

## Role of Integrative Physiology in Research Programs of Modern Physiology Departments

L. Gabriel Navar, PhD  
Department of Physiology,  
Tulane University School of Medicine  
New Orleans, Louisiana

As one reads about the exciting developments in many areas of molecular biology and recombinant DNA biochemistry, it is quite difficult not to be completely overwhelmed. There are so many examples of major breakthroughs.

A recent report in the *Journal of NIH Research* that discusses the recent identification of the "Cystic Fibrosis gene" is an excellent example that may be particularly interesting to many physiologists. Investigations have identified a defect in the protein that may be responsible for regulating the transmembrane chloride conductance—either directly as a channel or by regulating the incorporation of the proteins that serve as channels. But, in spite of this great enthusiasm and without taking away any of the credit that is due to investigators in this area, it is important and worthwhile to remember a few facts.

First of all, this work was not done in a vacuum. To a very large extent, its completion was dependent on the revolution we have had over the last one or two decades in fields of computer science, bioengineering, and biotechnology. In a generic sense, all the folks that helped to make those laboratories productive and efficient should share in the credit, and many, in fact, most, were not molecular biologists, or biologists of any kind.

Second, who pointed to the need for looking at a possible gene defect related to proteins involved in chloride channels? What about the many clinicians and physiologists who carried out the detailed studies that led the way? One must wonder where we would be if all of these would have also opted to be gene jockeys instead of transporters.

Third, these findings are particularly important in the context of how they help understand the big problem, and to do this will require the cooperation of many different scientists with many different spheres of expertise. For what is clearer than ever in this day and age of modern biotechnology is that the day of the "all american" scientist or physician who can be an expert in all things is gone forever.

Importantly, this same article points out explicitly that other researchers, primarily physiologists, will now have to conduct "the experiments that will reveal exactly how and why the flawed protein fails to perform its function properly." In effect, the subtitle states "Physiologists see

a wealth of research questions ahead," but, and I ask this very seriously, Will physiologists, properly trained to conduct these sort of studies, be available?? With the present pseudo elitist's academic environment that exists at so many institutions *it is not likely*. Indeed, this attitude is best exemplified by the comments of a chairman of a department of medicine at a well known academic institution. During the course of a faculty meeting, he strongly emphasized to all the division chiefs that the "tide was very strong and, everyone should channel *all* their scientific interests, training programs, and young, good talent to molecular biology." At which point my good friend of many years was prompted to say "do you mean to say that all those other problems *that were so important* only a few months or years ago have now all been solved?" At this, the chairman was compelled to respond "no, no, that certainly isn't true, but unless you are working on a very important problem, you should really think seriously about switching over to molecular biology."

Well, that wasn't quite good enough for the questioner. He had to retort "then, does that mean that if you choose to work in molecular biology, then you are free to work on any old problem, important or not?" We can only surmise that the conversation deteriorated. Nevertheless, the point was made. Do we choose our areas of endeavors based on current fads or on our notions of relevant and important issues?

This brings to mind another recent article that appeared in *Science*, it had nothing to do with biology, but it did emphasize how Raymond Jeonloz was making tremendous advances in understanding the physics of earth's internal core. What struck me was the short legend under his picture that read "Thomas Ahrens of CalTech was quoted as saying about Jeonloz, "He's very bright, but a lot of people are bright! His most important attribute is that he picks *very important problems and works on them very hard.*"

Isn't this, after all, the real bottom line. Let's all work toward that most important motto for all our students. "Within your domain of interest and expertise, choose the most *important* problem and work on it very, very hard! And, if you use the very best tools and approaches that have been made available by modern science, then that is all *that anyone can ask or expect*. And, it's *o.k.* if everyone isn't a molecular biologist."

*Most importantly, we should not attempt to mold all*

faculty, all physician scientists, and all fellows and graduate students into one pattern. It can't be done, and we will fail miserably. On the one hand we will discourage and disenchant many bright, young minds that simply have inclinations in other directions. Furthermore, we will be irresponsible by failing to provide the balanced scientific pool capable of solving problems at many different levels. Perhaps the most unfortunate consequence is that many bright, talented individuals, especially the physician scientists, will simply bow out of scientific endeavors all together. For if the greatest freedom of the scientist, the freedom to work on problems that are most intriguing, is taken away, then one might as well go make more money doing something else. That is already happening now. And, if it continues, we are to blame for the absence of well-trained physiologists in the 21st century.

These considerations raise important issues we as individuals, as chairpersons, and as an organization must address.

Are we physiology chairpersons prepared to be "trend setters" or will we be content to be "camp followers?" Are we going to follow the developing patterns and simply establish made-over departments of biochemistry, or do we want to subserve a unique role in the overall research sector? The unique role of being able to emphasize functional biology that, by any other name, is still *physiology*.

Are we preparing to forge ahead into those biotechnological areas that others do not want or that may not be in vogue right now?

So, in essence, it is *not* a controversy of integrative versus reductionist's approaches to science. After all, we as scientists, in general, and physiologists in particular, are supposed to be characterized by independent thinking, healthy skepticism, and logical approaches to the scientific issues.

These attributes flourish in an environment characterized by modern scientific approaches using the best technology available.

Thus, it seems we should refocus our attention on the fundamental issues such as understanding the importance of the problem and determining the most direct manner of addressing the issues. The malady that is attempting to infect our scientific community is that there are those that *insist* you *must* address the issue—any issue—with the techniques and approaches *they* deem most important and innovative. Yet surely we all know that all questions and issues are not created equal or alike. What works for one problem may not work for the other. So, ultimately, we must be creative enough to recognize, just as always, it takes many different investigators working on multiple facets of the problem, at several levels, to provide a better understanding of the questions and, indeed, to provide the answers.

Let us all work together to establish an ambience of cooperation and mutual respect for one another's strengths and viewpoints, so we can enter this next decade with a more mature attitude about the role of the physiological sciences in this universe of scientific inquiry.

## Portraits of A Partnership For Life

*Portraits of a Partnership for Life: The Remarkable Story of Research, Animals & Man* is a 48-page publication that combines factual information about the use of animals in research with the personal reflections of individuals whose lives have been affected by animal research. These include actress and singer Gloria Loring, whose son has type-1 diabetes; sportswriter and editor Frank Deford, whose daughter died of cystic fibrosis; Jana Koch, whose 9-year-old daughter received a pacemaker shortly after birth; Robin Ford, a transplant recipient; and former olympic skier Jimmie Heuga, who has multiple sclerosis.

In addition, the publication presents statements in support of animal research by such prominent individuals as former US Public Health Service Surgeon General C. Everett Koop; actress Helen Hayes; Constance Horner, Undersecretary, US Department of Health and Human Services; Ethicist Father Philip Boyle; and US Senator Jake Garn.

*Portraits* is suitable for a lay audience, including high school students, and would be an excellent publication for distribution as an educational tool.

### Order Form

	Quantity	Unit Cost	Amount Due
<i>Portraits of a Partnership for Life</i> .....	_____	\$5.00	\$ _____

Please make checks payable to:  
 Foundation for Biomedical Research  
*Prepayment Required*

Please return completed order form to:  
 Foundation for Biomedical Research  
 818 Connecticut Ave., NW, Suite 303  
 Washington, DC 20006  
 (202) 457-0654

Name/Title: \_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Phone: \_\_\_\_\_

\*Please duplicate form for additional orders.