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A Tribute to Shu Chien's Scientific Achievement

This issue is dedicated to the scientific achievement of Professor Shu Chien on the occasion of his 80th birthday. The title of this issue is "Mechanobiology: a Tribute to Shu Chien's Scientific Achievement." Certainly, Shu Chien has made enormous contributions to our understanding of the role of mechanics in biology, in particular as it pertains to the vascular system. His contributions, however, go far beyond vascular mechanobiology as will be discussed in this preface to this issue.

To start with, Shu Chien was born 80 years ago in Beijing, China. His early education was in what is now the People's Republic of China. This includes his premedical studies at Peking University. He then moved to Taiwan, and his M.D. degree was obtained in 1953 from the College of Medicine at National Taiwan University. In 1954 he moved to Columbia University in New York where he did his Ph.D. studies, receiving his degree in 1957. Following his Ph.D. Shu Chien joined the faculty in physiology at Columbia University, starting as an Instructor and being promoted to the rank of Professor of Physiology in 1969.

Early in his academic career Shu Chien became involved in studies of blood rheology and the microcirculation. This ultimately led to his befriending Professor Richard Skalak, an engineering professor at Columbia University. These two friends forged a real intellectual partnership, and the first journal article that they co-authored was published in the early 1970s in the journal Biorheology. Although Shu Chien collaborated and published with many others, this friendship and partnership with Richard Skalak was critical in shaping his thinking. These two, Shu Chien and Dick Skalak, together with their collaborators including students, made a major impact on the field of bioengineering. Although most of their time together was at Columbia University, in 1988 they moved to the University of California, San Diego (UCSD), being recruited by Professors Y.C. Fung and Benjamin Zweifach. There they continued their collaboration and friendship until the passing of Dick Skalak in 1997.

It was in the mid to late 1980s that Shu Chien turned part of the focus of his research to vascular endothelial biology, with the first publication in this area of research appearing in 1988. It was the entry of Shu Chien into the study of vascular endothelial biology and the continuing contributions he has made in the last 20 years that has firmly established Shu Chien as a leader in mechanobiology. He has continued to be at the forefront, and his studies over the years have involved the investigation of the various influences of different types of mechanical, i.e., physical force, environments on cell behavior. These have focused on a range of cellular responses including the cytoskeleton, gene regulation, and signaling mechanisms.

Throughout his career he has not only been at the forefront of the field intellectually, but a prolific individual. This includes more than 500 publications in peer-reviewed, archival journals, 11 books, and more than 50 book chapters and conference publications on science policy, public affairs, and other more general topics. This includes six tributes to others in the life science field.

Because of his scientific achievements, Shu Chien's career has been intertwined with the evolution of bioengineering as a separate engineering discipline, one that integrates the science of biology with engineering. At UCSD he was the founding chair in 1994 of the Department of Bioengineering. He actually has served two terms as chair, 1994–1999 and 2002–2005. His impact in California, however, has been beyond UCSD. Within the University of California system he is University Professor of Bioengineering and Medicine, having been appointed to this position in 2002. This was followed in 2004 with his appointment as the Director of the University of California System Bioengineering Institute of California, with his continuing to serve in this position. He also is at UCSD the Y.C. Fung Professor in Bioengineering and the Director of UCSD's Institute of Engineering in Medicine.

Nationally, Shu Chien has been active in a number of scientific societies. This includes serving as President of the following ones: the Microcirculatory Society (1980–1981), the American Physiological Society (1990–1991), the Federation of American Societies for Experimental Biology (FASEB) (1992–1993), the American Institute for Medical and Biological Engineering Society (2000–2001), and the Biomedical Engineering Society (2006–2008). Internationally he has also been at the forefront providing leadership. This includes being President of the International Society of Biorheology 2005–2008. He was chair of the 2005 International Congress of Biorheology held in Chungqing, China and also chair of the organizing committee for the International Congress of Physiological Sciences. This year Shu Chien is the honorary

Chair of the 7th Congress of the Federation of Asian and Oceanian Physiological Societies.

The above leadership activities are the result of Shu Chien's scientific achievements and his demonstration of being an effective leader. As a result he has more than 100 honors and awards. He is one of only five individuals who is a member of the National Academy of Sciences, the National Academy of Engineering, the Institute of Medicine, and the American Academy of Arts and Sciences. He also is a foreign member of the Chinese Academy of Sciences in Beijing and the Academia Sinica in Taiwan. Just recently President Barack Obama awarded Shu Chien the National Medal of Science, an honor for him that is extremely well deserved.

As part of this tribute to Shu Chien and the celebration of his 80th birthday, it also is important to celebrate the 80th birthday of Shu's wife Kuang-Chung Hu Chien, or K.C. as she is known in the community. K.C. is also an M.D. and the partnership of Shu and K.C. has been a strong element in the success of Shu Chien. K.C. has been a true and important partner in all that Shu has achieved.

In closing, Shu Chien has truly followed what the poet Ralph Waldo Emerson once said, "Do not go where the path may lead, go instead where there is no path and leave a trail." In doing this he has left a trail for all of us and for our community. He has made enormous contributions to science and to mechanobiology, and he is a world leader in bioengineering and in physiology. He has been at the forefront of the development of bioengineering as an academic discipline both in the U.S. and internationally. He has mentored many students who have become leaders in the field and he has collaborated with many others.

It is thus appropriate that this issue of this journal be a tribute to Shu Chien the scientist, Shu Chien the leader, and Shu Chien the person. Our knowledge of mechanobiology and the development of bioengineering as a discipline is what it is today because of the contributions of Shu Chien. Thus, this preface and the articles within this journal issue are not only a tribute, not only a happy birthday greeting on the occasion of his 80th birthday, but a celebration of the achievements, the life, and the person Shu Chien.

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