

Where Do You Get Your Technical Information?

Arthur T. Johnson

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Biological engineering has often been described as multidisciplinary. I really would rather see it described as a single, distinct discipline of its own, but so broad that it needs to connect with many other scientific, engineering, and even some non-technical fields. No matter what you call it, biological engineering is broad, and its practitioners do need to keep up with advances in many directions that are coming at a very rapid pace. I can think of no more interesting and exciting work these days than the new discoveries about the workings of the brain.

The challenge for us teachers of biological engineering subjects is to keep current with all this new information in many fields often peripheral to our own research. I have found that what works best for me is to read (continually!) articles that summarize, explain, and connect sundry scientific advances, each of which has been the subject of its own published paper. Thus, journals such as *Science* and *Nature*, I have found, do not well serve my needs.

Instead, there are some publications that, more times than not, give me the information in the form that I need. First among these is *American Scientist*. There is no better source of information in the context of perspective than in this journal. The articles seem to be written at just the right level: to those of us who are scientifically literate, but unfamiliar with the details of specific areas of research. *American Scientist* articles are well-explained and interpreted, so that I can use that information almost immediately in my classes. *Scientific American* is similar, but does not fit my needs as well.

For general advances in technology, the *MIT Technology Review* is good, although it doesn't give me the interpretations and perspectives that I need. Its articles do not give enough depth of information nor explain how the information that is presented fits with other knowledge.

For information about basic biology, and especially cells and genetics, *HHMI*, a publication of the Howard Hughes Medical Institute, does a fine job. Its articles focus on individual Howard Hughes Medical Investigators and the work that they do. Interviews with the researchers result in both explanations of their progress plus perspective about why it is important.

The popular press can be helpful. The *Baltimore Sun* frequently has short articles extracted from scientific papers published elsewhere. Reading these can alert me to advances that I perhaps had not been aware of and need to be. I then go to the original cited source for the details. Interestingly, however, the *Sun* article is often more useful for judging the importance of the research findings. *Time* magazine has had a set of very informative special issues about specific scientific advances. There was one recently about the workings of the brain, of the mind, and what constitutes consciousness. Other issues have dealt with evolution, astrophysics, and biomimetics. These articles are very well written and amazingly scientific in their tone. Written for an audience of broad background, they are instructive in style yet not devoid of hard scientific findings.

I have also found *Popular Science* to be useful. It was in this publication that I first read about synthetic biology and about the use of random processes as a design tool. There is a lot of filler in *Popular Science*, so its use for me is not as great as some of the

other publications I read, but when I find something useful, it is a gem that usually is not found anywhere else that I look.

For information about agriculture, food, and environment, *California Agriculture*, published by the University of California system, and *Agricultural Research*, published by the USDA Agricultural Research Service are very good sources. Articles in these two are light reading, but written for a broad audience, and so can alert me to scientific advances with a practical flavor.

Because I keep sheep, I also read *The Shepherd*, a sheep industry journal. Included frequently are articles on nutrition basics, workings of the immune system, and other practical, but fundamental, issues. *The American Bee Journal* has also helped fill voids in my scientific knowledge base, as does *Good Fruit Grower*.

There are publications from universities that I sometimes find useful. The University of Illinois School of Engineering used to have one of these (I cannot remember its name) and the University of Georgia has the *UGA Research Digest*. Articles in these issues usually take the form of interviews with local faculty members, and I often get useful information from them.

American Heritage of *Invention and Technology* is a good source of information, not for the newest advances, but for the history of technology. I have found the articles normally very interesting and fun to read. Topics range from the building of the interstate highway system, to bringing water to Los Angeles, to development of artificial organs, to steamships, to development of the sewing machine. Virtually no type of technology is left out, and there seem to have been more articles recently concerning biomedical technologies.

I do read my share of scientific and engineering journals, but these are not enough to inform me of what is going on in the wide-ranging scientific specialties that I feel I need to know about. The same can be said for the internet. Yes, there is a lot of information on the internet, but if you don't know the topics to search for, then this information is largely useless. I let these other publications alert me to the need to investigate a topic further.

So, you can appreciate the amount of reading I do, and it is reading directed to the goal of keeping me abreast of everything. That's not an easy task, and I sometimes am asked a question in class, or some student brings to my attention some new fact of which I had not been made aware. But, given my diligence, the situation is almost always the other way around. I take it as a personal challenge to be as knowledgeable to things relevant to biological engineering as possible, and this is how I do it.

So, do you have a different approach or different publications that you have found useful? If so, I'd like to hear from you. Where do you get your information?