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Editorial

EDITORIAL

A Journalistic Break Through

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This issue of *Function* will found a journalistic effort aimed at resolving a long-standing challenge of how to publish complex computer models and simulations together with the related experimental studies required for validation of these models. The studies by Lopez et al. "Impaired Myocardial Energetics Causes Mechanical Dysfunction in Decompensated Failing Hearts"[1] were based upon hypotheses developed from a multiscale mathematical model. Using this combination of computer simulation and experimental studies the investigators were able to integrate the mechanistic effects of changes of adenosine triphosphate, adenosine diphosphate, and phosphate levels with crossbridge kinetics, muscle dynamics, and whole-organ cardiac function observed in the failing heart. This combined computational–experimental approach significantly enhanced our mechanistic understanding of how changes of cardiac myocyte metabolism lead to the reduced contractility of the failing heart.

No one could deny the contribution of quantitative modeling to our mechanistic understanding of physiological mechanisms as illustrated in multiple fields of biology long ago by the likes of Poiseuille, Hodgkin-Huxley, and many others. However, biological and clinically oriented journals have long struggled with how to evaluate, present, and publish research that is laden with computational modeling and simulation. The reasons for this are well understood. First, most physiologists/biochemists/molecular biologists are not mathematically trained. Second, for those that are a rigorous and detailed exposition of computational models as complex as that employed by Lopez et al.[1] can easily overshadow the important experimental aspects of the study. Likewise, an evaluation of the rigor and fidelity of mathematical and computational aspects of analyses such as these can overwhelm a review process that should be primarily focused on the significance of the hypotheses and the credibility of the experimental results and conclusions. To relegate one or the other aspect of the study to an appendix renders a disservice to one or the other aspect of the science. If published in journals of bioengineering or mathematics or computer sciences, they lose the biological audience for which they were intended.

Our new journal *Function* has encouraged the submission of such models and upon receiving the first such submission was faced with the dilemma of how to do justice to both modeling and experimental elements of this work. Recognizing that our audience will be largely biological, we have developed a novel cross-cutting journalistic format which I believe represents a "journalistic break through." This was enabled by the close cooperation of the Editors of *Function*, the trust and support of the American Physiological Society's (APS) Publications Committee, and the leadership of the recently developed *Physiome* journal. The *Physiome* journal was launched in 2017 under the auspices of the International Union of Physiological Sciences (IUPS) to promote and support the adoption of technologies and workflow that improve the ability of scientists to discover computational models which are relevant to their work.

The way this works is as follows. The experimental studies will be reviewed by physiologists with an appreciation of quantitative approaches to complex biological functions (with full access to the underlying equations). At the same time, the underlying equations and computer codes will be reviewed by expert computational biologists selected by the editors of the *Physiome* journal. This cooperative agreement between the *Function* and *Physiome* journals requires that both the computational and biological aspects of the study be deemed acceptable by both parties prior to acceptance for publication in either journal. A great value that the *Physiome* journal brings to the field of modeling is that all publications must include a complete documentation of the computer model and software codes in a way they can be examined, modified, and run by anyone. This was driven by what has been a general lack of rigor and standardization in the area of biological computer modeling. This alone is an important step forward for all of us.

In brief, this cooperative publishing approach provides a unique electronic journalistic solution to a long-standing problem by enabling the parallel publication of the complex computational model with the associated experimental application of the model. The Lopez et al.[1] article represents the first such publication with all of the underlying equations, computer codes, and the associated data used for parametrization and computation of these models being made available.[2]

References

1. Lopez R, Marzban B, Gao X, et al. Impaired myocardial energetics causes mechanical dysfunction in decompensated failing hearts. *Function* 2020;1(2):zqaa018.
2. Marzbah B, Lopez R, Beard DA. Computational modeling of coupled energetics and mechanics in the rat ventricular myocardium. *Physiome* 2020. doi: 10.36903/physiome.12964970.