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JRRD Guest Editorial

New directions in research bring new clinical challenges

Sputnik! On October 4th, 1957, Russia launched the first satellite into successful space orbit. I was 13 years old and remember how that event rocked America. Between playing ball and riding bicycles, my friends and I were enjoying the pleasure of watching the older boys hot rod their old Fords and Chevys. Listening to the sweet sounds of Hollywood pipes sing their songs as two and then three carburetors made engines wind faster and faster. Then Sputnik. Our technology was trashed. Three deuces, dual quads, three-quarter cams, headers—all were just junk next to the realization that someone had succeeded in putting a spacecraft into orbit. It was demoralizing. America did wake up. We entered a new era of investing heavily in engineering and technology. We also started to understand that developing a technology for one application (say, space travel) did not limit the application. Technology developed for space, industry, or weapons was not orphan to where it could be applied. Transfer of technology became more commonplace. It took another seminal moment for rehabilitation to get into the game. In December 1963, the news of the Russian Arm took center stage. By that time, I was a college student heading for a career as a prosthetist. The Russians did it again. Here we were, convinced that our ability to develop and produce medical devices was unsurpassed, yet we were trumped once more. They had done it: developed a prosthetic arm that used myoelectric signals from muscle to control an electronic hand. That one shook the rehabilitation world. We had publications like *Artificial Limbs* from the National Academy of Sciences and the *Bulletin of Prosthetics Research* (*BPR*) from the Veterans Administration disseminating information on newer plastics applications, unique personal fittings, and some hydraulics, but nothing like what the Russian Arm had done. Playing catch-up is no fun. I am not disparaging the Russian achievements, and today's environment of cooperation is much different than 1963. But give me some latitude for a sense of national pride and competition to be the best and the first. After all, those feelings are part of what drives everyone on this planet. We all benefit from that competition. Remembering those days brought me to work on this issue of *JRRD*, the prodigy of *BPR*.

When I began developing the contents for this issue, I did not focus on current clinical practices, fabrication techniques, surgical options, and rehabilitation protocols. Many other publications already do that. My goal was to not only shed some light on where we are but also to put into print some forward thinking in order to stimulate many in research, perhaps unrelated, to become involved in this fascinating work. Along with that thought was the knowledge that as new devices and technologies are developed, clinicians will be challenged to apply them. After all, we do not ever want to play catch-up again. With only that concept in mind, I approached our Editor,

Dr. Stacieann Yuhasz, and made my pitch. She enthusiastically accepted. Confession is good for the soul, and I must admit that I was unsure how much cooperation I would find in the existing research community. Frankly, I was not sure that enough work was even being done to be worthy of a dedicated issue. You see, I am a practicing prosthetist—a clinician whose daily work involves implementing the tools that are currently available. So, like the sailor who is about to embark on a journey into unknown waters, I had cast the lines and left the comfort of the familiar.

Clinicians often complain that research is not relevant to practice. The projects are too esoteric, too futuristic, and only being done to satisfy the researchers or to finance their institutions with grants. That academic scientists who govern research have no interest in developing "real world" solutions is a common lament. I discovered those beliefs are simply not true. My journey led me to realize that many more research projects are in progress than I had ever imagined. I was delighted that conversations clarified the desired clinical benefits of the research. The degree of cooperation between institutions was also an eye-opener. As interviews ended, often a referral was made to yet another project in a different institution: from the University of Washington to Northwestern University to the Massachusetts Institute of Technology to Scandinavia, and so it went. The course was laid, with each encounter leading to the next.

Those of you looking for articles on the development of hardware for use in prosthetics will not find them in this issue. First, that was not the goal of the issue; second, that is where I found the most resistance. Regardless of public or joint public and private investment in the research, these projects are held tight to the vest until the proper patents are secured. I can only say that there are many, they are exciting, and their unveiling will occur based on market forces, not the desire for public information. The use of public funds for private gain has been an ethical argument for decades. Clearly, it will remain a debate.

The field of external limb prostheses has significantly advanced in the past 40 years: the materials we use, electronics, hydraulics, pneumatics, surgical techniques, and applications of biomechanics. All of these advances have positively affected the day-to-day lives of the patients we serve. This is all good, but it pales to what the research has for us on the horizon. What is more significant is the pace at which the change will occur. This will require commitment on many levels.

Clinicians, beware. I met Kathleen Yancosek when she was in command of the occupational therapy department at the Walter Reed Army Medical Center. She provides us with some insight into the world of occupational therapy with her comments in this issue (p. xi). When an upper-limb loss occurs, occupational therapists are expected to provide the training necessary to return that person to function with and without a prosthesis. Like most occupational therapists, Katie had little exposure to upper-limb prostheses. When wounded warriors began to return from Iraq and Afghanistan with upper-limb loss, she had to learn on the job. For prostheses, she had to rely on the prosthetists to explain how several of the prostheses functioned. Her story is not unique. Neither is it unique that physical therapists, surgeons, and rehabilitation physicians have little training in prosthetics. No doubt exists that this lack of training will not be satisfactory in the future. The prostheses of the future will require more coordinated input across professions. We have all recognized that a multidisciplinary approach is necessary to successfully rehabilitate persons with limb loss. Applying that approach will require more specialty training.

Think of it: prostheses attached directly to bone, multiple joints all coordinated with microprocessors, speed and force infinitely variable, monitoring systems that predict future movements, gait tuned by computer analysis, sense of feel, balance enhancements, and transplants. All are possible, and all are right at our doorstep. Can you honestly say your profession has the training to select and apply the appropriate technology for each individual? Education across the clinical specialties will need to meet the challenge for the successful application of these new developments. We are fortunate to have the challenge. This is all for the good. The

veterans and general populations we serve will all benefit.

My sincere hope is that you find inspiration in this issue. If you are involved in research, my wish is that you are challenged to do more. If you are an educator, I ask you to develop the training required. If you are a clinician, I challenge you to apply the technology presented as it emerges. If you are a person with limb loss, I trust you will benefit from all of our efforts. Enjoy!

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