

GUEST EDITORIAL

The March of Science

1994 marks the centenary of the birth of Norbert Wiener, a prolific and original mathematician and philosopher, who coined the term “cybernetics” to characterize the similarities of, and potential synergism between, humans and machines—the latter exemplified by the computers and servomechanisms of the 1940s and 1950s, which he observed during his long tenure on the Mathematics Department faculty at the Massachusetts Institute of Technology.

As I was to learn when I was asked in the mid-1980s to comment on his thin but prescient writings in this area (1), Professor Wiener envisioned his cybernetics as applying to issues of rehabilitation. He speculated on a limb-replacement prosthesis controlled by the brain of the amputee and was engaged in a project to present speech to deaf persons via vibration on the fingers.

As a Mechanical Engineering Department faculty member and design engineer, I was embarked serendipitously on a parallel path. I was exploring other applications of my missile power supply R&D of the 1950s (2), including external energy sources for servomechanism-driven joints in amputee prostheses (3).

The defining event of our confluence of interests was Professor Wiener’s accident (a broken hip) in 1962, which put him in the Massachusetts General Hospital where our endeavor (the Boston Arm project) crystallized. My Master’s degree candidate, Ronald C. Rothchild, conceived and implemented in a brilliant thesis an electronic, electrical, and mechanical realization of an above-elbow prosthesis (4).

Several design iterations later, the Liberty Mutual Insurance Company was fitting the limb, with some 500 applications to date, and the Boston design was complemented by the Utah Arm developed by my M.I.T. Ph.D. student, Stephen C. Jacobsen, enabling 750 above-elbow amputees.

I later learned that improved prostheses had not only been a goal in the post-World War II U.S.A., but also during the height of that conflict in Nazi Germany, a muscle-signal controlled hand (using electronic vacuum tubes!) had been developed, the precursor to the Russian Hand demonstrated in 1960.

Pasteur is reported to have noted “chance favors the prepared mind.” While my student and I had studied the possible application of our missile power knowledge to prostheses, and by that time I had



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enjoyed several years of R&D to help ameliorate blindness (5), it was the happenstance of Professor Wiener’s injury that thrust me into real musculo-skeletal products. The march of science is not the orderly linear progression some would make it out to be. And wouldn’t Professor Wiener be delighted by the advances in assistive technology that have burgeoned during these past four decades!

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REFERENCES

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4. Rothchild RD, Mann RW. An EMG controlled, force sensing, proportional rate, elbow prosthesis. In: Proceedings of the Symposium on Biomedical Engineering, Milwaukee, WI: Marquette University, Vol. I, June, 1966:106-9.
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LETTER TO THE EDITOR

To the Editor:

Many thanks for this great honor and opportunity, especially for Vol. 31, No. 3, edited by my old friend, Ernest M. Burgess, M.D.

But now, I am an old man, and you should cancel my name. But your publications have been a great help during my professional life.

Sincerely yours,

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The Editor Replies:

It was such a pleasure to hear from you and to know that you have been reading the *Journal* for so many years. I contacted Ernest M. Burgess, M.D. and Hans Richard Lehneis, Ph.D., both of whom have been Guest Editors of past issues of the *Journal*, as well as members of the Editorial Board, sending each a copy of your message to me. All three of us cannot accept your thinking of yourself as an "old man" knowing full well that you are still called upon professionally in an Emeritus capacity by people from all over the world, and asked for your expert opinion relative to management of persons with amputation.

We have not removed your name from our mailing list or from our minds. We would be pleased to receive critiques from you of some of the printed papers published in the *Journal*, which we could relay to the authors, and perhaps publish. Both the *Journal* and the authors would be extremely appreciative of, and interested in, your views. Thank you, Dr. Marquardt.

Tamara T. Sowell

Editor