Editorial

Larry A. Taber¹

Received: 17 February 2016 / Accepted: 18 February 2016 / Published online: 11 March 2016
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Keywords New EiC

It is my honor to introduce Dr. Peter Hunter as the new co-Editor-in-Chief of *Biomechanics and Modeling in Mechanobiology* (BMMB). Dr. Hunter is Director of the Auckland Bioengineering Institute and Professor of Engineering Science at the University of Auckland. He also is Director of Computational Physiology at Oxford University. For decades, he has been a foremost leader in computational modeling of physiological systems and has played a major role in the creation and success of the Physiome Project of the International Union of Physiological Sciences.

As my replacement, Dr. Hunter has joined Dr. Gerhard Holzapfel, who is continuing in the same capacity. Drs. Holzapfel and Jay Humphrey founded BMMB in 2000 and have worked tirelessly to build BMMB into a top journal in the field (impact factor 3.145 in 2014). It has been my pleasure to serve alongside Dr. Holzapfel during the last 5 years. I am extremely grateful for the opportunity.

During my tenure with BMMB, I watched the field of mechanobiology grow and evolve at an accelerating rate. A field that began as largely a qualitative science has blossomed into a rigorous quantitative discipline that fosters integration of experiments and computational modeling. Studies that used to involve mostly biology with a little engineering now often include biology and engineering on an even footing. Realizing the need at the time to elevate mechanobiology to the level of biomechanics in considering the fundamental equations of mechanics, Drs. Holzapfel and Humphrey decided to include “modeling” in the title of their new jour-

nal. Mechanobiology now is the primary focus of BMMB, although it continues to publish high-quality papers in biomechanics.

The difference between the terms “biomechanics” and “mechanobiology” may remain somewhat unclear to some, and there is no universally accepted definition. Here, as one of several possible options, I offer the following. *Biomechanics* is the study of the *mechanical response* of cells and tissues to loads, whereas *mechanobiology* is the study of the *biological response* (actually mechanobiological response) of cells and tissues to mechanical loads. Problems in biomechanics often involve only passive behavior, but can include active processes (e.g., muscle contraction). On the other hand, problems in mechanobiology typically involve active behavior (e.g., growth, remodeling, and morphogenesis). Mechanotransduction and functional adaptation are important aspects of the field of mechanobiology. According to these definitions, bone fracture is biomechanics and fracture healing is mechanobiology.

The field of biomechanics dates back at least several hundred years to the time of Leonardo da Vinci and Galileo Galilei, while mechanobiology may have originated with ideas concerning functional adaptation proposed in the 1800s by Wilhelm Roux and Julius Wolff. With Y.C. Fung leading the way, interest in biomechanics and mechanobiology began to accelerate during the 1960s and 1980s, respectively. In fact, many consider Professor Fung, who wrote a forward to the very first issue of BMMB, to be the inventor of tissue engineering, which is an outgrowth of mechanobiology.

In my view, the field of mechanobiology is now approximately at the stage where biomechanics was during the 1980s, when it really began to mature as a discipline. Progress in both fields follows increases in computational power and technological innovation. Among the many challenges for the future, I mention two. First is the need to bridge multiple

✉ Larry A. Taber
lat@wustl.edu

¹ Department of Biomedical Engineering, Washington University, St. Louis, MO, USA

spatial scales both experimentally and computationally, from the molecular level to the tissue and organ level. With some targeted NIH funding, this problem has enjoyed an uptick in interest, but significant gaps remain in our ability to link scales. The second is the need to integrate mechanics with biochemistry and genetic activity. Significant advances are being made in this area at the cell level, but this problem is in its infancy, especially at higher scales. These challenges are immense and likely will take many decades to solve,

but only then can we have complete understanding of these highly complex problems.

I wish Drs. Holzapfel and Hunter the very best as BMMB continues to serve as a leading venue for reporting exciting research that advances the fields of biomechanics and mechanobiology. It will be interesting to watch how these fields grow and adapt to changing conditions (so to speak) in the future.