

## **Fostering Biological Engineering**

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Medical and biological engineering—the phrase is beginning to catch on. It took quite a few years for AIMBE to accept the biological engineering part of this phrase, but right now it is drifting in the right direction. There is a lot of overlap between the two, and it should be part of AIMBE’s mission to educate the world that we are not representing two fields, but one. Medical engineering really is what most of us routinely call “biomedical engineering” when we speak of engineering applied to human health care delivery. As such, it is an applications discipline, specifically directed to the particular use of human health. Biological engineering is the more generic term, an engineering discipline based upon the science of biology with many possible applications. As such, it is a science-based discipline. So, medical and biological engineering represents an engineering discipline that rests upon the science of biology with its major application in human health care.

And now the first disclaimer: I have been around long enough to know that there are those who have other definitions for all of these terms, and others besides. So, it wouldn’t surprise me if a few of these grab my lapel when they see me and point out the errors of my ways. I shall not be moved.

Now permit me to suggest how AIMBE can assert leadership in the field of medical and biological engineering, and that is to promote the message that these two are one and are inseparable in the holistic view of human health.

Take the National Institutes of Health, for instance. NIH, with “Health” in its title, really is concerned with restoring health, not guarding it or maintaining it. But

health to the vast majority of Americans is maintained through adequate diet, sanitation, and exercise. Sure, there are millions who contract disease, suffer traumatic accidents, or are prone to genetic weakness. But, there are hundreds of millions of Americans who don't because they eat healthy food, have flush toilets, and move around a bit. We have gotten so inured to these commonplace things that we take them for granted. When a few of us get sick or die from tainted spinach, it's a big deal. When the toilets don't flush, we are quick to show disgust. When we don't exercise enough, we all become fat ("obese" is the acceptable euphemism), and throw our hands up in resignation.

Yet, as dependent as the health of this nation is on nutritious food and clean water, the National Institutes of Health barely notice. If there isn't a named disease, there is scant attention. AIMBE should act to fix that.

Looking at the other side of the coin, the United States Department of Agriculture and the Environmental Protection Agency both give some recognition to the importance of their activities to maintain human health. USDA sponsors human food nutrition research and EPA regulates pesticide use on human food. AIMBE needs to support these agencies and help the public realize their importance.

Making a more nutritious steak is not nearly as glamorous as allowing a disabled person to walk again or as restoring sight to the visually impaired. But glamour and rock-steady dependability do not easily walk hand-in-hand. AIMBE can help people realize that there is importance in the seemingly mundane, and a great, big payoff for those who contribute to keeping people out of hospitals.

There are volunteers in the AIMBE organization who apparently still do not know that biological engineering includes applications remote to human medical care. Recent

Fellows nominations have been rejected because the nominees' activities were not closely enough related to biomedicine. There was no indication that nominees' credentials were searched for substantial and continuing activity relating engineering to biology. AIMBE still has a lot of education challenge in-house.

Why can't a biological engineer working with biofuels be an AIMBE Fellow? Why not someone who works to remove nitrates from groundwater? Why not a protector of exotic species? Why not someone who develops biomimetic adhesives (as Geckos use to climb walls)?

Now the second disclaimer: although I have strongly advocated the biological engineering side of MBE, my own teaching and research has been more biomedically oriented. I have taken the positions I have because I believe enough attention has not been directed to biological engineering and that biological engineers deserve more recognition than they have gotten. I believe that looking at the whole system has advantages for understanding, and biological engineering, at least as far as I understand it, gives an opportunity to look at the entire system.

Several years ago, AIMBE gave special recognition to Dr. Norman Borlaug, the father of the green revolution. Because of the work of Dr. Borlaug, more people in the world are eating healthy food. AIMBE could follow up this recognition by establishing an award to honor those whose MBE activities have helped to keep us safe and healthy every day, day in and day out. And, with such an award could come press releases that tell of the overwhelming successes that such people have had to keep us safe and well. Now that's a message all should hear.