PHYSIOLOGY

THE STUDY OF LIFE, and how genes, cells, tissues, and organisms function.

Physiologists teach and mentor students in both the classroom and laboratory.

Physiologists apply basic research findings to human and animal studies.

Cutting edge cellular and molecular techniques often are used in physiology research.

Physiologists work in clinical settings, drug companies, government agencies, and universities.

What is PHYSIOLOGY?

PHYSIOLOGY IS THE STUDY of life, specifically, how cells, tissues, and organisms function.

Physiologists are constantly trying to answer key questions in areas ranging from the functions of single cells to the interactions between human populations and our environment here on earth, the moon, and beyond.

Questions like . . .

- Why does blood clot in a wound but not while flowing through blood vessels?
- Can we prevent loss of bone mineral during space flights or confinement to bed?
- How does the nervous system convert stimuli into memories?
- What factors limit human athletic performance?
- What causes new genes to be activated and expressed in ailing hearts, and how does this contribute to poor performance of these hearts as circulatory pumps?
- How does a person's genetic inheritance predispose him or her to certain diseases later in life?
- How does a person's gender affect his or her body's response to physiological or environmental stress?
- How do organs repair themselves after damage due to stroke, heart attack, or other insult?

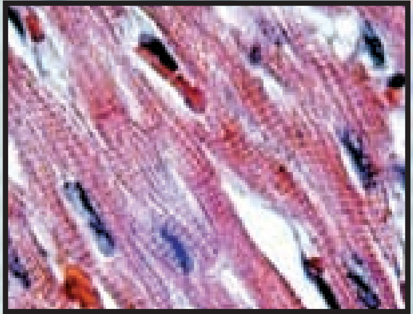
Why is PHYSIOLOGY Important?

Physiology is important because it is the foundation upon which we build our knowledge of what “life” is, how to treat disease, and how to cope with stresses imposed upon our bodies by new environments. Physiological studies of normal biological function provide the basis for understanding the abnormal function seen in animal and human disease (pathophysiology) and for developing new methods for treating those diseases (translational research). Many physiologists place great importance on the use of animal models as an important tool in their research.

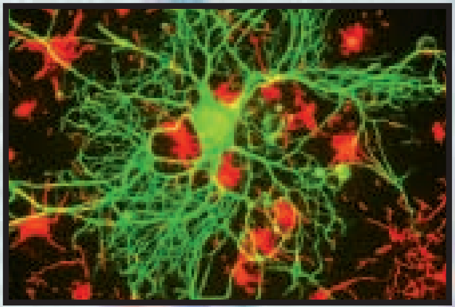
Most recently, geneticists and molecular biologists have recorded and translated the entire genome (DNA) of humans and several other organisms. Still remaining is the immense task of understanding the roles that each of these genes plays in cellular function (physiological genomics and proteomics) and ultimately in the organism itself. This is the exciting challenge of modern physiology!

“This is an exciting time for physiologists as they study the genetic make-up of a variety of animal models in order to understand the function and relevance of genes in both normal and disease states.”

Martin Frank, Ph.D.,
Executive Director, APS

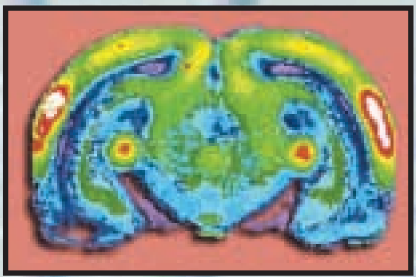


1. Stained section of heart muscle from the right ventricle.



2. Autoradiographic image of the brain showing use of sugar in the cerebellum.

3. Many physiologists study animals such as laboratory mice and rats to understand how cells, tissues, and organ systems function in health and in disease.



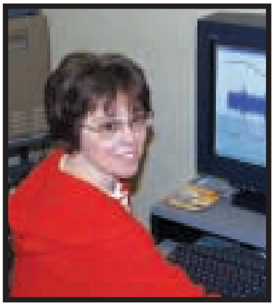
4. Stained neurons (nerve cells) in rat brain.

Photo credits: 1.(From Lemler et al Am J Physiol Heart Circ Physiol 279: H1365-H1376, 2000) 2. (From Passineau et al., Am J Physiol Heart Circ Physiol 279: H924-H931, 2000) 4. (From Evans et al., J Neurophysiol 87: 1076-1085, 2002)

What Do PHYSIOLOGISTS Do?

PHYSIOLOGISTS WORK in many different settings. This flexibility is useful when the time comes to select a job. Many physiologists work in colleges or universities, where they teach undergraduate, graduate, or medical students. They also guide doctoral (Ph.D.) students who will become the teachers and investigators of the future. Some do problem-specific or applied research in private industry. In large pharmaceutical (drug) companies, physiologists play important roles in drug discovery and the development of new disease treatments. Government laboratories, hospitals, and other clinical settings also provide opportunities to focus on research. In addition, many physiologists use their knowledge and expertise to work in full-time educational jobs or as consultants.

Salaries range from good to excellent, but benefits often include more than money. For instance, professors may enjoy a high degree of job security with regular opportunities for study and research at other locations throughout the world. The need to discuss research with other scientists means that travel to meetings in the U.S. and overseas is a regular part of a physiologist's activities. Physiologists who study unusual species or the effects of environmental extremes may travel to the deserts or poles of the earth or may even journey into space.



Susan Barman never imagined that she'd be a scientist, although she liked science experiments in high school. During graduate school she discovered a passion for physiology. After earning her doctoral (Ph.D.) degree, she became a research associate at Michigan State University and later became a full professor there. Dr. Barman teaches medical and graduate students and leads her research team in exploring how the brain controls blood pressure and heart rate via through nerves in the blood vessels and heart.

It was always Michael Romero's desire to be a scientist, either in biology or chemistry. As he explored possible areas of research, he discovered the exciting fields of physiology and genetics. To work in these areas, Dr. Romero learned research techniques in both molecular biology and cloning. After training, he and his wife (who is also a physiologist) accepted faculty and postdoctoral positions at Case Western Reserve University. His current research uses molecular techniques to study how ions move across cell membranes in different organs. He also enjoys mentoring the graduate students in his lab.

When Evangeline Motley entered college, she planned to go on to medical school but later changed her goal to a research career in industry. She earned her doctoral (Ph.D.) degree while doing research at a drug company. Subsequently, during a postdoctoral fellowship, she decided to accept a position at Meharry Medical College, an historically black college. Dr. Motley does research on high blood pressure and teaches physiology to medical, dental, and graduate students.

Barry Peterson's scientific training offered him opportunities to work in physics, biophysics, and respiratory physiology. He also has a strong interest in helping young people learn how exciting a scientific career can be. After 16 years at a university, Dr. Peterson moved to a position in industry. At Pfizer Global Research and Development, he works to develop methods for measuring the effectiveness of new drugs on lung diseases.

To learn more about the careers of these and other physiologists, visit our website at http://www.the-aps.org/careers.htm.

Thomas Herzig's experiences as an undergraduate researcher and laboratory technician sparked his interest in pursuing a graduate degree in science. His ongoing interest in applied physiology offered an opportunity to combine research and a military career. As a commissioned Naval officer at the Uniformed Services University of the Health Sciences, Dr. Herzig teaches medical students who will become physicians serving in the armed services. Dr. Herzig's research team investigates how working in extreme environments affects human physical performance, especially as it relates to changes in the cardiovascular system.

"The best thing about being a physiologist is…

having fun discovering new things and sharing this knowledge with others."

Susan M. Barman, Ph.D.

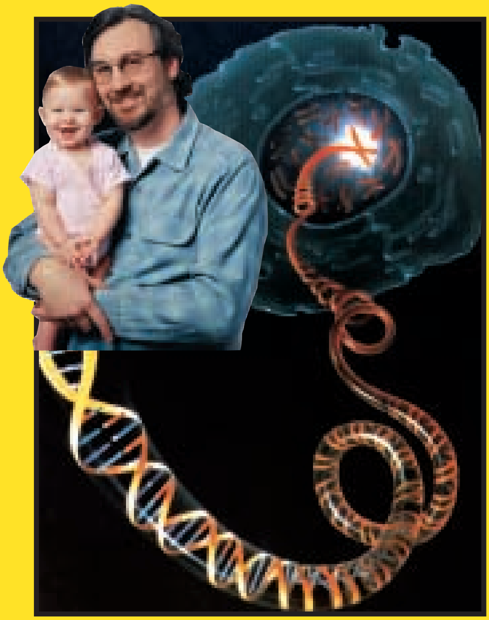
having the ability to creatively design and execute research that improves the performance of US sailors."

Thomas C. Herzig, Ph.D.

that I can teach young people about a subject I love and do research in an area that will benefit mankind. I am proud to be a role model for and contribute to the education of young people who will become our future healthcare professionals."

Evangeline D. Motley, Ph.D.

How Do I Become a PHYSIOLOGIST?



THE EDUCATION of a physiologist usually begins with an undergraduate major in science or liberal arts with a strong science focus.

Those with a Bachelor's or Master's degree typically work under the supervision of a senior physiologist. To be an independent investigator who directs his/her own laboratory group or teaches courses, one usually earns a Ph.D., M.D., or equivalent degree.

Physiologists never stop learning. Each new generation of physiologists faces questions that require the development of new techniques, which in turn raise new questions and, often, the need to re-address earlier questions.

For more information on becoming a physiologist, see: http://www.the-aps.org/careers.htm.

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