and survive in the present? However, given that, we have to restructure the NASA program. Wherever I can talk to the life science and biological community, I do that because you have to engage with us. You cannot run away from us. You cannot say the space program is going to get done and then talk about the fact that there is not enough funding in science.

Reprogramming NASA

We want to reprogram our monies, but we do not want to do it by ourselves. I have asked for help from Bruce Alberts at the National Academy of Sciences and

Neil Lane at NSF. I have talked to the folks at the National Research Council. In fact, we have asked the space studies board of the National Research Council to do a job search for us because I would like to have the NASA Chief Scientist come from the life sciences and biological community, which would be a first for NASA. I need someone to advise me. I love physicists, and I love chemists. But I know that stuff, and I can take them head on. I have been reading textbooks like crazy, trying to come up to speed in biology, but I need someone to advise me. So if you know anyone, get his or her name in to the space studies board. Claude Canizares is leading the job search. We will probably put out the word over the Internet.

Now, let me tell you some of the things we are going to do. In the space science area, even though the budget came down, the President appropriated one-anda-quarter billion dollars to answer questions one and two that I discussed earlier. We are starting a whole series of new spacecraft. We have 10 missions going to Mars, but once again, up through the year 1998, those missions have been designed by chemists, physicists, geophysicists, and geologists.

Starting in 2001 and from then on, we want to see some of these missions designed by people who understand what the search for life is all about. We are going to build huge observatories, and we are going to locate them out in an orbit a half billion miles from here. It will be the objective of these observatories to search for Earth-sized planets around stars within 100 light years from Earth. That is 600 trillion miles, and we are going to try and get a resolution of 5,000 miles. That is a pretty good resolution. Inside that volume are thousands of stars, many like our own sun.

To give you a sense of how difficult this problem is, in the visible spectrum, if you take a picture of one of these terrestrial-sized planets, it does not glow by itself. It gets reflected light off its own star and has a very low level of background infrared. In the visible, the energy it puts out relative to the star is onetenbillionth. If we go into the near infrared, it is one-ten millionth, but that is still like picking a firefly out of a nuclear holocaust. This is a tough, tough telescope to design and build. It is an interferometer. It will be a group of telescopes that will be separated perhaps by kilometers, maybe five meters in diameter. We will have to know their relative position to within a billionth of a meter. We will have to physically locate them within one or two centimeters. It generates some very, very tough problems. We hope to fly them within 10 years.

We are going to fly our first test interferometer in two years. It is a program called Deep Space Three. With these devices, we hope to not only directly not involved is another moment for the physicists to hone the butter to a fine edge. We invite you to interact with us and help us to define these experiments. In fact, we are going away from NASA control of picking the science, and we are running completely open, peer-reviewed programs where the principal investigator proposes the scientific question, composes the solution, and then is responsible for building the spacecraft. When spacecraft used to cost billions of dollars and take decades, this did not make sense. However, we said we wanted to do shorter programs. Our longest program is three years, and typically we would like to do them in one to two years. So now, you can begin to build spacecraft on desktops, and graduate students can actually do it without being 75

When people think of NASA, they think about big rocket engines and the shuttle, but it is biology and information systems that will lead the revolution.

detect Earth-sized planets, which we have yet to do, but we hope to remotely sense the atmospheres and do a spectral analysis so we can determine whether there is any methane, water vapor, carbon dioxide, or oxygen present. We can then begin to fingerprint these planets, but we have to do enough evolutionary biology work on Earth to have the ground truths to understand what is going on. It is not trivial, and it is part of the whole process of understanding life itself. So even though we cannot travel there yet, we can use remote sensing. Ultimately, we intend to take pictures with a resolution of about 50 kilometers. If there are continents, oceans, clouds, or other surface topographical features, we will pick them out. I will not go into the physics of it, but you get the point. This is a tough problem, but we are committed to doing it.

We also have an armada of small spacecraft. We used to launch two spacecraft a year in the planetary program. By the turn of the century, we expect to be launching perhaps a dozen a year, one a month. You know, every minute you are years old. There were some programs I was involved in that from the time they started until the time they get the data back is 25 years. This is not too good. So again, I want to give the message that it is safe to do business with NASA.

Biology: The Next Frontier

We do a lot of other things, but clearly biology and information systems are going to be driving us. When people think of NASA, they think about big rocket engines and the shuttle, but it is biology and information systems that will lead the revolution. We need thinking spacecraft. Remember I mentioned you have to go out beyond the orbit of Pluto. To communicate with a spacecraft at that distance, you begin to talk about a turnaround time, at the speed of light, of a day. We want to understand what is frozen out there — and we are going to have to get out there lickety-split - but you cannot have mission control on the ground, so we almost do not need an uplink.

The spacecraft has to be patterned after the biological system of the body, with a sensory system, a nervous system, muscles, the capacity to self-heal, and a capacity maybe not to think, but to have enough of a knowledge base transmitted by the best scientific minds to do its own mission planning, to know what features to look for, to collect data, and to send it sound, tactile feel, and smell. We are building an artificial nose right now. These are the tools you are going to need to do these kinds of jobs. When we have to train astronauts, we will need totally interactive virtual presence systems for the designbased simulation. We will have to integrate with our total medical knowledge because you are not going to take ambu-

What happens in the absence of gravity or in cosmic radiation? These physiological problems make some of the problems here on this planet look simple.

back. Because as you go zipping along real fast and you wait years to get out to the orbit of Pluto, you know it is going to be a half-hour encounter. So if it takes a day's turnaround, at the speed of light, to operate the system, it will be difficult. We need to get into very, very deep systems like that with unbelievable speeds. We need self-assembling, biomolecular materials. We either have to mimic biology or utilize biology to do the kinds of things we want to do. In fact, the mirrors I talked about that take those pictures so we could see surface features on planets within 100 light years of Earth, they may have to be biogenically generated surfaces out in space because we will need a half square kilometer of mirror with unbelievable accuracy. But we are not afraid of that; that is the kind of thing that is fun to do.

We have to understand: how do you protect astronauts? A mission to Mars on a sustained basis is going to be three years. What happens in the absence of gravity or in cosmic radiation? These physiological problems make some of the problems here on this planet look simple. In fact, we just signed an agreement with the American Medical Association. They think this is the ultimate experiment in remote medicine. They are going to use the space station to develop protocols to handle remote medicine on Earth because we are going to be developing tools like total immersion virtual presence with sight, lances and operating rooms out into space. At the very best, each crew will have one physician, so the tools we develop are going to be incredible.

Now, we cannot afford to take a lot of people, so if someone gets sick, that person will take up all the resources. How do you prescreen people? How do I know in three years that these people will not come down with disease? We do not know what happens to the immune system in space. We do not know what happens to the brain in the absence of gravity. What happens when we go into partial gravity? On the space station, we are going to be running these kinds of experiments.

Another problem: I talked about this prebiotic soup. We cannot do experiments in a test tube that last for 200 million years, so we will have to develop unbelievable simulation tools. The kind of tools we are looking at will require computer speeds at a factor of a million to a billion times faster than anything we have right now. We also will require the software to code it, but you cannot have enough software coders in the world to do that. We will need to have genetictype algorithms so our software will code itself, based upon the permutations and combinations of processes that take place in the body. In order to develop this kind of software, we need to have a biological connection. We have been very, very

weak in this area. The software we write has to validate itself; it has to be nondeterministic. When you write software now, you try to check every path. For example, a Pentium chip would not suit our future needs because it uses deterministic validation techniques. We need to get into a variety of different nondeterministic approaches, be they chaos theory or some stochastic approach. The integration of biology and information systems with physics, chemistry, and geology is where we are going, and it will be a multidisciplined approach.

To kick things off, we have a whole series of workshops, and the plan for these workshops will be out in the next few months. Look to the NASA Internet (www.nasa.gov), and you will see it. Our first workshop was in May, and we worked on it with the National Academy of Sciences. We are also working with NSF. We intend to form an Astrobiology Institute that will bring together these multidisciplinary fields, and we want to look at extreme environments. We want to form this Astrobiology Institute as a superdisciplinary working institute, but it will be a virtual institute, interconnected with the next generation Internet.

Why do we want to do that? Because we want to drive what the next generation of the Internet will do. This Internet, NASA was on it in 1969. We were one of the first nodes. It is terrific for the people who are using it today, but we need something with a bandwidth that is a million times wider. We want to use this Astrobiology Institute to drive what this Internet is going to do.

The next thing we want to do is to focus on postdoctoral fellows and junior faculty level people because they will be apt to embrace the next generation Internet and they will welcome a breakdown of traditional departmental barriers. We are finding a terrible problem in dealing with smokestacks because we cannot handle it. This is a multidisciplinary approach, and we need to interconnect people. We want to foster a visiting science program for crossfertilization. There are some folks at NASA who have

been doing the same thing for decades. I left NASA in 1967 because I wanted to design a Mars rocket and I decided it was not going to happen then. When I came back in 1992, I found people still doing the same thing. So there will be a lot more peer review, and we are doing much better on that. We intend to make this happen. We are going to do it not by asking for more money right now, but I think with these findings we will be doing a lot better. This Astrobiology Institute should be up and running in about a year. Our goal is that by September 1999, when we submit NASA's budget for FY 2000 to the Office of Management and Budget, we will have declared where the program will be for the next 25 years. We need your help.

Connecting the Biological Community With NASA

Another institute we just formed — we ran a major national competition for it ---is the Space Biomedical Institute in Houston, TX, with a team of Baylor, Johns Hopkins, Rice, Massachusetts Institue of Technology, Harvard, and Morehouse. It was a \$145 million grant. It is not that small, but it is not that big. I know the NIH numbers are a lot bigger, but it is a start. It is a start, and we have some really good minds who will begin to connect the biological community with NASA. We are working in three areas over the next year-and-a-half in our planning, and I call it the three pillars filters.

This is going to be the focus. We are spending a year and a half, and we are not just going to go rushing off. We will support these different workshops and findings with appropriate levels of funding.

I invite you to work with us, and I leave you with this. There are a lot of positive things happening, but there are sometimes some negative things as well. I read this item in the *Washington Post*; it appeared a few months ago. It was an article about AT&T Bell laboratories, which for physicists and chemists is

NASA's "Three Pillars Filters"

- 1. How do we use the unique environment of space to understand fundamental life processes?
- 2. How do we eliminate barriers to human space travel and to human habitation beyond the confines of Earth?
- 3. How do we understand life in the universe? Is there any? What are its origins?

mecca. They are having a little bit of trouble. The essence of the article was that Bell Laboratories is getting out of pure research and going to applied research. Everything had a target on it, and everything had a date. The article talked about this fellow, Alan Huang. "Today, nobody wants to pay for research where the outcome is in doubt or the payoff is 25 years into the future," said a bitter Huang who moved to Stanford University. "Even places like Bell

It is a start, and we have some really good minds who will begin to connect the biological community with NASA.

Laboratories are not going to do Christopher Columbus stuff anymore; now it is all Lewis and Clark." Huang notes ruefully that even as he was taking leave of Bell Labs, the Japanese government was quietly committing \$200 million toward long-term research into optical computers. This was the field he was interested in. "I showed the Japanese how to do it," Huang said, "And now I am here twiddling my thumbs."

I assure you we will not be twiddling our thumbs at NASA. Right now, we are beginning an experiment based on the findings we made on Europa, however preliminary. We think on Europa there might be a thick ice crust measured in kilometers and underneath it there could be a liquid water ocean. Europa has a core that is affected by the gravitational pull as it rotates around Jupiter. This pull

may heat the core, and if the core is warm enough, it melts the ice. If you look at the ice, you can see cracks that look like they are healing. There is a place at the South Pole. It is called Lake Vostock. It is below kilometers of ice. We are getting together with NSF to see how we can understand where the water is using long wavelength microwaves. We are also seeing how we can melt our way through the ice without contaminating the pristine environment so we can put a submarine into that ocean. This is happening this year or next year. We are designing a spacecraft that will go to Europa, and that spacecraft will have a submarine on it. Maybe not the first one; the first one will be a microwave radar. The second will have a submarine. Who knows? Maybe we will find some filaments under that ocean near a vent. Maybe we will find life, and maybe that life will be like ours and maybe it will not. However, we will enrich life in the world. Please join us.

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

The international community of physiologists has departed from St. Petersburg, Russia, giving the experience mixed reviews. Most of the attendees relished the opportunity to enjoy the beauty of St. Petersburg and to visit the magnificent palaces, Neva embankments, gardens, and parks, as well as about 50 museums in St. Petersburg and its suburbs (including the famous Hermitage and Russian Museum). Indeed, most enjoyed the opportunity to meet colleagues and develop collaborations with scientists from around the world. Unfortunately, the Congress site and many of the Congress activities left many attendees with some less than pleasant memories.

The Congress site was the Medical-Military Academy (formerly the emperor's Medical Surgical Academy), which was founded in 1798 by Paul I, the son of Catherine the Great. While it is one of the oldest and potentially most attractive institutions of higher education and biomedical research in Russia, its beauty has been tarnished by the country's current economic straits. In addition, the unseasonably warm St. Petersburg weather made many of the un-air conditioned rooms unbearable. Despite the conditions, attendees were able to participate in the 71 symposia, 31 workshops, 11 plenary lectures, 2 special lectures, and 1 roundtable discussion that made up the Congress program. The theme of the scientific program was "Integrative Physiology: From Molecules to Humans," a logical extension of the "Date With the Future of Physiology" theme of the 1993 IUPS Congress in Glasgow, Scotland.

The decision to hold the Congress in St. Petersburg was made at the 1989 IUPS Congress in Helsinki, Finland, at a time when President Mikhail Gorbachev was instituting his policies of glasnost and perestroika. By bringing the Congress to St. Petersburg, the IUPS General Assembly was voting to encourage the opening



St. Petersburg, Russia, site of the XXXIII IUPS Congress.

of the former Soviet Union to the West, increasing the opportunity for physiologists to meet scientists from former Eastern bloc countries. The decision of the IUPS General Assembly proved to be a correct one, as evidenced by the participation of 971 Russian scientists and students at the Congress. Overall, Russian physiologists made 392 presentations at the Congress, 10 times more than were made in Glasgow at the XXXII IUPS Congress in 1993. As a result of the active participation of Russian scientists in the Congress, numerous collaborative interactions were made with colleagues from Europe, Canada, and the US.

Nearly 3,000 people attended the

opening ceremony of the XXXIII IUPS Congress, which was held in the largest concert hall in St. Petersburg. President Boris Yeltsin sent a letter of greetings to the attendees, followed by special welcome remarks from Vladimir Yakovlev, Governor of St. Petersburg, and Zhores I. Alferov, Vice President of the Russian Academy of Sciences. Brief talks were also given by Stanley Schultz, CoChair of the Program Committee, Masao Ito, IUPS Past President, Oleg Gazenko, President of the Russian Physiological Society, Sviatoslav Medvedev, Chair of the Local Organizing Committee, and Ewald Weibel, IUPS President.

Following a brief concert, the opening lecture, "On the Human Brain," was presented by **Natalia Bechtereva**. After the opening ceremony, physiologists who had purchased tickets attended a reception and dinner at the Russian Museum. Unfortunately, the presence of many nonpaying guests resulted in a shortage of food for the participants, making the event memorable for reasons other than the magnificence of the great hall of the Russian Museum.

The "white nights" of St. Petersburg provided the international community of physiologists with an opportunity to explore the city, even after long days in scientific meetings. Numerous restaurants with world cuisine have opened in St. Petersburg during the last several years. In addition, jazz clubs, the symphony, and ballet provided additional diversions for those attendees frustrated with the Congress site and some of the hotel accommodations.

Congress participants were presented with two books prepared by the Russian Physiological Society, *Physiological Sciences in Russia: XIX-XX Centuries* and *A Guidebook of St. Petersburg Physiology*. The latter provided information about the 6 institutes of physiology, the 13 departments of physiology, and the many physiology laboratories in St.

Petersburg. St. Petersburg is the capital of Russian physiology, and it was home to the recipient of the 1904 Nobel Prize in Physiology or Medicine, Ivan Pavlov.

After a week of scientific interactions and exchange, physiologists purchasing tickets gathered at the "Farewell Party with Russian Surprise." While the latter was meant to refer to the musicians playing traditional Russian instruments and to the folk dancers, for many of the participants the "Russian Surprise" proved to be the same one experienced at the opening reception, an inadequate amount of food.

Overall, the XXXIII IUPS Congress could be viewed as a success because it was held at a time of deep financial crisis in Russia. Many of the Russian physiologists in attendance had no salary for the months leading up to the Congress, and the Russian government gave only minimal support to the Congress. For that reason alone, the organizers must be congratulated for their efforts and commended for their ability to hold the Congress under such difficult circumstances. Hopefully, physiologists inconvenienced by the Congress site, hotel accommodations, and food shortages will reflect on conditions in St. Petersburg when they judge their experiences.



Highlights from the XXXIII IUPS Congress in St. Petersburg, Russia, June 30-July 5, 1997.

The Milk Lady Monument

APS joined with representatives of the international physiological community to dedicate a monument to the Milk Lady, Katri Peltonen, the woman who provided milk and other food to the academician Ivan Pavlov and his dogs during the famine times after the Russian Revolution. The monument was dedicated in a park at the Pavlov Institute of Physiology in Koltushi, a village outside of St. Petersburg.

The Milk Lady Monument was dedicated by the international physiology community to show its appreciation to the Russians for hosting the XXXIII International Union of Physiological Sciences Congress and to leave a lasting memorial to Ivan Pavlov, one of the first Nobel Prize winners in physiology or medicine (1904). Support for the Milk Lady Monument was provided by the International Union of Physiological Sciences; the American, Finnish, Nordic, and Russian Physiological Societies; the Russian Academy of Sciences; the St. Petersburg Foundation (Finland); the Savo Foundation (Finland); and the Savo Language Society (Finland).



APS Executive Director Martin Frank at the dedication ceremony for the Milk Lady Monument outside St. Petersburg, Russia.

IUPS 2005: Washington, DC

Physiologists from around the world will gather in Washington, DC, from August 7-12, 2005, to participate in the XXXV IUPS Congress. At the recent IUPS Congress in St. Petersburg, Russia, the US National Committee (USNC) of IUPS submitted a bid to hold the Congress in the US. The letter of invitation, written by **Bruce Alberts**, President of the National Academy of Sciences, was presented to the IUPS General Assembly by **Stanley Schultz**, Chair of the USNC/IUPS delegation. USNC is comprised of six societies (APS, the Biomedical Engineering Society, the Microcirculatory Society, the Society of General Physiologists, the Division of Comparative Physiology and Biochemistry of the American Society of Zoologists, and the Society for Neuroscience).

The US bid was one of seven considered by the IUPS General Assembly. Competing countries included Canada, France, India, Israel, Japan, Spain, and the US. After three rounds, the choices were reduced to two countries, Canada and the US, with the US winning on the fourth and final ballot. While USNC is comprised of six societies, the bulk of the work associated with the staging of the IUPS Congress in 2005 will fall on the APS membership and staff. Anyone interested in helping should contact the APS Executive Office and volunteer for action. With your help, we can make the IUPS Congress as memorable as the one held in the US in 1968. In the meantime, mark your calendar and plan to participate in the XXXV Congress scheduled for August 7-12, 2005.�



Worldwide Directory of Physiologists **on the Internet** http://www.faseb.org/iups/

A searchable database for physiologists working all over the world.

1997 IUPS Travel Award Program

APS administered a travel award program for attendees to the XXXIII IUPS Congress in St. Petersburg, Russia. Funds for the program were derived from an account established from the profits associated with the 1968 IUPS Congress in Washington, DC. In addition, APS received \$38,000 from NIH and \$30,000 from NSF. APS members also contributed to the program through voluntary donations made while paying their dues.

The USNC of IUPS consists of representatives of APS, the Society for Neuroscience, the Society of General Physiologists, the Biomedical Engineering Society, the Microcirculatory Society, and the American Society of Zoologists' Division of Comparative Physiology and Biochemistry. A subcommittee of USNC was charged with reviewing all the travel applications and selecting the awardees. A total of 175 applications were received, and 156 awards were granted. Twenty-three applications (13.1%) were received from female scientists, and 22 received awards. Applications were received from 14 scientists (8%) who are members of underrepresented minority groups, and 13 awards were made. Societal affiliations of the applicants and awardees are listed in Table 1.

The awardees each were provided with a \$900 travel award to partially cover expenses associated with their attendance at the meeting. Many of the awardees used the St. Petersburg Congress as an opportunity to visit research laboratories and to develop collaborative research projects. Of those completing the travel award recipients' questionnaire, 78.4% (91 of 116) developed collaborative research projects with colleagues during the meeting, 44.4% (48 of 108) recruited future graduate or postgraduate students, and 49.6% (57 of 115) visited research laboratories in conjunction with their visit to St. Petersburg.

The median year for receipt of the doctorate for the awardees was 1979 (Table 2). The median year of birth for the awardees was 1951 (Table 3). The awardees were also asked to rank the Congress (with 10 being the best). More than 61.2% (63 of 103) gave the Congress a ranking of six or higher (Table 4). Overall, the attendees were supportive of the Congress and its scientific aspects despite the problems encountered in St. Petersburg. ❖

Table 1. Societal Affiliations of Applicants and Attendees

Society A ₁	pplicants	Awardees
American Physiological Society	115	104
Society for General Physiologists	14	13
American Society of Zoologists, DCPB	9	8
Society for Neuroscience	51	50
Biomedical Engineering Society	6	6
Microcirculatory Society	13	13
Other	43	38
TOTAL	251	232

Year	Number
1940-1944	1
1945-1949	0
1950-1954	4
1955-1959	10
1960-1964	14
1965-1969	13
1970-1974	16
1975-1979	22
1980-1984	30
1985-1989	25
1990-1994	15
1995-1997	6
TOTAL	156

Table 3. Applicant's and Awardee's Year of Birth

Date of Birth	Applicants	Awardees
1915-1919	1	1
1920-1924	1	0
1925-1929	8	7
1930-1934	12	12
1935-1939	13	10
1940-1944	17	16
1945-1949	27	26
1950-1954	31	31
1955-1959	28	25
1960-1964	27	24
1965-1969	2	2
1970-1974	2	2
TOTAL	169	156

Table	4.	Awar	dees'	Ranking	of	the
XXXI	Π	IUPS	Cong	ress		

Ranking (10 best)	Number
1	4
2	7
3	10
4	11
5	18
6	16
7	17
8	24
9	4
10	2

XIX ALACF Congress

Caracas, Venezuela, served as the host city for the XIX Congress of Latin American Physiological Sciences (ALACF), August 31-September 6, 1997. An organizing committee chaired by **Sonia Torres** was responsible for the development of the scientific program for the meeting. The symposium program involved 103 scientists from 16 countries, and the poster sessions involved 110 scientists who submitted 138 abstracts for presentation.

APS assisted in obtaining support for the XIX ALACF Congress by raising funds from NSF. These funds allowed the organizers to invite 10 US physiologists as symposium speakers. The NSFsupported investigators indicated that they used their visit as an opportunity to develop collaborative research projects with colleagues (10 of 10) and to recruit future graduate or postgraduate students (9 of 10). The meeting also provided an opportunity for these scientists to visit research laboratories in Venezuela (8 of 10). Overall, the NSF-funded investigators (8 of 10) rated the Congress highly, ranking it at 7 or better (10 being the best). During the Congress, **Brian Duling**, a past president of APS, met with Torres and other members of the ALACF Council. At the meeting, Duling presented a letter from APS President **Allen W. Cowley**, **Jr.**, inviting ALACF to meet with APS at the EB 2001 in Orlando, FL. The invitation was graciously accepted by ALACF shortly after the Congress. The participation of ALACF and the Spanish Physiological Society in EB 2001 will provide the societies with some unique opportunities in programming and scientific interaction. \clubsuit

Skou, Two Others Share Nobel Prize in Chemistry

Jens C. Skou, an honorary member of APS, shared the 1997 Nobel Prize in Chemistry with two other members of the FASEB community, **Paul D. Boyer** of the American Society for Biochemistry and Molecular Biology and John E. Walker of the Protein Society. The three were honored for their insights into how the cells of the body store and transfer energy through the molecule ATP.

The award citation presented to Skou, Boyer, and Walker from the Royal Swedish Academy of Sciences reads, "The three laureates have performed pioneering work on enzymes that participate in the conversion of the 'high-energy' compound ATP." For the discovery of the process that creates ATP, Boyer and Walker each received \$250,000, onequarter of the prize money awarded this year. Skou received the other half of the prize money, \$500,000, for discovering the enzyme that works with ATP to regulate the concentration of sodium and potassium inside the cell, Na⁺, K⁺-ATPase.

Skou's discovery of Na⁺, K⁺-ATPase in 1957 was the first of "an enzyme that can promote directed (vectored) transport of substances through a cell membrane, a fundamental property of all living cells," his citation reads. "Numerous enzymes have since been dis-



Jens C. Skou

covered to have essentially similar functions." When informed that he had won this year's Nobel Prize in Chemistry for discoveries made nearly 40 years ago, Skou laughingly told Danish Radio, "I do not know why I got it now."

However, others in the field pointed to the importance of Skou's discoveries. Biochemist Kathleen J. Sweadner of Massachusetts General Hospital and Harvard Medical School said Skou's discoveries stimulated researchers to pursue other important avenues. "The insight (Skou) had was really crucial," Sweadner said, "and not just for this one enzyme but for understanding a great deal about the physiology of the cell. It opened (researchers') minds to studying a whole bunch of other processes."

Stanford University chemist Richard Zare said the recognition of all three of the laureates' work on ATP indicated the importance of discoveries into the chemistry of life. "We are going to learn more and more as we understand that the body is some really marvelous chemical factory," Zare said. "In many ways, this factory is controlled by the mind, and that, too, is controlled by chemistry. It is amazing."

Jens C. Skou was born in Denmark in 1918. He received his medical training at Copenhagen University. In 1954, he received a doctorate from Aarhus University in Denmark, where he remains today as a professor of physiology. Skou has won numerous awards for his research in addition to this most recent recognition. Besides being an honorary member of APS, he is a member of the Danish Royal Society, an honorary member of the Japanese Biochemical Society, and a foreign associate of the National Academy of Sciences.

1998 Officers and Standing Committees

APS Council

Officers

Allen W. Cowley, Jr., President (1998) L. Gabriel Navar, President-Elect (1998) James A. Schafer, Past President (1998)

Councillors

Dale J. Benos (2000) Walter F. Boron (1998) Gerald F. DiBona (1998) Celia D. Sladek (1999) Richard J. Traystman (2000) John A. Williams (1999)

ex officio members

Barbara E. Goodman, Education (2000) Edward H. Blaine, Finance (1998) Ethan R. Nadel, Program (2000) Leonard R. Johnson, Publications (1998) John E. Hall, Section Advisory (1999)

Society Standing Committees

Animal Care and Experimentation

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

C. Terrance Hawk, Chair (2000) Susan E. Kaufman-Jacobs (2000) Ronald J. Korthuis (1998) Lorenz O. Lutherer (1999) Ingrid H. Sarelius (1998) John N. Stallone (1999) Jennifer Laiprasert, student member (1999) Andrea A. Seymour, *ex officio* (1998) Joseph R. Haywood, *ex officio* (2000)

Awards Committee

Oversees the award programs of the Society to ensure uniformity and conformity with the goals of APS, investigates new means of funding for the APS awards program, and selects Research Career Enhancement Awardees and APS Postdoctoral Fellowship Awardee. Dale J. Benos, Chair (2000) Thomas H. Adair (1999) William L. Joyner (2000) Martha E. O'Donnell (1998) Roger G. O'Neil (1999) Thomas V. Peterson (2000) John B. Stokes (1999) James B. Wade (1998) Eleanor Ison-Franklin, *ex officio* (1999) Kim E. Barrett, *ex officio* (1999)

Career Opportunities in Physiology

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

Edward J. Zambraski, Chair (2000) David P. Brooks (2000) Nicholas S. Gantenberg (1999) Andrew S. Greene (1998) Raul Martinez-Zaguilan (2000) Lori L. Woods (1998) Jo Rae Wright (1999)

Committee on Committees

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

Gerald F. DiBona, Chair (1998) Celia D. Sladek (1999) William J. Arendshorst (1999) James Bassingthwaighte (2000) Beverly P. Bishop (1999) Eldon J. Braun (2000) Peter M. Cala (1998) Joey P. Granger (1998) M. Harold Laughlin (2000) James M. Norton (1998) Mrinalini C. Rao (2000) Mary F. Ruh (1999) Erik R. Swenson (1998) William T. Talman (1999)

Ray G. Daggs Award

Annually selects a member of the Society to receive this award in recognition of distinguished service to APS and to the science of physiology. Elsworth R. Buskirk, Chair (1998) Beverly P. Bishop (2000) Ronald H. Freeman (1999)

Education

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

Barbara E. Goodman, Chair (2000) George T. Blevins (2000) Virginia L. Brooks (1998) William M. Chilian (1999) Linda S. Costanzo (1999) John R. Dietz (1999) Andrew J. Lechner (2000) James C. Schadt (1999) Steven S. Segal (2000) Mary Anne Rokitka, *ex officio* (1999) Penny Hansen, *ex officio* (1998) Edward J. Zambraski, *ex officio* (2000)

Finance

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

Edward H. Blaine, Chair (1998) Mordecai P. Blaustein (1998) Jack L. Feldman (1998) David R. Harder (2000) James A. Schafer (1998) Allen W. Cowley, Jr., *ex officio* (1998) L. Gabriel Navar, *ex officio* (1998) Leonard R. Johnson, *ex officio* (1998)

Honorary Membership

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

William H. Dantzler, Chair (1998) Vernon S. Bishop (1999) Franklyn G. Knox (2000)

International Physiology

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

Ernst Knobil, Chair (1998) Walter N. Duran (1999) Bernice Grafstein (2000) John E. Greenleaf (1999) Hector Rasgado-Flores (1998) J. Carlos Romero (1999) Aviad Haramati, *ex officio* (1998) Shu Chien, *ex officio* (2000)

Liaison With Industry

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

Andrea A. Seymour, Chair (1998) Salah D. Kivlighn (2000) Robert Murray (2000) David M. Pollock (1999) Francis G. Spinale (1999) Louis Van de Kar (2000) Edward J. Zambraski, *ex officio* (2000) Barbara E. Goodman, *ex officio* (2000) Ethan R. Nadel, *ex officio* (2000)

Long-Range Planning

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

Brian R. Duling, Chair (1999) Helen J. Cooke (1999) Robert D. Foreman (1999) Richard Hawkins (2000) Barbara A. Horwitz (2000) Hershel Raff (1998) Andrea J. Yool (1998) Richard J. Traystman, Councillor (2000)

Membership

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

Sue Amy Shapses, Chair (1998) Kirk W. Barron (1998) Pamela K. Carmines (1999) Meredith Hay (2000) Ali A. Khraibi (1999) Jeanne L. Seagard (1999) Lou Ann Stephenson (1998)

Perkins Memorial Fellowship

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

Aviad Haramati, Chair (2000) Matthew J. Kluger (2000) George D. Leikauf (1998) Arthur D. Loewy (2000) Molly P. Hauck, *ex officio* (indefinite)

Porter Physiology Development

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

Eleanor L. Ison-Franklin, CoChair (1999) H. Maurice Goodman, CoChair (1998) Martha L. Blair (1999) Margaret Colden-Stanfield (1998) J. Andrew Daubenspeck (2000) Jeffrey L. Garvin (2000) Irving G. Joshua (1999) Phillip L. Rayford (1998) Marian R. Walters (2000)

Program

Develops the scientific programs for the Society with the assistance of the Program Advisory Committee and assists Council in shaping policy for scientific programs and in the organization of fall conferences. Ethan R. Nadel, Chair (2000) Michael C. Andresen (2000) Catherine S. Chew (2000) Thomas E. Lohmeier (1998) Judith A. Neubauer (1998) Richard J. Roman (1999) L. Gabriel Navar, *ex officio* (1998)

Program Advisory

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

Chair—-Ethan R. Nadel (2000)

Cardiovascular—-Kathryn Lamping (1998) and H. Glenn Bohlen (2000)

Cell and General Physiology—-Simon A. Lewis (1999)

Central Nervous System—-Susan M. Barman (1999)

Comparative Physiology—-Stephen C. Wood (2000)

Endocrinology and Metabolism—-Susan K. Fried (1999)

Environmental and Exercise Physiology— Ronald L. Terjung (1999)

Gastrointestinal Physiology—Helen Raybould (2000)

Neural Control and Autonomic Regulation—Frank J. Gordon (2000) Renal—Jeff L. Garvin (2000) and Jurgen B. Schnermann (1999)

Respiration—Ivan F. McMurtry (1999) Teaching of Physiology—Ann P. McNeal (2000)

Water and Electrolyte Homeostasis— Joseph R. Haywood (1999)

Epithelial Transport Group—John Cuppoletti (1998)

History of Physiology Group—G. Edgar Folk, Jr. (1999)

Hypoxia Group—-Nanduri R. Prabhakar (1999)

Myobio Group—Thomas M. Nosek (1999) Members in Industry Group—Andrea A. Seymour (1998)

Education Committee—Barbara E. Goodman (2000) & Penny Hansen (1998)

Public Affairs

Advises Council on all matters pertaining to public affairs that affect physiologists and implements public affairs activities in response to Council guidance. Eric O. Feigl, Chair (1997) David D. Gutterman (1998) Florence N. Hutchison (1997)

Joseph R. Haywood, Chair (2000) Philip S. Clifford (2000) David J. Dzielak (2000) David D. Gutterman (1998) Ralph Lydic (1999) David W. Ploth (1999) R. John Solaro (1998) C. Terrance Hawk, *ex officio* (2000) Andrea A. Seymour, *ex officio* (1998)

Publications

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

Leonard R. Johnson, Chair (1998) Donald S. Faber (1998) R. Davis Manning, Jr. (2000) Virginia M. Miller (1998) Stephen H. Wright (1999) Allen W. Cowley, Jr., *ex officio* (1998)

Section Advisory

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

Chair—John E. Hall (1999) Cardiovascular—William M. Chilian (2000)

Cell and General Physiology—Paul J. De Weer (1998)

Central Nervous System—Bruce G. Lindsey (1999)

Comparative Physiology—David H. Evans (2000)

Endocrinology and Metabolism—-Marian R. Walters (1998)

Environmental and Exercise Physiology— Charles M. Tipton (2000)

Gastrointestinal Physiology—Hannah V. Carey (2000)

Neural Control and Autonomic Regulation—Eileen M. Hasser (1999) Renal Physiology—Mark A. Knepper (1999)

Respiration—Thomas R. Martin (1999) Teaching of Physiology—Robert G. Carroll (1999)

Water and Electrolyte Homeostasis—-Ronald H. Freeman (2000)

Senior Physiologists

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

Robert M. Berne, Chair (1998) Michael Bárány (2000) Stephen M. Cain (1999) Eugene M. Renkin (1998) William J. Stekiel (1998) Arthur J. Vander (1999) Kenneth L. Zierler (2000)

Women in Physiology

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

Kim E. Barrett, Chair (1999) Susan M. Barman (1999) Ann Bonham (1999) Ulla C. Kopp (1999) Jane F. Reckelhoff (1998) Mary I. Townsley (1998) Alice R. Villalobos (1999) Erin L. Seifert, student member (1999)

Society Representatives to Other Organizations

American Association for Accreditation of Laboratory Animal Care C. Terrance Hawk (2000)

American Association for the Advancement of Science Lynne E. Olson (1998) Frank L. Powell (1998)

Council of Academic Societies of the Association of American Medical Colleges

Vernon S. Bishop (1998) William H. Dantzler (2000)

FASEB Board

James A. Schafer (1999) L. Gabriel Navar (2001)

Executive Officers Advisory Committee Martin Frank (indefinite)

Finance Committee Franklyn G. Knox (1998)

Excellence in Science Award Kim E. Barrett (1999)

Research and Education Committee Mary Anne Frey (2000)

Public Affairs Executive Committee James A. Schafer (1999)

Public Affairs Advisory Committee Joseph R. Haywood (2000)

Publications & Communications Committee

Pamela Gunter-Smith (2000)

Research Conference Advisory Committee R. Clinton Webb (1999)

Wellcome Visiting Professorship Robert Gore (1999)

National Association for Biomedical Research

Martin Frank (indefinite)

L. Gabriel Navar (2000)

US National Committee for IUPS James A. Schafer (1998) Allen W. Cowley, Jr. (1999)

US National Committee on Biomechanics David Brown (1999)

Membership

Election of New Regular Members (70)

Anupam Agarwal University of Florida

Michael Apkon Yale University

Peter Baluk University of California

Nora Valeria Bergasa Beth Israel Medical Center

* Russell A. Bialecki Zeneca Pharmaceuticals

Marion A. Blank Procter & Gamble Company

Joseph A. Bonanno University of California

* Luiz G. S. Branco University of Sao Paulo, Brazil

Dennis Brown Massachusetts General Hospital, East

David Bullough Gensia-Sicor, Inc.

Brendan J. Canning Johns Hopkins Asthma/Allergy Center

Gale B. Carey University of New Hampshire

Jon P. Costanzo Miami University

* Kevin P. Davy University of Colorado

* Christopher A. DeSouza University of Colorado

Chris J. Dickinson University of Michigan

* Melinda R. Dwinell University of California at San Diego

* Ann R. Elliott University of California at San Diego

Keith Stewart Elmslie Tulane University Medical School

Mohamed A. Fahim United Arab Emirates University

* Christopher Gaposchkin New York Hospital

Raul Garcia Clinical Research Institute of Montreal

John Geibel Yale University

* John R. Halliwill Mayo Medical School, Mayo Clinic * Upgrade from Student

* Gregory A. Hand University of South Carolina

Paul A. Insel University of California at San Diego

Valerie G. Kalter Wilkes University

Alan David Kaye Tulane University Medical Center

* Stephen T. Kinsey Univ. of North Carolina at Wilmington

Penny Knoblich University of Missouri

George Koike Medical College of Wisconsin

* Donna Hope Korzick NIH

Sean C. Kumer Univ. of Virginia Health Science Center

Ann Leevers Queen's University, Canada

* Alex B. Lentsch Univ. of Michigan Medical School

Sheng-Xing Ma University of California at Los Angeles

* Michael P. Massett New York Medical College

Derek M. Mckay McMaster University

Dennis B. McNamara Tulane University Medical School

Daniel Richard Meldrum University of Colorado

John W. Mills Clarkson University

* Christopher Minson Mayo Foundation

Michael A. Moskowitz Massachusetts General Hospital

Bobby D. Nossaman Tulane University Medical Center

John A. Oaks University of Wisconsin at Madison

Andrew Pellett Louisiana State Univ. Medical Center

Lori Ploutz-Snyder Syracuse University

* Deborah Ann Podolin University of New England * Robert A. Rebres Washington University

Margaret M. Redfield Mayo Clinic

Deborah C. Rubin Washington Univ. School of Medicine

Benjamin L. Shneider Mount Sinai Medical Center

Michael Simons Beth Israel Deaconess Medical Center

Lawrence Snyder Washington Univ. School of Medicine

Alan H. Stephenson St. Louis University

Craig S. Stump Mayo Clinic

Roy L. Sutliff University of Cincinnati

Erik Svensjo Univ do Estado do Rio de Janeiro

John A. Sweeney University of Pittsburgh

Janice H. Urban Chicago Medical School

Julia K. L. Walker Duke University Medical Center

Neal L. Weintraub Univ. of Iowa College of Medicine

James N. Weiss UCLA School of Medicine

Pete Gregory Weyand Harvard University

* Darryn S. Willoughby University of Southern Maine

Allan W. Wolkoff Albert Einstein College of Medicine

Jian-Young Wu Georgetown University

* Xiaoyan Wu University of Toronto, Canada

John (He) Zhang Deborah Research Institute

* Xiaoming Zhou F. Edward Hebert School of Medicine

Membership

Election of New Corresponding Members (30)

Joji Ando University of Tokyo, Japan

Anita Chatarina Aperia St. Goran's Children's Hospital

Bakhrom K. Berdiev University of Alabama at Birmingham

Stefan H. Boese University of Newcastle, Australia

* Chao-Yin Chen Kent State University

Ling Chen Long Island Jewish Medical Center

Kazuo Chin Kyoto University, Japan

Steven C. Dennis Sports Science Institute of South Africa

Zoran Dogas Medical School of Split, Croatia

Fuyong Du State University of New York

Kevin Tate Belasco University of Iowa

Amanda Berg Michigan State University

Anindya Bhattacharya State University of New York at Buffalo

Jill Ann Bush Penn State University

Michael Byers University of Kentucky

Kevin James Canning University of Western Ontario

Gennady Chernyak Ball State University

Xuedong Chi University of South Florida

Chris Clevenger University of Colorado

Susan Copeland University of Alabama at Birmingham

Bruce M. Damon University of Illinois

Pedro Del-Corral University of Tennessee

Frank Dihenno University of Colorado * Upgrade from Student

Dino Antonio Giussani University of Cambridge, UK

Menachem Hanani Hadassah University Hospital, Israel

* A. Z. M. Arif Hasan East Carolina Univ. School of Medicine

Elin Helset University Hospital of Tromsce

Jin Sup Jung Pusan National University, Korea

Stephen C. Land Ninewells Hospital & Medical School, UK

Florian Lang Physiologisches Institute

Yanping Liu Medical College of Wisconsin

Fadi Mourad University of Alabama at Birmingham

Soren Nielsen University of Aarhus, Denmark

Approved Student Members (70)

Ana Yesenia Estevez Wayne State University

Mark J. Fedele Penn State University

Christina M. Ferrell Wright State University

Timothy J. Fort University of Rhode Island

Jess Fradette Michigan State University

Sharon C. Francis University of Alabama at Birmingham

Ada Iris Fraticelli University of Minnesota Health Center

Todd M. Fruchterman University of Louisville

Clifford T. Fulton Kent State University

Peter Michael Gorayski Michigan State University

Bing Han State University of New York at Buffalo

Fred S. Harman University of Colorado

Shawn G. Hayes University of California at Davis Hiroaki Oda Hennepin County Medical Center

John H. T. Power Flinders University of South Australia

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EB '98 Symposia Preview

Saturday, April 18, Morning Session

Refresher Course for Teaching Renal Physiology V. L. Brooks and A. J. Vander

Saturday, April 18, Afternoon Session

Alternative Premessenger RNA Splicing: Biology and Pathology
E. J. Benz and P. A. Sharp
(sponsored by the Society for Experimental Biology and Medicine)
APS Public Affairs Symposium: Institutional Animal Care and Use Committee Issues Roundtable
C. T. Hawk and S. W. Mifflin

Mechanisms of Adaptation to Hypoxia: Organizational, Cellular, and Molecular Responses

F. Ismail-Beigi and C. M. Beall

Strength, Functional Capacity, and Trainability of Aging Skeletal Muscle R. S. Mazzeo

Sunday, April 19, Morning Session

Understanding Biological Systems Through Mathematical Modeling J. C. Collins and R. C. Boston (sponsored by the Biomedical Engineering Society) Vascular Biology of Homocysteine S. J. Elliott and K. S. McCully Intestinal Adaptations to Fasting R. P. Ferraris and H. V. Carey

Sunday, April 19, Afternoon Session

Emerging Technologies' Role In Physiology Instruction
R. G. Carroll and M. J. Davis
A Centennial Symposium on the Publication of the American Journal of Physiology
C. M. Tipton and D. L. Gilbert

Monday, April 20, Morning Session

Transport Phenomena in Cellular and Molecular Processes S. L. Diamond (sponsored by the Biomedical Engineering Society) New Perspectives of Pulmonary Blood Flow Distribution M. P. Hlastala

Monday, April 20, Afternoon Session

Neuronal Assembly Dynamics: Cellular and Network Mechanisms in Cardiorespiratory Control S. M. Barman and B. G. Lindsey Molecular Mechanisms of Protein Traffic and Secretion K. L. Kirk and H. J. Bellen Molecular and Cellular Changes During Aging P. S. Wang and Y. Wei (sponsored by the Chinese Physiological Society)

Tuesday, April 21, Morning Session

Interaction Between Vascular Endothelium and Smooth Muscle Advances in Physiology and Pathophysiology G. W. He and R. A. Cohen

Current Mechanisms of Blood Coagulation S. T. Rapundalo and B. R. Lucchesi

Role of Tight Junctions in the Regulation of Tissue of Permeability L. Reuss and K. R. Spring

Engineering Gene Therapeutics M. L. Yarmush and J. R. Morgan (sponsored by the Biomedical Engineering Society)

Tuesday, April 21, Afternoon Session

Neurochemical and Peptidergic Pathways of the Baroreflex Arc in the Medulla Oblongata

D. B. Averill and S. A. Aicher

Control of Mitochondrial Free Fatty Acid Uptake and Oxidation in Working Skeletal Muscle G. A. Brooks

Hemodynamic and Renal Tubular Interactions of Endothelin and Nitric Oxide D. M. Pollock and T. D. Warner

Glutamate Transport, Metabolism, and Physiological Responses **T. C. Welbourne**

Wednesday, April 22, Morning Session

Role of Sex Steroids in Cardiovascular-Renal Physiology and Pathophysiology J. F. Reckelhoff and L. Share

Protein Phosphatases in Cell Signaling Pathways A. V. Somlyo and C. B. Klee

Pluripotent Effects of Tumor Necrosis Factor on Insulin Sensitive Tissues J. M. Stephens and P. A. Kern

Molecular Approaches to Understanding Cellular Responses to Stress

K. B. Storey

Na-K-2Kl Cotransporters: Heterogeneity of Structure, Function, and Regulation S. M. Wall and B. Forbush, III

Wednesday, April 22, Afternoon Session

Dominant-Negative Approaches to Explore Physiology J. R. Dedman Is the Development of Atherosclerotic Lesions Determined by Monocyte-Endothelial Adhesion?

K. Ley and A. L. Beaudet

Physiology InFocus

Genomics to Physiology and Beyond: How Do We Get There? Organizers: Francis Collins and Allen W. Cowley, Jr., Medical College of Wisconsin

Monday, April 20, 1998 Morning Session

Genomics and Genetics as a Window Into Physiology

Francis Collins National Human Genome Research Institute

Speakers:

Francis Collins, National Human Genome Research Institute; **Michael Welsh,** University of Iowa College of Medicine; **Douglas Marchuk,** Duke University Medical Center; **Monica Riley,** Marine Biological Laboratory

Monday, April 20, 1998 Afternoon Session

Applying Molecular Genetic Tools to Physiological/Pharmacological Questions

Howard J. Jacob Medical College of Wisconsin

Speakers:

Mark Fishman, Massachusetts General Hospital; Carl Johnson, Nemapharm, Cambridge, MA; William Dietrich, Harvard Medical School

Tuesday, April 21, 1998 Morning Session

Yeast as a Model for Genomic Analysis and the Analysis of Human Disease Stanley Fields

University of Washington

Speakers:

Stanley Fields, University of Washington; Stephen H. Friend, Fred Hutchinson Cancer Research Center; David Vallee, Johns Hopkins University School of Medicine; Joseph Heitman, Duke University

Tuesday, April 21, 1998 Afternoon Session

High-Throughput Technology: From Expression Arrays to Physiological Function

Pat Brown

Stanford University

Speakers:

Louis M. Staudt, National Cancer Institute; David Mack, Affymetrix, Santa Clara, CA; Joe Derisi, Stanford University School of Medicine; Cammy Kao, Stanford University School of Medicine

TIME IS RUNNING OUT!

Conference Proposals for the year 2000 are due February 13, 1998



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Distinguished Lectureships



HENRY PICKERING BOWDITCH AWARD

Michael Caplan Yale University

The Sorting of Ion Transport Proteins in Polarized Cells: From Molecular Signals to Physiological Function



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

Eric R. Kandel Columbia University

Genes, Synapses, and Long-Term Memory



ROBERT M. BERNE DISTINGUISHED LECTURESHIP OF THE CARDIOVASCULAR SECTION

Kenneth R. Chien University of California at San Diego

Genetically Engineered Animal Models of Cardiac Development and Disease: Genes and Physiology



Lawrence B. Cohen Yale University

Optical Measurement of Brain Activity in Aplysia and Turtle: Spikes and Waves



HUGH DAVSON DISTINGUISHED LECTURESHIP OF THE CELL AND GENERAL PHYSI-OLOGY SECTION

Sir Andrew Huxley Trinity College (UK)

The Unpredictability of Science: Lessons from Muscle Physiology

August Kroch Distinguished Lectureship of the Comparative Physiology Section

Harold T. (Ted) Hammel Indiana University

Evolving Ideas About Osmosis

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

Phyllis M. Wise University of Kentucky

"Menopause": Interplay Among Several Endocrine Pacemakers





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

Kenneth M. Baldwin University of California at Irvine

Interaction of Mechanical Activity and Thyroid Hormone on Skeletal Muscle Plasticity

The Physiologist

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HORACE W. DAVENPORT DISTINGUISHED LECTURESHIP OF THE GASTROINTESTINAL SECTION

George Sachs University of California at Los Angeles

Gastric Acid and Gastric Microorganisms



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

K. Michael Spyer Royal Free Hospital, UK

Neuromechanisms Underlying Autonomic Control of Circulation



CARL W. GOTTSCHALK DISTINGUISHED LECTURESHIP OF THE RENAL SECTION

Walter F. Boron Yale University

Acid-Base Transport: From the Squid Giant Axon to the Renal Proximal Tubule



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

John M. Harlan University of Washington

Leukocyte-Endothelial Interaction: Molecular Basis and Clinical Relevance



CLAUDE BERNARD DISTINGUISHED LECTURESHIP OF THE TEACHING OF PHYSIOLOGY SECTION

Donald T. Frazier University of Kentucky

Appreciation and Enhancement of Physiological Teaching Through Outreach Involvement



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

John E. Hall University of Mississippi

Cardiovascular and Renal Pathophysiology of Obesity and Insulin Resistance

Conferences

1998 APS Conference Endothelial Regulation of Vascular Tone: Molecular to Integrative Physiology September 16–19, 1998 • Augusta, GA Radisson Riverfront Hotel

ORGANIZER:

David M. Pollock Medical College of Georgia

STEERING COMMITTEE:

John D. Catravas Medical College of Georgia Harris J. Granger

Texas A&M University

L. Gabriel Navar Tulane University

Jennifer S. Pollock Medical College of Georgia

Subsequent to the realization that endothelial cells are important regulators of vascular, immunological, and probably many other functions, endothelial cell biology has rapidly expanded into a distinct discipline. Simply in terms of vascular function, this relatively new area covers an extremely wide range of the more traditional disciplines, including physiology, pharmacology, and cell and molecular biology. The purpose of this conference is to present the most recent information on the interaction among major endothelial factors in the control of the vascular tone.

The conference brings together rapidly growing areas of endothelial cell biology so as to develop a more cohesive picture of the vascular endothelium as a physiological organ system. While the primary emphasis will be on specific mediators, related subjects such as shear stress and vascular remodeling will also be covered. Molecular and whole animal physiologists will demonstrate how their methodologies integrate into a central hypothesis and also define the similar aspects and unique mechanisms that exist among the different vascular beds. The conference is different from other vascular related meetings in that it attempts to bring together diverging areas of endothelial cell biology to develop a more cohesive picture of vascular endothelial function.

WEDNESDAY, September 16, 1998

Discovery of EDRF Salvador Moncada, University College, UK

Signal Transduction and Gene Regulation

Robert Highsmith, University of Cincinnati; Rudi Busse, J.W. Goethe University, Germany; Ferid Murad, Molecular Geriatrics; Brian Duling, University of Virginia

THURSDAY, September 17, 1998

Paracrine Regulation of the Renal Circulation **L. Gabriel Navar**, Tulane University

Endothelial Control of the Renal Microcirculation Josephine P. Briggs, University of Michigan; Christopher Wilcox, Georgetown University; William J. Arendshorst, University of North Carolina

Interaction of Nitric Oxide With Other Mediators David M. Pollock, Medical College of Georgia; Pam Carmines, University of Nebraska; Tom Hintze, New York Medical College

Regulation of NOS in Vascular Smooth Muscle Jennifer S. Pollock, Medical College of Georgia

TGF in Fibrotic Disease **Wayne Border**, University of Utah

FRIDAY, September 18, 1998

Transgenic Mice as Models for Hypertension **Ed Shesley**, Henry Ford Hospital

Endothelial Dysfunction: Pharmacology Joan Keiser, Parke-Davis; Lou Ignarro, University of California at Los Angeles; Ulrich Förstermann, Gütenberg University, Germany

Endothelial Dysfunction: Pulmonary **Bruce Pitt**, University of Pittsburgh; John D. Catravas, Medical College of Georgia; Steve Abman, University of Colorado

Endothelial Dysfunction: Cardiovascular **Richard Paul**, University of Cincinnati; **Leslie Fuchs**, Medical College of Georgia; **Richard Cohen**, Boston University

Peptidase Activity in the Vascular Endothelium Jim Ryan, Medical College of Georgia

Pivotal Role of Endothelium to Heart-Lung Transplantation **Sir Magdi Yacoub**, Imperial College, UK

SATURDAY, September 19, 1998

Endothelial Regulation of Angiogenesis **Harris J. Granger**, Texas A&M University

Vascular Remodeling

Mary Gerritsen, Bayer; David Harrison, Emory University

Shear Stress

John Frangos, University of California at San Diego; Robert Nerem, Georgia Tech University; Barbara Ballerman, Johns Hopkins University

Estrogen Modulation of the Vascular Endothelium:

Implications for Development of Coronary Artery Disease Virginia Miller, Mayo Clinic

Endothelial Gene Transfer in Restenosis

Conferences

1998 APS Conference The Paraventricular Nucleus of the Hypothalamus: A Crossroads of Integrative Physiology December 5–9, 1998 • San Antonio, TX The Menger Hotel

ORGANIZER:

Joseph R. Haywood University of Texas Health Sciences Center at San Antonio

STEERING COMMITTEE:

Alan K. Johnson University of Iowa

Arthur D. Loewy Washington University

Leo P. Renaud University of Ottawa

Catherine Rivier Salk Institute

Anton J. W. Scheurink

University of Groningen, The Netherlands

The paraventricular nucleus of the hypothalamus (PVN) serves as the crossroads of integrative physiology. This discrete hypothalamic area receives neural, humoral, and endocrine input regarding the state of the cardiovascular, endocrine, and immune systems, as well as fluid and electrolyte and energy balance. Integration of afferent inputs results in efferent neural or hormonal regulation of specific organ systems. This conference will bring together scientists who study different physiological systems and who use a variety of technical approaches ranging from molecular biology to whole animal physiology. The goal will be to understand how the PVN integrates afferent information, controls specific physiological functions, and coordinates interactions among organ systems.

TENTATIVE PROGRAM

Anatomy, Neural Pathways, and Neurochemistry Arthur Loewy, Washington University; Paul Sawchenko, Salk Institute; Larry Swanson, University of Southern California

Integration of Ingestive Behaviors

Alan K. Johnson, University of Iowa; Glenn Stanley, University of California at Riverside; Stephen Woods, University of Washington; Joseph Verbalis, Georgetown University; Gaylen Edwards, University of Georgia

Role in Metabolism and Energy Balance

Anton J. W. Scheurink, University of Groningen, The Netherlands; John Vissing, University of Copenhagen, Denmark; Barry Levin, Veterans Affairs Medical Center, East Orange, NJ; Gertjan van Dijk, University of Groningen, The Netherlands; Martine Orosco, University of Paris; Mary Dallman, University of California at San Francisco.

Neuroendocrine Regulation

Leo P. Renaud, University of Ottawa; Stanley Watson, University of Michigan; Ruud Buijs, Netherlands Institute of Brain Research; Charles Bourque, McGill University; William Crowley, University of Tennessee at Memphis; Paul Plotsky, Emory University

Stress and the Immune System

Catherine Rivier, Salk Institute; **Serge Rivest**, Laval University; **Dwight Nance**, University of Manitoba; **Adrian Dunn**, Louisiana State University; **James Herman**, University of Kentucky

Control of Cardiovascular-Renal Function

Joseph R. Haywood, University of Texas Health Sciences Center at San Antonio; Steven Bealer, University of Tennessee at Memphis; Quentin Pittman, University of Calgary; Mariana Morris, Wright State University; Kaushik Patel, University of Nebraska; Alastair Ferguson, Queens University

Call for Nominations

for the Editorship of American Journal of Physiology: Heart and Circulatory Physiology

Nominations are invited for the editorship of *AJP: Heart and Circulatory Physiology* to succeed Harris J. Granger, who will complete his term as Editor on December 31, 1998. The Publications Committee plans to interview candidates in the spring of 1998.

Applications should be received before March 15, 1998.

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

NAS Seeks Congressional Exemption From Open Meeting Rules

In the wake of the Supreme Court's refusal to hear its appeal, the National Academy of Sciences (NAS) sought Congressional relief from a court decision requiring that its advisory committees must abide by federal open meetings rules. On November 10, the House passed a bill partially exempting the Academy from the Federal Advisory Committee Act (FACA). As of this writing, it was uncertain whether the Senate would have time to act on the bill before Congress adjourned.

NAS had been sued by animal rights groups, who asserted that it must abide by the 1972 law. The law requires that committees established to provide advice to the government must be chartered and managed by a government agency, have members representing opposing views, and conduct all their business in meetings open to the public.

The legal case involved an advisory committee established to revise the Guide for the Care and Use of Laboratory Animals. The Animal Legal Defense Fund (ALDF) and two other animal rights groups sued the Department of Health and Human Services, which had contracted with an NAS committee for the revision. ALDF charged that the committee was operating illegally because it did not follow FACA rules. The suit was initially dismissed, but the case went in ALDF's favor on appeal. NAS joined the suit as a defendant and carried the appeal to the Supreme Court, even when the Justice Department declined to file the appeal on behalf of the government.

After the Supreme Court announced on November 3 that it would not review the case, NAS President Bruce Alberts issued a statement expressing disappointment in the decision. Alberts pointed out that closed deliberations are important to permit objective examination of complex questions of science, technology, and public health without external pressures from sponsoring agencies or special interest groups.

"If FACA is applied to Academy studies," Alberts said in his statement, "the likely outcome is that the Academy will be conducting far fewer studies because the Academy will not create FACA-regulated committees."

Moving swiftly before Congress adjourned, the House Government Reform Subcommittee on Government Management held a hearing November 5, just two days after the Supreme Court turned down the NAS appeal. Subcommittee Chairman Steve Horn (R-CA) convened the hearing to consider legislation to partially exempt the Academy from FACA. The witness list included Academy President Alberts, representatives of the Government Accounting Office and General Services Administration (GSA), and lawyers from animal rights and environmental groups that had sued the academy for FACA access to committee deliberations.

In his opening statement, Horn pointed out that Congress had not intended for the law to apply to NAS, which had been made clear in the 1972 legislative debate. Horn noted that there was broad agreement in Congress and the administration that NAS should receive a partial exemption.

Alberts agreed that some aspects of the NAS advisory committee process could be made more open but argued that NAS could not provide the government with the objective advice it seeks if the full range of FACA rules were left in force. Alberts noted that the Academy's independence from the government has been "essential for our credibility" in providing "unbiased, highquality scientific advice on controversial, complex issues." Alberts explained that the Academy appoints committees of volunteer experts who draft reports that are revised through a "rigorous internal peer review process" before being released to the requesting agency

and the public. Subjecting the Academy to FACA rules would remove its independence and therefore jeopardize the objectivity and value of its advice, Alberts told the panel.

Alberts requested that the Academy be exempted from the requirement to open all its committee deliberations to the public. He argued in his testimony that "keeping the committee deliberations and our review process closed and confidential is fundamental for ensuring the independence of our studies and the scientific quality of our reports, enabling our recommendations and findings to be based on science rather than politics."

NAS has also requested to be exempted from the time-consuming requirement that GSA must process the charter of each advisory committee before it can be convened. Alberts also asked that the Academy, rather than GSA, should manage and control its committees, including appointments. Alberts further requested that alreadycompleted NAS reports be protected from after-the-fact court challenges. In return, he promised that the Academy would "continue to increase public access to its process" but not in ways that would compromise its independence.

The House-passed legislation exempts the Academy from having to surrender control of its committees to the government and open their deliberations to the public. However, the Academy must allow public comment on the choice of committee members, keep information-gathering meetings open, provide summaries of all committee meetings including deliberations, and disclose the names of those who review committee reports before they are finalized.

Do Not Charge Animal Costs Directly, APS Tells OMB

The federal government should not require universities to recover all the costs associated with animal research through direct charges to research grants, APS told the federal Office of Management and Budget (OMB).

The comments were made in response to a notice published in the *Federal Register* concerning proposed changes to OMB Circular A-21. APS asked the government not to include animal research facilities in the category of specialized service facilities, which are required to recover virtually all their costs through direct charges to grants.

"APS firmly believes that the facilities where research animals are kept and used are a direct extension of conventional laboratory space, and that their costs should be included in an institution's Facilities and Administrative (F&A) costs just as other laboratory spaces are," the APS letter said.

At the moment, there is some ambiguity as to whether animal research facility costs may be considered as F&A costs, previously known as indirect costs. Some institutions apparently still include part of these costs under F&A costs, but OMB is pressing for all animal-related costs to be charged directly to investigators. In an article published in the May 2 issue of *Science*, Stanford University Chair of Comparative Medicine Linda Cork estimated this policy could more than double the cost of animal research projects. "The direct charging of animal costs to individual research grants is unworkable because charging these costs to research grants through per diems creates instability that defeats budgetary planning efforts," the APS letter explains.

Since under such a system "neither the principal investigator nor the granting agency will be able to reliably predict what the costs of the project will be," this will "compromise the ability of scientists to perform the research they have proposed within the budget accepted by the granting agency," the letter stated. "This outcome is not in our interest as a nation seeking to maximize its research efforts."

The comment period on the proposed changes closed November 10.



APS, ARENA Present Science Teachers Symposium

"The Importance of Animals in Biomedical Research" was the title of a symposium presented at the National Association of Biology Teachers annual meeting in Minneapolis, MN, cosponsored by APS and the Applied Research Ethics National Association (ARENA).



APS member Virginia Miller.

The program, which was held Wednesday, October 8, attracted about 40 high school biology teachers who participated in three hours of presentations and discussion. Financial support for the symposium was provided by the 3M Corporation, Mayo Medical Center, and AVECOR Cardiovascular, Inc. The program was moderated by Molly Greene, President of ARENA and Executive Assistant to the Vice President of the University of Texas Health Science Center at San Antonio.

APS member Virginia Miller opened the symposium with an historical perspective on how animal research has contributed to our understanding of basic physiological principles used in medicine today. Miller, who is Associate Professor of Surgery and Physiology at the Mayo Clinic and Foundation, contrasted the assertions of animal research opponents with the tangible benefits that animal research has produced. She pointed out one quote from the British Society for the Abolition of Vivisection that asserted that animal research has no further contributions to make to medical progress. The statement was made in 1875. However, as Miller noted, animal research has played a critical role in such 20th century medical advances as insulin therapy for diabetes, the polio vaccine, and heartlung bypass surgery.

APS member Timothy Ebner, Professor of Physiology and Neurosurgery at the University of Minnesota, discussed how animal research has helped to unlock the secrets of the brain. Noting the brain's complexity and the fact that there are more diseases of the brain than of any other organ, Ebner explained that brain researchers use various approaches to gain understanding of the brain at every level "from molecules to madness." He gave an overview of what neuroscience has revealed about the brain, placing these discoveries in stark contrast to a series of anti-research statements made by those who oppose the use of animals in research.

Miller and Ebner were followed by a panel consisting of two experts in laboratory animal medicine and a research administrator for the University of Minnesota. Cynthia Gillett, Campus Veterinarian for the University of Minnesota, explained the role of the institutional animal care and use committee in overseeing the university's animal research program and approving research protocols. She described the chief veterinarian's responsibilities, which range from managing every aspect of the university's animal facilities to answering scientists' questions about what species of animals to use and what anesthetic drugs are most appropriate.

Richard Bianco, Institutional Official for Animal Care and Use at the University of Minnesota, discussed his role as the "institutional official" who bears ultimate responsibility for the research program under the federal animal care rules. He pointed out that the University of Minnesota is actually subject to several sets of animal care standards. In addition to federal Animal Welfare Act regulations and the Public Health Service Policy on the Humane Care and Use of Animals, the university also must comply with a set of guidelines provided by its own regents. The Regents Policy applies to every animal owned by the university, no matter what species and no matter whether it is used for research, education, agriculture, or display. The University of Minnesota also is accredited by the Association for the Assessment and Accreditation of Laboratory Animal Care, which performs thorough audits of animal care programs before it will certify them to be in compliance with the highest professional standards.

Veterinarian **DeWayne Walker** of the 3M Corporation gave an industry perspective, noting the wide range of products that involve some kind of animal testing, such as cosmetics, hair sprays, bug repellents, drugs, medical devices, as well as many different kinds of chemicals. He noted that in addition to USDA's Animal Welfare Act Regulations, various products are subject to regulations from other agencies, such as the Food and Drug Administration (for approval of drugs and medical devices), the Department of Transportation (for permission to transport potentially hazardous chemi-



APS member Timothy Ebner.

Public Affairs

cals), the Environmental Protection Agency (for regulation of potential environmental hazards), and the Occupational Safety and Health Administration (to assure the safety of those who work with industrial products). In addition, most companies have their own internal quality assurance audits.

Walker pointed to the cosmetics industry as one that had responded to the public's concern about animal testing by identifying alternative testing methods. However, he pointed out the difference between cosmetics, which are applied externally, and other categories of products. On the one hand, drugs and some medical devices are meant to be used internally. On the other hand, the potential danger posed by many chemicals comes from the fact that people and animals might unintentionally ingest or inhale them. Poison control centers and other emergency response units rely on the safety data that is currently generated through animal testing, which cannot easily be replaced with existing alternative methods.

The final panel at the symposium consisted of two high school biology teachers who use animals in their classrooms. **Jan Haffey** is a teacher of human anatomy and physiology at Hickman High School in Columbia, MO, and



Lesli Adler, biology teacher at T. S. Wootton High School in Rockville, MD.

Lesli Adler is a biology teacher at T. S. Wootton High School in Rockville, MD. Haffey is also a member of an APS Local Outreach Team that provides inservice workshops for local teachers using physiology curriculum units they can use in their classrooms. Adler is a former APS Summer Research Teacher who worked at the Armed Forces Radiobiology Research Institute (AFFRI) in Bethesda, MD.

Haffey explained how she uses dissection in the curriculum, how she approaches dissection exercises, and why she considers this important. She emphasized the importance of being sensitive to student concerns, discussing with them how the specimens were obtained, and teaching students to be respectful and behave responsibly toward the animals. She stated her view that there is no substitute for a three-dimensional, hands-on, manipulative approach to learning when it comes to teaching students about the complexity and interrelatedness of the body's organs. Dissection is an especially useful tool for students whose learning styles are visual or tactile. She also provided a series of overwhelmingly positive comments made by students about the dissection portion of the course.

Adler's approach to dissection includes regular reconsideration of whether the exercise remains valid for her students. She said that she continues to opt for dissection because of the superiority of this "hands-on" experience to existing computer simulations. However, she noted that she now uses fewer animals because she has devised strategies such as designating various groups of students as "experts" to teach their peers about a particular species. If a student raises concerns about participating in dissection, Adler meets with the student and the parents. She said that thus far the only student who was categorically unwilling to dissect for ethical reasons was asked instead to observe a veterinary surgery. That student became so intrigued that she decided to become a veterinarian.

Adler called on teachers to be concerned about the conditions under which live animals are kept in classrooms and used in science fairs and other research projects. After her summer research experience at AFRRI, Adler was asked to become the public member of AFFRI's Institutional Animal Care and Use Committee. She said that in that capacity she seeks to represent a wide range of public



Jan Haffey, teacher of human anatomy and physiology at Hickman High School in Columbia, MO.

concerns about the care provided for animals and how they are used in research. Because of her connection with AFRRI, she said that she found it especially gratifying when she learned that a friend's son, who had to undergo cancer chemotherapy, had his nausea substantially alleviated by a drug developed at AFFRI.

Along with the presentations and discussion, the teachers who attended the symposium were provided with a wealth of information and classroom materials about the importance of animals in medical research.

Public Affairs

Congress Approves FY 1998 Funding

NIH: After weeks of debate surrounding issues unrelated to NIH funding, the fi nal conference agreement on the Labor-He alth and Human Services-Education appropriations bill passed the House and Senate on November 7 and 8, respectively. With compromises worked out on controversies such as national educational testing that had stalled the legislation, President Clinton was expected to sign the bill. NIH has been temporarily operating at last year's funding level pending final passage of the bill.

The bill provides NIH with \$13.648 billion for FY 1998, an increase of \$907 million or 7.1% more than in FY 1997. The dollar increase for NIH was the largest the agency has received during one appropriations cycle. The unprecedented increase came about due to extraordinary efforts by Rep. John Porter (R-IL) and Sen. Arlen Specter (R-PA), who have both announced themselves in favor of doubling the NIH's budget. The institute-by- institute breakdown is shown in Table 1.

The final conference agreement included language authorizing up to \$100 million for research into Parkinson's disease. This was a compromise in response to the concerted efforts of supporters of a Parkinson's research authorization bill that is named in honor of Rep. Mo Udall, a former Member of Congress who suffers from the disease. Additional research was authorized, but no specific funding level was specified in deference to the fact that funding legislation is not supposed to be used as a vehicle for authorizing legislation. In a related matter, the conference agreement directs the Secretary of Health and Human Services to have the Institute of Medicine study how NIH determines what resources to allocate to the study of various diseases. This has been an area of intense concern on Capitol Hill this year as advocates of increased funding for diabetes, heart disease, Parkinson's, and other diseases questioned NIH's decision-making process.

Another area of special Congressional interest was the Office of Alternative Medicine. Its funding was increased from \$12 million in FY 1997 to \$20 million in FY 1998, with the additional funds designated for peer-reviewed competitive grants and contracts to fund research submitted in response to Program Announcements and Requests for Proposals.

Table 1. FY 1998 Appropriations for NIH Institutes, Centers, and Divisions

Institute or Center	FY 1997 Comparable	FY 1998 Request	FY 1998 Final
National Cancer Institute	\$2,389.1	\$2,441.7	\$2,547.3
National Heart, Lung, and Blood Institute	1,431.8	1,467.2	1,531.1
National Institute of Dental Research	197.1	202.8	209.4
National Institute of Diabetes and Digestive and Kidney Diseases	813.1	833.8	873.9
National Institute of Neurological Disorders and Stroke	729.3	747.8	780.7
National Institute of Allergy and Infectious Diseases	1,257.8	1,312.5	1,351.7
National Institute of General Medical Sciences	995.5	1,020.2	1,065.9
National Institute of Child Health and Human Development	631.6	647.3	674.8
National Eye Institute	331.6	340.4	355.7
National Institute of Environmental Health Sciences	307.6	319.9	330.1
National Institute on Aging	484.3	497.1	519.3
National Institute of Arthritis and Musculoskeletal and Skin Diseases	256.2	263.2	274.8
National Institute on Deafness and Communication Disorders	188.3	194.2	200.7
National Institute of Nursing Research	59.6	61.1	63.6
National Institute on Alcohol Abuse and Alcoholism	211.3	219.3	227.2
National Institute on Drug Abuse	490.1	521.9	527.2
National Institute of Mental Health	700.7	728.2	750.2
National Center for Human Genome Research	189.0	205.2	217.7
National Center for Research Resources	414.0	410.9	453.9
Fogarty International Center	26.5	27.2	28.3
National Library of Medicine	150.4	156.0	161.2
Office of the Director	286.1	270.2	296.4
Buildings and Facilities	200.0	190.0	207.0
TOTAL	\$12,740.8	\$13,078.2	\$13,647.8

Dollars in millions. Numbers may not add due to rounding.

Public Affairs

NSF: In earlier action, Congress increased NSF's budget for FY 1998 by 5% overall to \$3.429 billion, a \$159 million increase. Research and Related Activities at NSF increased \$114 million, or approximately 5%, to \$2.546 billion. The bill included language specifying that \$40 million be spent for a "competitive, peer-reviewed plant genome

research program" that was favored by Sen. Christopher Bond (R-MO), chairman of the Senate subcommittee that oversees NSF funding.

VA MEDICAL RESEARCH: Medical and prosthetic research within the VA budget increased \$10 million to \$272 million, a 3.8% increase. The VA research program emphasizes diseases afflicting veterans. The conference agreement specified that \$10 million of the VA budget be spent for research into Parkinson's disease and \$12.5 million be used for Gulf War illnesses affecting Persian Gulf veterans.

Budget Outlook Creates Optimism for Science Funding

The Congressional Budget Office released a report in October predicting a possible budget surplus totaling \$135 billion over the next five years. This was in sharp contrast to reports issued only a few months earlier that still showed the federal government facing a budget deficit for the next several years. This rosy prediction was the result of an unexpected increase in government tax receipts due to the strong economy and to Congressional efforts to balance the budget. Science advocates are making every effort to ensure that research funding is one of the beneficiaries of this new fiscal landscape.

At the beginning of the year, some Members of Congress started calling for major increases in our investment in science and health research. At the time, deficits were still being projected, so these calls seemed overly optimistic. Even NIH, which has enjoyed generous increases over the past several years, had cause for concern because the current balanced budget agreement called for little to no real growth in spending over the next several years.

However, over the last few months, initiatives to increase science funding gained new strength and garnered new supporters, as the gloomy forecasts of soaring budget deficits were replaced by predictions that were considerably more sunny. What had once been viewed as optimistic for science funding became increasingly more plausible.

One effort that sought to capitalize on the new optimism surrounding the budget was the "Unified Statement on Research," which called for a doubling of the current level of federal support for research over the next 10 years. APS joined more than 100 other scientific and professional organizations in endorsing the statement, which was announced at an October 22 ceremony at the Capitol. The same day, Sens. Phil Gramm (R-TX) and Joseph Lieberman (D-CT) introduced a bill to double the federal investment in nondefense science and health research over the next decade. At a press conference announcing the introduction of the bill, Sen. Gramm said, "The US is underinvesting in basic research. That is right. The author of the landmark deficit reduction legislation known today as Gramm-Rudman supports the idea of the government spending more money on something. ... If we, as a country, do not restore the high priority once afforded science and technology in the federal budget and increase federal investment in research, it will be impossible to maintain the US position as the technological leader in the world. ... I cannot think of anything more important than science and research."

Meanwhile, the House of Representatives began considering what to do if the projected budget surplus indeed materializes. The House Budget Committee started the ball rolling with an October 23 hearing to discuss national priorities in the face of a possible budget surplus. Speaker Newt Gingrich (R-

GA) said in testimony that science funding was on his short list of priorities and that he was "willing to renegotiate the budget numbers for science" because of the importance of science to the nation's future. "In order for us to lead, we have to invest in science and research," Gingrich said.

At the same time, Rep. John Porter (R-IL), chairman of the House Appropriations subcommittee that provides NIH funding, began to stake his own position regarding the future of NIH funding. During an interview that appeared in the October 31 issue of Science, Porter said he "strongly" favored efforts like the Gramm-Lieberman bill that sought to double the nation's investment in science funding over the next decade. However, Porter said he saw room in the new budget environment for an even greater increase for NIH. In conversations with various audiences, Porter said he believed an increase of up to \$3 billion for NIH for FY 1999 was "in the ballpark." This would put NIH in line for a doubling of its account in just five years. "Research funding is about the best funding that the government does,"

Fellowship Opportunities from the National Research Council: Deadlines Soon!
 Ford Foundation Postdoctoral Fellowship for Minorities For information, e-mail: infofell@nas.edu

NASA Administrator's Fellowship Program

Internet: http://fellowships.nas.edu

Education

Explorations in Biomedicine Retreat

The APS Education Office held a retreato n September 26-28, 1997, for Montana life science educators through the *Explorations in Biomedicine* program, a joint

project of APS and the American Indian Research Opportunities (AIRO) consortium of Montana. 1997 The *Explorations* in Biomedicine Retreat was the first of three annual meetings planned for 1997-1999, and according to feedback from the participants, this first gathering was a great success. Thirty-one elementary, middle, and high school life science teachers and Tribal College life sciences faculty joined APS and AIRO staff, APS members, and Frontiers in Physiology Local Outreach Team

(LOT) teachers in Billings, MT, to explore inquiry approaches in science education. The participating K-12 teachers were from schools serving Native American student populations, including those on Montana reservations, and the college faculty members were all life science faculty from the Montana tribal community colleges.

The topic of the first retreat, inquiry approaches in science education, was selected by AIRO representatives and APS staff during a planning meeting held in Bozeman, MT, in February 1997. Inquiry approaches are strongly advocated by a number of sources, including the National Science Education Standards, the National Science Teachers Association, the American Association for the Advancement of Science (Project 2061),



Billings, MT, site of the 1997 Explorations in Biomedicine Retreat.

most federal science education agencies, and many state departments of education. Educators are frequently asked to use inquiry approaches when teaching science but are not often given adequate guidelines or training on what inquiryapproach teaching is, how to incorporate it into the classroom, or how to assess student learning when using an inquiry approach.

During the retreat, participants actively explored these questions, learning how inquiry-approach teaching could motivate their students and enhance the teaching and learning of science subjects in their classrooms. Retreat participants

> also built connections with physiologists and teachers from around the country. APS members and middle/high school science teachers from *Frontiers in Physiology* LOTs modeled inquiry-approach lessons for the retreat attendees, presented career information, and offered support and guidance throughout the retreat.

APS members in attendance included **Robert Carroll** of East Carolina University, **Barbara Goodman** of the University of South Dakota, **Diana Kunze** of

MetroHealth Medical Center, Margaret Sullivan of the University of Missouri, Alice Villalobos of University of Connecticut, and Norman Weisbrodt of the University of Texas Medical School. Carroll, Goodman, Sullivan, and Weisbrodt, along with two teachers, Lisa Bidelspach of Clear Creek High School in League City, TX, and Sally Schempp of Vermillion Middle School in Vermillion, SD, are members of LOTs at their respective institutions.

After the weekend's activities, retreat participants took home the APS Education Office publication, *Women Life Scientists: Past, Present, and Future*, a book of 20 classroom modules incorporating inquiry-approach and hands-on activities; a variety of handouts and articles, including information on connections between Native American culture and life science; and career information for their students. Participants also received information about various opportunities for teachers and students in APS Education Office programs.

The *Explorations in Biomedicine* program is supported by a grant from the National Institute of General Medical Sciences. The program also supports a number of summer research teachers each year who participate in summer research fellowships with APS members.

To answer questions about the program's activities, please contact APS Education Officer Marsha Lakes Matyas, 9650 Rockville Pike, Bethesda, MD 20814-3991. Tel: 301-530-7132; fax: 301-571-8305; e-mail: mmatyas@aps.faseb.org; Web site: http://www.faseb.org/aps/educatn/ explorbi.htm.*



Nora Bird (l) and Alice Villalobos (r) work together on an APS classroom unit at the 1997 *Explorations in Biomedicine* Retreat.

Education

APS Participates in the 1997 NABT Annual Convention

APS was a sponsor, exhibitor, and workshop presenter at the National Association of Biology Teachers (NABT) 1997 A nnual Convention in Minneapolis, MN, on October 7-11, 1997. This year's convention, entitled "Focus on the Study of Life," was attended by approximately 2,000 participants, including biology and life sciences educators, suppliers, and other industry professionals.

The APS exhibit hall booth received a large volume of traffic, especially on the first night of the event. Hundreds of application materials were handed out to teachers and faculty for the APS Education Office's Frontiers in Physiology and Physiology Insights programs, which offer summer research fellowships to middle/high school science teachers and community college life science faculty members. Participants took free copies of a variety of career resources, teaching resources, and other information about APS programs. They purchased copies of the APS publication, Women Life Scientists: Past, Present, and Future, a book of 20 classroom modules incorporating

inquiry-based and hands-on activities; APS T-shirts; and the APS videos, "Reflecting on Effective Teaching Practices" and "Physiology: An Inside View."

APS members and APS Education Program teachers were active participants. Many helped staff at the APS booth during the exhibit, including APS members **Robert Carroll**, East Carolina University, and **Douglas Curran-Everett**, University of Colorado Health Sciences Center, and several teachers who were former APS Summer Research Teachers, including **Anthony Kilyanek** and **Daniel McGee**, of Lame Deer High School and Lame Deer Junior High School, respectively, in Lame Deer, MT, and **Jeanna Pisegna**, of Theodore Roosevelt High School in Kent, OH.

The APS Education Office conducted two successful sessions during the convention that received excellent feedback from participants. "Resource- Full Networks," a workshop conducted by APS Education Officer Marsha Lakes Matyas; Robert Carroll; Jeanna Pisegna; and Mary Lightbody, an APS Local Outreach Team teacher from the Columbus, OH, school system, focused on how to create a network of resources between physiologists and teachers. Another workshop, "Exploring Diet and Nutrition: Research Perspectives from Native American Cultures and Prairie Dog Populations," was conducted with contributions by Marsha Matyas, **Virginia Hammarlund** and **Jewel Payne** of Montana State University at Bozeman, **Tricia Kritzberger**, of Mitchell High School in Mitchell, SD, **Anthony Kilyanek**, **Daniel McGee**, and **John Hunt** of Dodson High School in Dodson, MT.

NABT's annual meeting provides an excellent forum for publicizing and promoting APS Education Office programs for teachers, and APS looks forward to participating next year in the 1998 NABT Annual Convention in Reno, NV. APS members interested in participating in the program can contact the APS Education Office or see the NABT Web site at http://www.nabt.org.

APS To Sponsor AAAS Mass Media Science and Engineering Fellow Applications Invited

In 1998, APS will sponsor an American Association for the Advancement of Science (AAAS) Mass Media Science and Engineering fellow. This individual will spend a summer working in the newsroom of a newspaper, magazine, or radio or television station, sharpening his or her ability to communicate complex scientific issues to nonscientists and helping to improve public understanding of science. The fellowship program is a 23-year-old AAAS initiative that has already provided summer placements for some 359 advanced students of the sciences.

The APS-sponsored fellow will spend 10 weeks helping to cover science and technology issues. AAAS will arrange placements at a participating media outlet as part of the selection process. Fellows will travel to Washington for an advance orientation to journalism and a wrapup and evaluation session at the conclusion of their assignments. The fellowship includes travel to these sessions and the job site and a weekly stipend based upon local cost of living.

Application information: To be eligible for the program, you must be currently enrolled as a graduate or postgraduate student of physiology or a related discipline. Application forms are available from Alice Hellerstein in the APS Office of Public Affairs at the address below. In addition to the completed form, applicants must submit a current resumé, at least one three- to five-page writing sample directed to the general public, transcripts of graduate and undergraduate work, and three letters of recommendation. Two recommendation letters should be from faculty members, and the third should be a personal reference. The selection process is designed to seek out qualified candidates especially from underrepresented communities, including blacks, Hispanics, and Native Americans, as well as scientists with disabilities.

The application deadline is January 15, 1998. For more information, contact Alice Hellerstein, APS Office of Public Affairs, 9650 Rockville Pike, Bethesda, MD 20814-3991. Tel: 301-530-7105; fax: 301-571-8305; e-mail: ahellers@ aps.faseb.org.

Web News

Educational Resources for K-12 Teachers on the Internet

This month, we turn our focus to some of the many Internet resources available to teachers involved in biology and physiology education. What follows below is a listing of these sites along with a brief review of each. Many of these sites can be

APS Resources and Programs for Science Education in Grades K-12

http://www.faseb.org/aps/educatn/k-12.htm

APS education activities, resources, and programs in physiology as well as careers in physiology education.

Access Excellence

http://www.gene.com:80/ae/

Access Excellence is one of the best Web sites available for the life sciences educator, offering a variety of activities, content updates, discussion forums, and links to other Web sites.

National Association of Biology Teachers (NABT) http://www.nabt.org

Offers position statements, chat rooms, bulletin boards, and life sc iences activities for the biology teacher, K-undergraduate.

The Virtual Public Health Center

http://www-sci.lib.uci.edu/HSG/PHealth.html

Provides extensive resources and links related to infectious and environmentally caused diseases and conditions, water quality, toxins, animal vectors, and other public health concerns.

PEP - Educational Software

http://www.microweb.com/pepsite

An informational resource for parents, educators, and children's software publishers. Includes descriptions and reviews.

Anatomy and Physiology at the Mississippi School

for Mathematics & Science

http://www.msms.doe.k12.ms.us/groups/science/biology/ anatomy/apmain.html

This page features information and exercises in digestive, circulatory, endocrine, lymphatic, muscular, nervous system, reproductive, skeletal, urinary, and artificial life physiology.

Electronic School Online - The On-line Version of Electronic School Magazine

http://www.electronic-school.com/

Addresses issues related to the latest technologies in schools.

Schools Online - Science - Sheffield Hallam University http://www.shu.ac.uk/schools/sci/sol/contents.htm

Features hands-on science activities, and a section where you can submit questions to a staff of scientists.

Developing Educational Standards: Putnam Valley, NY, Schools http://putwest.boces.org/standards.html

An annotated list of Internet sites with K-12 educational standards and curriculum framework documents. found listed on the APS Web site under the "Related Links" page. If you know of a page that you would like to see listed or reviewed, please forward its address to Paul Lombard at plombard@aps.faseb.org. Until then, happy surfing!

Explore Science - by Raman Pfaff

http://www.explorescience.com/

Allows students and teachers to interact with material on the Web by way of a Shockwave system of graphics display.

The Gakkos Web Site:

Sponsored by NEC Educational Resources

http://www.gakkos.com

Provides a mix of lessons from professional teachers and educational experts.

Canada's SchoolNet

http://schoolnet2.carleton.ca

A resource for teachers with links both in Canada and other nations. Presented in English and French.

Teacher's Edition Online http://www.teachnet.com/lesson.html

Provides lesson plans for teachers of various grades and disciplines.

NASA K-12 Internet: Live From the Hubble Space Telescope http://quest.arc.nasa.gov/livefrom/hst.html

This site includes exercises and a chat room for educators.

Busy Teachers' Web Site K-12

http://www.ceismc.gatech.edu/BusyT/ Subject matter is presented in alphabetical form from archaeology to teachers' references.

Mighty Media's Teacher Talk

http://www.mightymedia.com/talk

Presents interactive discussions on such issues as school reform, technology and schools, etc.

Classroom Connect

http://www.classroom.net

A great resource for teachers looking for information on the Web. Contains a searchable index of educational links.

WEB 66: a K-12 World Wide Web Project -

University of Minnesota

http://web66.coled.umn.edu

Find out how to set up your own Internet server and connect to other educators and students. An extensive listing of useful information for teachers.

Cyberspace Middle School Activities Guide http://www.scri.fsu.edu/~dennisl/

Pointers, activities and resources for middle school science teachers.

itary as a potential employer? Yes, the

What are some of the basic requirements for positions with the military? You must be a US citizen and eligible for a security

Career Corner

Career Opportunities in the Military: An Alternative to Traditional Academic Science

cardiovascular changes that occur fol-

lowing exposure to combined radiation

and chemical warfare agents.

Basic Requirements

ment commands that employ MS and PhD scientists. Although all major biomedical and clinical sciences are represented by the military as a whole, all areas are not represented by each service, especially when one examines the research conducted within each branch of service. The following discussion will focus on opportunities for physiologists in the Navy. However, opportunities in other areas of science with another branch of service may be possible.

Are you stuck on the postdoctoral fellow

treadmill? Do you not have a First Inde-

pendent Research Support and Transition

award to get academic institutions to give

you a look? Have you considered the mil-

military. The Army, Navy, and Air Force

all have extensive research and develop-

What is Expected?

You may be interested in what the military has to offer, but what is expected of you initially? First and foremost, you must have a strong desire to be in the military. Although the military does hire some PhD scientists as contractors for specific projects, the opportunities discussed here require you to be commissioned as an officer in the armed forces. In addition, you must also be capable of redirecting your research. As an officer, your doctoral training and experience will be the foundation for conducting novel research that is of interest to the Department of Defense (DoD). You will not necessarily extend your dissertation or postdoctoral research, but you will expand your area of expertise to answer defense-related questions. For example, I am a cardiovascular pharmacologist trained in the physiology of hypertension. I now use my expertise to study the

apply). While there are a select few positions at the masters level, most of the billets require a doctoral degree. However, a degree in physiology is not required to fill a physiology billet, but demonstrated proficiency in the field is necessary. Although postdoctoral experience is not imperative, the additional training of a postdoctoral fellowship makes your application much stronger and far more competitive. As with any scholarly work, publications in refereed journals are expected. The applicant must have strong professional recommendations. Also, references should come from more than one institution, thus addressing a broad time frame and more than just the current place of employment. Finally, applicants should be professionally versatile, illustrated by their broad knowledge of a field and/or mastery of several diverse technical procedures. Generally, the basic requirements for the military are no different than those for an academic appointment.

Primary Areas of Research

Most research within DoD, including research at the basic science level, can be classified into four categories: operational, environmental, occupational, and performance/evaluation. These categories are used primarily for funding purposes, but they also provide a means of targeting scientific applications to the force/fleet. Research disciplines within these categories include, but are not limited to, physiology, microbiology, toxicology, chemistry/biochemistry, pathology, radiology, psychology, and pharmacokinetics/dynamics. Remember, however, not all disciplines are represented by all branches of the military. For opportunities in physiology, the positions are exclusively in the Navy, except for the field of aerospace physiology, which is represented by both the Air Force and the Navy. Within the physiology community, the subspeciality areas of research include cardiovascular, pulmonary, neurology, environmental, exercise. and diving/hyperbaric. These physiology positions are part of the Medical Service Corps of the Navy. Moreover, physiologists may be assigned to various naval research laboratories or billeted with a triservice organization, an organization that has Army, Navy, and Air Force personnel. The primary locations for naval research performed within the continental US are the Washington, DC, region; Groton, CT; Pensacola, FL; and San Diego, CA. Assignment to a triservice organization may offer additional locations.

Application Process

To initiate the application process, you should first contact a medical programs recruiter in your region. Generally, these special recruiters are well versed in the various programs available for professionals and will answer questions the





Thomas C. Herzig

clearance (criminals and felons need not

The following information was originally presented at the Career Opportunities in Physiology Symposium at EB '97 in New Orleans, LA, April 1997.

Career Corner

applicant may have regarding a particular program. The recruiter will also act as a liaison between the applicant and the specialty advisor who oversees a particular field or discipline. The next step in the application process is the submission of the applicant's curriculum vitae and transcripts to the specialty advisor. Following the review of this material, the specialty advisor may request an interview with the applicant, which is frequently arranged by the recruiter. It is generally recommended that the applicant complete the interview before drafting the application and security clearance forms, the next step in the application process, because of the high cost of the application process to the government. This is suggested to alleviate unnecessary processing of applications should the candidate lose interest in the appointment or not meet the requirements for a specific billet. Finally, a medical physical, including drug testing, must be completed before an appointment and commissioning ceremony can be executed.

Career Progression

What can you expect or be expected to accomplish during your career progression as an officer in the Medical Service Corps of the US Navy? The foundation for your career development lies in the academic and research experience a scientist brings into the Navy and is crucial to your overall progress. As an officer, it is expected that you will gain valuable operational, management, and training experience. This means that your research should coordinate with the needs of the Navy. To assist with accomplishing this duty, interactions and collaborations with academic or other DoD facilities are encouraged. Appropriate training and careful management of personnel are fundamental assignments, while publication of your results in peerreviewed journals is also expected. Furthermore, as a senior officer, time at the bench will be limited, permitting you appropriate time for managerial and leadership roles in executive medicine

for training and research and development commands.

Salary Comparison

What financial compensation can you expect and how does it relate to academic appointments? The sources of information regarding salaries come from the Office of Personnel Management (civil service), DoD (military), and the Association of Chairmen of Departments

of Physiology annual survey as reported in the April 1997 issue of *The Physiologist* (academic). Comparisons are for average salary given five years in rank, and the experience levels are defined in Table 1.

A comparison of salaries for civil service, military, and academic employees is shown in Figure 1. From this

Table 1. Description of experience lev-
els for civil service, military, and aca-
demic positions

	Civil Service	Military	Academic
Entry	GS-12	O-3	Assistant Professor
Advanced	GS-13	O-4	Associate Professor
Senior	GS-14	O-5	Professor
Chair	GS-15	O-6	Chairperson

graph, academic positions, on average, pay more at each level of experience. Be that as it may, civil service salaries include base pay but do not include locality pay, which varies depending on the region of the country where one is employed.



Figure 1. Salary comparison for civil service, military, and academic positions by level of experience

Military pay includes basic pay for commissioned officers, subsistence allowance, and basic allowance for quarters. This salary for military personnel does not include the variable housing allowance, which can add several thousand dollars to annual income. An additional point to make here is that for military personnel, only our basic pay is taxable income. All allowances (subsistence, basic allowance for quarters, and variable housing allowance) generally comprise one-third of a soldier's or sailor's gross salary and are not taxable income. There are no deductions from your pay for medical or dental coverage, as these services are provided free of charge. Prescriptions, as well as some over-the-counter analgesics and cold medications, are included in this free service. Dependents of military personnel can receive health coverage for a nominal monthly fee. Moreover, military personnel can purchase life insurance at highly discounted rates to provide financial assistance for your family should something happen to you, the military member. Finally, military personnel do not lose income as a result of contributing to a retirement fund. A pension, dependent on the number of years served, is paid upon retirement from military service.

Career Corner

Additional Information

Finally, I would like to provide some additional information that may prove helpful, as well as including answers to some frequently asked questions. Each of the services has a recruiting Web site containing much more information than can be incorporated here. Furthermore, the services have Web sites with information specifically for medical professionals, including biomedical scientists (see Table 2). Telephone numbers for the national recruiting centers are included in Table 2.

What commitment is required of the candidate to the military?

If a candidate is selected for commissioning, his or her commitment to the military is generally for three years. For physiologists in the Navy, a three-year pledge is standard, at which time you can resign your commission and move on to other things or stay in the Navy as a career. However, to stay in the military, you must be able to meet the necessary promotional requirements.

Does one get credit for prior service?

Yes. Masters candidates for physiology billets are commissioned at the rank of O-2 (Lieutenant junior grade), while PhD candidates are commissioned at the rank of O-3 (Lieutenant). Although prior service will not affect your rank at commissioning, you will get credit for years of service, thus increasing your level of pay.

Do you have to write grants to fund your laboratory?

Technically, no. Most physiological research is funded through your department via DoD appropriations. However, you may be asked to write a proposal for use within your command for allocation of funds and to justify capital equipment purchases, technical support, animal use, supplies, and travel. You will also be expected to present your proposal to an Institutional Animal Care and Use Committee for review if your protocol calls for the use of animals or cell culture. Although grant writing is not required, some institutions encourage investigators to apply for extramural funding.

Do you have to publish in peer-reviewed journals?

Although the frequency of publication in peer-reviewed journals may not be as critical in the military as in academia, you are expected to publish.

How do you handle military obligations when you are trying to run your laboratory?

Sometimes this is a difficult issue, especially for newly commissioned officers. However, by accepting and signing your commission, you are an officer first and a scientist second. You represent the US Navy and our country, and these obligations come first. It is important, therefore, as a scientist to adequately train your technical staff to handle the day-today operations of the laboratory in case you are called away for a temporary additional duty. However, these obligations are generally no different than assistant professors who must juggle committee work, teaching, managing graduate students, and the operation of their laboratories.

Can you collaborate with investigators at other institutions?

Yes. In fact, this is highly encouraged. Collaborations may be established with investigators at universities, private industries, or other governmental facilities. Be advised, however, that appropriate approval should be garnered prior to starting any experiments. In addition, clearance and/or a security waiver may be necessary for all parties involved, especially if the research entails proprietary information.

Conclusions

In summary, I hope this presentation has provided some helpful information. A career in the military is not for everyone. However, the military is a viable alternative to traditional academic science. Physiologists looking for challenging careers as scientists and executive managers should consider the Navy. May you have fair winds and following seas in your future endeavors. Go Navy!

> Thomas C. Herzig Armed Forces Radiobiology Research Institute

 Table 2. Telephone numbers and Web sites for Army, Navy, and Air Force

 recruiting and information centers

	Telephone Number	Information Web Site	Medical-Professional Web Site
Army	800-USA-ARMY	http://www.goarmy.com	http://www.acs. amedd.army.mil
Navy	800-USA-NAVY	http://www.navy.com	http://support1.med. navy.mil/bumed
Air Force	800-423-USAF	http://www.airforce.com	http://www.afpc. af.mil

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Special thanks to Steve Bealer for inviting me to participate in the Career Opportunities in Physiology Symposium at EB '97. I am also grateful to CDR Brad Bennett, MSC, USN, and Blair E. Taylor for their insightful discussions.

Positions Available

Sr. Scientist/Scientist - Whole Animal Physiologist. The Endocrinology and Metabolism Department at Genentech is recruiting for a physiologist. The successful applicant will develop a team-oriented program in which protein-based therapeutics are evaluated in relevant biological models. The successful candidate will have a PhD and/or MD and at least two years of postdoctoral experience in a relevant area of physiology. We are particularly interested in applicants who have experience in one or more aspects of statural growth, bone metabolism, organ development, feeding behavior, and fuel homeostasis. Interested candidates should forward a curriculum vitae or résumé, indicating Job Code APS782, to Genetech, Inc., Human Resources Dept., PO Box 1950, South San Francisco, CA 94083-1950. We cannot accept faxed résumés. You may e-mail your résumé, indicating Job Code APS782, to jobs@gene.com. (ASCII files only with maximum line width of 76 characters.) Do not send as attachments to your e-mail. Paste your résumé into the body of the e-mail. Genentech is an equal opportunity employer. You may visit our website at http://www.gene.com.

Vascular Physiologist - Assistant/Associate Professor, Tenure Track. Applications are being solicited for a vascular physiologist to complement existing research programs in vascular smooth muscle regulation and endothelial cell physiology. Preference will be given to applicants with demonstrated productivity, as evidenced by peer-reviewed publications and extramural funding, and interest in signal transduction, ion channels, and gene expression relevant to vessel tone in vascular tissue. Minimum qualifications include an MD and/or PhD degree and relevant postdoctoral training. For best consideration, candidates should submit a curriculum vitae, a short description of research program, and the names of three references by January 9, 1997, to Benjimen R. Walker, Department of Cell Biology and Physiology, University of New Mexico School of Medicine, Albuquerque, NM 87131. [EO/AAE]

Postdoctoral Position in Physiology/Surgery-Mayo Clinic. A position is available immediately in an NIH training grant to study neutral regulation of water and electrolyte absorption-secretion. Applicants must have a PhD or MD degree with expertise in methods involving Ussing chamber work and in vitro transport studies. Applicants must be a US citizen or permanent resident. Send resume and letters of reference to: Michael G. Sarr, Mayo Clinic/Mayo Foundation, GI Research Unit, Alfred Building, Second Floor, 200 First Street S.W., Rochester, MN 55905. [EOE/AA]

Postdoctoral Fellowship in Vascular Physiology/Biology. Applications are invited for a NIH-sponsored postdoctoral fellowship in vascular biology in the Department of Biomedical Engineering/Physiology at the Johns Hopkins University School of Medicine. The fellowship is funded through a NIH Institutional postdoctoral training grant in cardiovascular regulation and control. The fellowship will focus on cardiovascular regulation and control from several levels of organization. It will include whole animal physiology. It will also include aspects of in vivo regulation, as well as in vitro regulation at the macro- and microvessel levels of organization and receptor identification. Training would include cardiovascular systems physiology, organ physiology, cellular physiology, and molecular biology as it relates to pathophysiologic changes that occur during microgravity and aging. The successful candidate must have a PhD, MD, or MD/PhD and have previous training in at least one of the listed areas. S/he will receive indepth training in one or more of the other areas. S/he will become an integral part of a well funded program with excellent and diverse facilities. Information on the Biomedical Engineering Department and related faculty can be found at http://www.bme.jhu.edu/. The candidate must be a permanent resident or citizen of the US. A curriculum vitae, statement of research interests, brief future plans, and three references should be sent to: Artin A. Shoukas, Professor of Biomedical Engineering, Professor of Physiology, Johns Hopkins University School of Medicine, 720 Rutland Avenue, Baltimore, MD 21205. Tel: 410-955-2871; fax: 410-614-0019; e-mail: ashoukas@bme.jhu.edu.

Animal Physiology at the University of Utah. The Department of Biology at the University of Utah seeks applications for a tenure-track position in animal physiology at the assistant professor level. We are interested in physiologists with postdoctoral experience who work at the system and organismal levels but who are also able to relate their research to broader issues in evolutionary biology. Ours is a large, integrated biology department with strength in many areas, including functional and evolutionary morphology and neuroethology. Applicants should submit a curriculum vitae, a statement of research and teaching interests, and copies of two or three recent publications and should arrange to have three letters of recommendation sent to the Animal Physiology Search Committee, Department of Biology, 257 South 1400 East, University of Utah, Salt Lake City, UT 84112. Review of completed applications will begin December 1, 1997 and continue until the position is filled. The University of Utah is an AA/EO employer and encourages applications from women and minorities and provides reasonable accommodations to the known disabilities of applicants and employees.

Positions Available

Molecular Physiologist. The Department of Cell Biology at Duke University Medical Center is planning an expansion of its faculty in the field of physiology. Interactive scientists with a strong research commitment and interest in an integrative approach to physiology using cellular and molecular approaches are encouraged to apply. Preference will be give to vertebrate model systems. Appointments will likely be at the level of assistant professor. Minority applicants are encouraged to apply. Please send a curriculum vitae and a brief description of research interests and arrange for us to receive letters from at least three references by **December 1, 1997**. Address initial correspondence to Molecular Physiology Search, Michael P. Sheetz, Chairman, Department of Cell Biology, Duke University Medical Center, Box 3709, Durham, NC 27710. Duke University is an Equal Opportunity/Affirmative Action Employer.

Faculty Position - Pharmacology/Biochemistry/Molecular Biology. The Department of Veterinary Biomedical Sciences at the University of Missouri is accepting applications for a tenure-track faculty position(s). Although preference will be given to candidates at the assistant professor level, outstanding candidates at the associate professor level will also be considered. Qualifications include a PhD, DVM, or MD and exceptional potential to develop and maintain a strong biomedical research program competitive for extramural support. Preference will be given to candidates whose research interests enhance existing areas of excellence in cardiovascular biology, exercise science, transmembrane signaling, and membrane transport at the molecular, cellular, organ, or systems level. Teaching responsibilities will be in veterinary and graduate pharmacology and/or cellular and molecular biology courses. A joint appointment at the Dalton Cardiovascular Research Center and/or Biochemistry Department is possible. Minorities and women are encouraged to apply. Applications should include a curriculum vitae, names of three references, and a letter stating professional goals. The closing date for applications is January 16, 1998 or until the position is filled. Address correspondence to: Meredith Hay, UMC-Veterinary Biomedical Sciences, E102 Veterinary Medicine Building, 1600 East Rollins, Columbia, MO 65211. The University of Missouri is an Affirmative Action/Equal Opportunity Employer and complies with the guidelines of the Americans With Disabilities Act of 1990.

Postdoctoral

Fellowship. Individual with PhD in exercise physiology (or re lated field) and experience in working with human subjects needed to assist with NIH-funded research. Study involves use of radioactive and stable isotope tracers along with muscle biopsy and magnetic resonance measurements to examine the effects of aging on muscle FFA metabolism. Interested persons should contact Andrew R. Coggan, 815 Market Street, Galveston, TX 77550. EOE/AA employer M/F/D/V.

ASSISTANT PROFESSOR OF PHARMACOLOGY. The

Department of Pharmaceutical Sciences of the School of Pharmacy at the University of Connecticut invites applications for a tenure-track position at the assistant professor level in its pharmacology/toxicology discipline to begin August 23, 1998. Candidates must have a PhD in a biomedical science, with an emphasis in cellular/molecular physiology; must have postdoctoral experience; and will be expected to develop and maintain innovative, independent, and externally funded research programs that emphasize mammalian cellular and molecular physiological responses to xenobiotics. Preferred research interests include, but are not limited to, cell cycling, apoptosis, and signal transduction pathways. Responsibilities also include teaching organ systems and cellular physiology at both the undergraduate and graduate levels. The successful candidate will have the opportunity to interact with faculty in an NIH pre- and postdoctoral training program in toxicology. Applicants should send a curriculum vitae and arrange for three letters of recommendation to be sent directly to: Andrea K. Hubbard, Chair, Pcol/Tox Search Committee, Department of Pharmaceutical Sciences, University of Connecticut School of Pharmacy, U-92, Storrs, CT 06269. Applications will be received until the position is filled. Initial review of applications will begin January 15, 1998. We encourage applications from women, minorities, and people with disabilities.

CHAIRPERSON, MECHANICAL ENGINEERING. The University of Maryland Baltimore County (UMBC) invites applications for the position of Chair of the Department of Mechanical Engineering. Candidates should have an earned PhD in mechanical engineering or a closely related field, a strong research record, a commitment to excellence in undergraduate and graduate education, and demonstrated leadership skills. The candidate should be qualified for the rank of tenured full professor and is expected to maintain a strong research program. Founded in 1966, UMBC, the youngest campus of the University of medium-Maryland system, is а sized research university with a faculty of more than 400 and 1 0,500 students. Its sponsored research stands at more than \$43 million, and the campus is a growing and dynamic institution. UMBC is conveniently located in the Baltimore-Washington corridor near major industries, federal laboratories, and sponsoring agencies. The research areas of the department faculty are biomechanics, design and manufacturing systems, and the traditional areas of applied mechanics and thermal/fluid sciences. Interested candidates should submit a curriculum vitae, a statement of goals, and the names of four references to ME Chair, Search Committee, Office of the Dean, College of Engineering, 1000 Hilltop Circle, Baltimore, MD 21250. Screening of candidates will begin in November 1997 and will continue until the position is filled. UMBC is an EOE/AA employer.

Publications

Two Journal Editors Hold Mini-Retreats

Kim E. Barrett, editor of AJP: Cell Physiology, met with her associate editors in Santa Barbara, CA, on September 13, 1997. D. Eugene (Gene) Rannels, editor of AJP: Lung Cellular and Molecular Physiology, met with his associate editors on October 11, 1997, in San Antonio, TX. Brenda Rauner, Publications Manager, attended both meetings. The purpose of these meetings was to bring editors and associate editors together to assess the efficiency of the journal's review process and to discuss the overall implementation of recent policies formulated by the Publications Committee. The Publications Committee considers such "mini-retreats" as vital to the continued health and prestige of its journals and encourages editors to hold them after their first year in office and upon reappointment to a second term.

At both meetings, the editors discussed reviewing policies, including amendment of the reviewing form; ethical concerns, such as plagiarism and duplicate publication; and the need to adjust rejection rates to adhere to the page caps the Publications Committee has imposed to control the size of the journals. Rauner updated both groups on the progress of special articles and covers planned for their journals to commemo-



AJP: Cell Physiology Editor and Associate Editor Meeting, Santa Barbara, CA. (l to r): Tim Bigby, Kathy Morgan, Dennis Brown, Kim Barrett, Art Mercurio, Brenda Rauner, Paul Insel, and Kevin Foskett.

rate the centennial of *AJP* and on the mandatory submission fee and mandatory page charge policies being implemented in January 1998. She also outlined the timetable and provided details on the Society's on-line publication of the journals.

Both editors asked for support from their associate editors to maintain a steady flow of invited reviews. Barrett is



AJP: Lung Cellular and Molecular Physiology Editor and Associate Editor Meeting, San Antonio, TX. (1 to r): John Widdicombe, Brenda Rauner, Gene Rannels, Ivan McMurty, Jeanne Snyder, Bruce Freeman.

planning to introduce a new series of "invited commentaries" that will focus on presenting balanced discussions of topics that may be the subject of controversy in the broad field of cell physiology. Both editors asked their associate editors to look out for papers of exceptional merit during the review process and plan to ask a guest author to write a brief editorial focus on the paper, which would appear in the same issue.

Barrett plans to write an editorial for her journal in which she will restate the scope statement of the journal, ask authors to write more succinctly, emphasis the importance of significance and priority for acceptance, and point out the increased speed of publication. An editorial from Rannels will be concerned with the ethics of publication.

The attendees of both meetings expressed great satisfaction with the amount of work accomplished and the value of meeting with their fellow associates to discuss common problems and overall publication policy.

People and Places

Traystman Receives Award for Excellence in Research

APS Councillor **Richard J. Traystman** recently received the 1997 American Society of Anesthesiologists Excellence in Research Award. The award recognized Traystman's broad contributions to anesthesiology research as both a clinical physiologist and basic scientist.

Traystman is best known for his research into brain blood flow and cerebrovascular regulation in health and disease. He has made major contributions to the understanding of how the brain and its circulation respond to disease states such as stroke, cardiac arrest, hyperammonemia, hypoxia, and intracranial hypertension. Throughout his long and distinguished career, his studies have built a framework for understanding vascular responsivity in the adult, pediatric, and neonatal brain.

Traystman received BS and MS degrees from Long Island University and earned a PhD from Johns Hopkins University in 1971. He pursued postdoctoral training at the Bowman Gray School of Medicine for one year and then returned



Richard J. Traystman

to Johns Hopkins in 1972 as an assistant professor. He has remained there ever since.

Traystman has contributed greatly to the research program at Johns Hopkins. In addition to the 25 years of NIH support he himself has received, the Department of Anesthesiology and Critical Care Medicine, of which he is Chair, recently was determined to be the number one such program in the country in terms of NIH funding. In his role as a mentor, Traystman has trained more than 75 residents, fellows, postdoctoral fellows, and students throughout his career at Johns Hopkins. He has built a unique shared laboratory system in his department that emphasizes collaboration and productivity.

Traystman, the author of more than 300 published manuscripts and 80 book chapters, has made impressive contributions to anethesiology literature. The award he received from the American Society of Anesthesiologists also noted how he has bridged the basic science of his research with anesthesiology and critical care medicine.

Traystman has received numerous other awards and citations for his work, including his selection last year as the Robert M. Berne Distinguished Lecturer of the APS Cardiovascular Section.

Kandel Wins Award for Pioneering Achievement in Health

APS member **Eric R. Kandel**, the 1998 Walter B. Cannon Award Lecturer, received another honor recently when he was presented with the Twelfth Annual Charles A. Dana Award for Pioneering Achievements in Health.

The Dana Award in Health recognizes advances in fundamental or clinical neuroscience that lead to innovations in the diagnosis, treatment, or prevention of human disease. Areas of particular interest include the identification and characterization of genes relevant to neurological disease and mental illness, the identification of new procedures to facilitate recovery of function after injury or insult to the nervous system, and the elucidation of the fundamental processes of learning and memory.

Kandel, a professor at Columbia



Eric R. Kandel

University and a senior investigator with the Howard Hughes Medical Institute, is a world-renowned neurobiologist whose studies into learning and memory from a cellular and molecular perspective have revolutionized our knowledge about short- and long-term memory storage. Using the accumulated data from three decades of landmark discoveries, Kandel is now pursuing an approach to treat agerelated memory loss.

Kandel was presented with his award and a \$50,000 cash prize at a gala reception in New York on November 5.

The Charles A. Dana Foundation is accepting nominations for the 1998 Dana Award in Health. The deadline for nominations is **February 13, 1998**. For further information, see the Foundation's Web site at http://www.dana.org.*

People and Places

Leonard B. Bell, formerly an assistant professor with the VA Medical Center in Milwaukee, WI, has accepted the position of Director, Midwestern University College of Allied Health Professionals, Glendale, AZ.

Recently, **Lawrence E. Boerboom** became Director of Research-Transplantation, Life Cell Corporation, The Woodlands, TX. Prior to his new appointment, Boerboom was an associate professor in the Department of Cardiothoracic Surgery at the Medical College of Wisconsin, Milwaukee.

Accepting a position with the Department of Kinesiology, Kansas State University, Manhattan, KS, **Craig A. Harms** is no longer with the Department of Preventive Medicine, University of Wisconsin at Madison.

Samantha P. Harris has moved from the Department of Physiology, University of Michigan Medical School, Ann Arbor, to the Department of Physiology, University of Wisconsin at Madison.

H. Kurt Jacobs is now with the Institute for Minimal Invasive Surgery, West Chicago, IL. Prior to his new assignment, Jacobs was with the Department of Surgery, Loyola Unit Medical Center, Maywood, IL.

Formerly Director of the Cleveland Clinic Foundation's Cerebrovascular Research Lab in Cleveland, OH, **Stephen C. Jones** is now Director of the Department of Anesthesiology, Allegheny General Hospital, Pittsburgh, PA.

Accepting a position with Abbott Laboratories Diabetes Research, Abbott Park, IL, **Jyotirmoy Kusari** has moved from the Department of Physiology, Tulane University Medical Center, New Orleans, LA.

Scott W. Mittelstadt has accepted a position with Procter & Gamble Company's Miami Valley Labs, Cincinnati, OH. Prior to his new position, Mittelstadt was associated with Development Pharmacology, Procter & Gamble Pharmaceuticals, Norwich, NY.

Deceased Members

Charles Cornelius	La Jolla, CA
Walter R. Gibbons	Burlington, VT
Carl W. Gottschalk	Chapel Hill, NC
Herbert Hultgren	Stanford, CA
Melvyn Lieberman	Durham, NC
Leonard D. Miller	Philadelphia, PA
Benjamin Zweifach	La Jolla, CA

Patrick J. Mueller is currently affiliated with the Department of Veterinary and Biomedical Sciences, University of Missouri at Columbia. Prior to his new appointment, Mueller was with the Department of Anesthesiology, Medical College of Wisconsin, Milwaukee.

Having become associated with SmithKline Beecham Pharmaceuticals, Safety Assessment in Welwyn, UK, **Peter James O'Brien** is no longer with Procter and Gamble Company's Miami Valley Laboratories in Cincinnati, OH.

Previously, **Nanduri R. Prabhakar** was an assistant professor in the Pulmonary Division of the Department of Medicine at University Hospitals in Cleveland, OH. This fall, Prabhakar became assistant professor in the Department of Physiology & Biophysics at Case Western Reserve University in Cleveland, OH.

Formerly with the Department of Physiology, Johns Hopkins University School of Medicine, Baltimore, MD, **Erik M. Schwiebert** is currently Assistant Professor of Physiology and Biophysics at the University of Alabama at Birmingham's Gregory Fleming James Cystic Fibrosis Research Center.

Quentin R. Smith has accepted the position of Professor and Chair of the Department of Pharmaceutical Science at the Texas Tech University Health Science Center School of Pharmacology in Amarillo. Smith was formerly Section Chief, Laboratory of Neuroscience, National Institute on Aging, Bethesda, MD.

Moving to Cambridge, UK, **James F. Staples** is now affiliated with the Department of Zoology, University of Cambridge. Prior to his move, Staples was with the Department of Biological Sciences, University of California at Santa Barbara.

John D. Strauss is now affiliated with the Division of Preclinical Sciences, New York College of Osteopathic Medicine, Old Westbury. Prior to his new post, Strauss was with the Department of Molecular Physiology & Biological Physics, University of Virginia, Charlottesville.

Caroline Sussman has moved from the Department of Physiology and Neurobiology, University of Connecticut, Storrs. Sussman is presently affiliated with the Department of Neuroscience, Case Western Reserve University School of Medicine, Cleveland, OH. Moving to New Haven, CT, **Stanislav I. Svetlov** recently affiliated with the Department of Pathology, Yale University School of Medicine. Svetlov moved from the Department of Biochemistry, University of Texas Health Science Center at San Antonio.

Douglas Swank has moved from the Department of Physiology, University of Pennsylvania School of Medicine, Philadelphia, to the Department of Biology, San Diego State University, San Diego, CA.

Ronald L. Terjung has joined the Department of Veterinary Biomedical Science, University of Missouri at Columbia. Terjung moved from the State University of New York Health Science Center, Syracuse.

Accepting the position as Deputy Head, Department of Cardiology, Moji Rousai Hospital, Kitakyushu, Japan, **Masato Tsutsui** has moved from the Mayo Clinic's Department of Anesthesia Research in Rochester, MN.

Joining the Hematology/Oncology Department of the VA Medical Center, Houston, TX, **David Anthony Tulis** has left the Department of Physiology, Eastern Virginia Medical School, Norfolk.

Frank Benton Underwood has joined the Physical Therapy Department, University of Evansville, Evansville, IN. He was previously with the Department of Physical Therapy, Baylor University, Fort Sam Houston, TX.

Helen Vogl has accepted a position with the Department of Veterinary Biomedical Sciences, University of Missouri at Columbia. Vogl was previously affiliated with the Nelson Labs, Department of Biological Sciences, Rutgers University, Piscataway, NJ.

Formerly with the Department of Anatomy, University of Iowa College of Medicine, Iowa City, **Gang Wang** is currently affiliated with the Laboratory of Cardiovascular Science, National Institute on Aging, Baltimore, MD.

Wendy W. Waters has joined the Cardiovascular Physiology Laboratory of Krug Life Sciences, Inc., Houston, TX. Before her new affiliation, Waters was with the Department of Animal Science, Texas A&M University, College Station.

Previously Chairman of the Department of Physiology, East Carolina University School of Medicine, Greenville, NC, **Stephen C. Wood** recently became Vice President of the Foundation/Research, Summa Health System Foundation, Akron, OH.

News from Senior Physiologists

Letter to Robert M. Berne

E. Up Chae writes: "In 1993, I retired as professor at age 65, but at the sametime Keimyung University Hospitalgranted me the privileged position of full-ti me research lecturer of physiology. I have kept my office in the Department of Physiology in the School of Medicine.

"So far, I have been involved in research in gravitational physiology. I had an opportunity to present a paper entitled "Cardiovascular and Hormonal Responses to Simulated Weightlessness" at the 1996 Japanese-Korean Joint Conference on Occupational Health, which was held in Sapporo, Japan.

"I enjoy browsing the World Wide Web with my personal computer, which I bought in May 1996."

Letters to Eugene Renkin

Kaare Rodahl writes: "I am still active in the field of applied work physiology, and I am writing professional papers and books. At present, I am involved in two projects: attempting to measure objectively treatments for skeletal-muscular complaints such as tennis elbow and measuring the effect of age on the night vision, shortterm memory, and simultaneous capacity of air traffic controllers.

"As to a word of advice for our younger colleagues, I would say what I have learned in my professional life is to find out what you can do, accept the challenge, and do your very best where you are. It is then likely that someone will take notice of you and invite you to move on to more outstanding positions. To my older colleagues, I would say that the purpose of life is not just to last as long as possible but to live actively and to do your part as long as you can."

Allen F. Reid writes: "To answer your questions, my professional activities are mostly journal reading. As to words of wisdom to pass on to colleagues, I think everything has been said by wiser minds than mine. Anyway, at this age there seem to be more questions than answers, so I will pass on that tempting offer,



thank you.

"I am retired! My wife, a cocker spaniel, and I live on a wooded, 21-acre farm in the Finger Lakes region of western New York, in my opinion one of the most beautiful areas in the country."

Letter to William J. Stekiel

Joseph A. Panuska writes: "I remained active in physiology teaching at Georgetown University, serving as editor-inchief of *Cryobiology*, the international journal for low temperature biology and medicine, until I was called to lead the seven-state Maryland Province of the Society of Jesus, the Jesuits, in 1973.

"I continued my work through my laboratory at Georgetown for a few years but found it was impossible to continue it adequately while holding the other position. Upon completing my six-year term as Provincial of the Maryland Province in 1979, I continued in administrative work by becoming Academic Vice President and Dean of Faculties at Boston College. Throughout this period, I maintained a strong interest in physiology, especially the phenomenon of hibernation. I continued to give popularized talks on low temperature biology but became further and further away from proficiency in the field.

"In 1982, I was elected President of the University of Scranton, a very successful Jesuit institution in northeastern Pennsylvania. I have been here ever since. I am now completing my 15th year as President, the longest in our history, and plan on leaving the presidency in the summer of 1998.

"I continue to have an interest in physiology, especially in my area of specialization; however, my only publications in recent years have been related to problems in medical ethics and education. These have not been extensive because of the demands of my present position.

"My work for the past quarter century has carried me far beyond the laboratory and into many parts of the world where I could be of some assistance. Although I have received a number of honors and degrees, most interesting to me has been an honorary doctorate in health science awarded by the University of Tranava in Slovakia. This was in response to assistance my university gave through a USAID program relating to health management in that country. In a way, that project merged many of my life-long interests: physiology, medicine, and public service."

Letter to Richard Malvin

Kenneth A. Hubel writes: "I became interested in 'membrane transport' when, for financial reasons, I interrupted a residency in medicine at the State University of New York Health Science Center in Syracuse and worked for Bristol Laboratories in that city for three years (1956-59). In screening antibiotic salts of tetracycline for their rates of absorption in the human gut, some were absorbed well, and others were not. I wondered why. Adrian Hogben had recently published landmark studies of the effects of lipid solubility and pH on the absorption of inert substances. When he became head of physiology at George Washington University, I asked to join him as a research fellow.

"Adrian believed his studies answered most questions concerning drug absorption and proposed that I study bicarbonate secretion in the colon, continuing studies he had initiated with Irv Cooperstein at NIH. When I returned to Syracuse for a final year of residency

Correction

In the August 1997 issue of *The Physiologist*, a letter in this space addressed to Robert M. Berne incorrectly referred to John C. McGiff as John C. McGriff.

We apologize for the error.

News from Senior Physiologists

before joining Hogben, I benefitted from auditing a course in the biophysics of membrane transport given by Arthur C. Brown, then an assistant professor in the department. Art presented the course with the encouragement of Eugene Jacobsen, then a graduate student. My two-year fellowship with Hogben yielded no publishable data, but it did provide experience in measuring net movement of ions and water by intestinal perfusion in small animals.

"I was invited to join the faculty of the College of Medicine at the University of Iowa at the completion of my fellowship in 1962, an invitation that was attractive because Hogben had become head of physiology the year before. Jim Clifton and Hal Schedl, who comprised the small Gastroenterology Division at Iowa, had published the first studies of electrolyte and water absorption in the human small intestine using intestinal perfusion, and they wished to recruit a candidate with research interests in gastrointestinal physiology.

"In spite of a nourishing academic environment for research, my first couple of years were not productive. Then one afternoon, a rat ileum that had consistently secreted bicarbonate failed to do so when the lumen was perfused with mannitol. Subsequent studies revealed that lumenal chloride was required, a finding that supported the hypothesis of Dennis Parsons of Oxford, and that offered the first evidence that in the mammalian intestine bicarbonate was secreted in exchange for lumenal chloride. I spent a year with Parsons in Oxford in 1969. Dennis was an exemplary mentor, and Oxford was the ultimate sabbatical experience for me, my wife, and three young children.

"My efforts to understand the mechanisms of bicarbonate secretion led to studies in which electrolyte and water movement were studied before and after the intravenous infusion of peptides (secretin, glucagon, cholecystokinin). When cholera toxin became available, it proved to be a maximal stimulus for bicarbonate secretion in the ileum and provided a means to determine the transport mechanisms by which bicarbonate is accumulated in the ileal lumen. Hogben proposed the method of testing during my fellowship. If bicarbonate ions moved into the lumenal fluid, the partial pressure of carbon dioxide (Pco2) should increase. If hydroxyl ions were transported into lumenal fluid to combine with lumenal CO₂ to form bicarbonate ions, Pco₂ should fall. The results from the studies were clear: when bicarbonate is secreted at a high rate, the lumenal PCO₂ falls below that of arterial blood, i.e., hydroxyl ions are secreted. In the 1980s, the studies of John Dobbins et al. with membrane vesicles supported this view.

"A series of papers from the laboratory of Neal Miller at the Rockefeller Institute provided evidence that visceral responses governed by the autonomic nervous system could be learned. Operant conditioning appeared to provide a way of conditioning neural responses in a way that approached the physiological. After two years of trying to duplicate some of the studies, I discovered that investigators in Miller's laboratory were also having difficulty. The original investigator had moved on, and it seemed increasingly apparent that the data had been concocted by Miller's doctoral student. I abandoned the operant conditioning studies but continued to study the effects of neurotransmitters on ion transport in the intestine.

"In my reading to prepare a grant request for support for operant conditioning studies, I found that electrical field stimulation could be used to depolarize intestinal nerves to determine their effects on smooth muscle contraction. It seemed likely that the technique could also be used to determine the effects of neural depolarization on ion transport in vitro and would thereby provide the most direct evidence of a neural influence. I had no experience in using flux chambers for studies of ion transport and received help in learning their use from Dave Dawson, who was then in our Department of Physiology at Iowa. Qais-Al-Awqati from Columbia University also helped clarify some of the method's pitfalls.

"The afternoon in 1977 when we first stimulated the nerves of a rabbit ileum mounted in the flux chamber remains an exhilarating memory. The short circuit rose within seconds after the nerves were depolarized, then gradually diminished when the stimulation ceased. It took me six months of using various controls to be certain that we were not measuring an electrical artifact, but thereafter I felt convinced that the short-circuit current rose because the mucosa secreted chloride. The neurotoxin, tetrodotoxin, prevented the response and also affected basal ion transport. The studies provided the first unequivocal evidence of what had been long suspected, that intrinsic nerves could affect transport of ions by the epithelium. It further demonstrated that intestinal tissue mounted in a flux chamber could no longer be regarded as a simple layer of transporting cells. The influences of neighboring cells had to be considered. I am pleased that our studies also stimulated investigations by others who showed that the intrinsic nerves mediated secretory responses in intestinal hypersensitivity caused by a variety of antigens. Similar responses to intrinsic nerve stimulation could be found in the human ileum and human colon.

"I chose rabbit ileum for the initial studies because the preparation had been used in numerous in vitro studies of the mechanisms of transport of carbohydrates and amino acids. Guinea pig intestine would have been a better choice because the anatomy and pharmacology of the intrinsic nerves were better understood from prior studies of intestinal motility and from the defining immunohistological studies of John Furness and Marcello Costa. Helen Cooke from the Department of Physiology at Ohio State University and I discussed the method of electrical field stimulation in 1983, and using the guinea pig ileum, she and her graduate students studied its neuropharmacology in depth, contributing significantly to our understanding of the role of intrinsic nerves in modifying intestinal ion transport.

"Having few fresh ideas for research, I did not reapply for NIH funds in 1991, after

News from Senior Physiologists

having the agency's support for 25 years. I reflect that physicians of my generation who chose to do research in physiology benefitted from research support when NIH could afford to be more open-handed and from being able to use techniques that did not require one to commit 90% of his or her time to the laboratory. One could be a good clinician and a good investigator. That is much more difficult today because of increasing clinical time required of academic physicians, the complexity of research techniques, and the need for continuing productivity if one is to compete successfully for support.

"I will retire fully in January 1998, having had the pleasures of discovering a few new facts of importance and having worked with good people for commendable goals in a stimulating setting where we shared an honorable ethic."

Letter to Arthur J. Vander

Alice M. Stoll writes: "I retired in 1980, a bit earlier than I should have. It would have been better had I stayed on another year or so and published a couple more papers to tie up the loose ends of our research that touched on so many different fields. However, having completed the discovery and analysis aspects of our work, I tired of the old rat race to generate funds for research in the face of funding sources' primary interest in shortterm applications.

"Indeed, working for the Aviation

Medical Research Institute, we did much applied research during WWII. Working at the Aviation Medical Research Laboratory from 1953 on, we did much more, including G protection, biochemical warfare protection, fire-resistant flight suits and gloves, ejection seat rocket burn protection, flight deck injury prevention, etc. However, despite the ever-growing emphasis on practical applications, we were able to eke out funds, especially in the thermal field, to carry on the basic research necessary to establish the average depth and firing temperature of thermal pain endings in the skin and the time and temperature relationship for thermal radiation, conduction, and flame contact in pain and burn production in human skin.

"From these data, we derived mathematical and graphical methods for relating the basic information to bioengineering needs for prediction of material properties of substances and coatings to provide protection from skin contact pain and burn, simply from a knowledge of the heat flow, mode of transmission, and exposure times anticipated.

"I thought of writing a monograph after retirement, but I got caught up in more extensive travel with my friend, colleague, and coauthor Maria Chianta, and the years flew by happily. When Maria died suddenly in September 1995, I was devastated. I did travel to the Holy Land over the following Christmas and New Year's holidays, as we had planned earlier. Upon returning, I plunged into volunteering full time in the township committees, etc. I still do this full time and am very grateful for the opportunity to keep usefully occupied. For recreation, I travel occasionally, attend the theater regularly, mow the couple acres of lawn around the house, 'housekeep' indifferently, swim when possible, party now and then, and enjoy the company of friends.

"Occasionally, it occurs to me that with the advent of computer information networks I might still write that monograph without having to travel to the city — Philadelphia is an hour and a half away — to restore my grip on the stateof-the-art. Ah well, we shall see.

"I wish I had some words of wisdom to impart to younger colleagues, but all I can say is find a field that really stirs your interest, follow your dream, and make time to enjoy each phase of life as it unfolds. This course probably will not bring you riches, but it surely will bring great personal satisfaction. With a bit of luck, who knows, maybe fame and fortune as well!"

Wellcome Visiting Professorships in the Basic Medical Sciences 1998-99

FASEB invites nominations from US medical schools, universities, and other nonprofit scientific research institutions for Wellcome Visiting Professorships in the Basic Medical Sciences.

Sponsored by the Burroughs Wellcome Fund.

For application procedures and information, contact Rose P. Grimm, FASEB Executive Office, 9650 Rockville Pike, Bethesda, MD 20814-3998. Tel: 301-530-7090; fax: 301-530-7049; e-mail: rgrimm@exe-cofc.faseb.org.

Deadline for Institutions to Apply is March 2, 1998.

Book Reviews

Endothelial Cell Culture

Roy Bicknell (Editor) New York: Cambridge University Press, 1996, 136 pp., illus., index, \$21.95 ISBN: 0-521-55990-1

This book belongs to the series, Handbooks in Practical Animal Cell Biology, that aims to provide practical workbooks for the cell biologist interested in cell culture. The book is divided into eight chapters, each devoted to the isolation, culture, and characterization of microvascular endothelial cells from different organs: lung, bone marrow, brain, breast, skin, adipose tissue, female reproductive system, and synovium. Each chapter is written by different authors who have devised methods for isolating and maintaining culture endothelial cells from a chosen vascular bed of a given species. As the editor indicates in the introduction, the selection of organs is not inclusive, and organs such as the colon, adrenal medulla, and liver are not covered.

The mere fact that a book is devoted entirely to the art of culturing endothelial cells from diverse vascular beds emphasizes endothelial heterogeneity and the importance of the endothelium in physiological and pathological processes, such as wound healing, inflammation, and tumor metastasis. In addition, this underscores the inherent difficulties in microvessel endothelial culture. The protocols in this book are detailed and easy to follow with only minimal overlapping or duplication of techniques from one chapter to another.

When more than one method for isolation and culture is available, the authors provide useful comparisons of the isolation procedures and the resulting cell preparations. Potential problems the researcher may encounter in obtaining the proper starting material, isolating the cells, and establishing pure endothelial cultures are dealt with expertly by all the authors. Helpful tips are provided. Detailed lists of ingredients for media, antibodies, and various reagents are given, and commercial sources are pointed out. Illustrations that assist the inexperienced by providing morphological comparisons are included in most chapters, with the exceptions being the skin, brain, and lung endothelium chapters. Techniques on how to obtain pure

populations of endothelial cells using PECAM-1 or UEA-Dynabeads or FACS are there, as well as the means of cell-type identification through immunocytochemistry and morphology. However, there are some omissions within the text. For example, there is no information on how to expose cultures to shear stress or on cultivating cells on permeable substrates, such as cellagen discs. This technique not only permits direct visualization of cells by phase contrast microscopy, but it is also suitable for permeability studies and interactions of endothelial cells with other cell types.

This is the first time a book entirely devoted to the culture of microvascular endothelium from various organs has been put together. It should be a valuable guide and is recommended to cell biologists, graduate students, and other scientists already involved in or interested in entering the challenging and exciting terrain of endothelial cell biology.

> Katerina Dorovini-Zis University of British Columbia

Perception as Bayesian Inference

David Knill and Whitman Richards (Editors)

New York: Cambridge University Press, 1996, 516 pp., illus., index, \$69.95 ISBN: 0-521-46109-X

It was simply a joy to read this book. Bayesian inference has become the primary framework for the analysis of complex data. This book presents diverse views on how to apply this mathematically demanding subject to the topic of human perception. The editors have written a remarkably clear introduction to Bayesian inference, with a minimum of mathematics and a variety of good examples to make this topic accessible to a broad audience. Also, a number of the chapters are written to appeal to those who wish to avoid the underlying mathematics. While the basic concepts underlying Bayesian inference are fairly simple, their application requires paying careful attention to the mathematical details. This is true for real world applications and for applications to the topic of human perception. This is reflected in most of the chapters. The editors have achieved a remarkable balance where the mathematically naïve to the most sophisticated will find topics that enlighten and stretch the imagination.

The book has two major sections, each of which ends with short commentaries on the preceding chapters. These are written primarily by the other authors. For example, Horace Barlow comments on David Mumford's view of Ulf Grenander's "Pattern Theory" in the first chapter, then Mumford gets in the last word by commenting on the last chapter by Barlow, "Banishing the Homunculus." The first section, "Bayesian Framework," provides five examples on applying the Bayesian formulation to modeling perception. Meanwhile, the second section, "Implications and Applications," consists of seven chapters devoted to applying these ideas to problems in vision, with a strong emphasis on psychophysical studies of vision.

For a neurophysiologist, a major drawback to this book is the complete lack of any reference to the underlying neuronal structure necessary to support the computations required for Bayesian inference. It does, however, provide a clear view of the future, where theories of neural computation finally move beyond simple feature detection into the realm of very complex and dynamic inference, based on models that attempt to encompass the true complexity of the world in which we live.

Charles H. Anderson Washington University School of Medicine

Meetings Announcement: Third International Congress of Pathophysiology June 28-July 3, 1998 • Lahti, Finland.

Information: ISP98, Department of Physiology, University of Kuopio, 70211 Kuopio, Finland. Tel: +358-17-163-108; fax: +358-17-163-112; e-mail: isp98@uku.fi; Internet: http://packer. berkeley.edu/conferences/isp98.html.

Book Reviews

Cardiothoracic Interrelationships in Clinical Practice

Anthony M. Cosentino and Richard J. Martin (Editors) Armonk, NY: Futura, 1997, 220 pp., illus., index \$47.00 ISBN: 0 - 87993-655-X

Before reviewing any book, I usually turn to the authors' foreword to determine the purpose of the volume. As stated by the editors, "It is the purpose of this book to review what is known about cardiothoracic interrelationships, both in normal and abnormal states." If this is the real purpose of this brief volume, then the book cannot be said to have achieved its goal.

This volume consists of a short review and update of a few selected topics, and its merits should be adjudicated in that light. The primary target audience is clinicians who need to make decisions about ventilatory and other treatment strategies for patients with cardiopulmonary disease, primarily, but not solely, in the setting of an intensive care unit. However, clinicians-in-training will also benefit from reading this book. In many instances, the brevity of the volume prevents subject matter from being covered in great detail, although adequate references are provided to allow those who wish to begin exploring the field on their own.

The volume consists of eight chapters. The first chapter is a select review of certain aspects of cardiorespiratory physiology. Since the heart and lungs share a common intrathoracic cavity, are connected both in series and in parallel via vascular channels, and have many neural cross connections, it is not surprising that the function or dysfunction of one influences the function of the other. This realization has spurred many clinical and basic studies on the means by which circulatory and respiratory systems interact. How this interaction is altered in disease states may even be exploited in certain clinical situations. In general, I have the impression that this chapter was written to include subject matter not dealt with elsewhere in the book and that a number of important topics, such as positive end-expiratory pressure, pulsus paradoxus, and pulmonary vascular resistance, are given superficial coverage in this chapter.

The second chapter on pulmonary edema by Matthey, et al, is excellent and reviews some of the newer work of the author. The third chapter on cardiopulmonary resuscitation (CPR) by Yakel et al. is a decent review of alternative mechanisms by which CPR produces blood flow to the periphery. Material on newer modes of CPR based on the "thoracic pump" concept is useful and interesting. Chapter 4, on respiratory considerations in congestive heart failure by Haddad et al. is an outstanding review of this often poorly understood topic and should be greatly appreciated by clinicians at all levels.

There are three chapters on the general topic of pulmonary vascular disease, pulmonary hypertension, and cor pulmonale. Chapter 5 is primarily a review of pulmonary vascular resistance. Chapter 6 is devoted to the topic of pulmonary hypertension in asthma. While this topic is not generally thought of as having great clinical import — few asthmatics die in right heart failure — it is here that some important concepts, such as venous return/cardiac output coupling, effects of intrathoracic pressure on cardiac function, and effects of blood gas alterations on pul-

monary vascular resistance, are dealt with, albeit briefly. Chapter 7 deals with cor pulmonale in two parts. Most of part 1 deals with a review of diagnostic modalities, including physical diagnosis. Part 2 is a nice review of the hormonal alterations leading to peripheral edema in patients with cor pulmonale and will be valuable for those used to thinking purely in mechanical terms.

Chapter 8 is a review of the modes of mechanical ventilation and weaning by Cosentino. The author imparts much practical wisdom gathered over years of watching ventilatory fads come and go. This chapter will be very useful to those at the beginning of their clinical careers who are confused by the alphabet zoo of ventilatory settings that have evolved over the past three years.

As noted, the volume is adequately referenced. I found some of the figures difficult to understand, as they were often not thoroughly discussed in the text. In addition, many aspects of what is now called respiratory-circulatory interactions are not thoroughly discussed. These include circulatory management of respiratory distress syndrome, cardiopulmonary monitoring, neurocirculatory interactions with abnormal ventilation, mechanisms of multiple organ failure, mechanisms of deficient peripheral oxygen utilization, and respiratory muscle function. However, given these limitations, I believe this volume will be a valuable addition to the library of clinicians and clinicians-in-training who are confronted with practical circulatory problems in patients with abnormal respiration.

> Steven M. Scharf Albert Einstein College of Medicine

MCQs in Basic and Clinical Physiology

Dom Colbert

New York: Oxford University Press, 1996, 336 pp., index, \$28.95 ISBN: 0-19-262735-8

This book, a collection of multiple-choice questions (MCQs), is intended as an aid for students studying for an examination in a physiology or a pathophysiology course. It is also intended for students studying for a licensure examination or for those reviewing physiological material during studies of clinical subject matter. The book is subdivided into 13 more or less traditional subject areas, including each of the organ systems. Within each subdivision, questions are grouped into labeled topics, with up to as many as 10 questions in each topic area.

A question consists of a brief stem (headline statement) followed by five choices (a to e), each of which may be true or false. Following the questions in each topic are the answers. An answer indicates whether each choice is true or false, and the correctness of every choice is followed by a short explanation. Neither the stem nor the choice is repeated in the answer. A question and its answer are always close enough together to permit the user to flip between them with no difficulty, although the user is admonished to be honest when answering a question in order to achieve maximum benefit from using the questions as a review. Most major concepts are represented by whole questions or by individual choices.

Two problems I have with the questions may result, in part, from "cultural" differences between Ireland — the author is at Uni-

Book Reviews

versity College, Galway, and is looking to prepare students for examinations in his environment — and the US. First, the trend in this country has been to write the stems of MCQs to alert the test taker of the choices that are to follow. We consider that given a well-prepared stem, a student should be able to predict what choices will appear. The MCQs in this book have very abbreviated stems that in no way provide the user with an indication of what will appear in the choices ("Sweating," "In the Kidney," and "Dead Space" are example stems).

Second, the choices that follow the stem often cover a wide range of concepts or facts, rather than being confined to more related subjects. The answerer has to consider many topics only superficially related. This, too, deviates from the style used in this country. However, a positive benefit from the author's broad questioning method is that it covers a larger number of concepts in a single question. This allows him to provide in a smaller number of questions a broader basis for review than would be possible with the question construction convention used in the US. Conversely, if the objective is, in part, to prepare students for the taking of course and/or licensing examinations, the book's questions deviate from the construction that is most commonly used here, including the fact that there may be — and usually are — multiple correct choices in each question in the book. We tend to write questions with only one correct answer.

The questions as a whole cannot be classified as to the cognitive levels they address in the user, since all questions have abbreviated stems and a wide variety of material in the choices. The only possibility for determining the cognitive level is in the choices themselves. Unfortunately, the vast majority of choices are of a strict, factual sort that requires only recall to answer. There are some application-type choices, but these are far fewer in number than I would like to see. There are almost no problem-solving choices requiring the user to manipulate, integrate, or synthesize material. There are no questions associated with figures, graphs, or tables. It is my opinion that the question set in this book seriously deviates from the kind of questioning many of us try to include in our examinations and from the kind of questioning represented increasingly in licensure examinations in the US.

Overall, I would not recommend the book to my students. \clubsuit

Allen Rovick Rush-Presbyterian-St. Luke's Hospital

Books Received

Advances in Cirrhosis, Hyperammonemia, and Hepatic Encephalopathy. Vicente Felipo & Santiago Grisolia (Editors). Advances in Experimental Medicine and Biology, Vol. 420. New York: Plenum, 1997, 281 pp., illus., index, \$95.00. ISBN: 0-306-45598-6.

The Carotid Body Chemoreceptors. Constancio Gonzalez. New York: Chapman & Hall, 1997, 224 pp., illus., index, \$89.95. ISBN: 0-412-11501-8.

Cellular and Molecular Biology of Airway Chemoreceptors. Ernest Cutz. New York: Chapman & Hall, 1997, 140 pp., illus., index, \$89.95. ISBN: 0-412-10801-1.

Cellular Aspects of Smooth Muscle Function. C. Y. Kao and Mary E. Carsten (Editors). New York: Cambridge University Press, 1997, 293 pp., illus., index, \$79.95. ISBN: 0-521-48210-0.

Clinical Autonomic Disorders: Evaluation and Management, 2nd Edition. Phillip A. Low (Editor). Philadelphia, PA: Lippincott-Raven, 1997, 849 pp., illus., index, \$179.00. ISBN: 0-316-53281-9. Diuretic Agents: Clinical Physiology and Pharmacology. Donald Seldin and Gerhard Giebisch (Editors). San Diego, CA: Academic, 1997, 666 pp., illus., index, \$79.95.

ISBN: 0-12-635690-4.

Electromyography in Clinical Practice: Clinical and Electrodiagnostic Aspects of Neuromuscular Disease, 3rd Edition. Michael J. Aminoff. New York: Churchill Livingstone, 1997, 630 pp., illus., index, \$99.00. ISBN: 0-443-07681-2.

Ion Channels: Methods in Enzymology, Vol. 207.

Bernardo Rudy and Linda Iverson (Editors). San Diego, CA: Academic, 1997, 917 pp., illus., index, \$59.95. ISBN: 0-12-601695-X.

Molecular Pathogenesis of Diabetes Mellitus. R. D. G. Leslie (Editor). Frontiers of Hormone Research, Vol. 22. A. B. Grossman (Series Editor). Basel, Switzerland: Karger, 1997, 228 pp., illus., index, \$198.25. ISBN: 3-8055-6373-6.

Multiple Choice Questions in Physiology, 3rd Edition. Lynn Bindman, Peter Ellaway, Brian Jewell, and Laurence Smaje. New York: Oxford University Press, 1997, 131 pp., illus., index, \$22.95. ISBN: 0-340-67677-9.

Pocket Companion to Textbook of Medical Physiology. Arthur C. Guyton and John E. Hall. Philadelphia, PA: Saunders, 1997, 812 pp., illus., index, \$19.95. ISBN: 0-7216-7118-7.

Oxygen Transport To Tissue XVIII. Edwin M. Nemoto and Joseph C. LaManna (Editors). Advances in Experimental Medicine and Biology, Vol. 411. New York: Plenum, 1997, 608 pp., illus., index, \$159.50. ISBN: 0-306-45516-1.

Polyamine Protocols.
David M. L. Morgan (Editor).
Methods in Molecular Biology, Vol. 79. John
M. Walker (Series Editor).
Totowa, NJ: Humana, 1997, 186 pp., illus., index, \$59.50.
ISBN: 0-89603-448-8.

Video Microscopy: The Fundamentals, 2nd Edition. Shinya Inoue and Kenneth R. Spring. New York: Plenum, 1997, 741 pp., illus., index, \$95.00. ISBN: 0-306-45531-5.

Announcements

OPRR Workshops on the Care and Use of Laboratory Animals

NIH's Office for Protection From Research Risks (OPRR) is continuing to sponsor workshops on implementing the Public Health Service Policy on Humane Care and Use of Laboratory Animals.

Each of the workshops focuses on a specific theme. The workshops are open to institutional administrators, members of Institutional Animal Care and Use Committees (IACUCs), laboratory animal veterinarians, investigators, and other institutional staff who have responsibility for high-quality management of sound institutional animal care and use programs.

The one-day workshop described in the box to the right will focus on nonaffiliated and nonscientist members of IACUCs. Ample opportunities will be provided to exchange ideas and interests through question and answer sessions and informal discussions.

For information on future NIH/FDA National Animal Welfare Workshops, please contact Darlene Marie Ross, Education Coordinator, OPRR Office of Extramural Research, NIH, 6100 Executive Blvd. Suite 3B01, Rockville, MD 20892-7507. Tel: 301-496-8101 ext. 233; fax: 301-402-0527; e-mail: dr20a@nih.gov.

DATE:	January 16, 1998 8:00 ам to 5:00 рм
TITLE:	"Nonaffiliated and Nonscientist Members of IACUCs"
LOCATION:	NIH Natcher Conference Center Bethesda, MD
SPONSORS:	OPRR, NIH NIH Intramural Research Program Bethesda, MD Scientists Center for Animal Welfare Greenbelt, MD
REGISTRATIO	N: Lee Krulisch Scientists Center for Animal Welfare 7833 Walker Drive, Suite 340 Greenbelt, MD 20770 Tel: 301-345-3500 Fax: 301-345-3503 E-mail: scaw@erols.com

Applications Sought for AACR Research Fellowships

Applications are being sought for the American Association of Cancer Research's (AACR's) research fellowships in clinical, translational, basic, and prevention research.

These fellowships are sponsored by Amgen, Inc.; Bristol-Myers Squibb Oncology; the Cancer Research Foundation of America; Hoechst-Marion Roussel; the Kimmel Foundation for Cancer Research; and AACR.

These one- or two-year grants support meritorious cancer research by young scientists in the Americas at the clinical or postdoctoral fellow levels.

Candidates must be nominated by a member of AACR and must be an AACR member or apply for membership at the time the fellowship application is submitted.

Candidates must have been a fellow for at least two years, but not more than five years, prior to the beginning of the award year (July 1998). Academic faculty holding the rank of assistant professor or higher, graduate or medical students, medical residents, federal government employees, and employees of private industry are not eligible for the award.

Deadline: January 15, 1998.

For more information, contact Jenny Anne Horst-Martz, AACR, Public Ledger Building, 150 South Independence Mall West, Suite 826, Philadelphia, PA 19106-3483. Tel: 215-440-9300; fax: 215-440-9372; e-mail: horst@aacr.org.◆

Meeting the Information Requirements of the Animal Welfare Act

The Animal Welfare Information Center (AWIC) of USDA's National Agricultural Library has developed a two-day workshop for individuals who are responsible for providing information to meet the requirements of the Animal Welfare Act.

The objectives of the workshop are to provide:

- an overview of the Animal Welfare Act and its information requirements
- a review of the alternatives concept
- a comprehensive introduction to the National Agricultural Library, AWIC, and other organizations
- instruction on the use of existing information databases/networks

For more information, contact AWIC, USDA National Agricultural Library, 10301 Baltimore Avenue, Beltsville, MD 20705-2351. Tel: 301-504-6212; fax: 301-504-7125; e-mail: awic@nal.usda.gov.

Scientific Meetings and Congresses

1998

January 17

Electrophysiology of the Brain. A Symposium in Honor of Ernst Neidermeyer, Baltimore, MD. *Information:* Conference Coordinator, Johns Hopkins Medical Institutions, Office of Continuing Medical Education, Turner 20, 720 Rutland Avenue, Baltimore, MD 21205-2195. Tel: 410-955-2959; fax: 410-955-0807; e-mail: cmenet@som.adm.jhu.cme; Internet: http://www.med.jhu.edu/cme.

February 12-17

AAAS Annual Meeting and Science Innovation Exposition, Philadelphia, PA. *Information:* AMSIE'98, Office of Membership and Meetings, American Association for the Advancement of Science, 1200 New York Avenue, NW, Washington, DC 20005. Tel: 202-326-6450.

February 21-26

The International Society for Optical Engineering International Symposium on Medical Imaging 1998, San Diego, CA. *Information:* SPIE, PO Box 10, Bellingham, WA 98227-0010l. Tel: 360-676-3290; fax: 360-647-1445; e-mail: spie@spie.org.

February 22-25

Vascular and Myocardial Aspects of Ischemic Heart Disease, Incline Village, NV. *Information:* Futura Media Services, Inc., 135 Bedford Road, PO Box 635, Armonk, NY 10504-0635. Tel: 914-273-1047; fax: 914-273-2559; e-mail: media@futuraco.com; Internet: http://www.futuraco.com.

March 4-7

Heart and Brain–4th International Conference on Stroke and 1st Conference of the Mediterranean Stroke Society, Marrakech, Morocco. *Information:* N. M. Bornstein, PO Box 50006, Tel Aviv 61500, Israel. Tel: +972-3-5140014; fax: +972-3-5175674 or 5140077; e-mail: stroke@kenes.ccmail.compuserve.com.

March 7-11

Twenty-ninth Annual Meeting of the American Society for Neurochemistry, Denver, CO. *Information:* Adron Harris, Department of Pharmacology, University of Colorado Health Sciences Center, 4200 East Ninth Avenue, Denver, CO 80262-0236. Tel: 303-315-8609; fax: 303-315-7499; e-mail: adron.harris@uchsc.edu; Internet: http://www.med.usf.edu/ASN/asn.html.

May 1-3

Biomedicine '98: Medical Research From Bench to Bedside, Washington, DC. *Information:* Biomedicine '98, 1200 19th Street NW, Suite 300, Washington, DC 20036. Tel: 202-429-5161; fax: 202-223-4579; Internet: http://www.afmr.org.

May 22-24

6th International Congress on Physical Education and Sport, Komotini, Greece. *Information:* Savvas Tokmakidis, 6th International Congress on Physical Education and Sport, Department of Physical Education and Sport Science, Democritus University of Thrace, Komotini, 69100, Greece. Tel: +30-531-21764 or 21762; fax: +30-531-33582 or 26908; e-mail: stokmaki@kom.forthnet.gr; Internet: http://www.cc.duth.gr/conf/icpes98.

June 3-6

6th International Symposium on Resistance Arteries, Mol, Belgium. *Information:* Department of Pharmacology, Maastricht University, PO Box 616, 6200 MD Maastricht, The Netherlands. Tel: +31-43-3881417; fax: +31-43-3670940; e-mail: isra@farmaco.unimaas.nl.

June 11-14

International Behavioral Neuroscience Society 7th Annual Meeting, Richmond, VA. *Information:* Marianne Van Wagner, Division of Life Sciences, University of Texas at San Antonio, 6900 North Loop 1604 West, San Antonio, TX 78249-0662. Tel: 210-458-4481; fax: 210-458-4510; e-mail: editoff@lonestar.utsa.edu; Internet: http://www.utsa.edu/Academics/COSAE/LifeSciences/IBNS.

June 27-29

1st European Congress of Human Locomotion Sciences: From Scientific Research to Public Health, Verona, Italy. *Information:* G. Bovo, 37043 Castagnaro, Verona, Italy. Tel and fax: +39-0442-92436.

June 28-July 2

International Conference on Intensive Cardiac Care, Jerusalem, Israel. *Information:* ISAS International Seminars, PO Box 574, Jerusalem 91004, Israel. Tel: +972-2-6520574; fax: +972-2-6520558; e-mail: isas@netvision.net.il.

June 28-July 3

3rd International Congress of Pathophysiology, Lahti, Finland. *Information:* ISP98, Department of Physiology, University of Kuopio, 70211 Kuopio, Finland. Tel: +358-17-163-080 or 163-108; fax: +358-17-163-112; e-mail: isp98@uku.fi; Internet: http://packer. berkeley.edu/conferences/isp98.html.

June 30-July 4

2nd FEPS Congress (Federation of European Physiological Societies and Czech Physiological Society), Prague, Czech Republic. *Information:* Scientific Secretariat Eva Sykova, Institute of Experimental Medicine ASCR, Videnska 1083, 142 20 Prague 4, Czech Republic. Tel: +420-2-475-2682; fax: +420-2-475-2783; e-mail: sykova@biomed.cas.cz; Internet: http://uemweb.biomed.cas.cz/FEPS99.htm.

July 19-24

International Symposium on Optical Science, Engineering, and Instrumentation (43rd Annual SPIE Meeting), San Diego, CA. *Information:* SPIE International Headquarters, PO Box 10, Bellingham, WA 98227-9861. Tel: 360-676-3290; fax: 360-647-1445; e-mail: sd98call@spie.org; Internet: http://www.spie.org/info/sd.

September 6-9

European Atherosclerosis Society 70th EAS Congress, Jerusalem, Israel. *Information:* Yechezkiel Stein, 70th EAS Congress, PO Box 50006, Tel Aviv 61500, Israel. Tel: +972-3-5140014; fax: +972-3-5175674 or 5140077.

September 19-23

European Respiratory Society Annual Congress, Geneva, Switzerland. *Information:* European Respiratory Society, 1 boulevard de Grancy, CH-1006 Lausanne, Switzerland. Tel: 41-21-613-02-02; fax: 41-21-617-28-65; e-mail: @ersnet.org.

September 27-October 1

Brisbane '98: Asian-Oceanian Congress of Australian Physiological and Pharmacological Society, Australian Neuroscience Society, and Physiological Society of New Zealand, Brisbane, Australia. *Information:* Brisbane '98 Secretariat, GPO Box 2609, Sydney, NSW 2001, Australia. Tel: +61-2-9241-1478; fax: +61-2-9251-3552; e-mail: reply@icmsaust.com.au.