

## SWING PHASE CONTROL—FROM FLUID MECHANICS TO MICROPROCESSORS

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The topic matter of “Properties of fluid flow applied to above-knee prostheses” is as relevant to the design and operation of prosthetic knees today as it was 50 years ago when it was published in *JRRD* (i.e., *Bulletin of Prosthetics Research*). The property of swing phase control—damping that is provided in some prosthetic knee units to modulate the period of swing—is important for enabling above-knee prosthesis users to walk at variable speeds. The article by Staros and Murphy is a comprehensive primer on fluid dynamics for clinicians who would prescribe, fit, and evaluate mechanical fluid-controlled knee units, covering important principles on how different hydraulic and pneumatic mechanisms operate. At the time, skilled clinicians were required to be mindful of numerous details about fluid-controlled knee units in order to appropriately adjust and evaluate the components and provide prosthesis users with optimal function.

Today, with the advent of microprocessor-controlled prosthetic knee units that are designed to modulate swing phase control, much of that burden is assumed by the knee unit itself. While prosthetists are still required to know fundamental principles about fluid-controlled prosthetic components to perform successful fittings, confidence can now be placed in the “smart” processing units for ongoing fine-tuning of the systems while the user walks with them. Operationally, the computer-controlled knee units today are similar to those mechanical units from decades ago. However, even broader ranges of walking speeds can be attained by prosthesis users walking with these knee units because of the constant monitoring and adjustments to swing phase control. Additionally, more sophisticated functions can now be imparted by microprocessor-controlled knee units, such as improved stumble control during swing phase. Today, numerous publications attest to the superiority of microprocessor-controlled knees compared with their mechanical counterparts. More importantly, these advancements in technology over the past 50 years have greatly enhanced patient care, enabling prosthetists and other caregivers to focus less on the intricacies of the prosthetic componentry and more on the rehabilitation and well-being of the prosthesis user.

