Physiology: found in translation

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EVERY YEAR, THE 12 SCIENTIFIC sections of the American Physiological Society each select a physiologist prominent in their scientific domain to deliver a distinguished, named lecture at the Society’s annual meeting (Experimental Biology). In 2011, the Environmental and Exercise Physiology section chose Michael Joyner, MD, from the Mayo Clinic for this honor, named the Edward Adolph Lecture.

Joyner’s lecture appears in this issue of the Journal of Applied Physiology (3) complementing his related narrative that recently appeared in the Journal of Physiology (4). He used this occasion to continue to promote the importance of the discipline of physiology, not just as a discipline that has delivered huge advances in understanding, diagnosing, and treating human and other animal disease, but as the cornerstone of what is currently the major biomedical research push—translational research. Simply put, physiology and physiological research remain the essential links between genes and clinical care. Translational research just cannot be accomplished without physiology.

Joyner provocatively contrasted the relative failure (to date at least) of the molecular revolution of the past 30 or so years to deliver on its own promises of cures, against the successes of physiology. Whether you buy Joyner’s stance or not, there is no question that the genomic revolution has had a major effect on the discipline of physiology. In many ways it has been a double-edged sword. The enormous impact of two editorial in 1987 [by then Director of the (NHLBI), Dr. Claude Lenfant, and Director of the NHBLI Lung Division, Dr. Suzanne Hurd] in the American Review of Respiratory Disease (1, 2) technically still promoted a balance between physiology and molecular biology, but clearly suggested that investigators wishing for research support through NHLBI had better get molecular, was but one blow to physiology that has since led to the disappearance, reorganization, and/or renaming of many former departments of physiology around the world; especially in the USA and UK. We have come dangerously close to losing the foundations of physiology as the masters who built those foundations have been lost. It was then ironic, to say the least, when Lenfant himself later complained that the molecular revolution had not so far produced adequate results, when he concluded (5): “Enthusiasm for gene-centered medicine is contagious, and I am certainly not immune to it. In my view, however, the fundamental issue remains the same. Enormous amounts of new knowledge are barreling down the information highway, but they are not arriving at the doorsteps of our patients.”

There is, however, light at the end of the physiological tunnel that is not the headlamp of an onrushing train: The molecular revolutionaries have started to recognize the need for a partnership with physiology. Increasingly, they are coming to those few physiologists left and asking for help in studying the significance of their genetic and genomic discoveries. They have even invented a new discipline “Systems Biology”—which of course is physiology. To this point, systems biology mostly addresses the interactions among genes to produce functional effects within cells. This will eventually build into larger and larger units of structure and function, and one day, we will proudly know that handshaking between molecular biology and physiology was the key research community transformation that advanced our ability to diagnose and treat disease. Physiology cannot do it alone, and molecular biology cannot do it alone.

While there is light at the end of our tunnel, remaining passive about our discipline and waiting for reductionists to knock on our doors may not get us to the end of that tunnel. We think we are in a period of incredible opportunity for physiology, precisely because of the genomic revolution and the resulting push for translational research—but we have to get the word out beyond our own ranks. We just have to become individually and collectively much more active in explaining the importance of our discipline to the rest of the world. As we all know, that is better done with data than with table banging. This has been recognized for some time, and both the American Physiological Society in North America and the Physiological Society in the UK have been and will continue to be active in meeting with funding agencies and political decision-making bodies to explain the importance of the discipline through examples. Equally importantly, we have, and will continue to, put a lot of societal energy and resources into what we call the “pipeline”—the physiologists of the future who are currently in primary school, secondary school, college, or university. They and their teachers need to be exposed to more physiology and thereby become excited by it. In this way, we can play a major role in ensuring the future of the discipline and, as a result, in translating basic discoveries into clinical care.

We just cannot let this unique opportunity slip by and thank Dr. Joyner for his provocative thoughts and timely encouragement. This should be a great springboard to a call for action to all physiologists, wherever you live and work. We need you to promote your discipline, not hide it. We urge you to speak to your local and national politicians and funding agencies about how physiology is essential to successful translation of molecular discoveries. We urge you to visit schools and colleges to promote and maybe even help teach physiology. We urge you to rebrand your Departments of Everything-But-Physiology back to Departments of Physiology. And most of all, we urge you to partner with those molecular biologists (and

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systems biologists) who are now in need of your scientific expertise, without which translation will not happen.

REFERENCES