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EDITORIAL

Paul F. Cranefield Award to Anne E. Carlson

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The late Paul F. Cranefield, MD, PhD, was the editor of the *Journal of General Physiology* for 30 years, from 1966 to 1995. During his editorship, Dr. Cranefield worked tirelessly to advance the mission of the Journal—to promote and publish high quality original research that elucidates basic biological, chemical, or physical mechanisms of broad physiological significance and that provides insight into fundamental mechanisms that govern biological function at all levels.

When Dr. Cranefield stepped down as editor, the Council of the Society of General Physiologists created the Paul F. Cranefield Award to recognize his enduring contributions to the Journal and the Society and to carry on his vision of excellence. The award was to be given to a young, independent investigator who, in the preceding year, had published an article of exceptional quality in the Journal. The award would be given at the Annual Meeting and Symposium of the Society in Woods Hole, MA. It was also decided that the award would only be given to a candidate that met stringent criteria, with the result that it has not been awarded every year.

In 2019, the leadership of the Society selected Anne E. Carlson of the University of Pittsburgh for the Cranefield Award.

Dr. Carlson graduated with a BS from Carleton College and received her PhD from the University of Washington in 2006. For her thesis work in the laboratory of Dr. Bertil Hille, she investigated the role of CatSper ion channels, Ca^{2+} entry and adenyl cyclase in the activation of motility in mammalian sperm (Carlson et al., 2003, 2005, 2007, 2009).

Remaining at the University of Washington for a postdoctoral fellowship with Dr. William N. Zagotta, Dr. Carlson investigated the regulation of ether à go-go potassium channels and hyperpolarization-activated cyclic nucleotide–gated channels. In a series of studies, she screened chemical libraries and discovered novel small molecule regulators of gating for both channels (Brelidze et al., 2010; Carlson et al., 2013a,b).

Dr. Carlson joined the Department of Biology at the University of Pittsburgh in 2014 as an Assistant Professor and established her independent laboratory to investigate mechanisms of fertilization, for which she received the Cranefield Award. The award was given, in part, for her two recent companion articles in the *Journal of General Physiology* (Wozniak et al., 2018a,b), which were highlighted by an accompanying Commentary (Jaffe, 2018). In these back-to-back articles, Dr. Carlson addressed a central question about fertilization in amphibians: How is polyspermy prevented, such that each egg is fertilized by only a single sperm?

Photo courtesy of Anne E. Carlson.

It was already known that amphibians used an electrical, fertilization-induced depolarization mechanism to rapidly block subsequent entry of a second sperm to prevent polyspermy. But the identity of the key ion channels involved, and the mechanism of the transduction pathway, had not been identified in adult amphibian eggs. To address this, the Carlson laboratory combined the electrophysiologically tractable system of *Xenopus laevis* eggs with powerful complementary techniques. They used proteomic and RNA sequencing screens to identify candidate channels in the eggs. Next, using a series of carefully designed pharmacological tests in combination with two-electrode voltage-clamp recordings of eggs undergoing fertilization, they determined that (1) PLC activates Ca^{2+} permeable IP3 receptors in the ER, which leads to Ca^{2+} release from the ER and a rise in cytosolic Ca^{2+}, and (2) the rise in cytosolic Ca^{2+} activates the Ca^{2+}-activated

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Cl^- channel TMEM16A, which leads to Cl^- efflux and depolarization of the plasma membrane, causing the fast depolarization block to polyspermy.

Because of their scientific quality in elucidating a physiological mechanism of broad significance, these papers were deemed sufficiently important to merit the Cranefield award.

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