

Fertilization

Guest Editors

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David L. Garbers

This Special Issue of The International Journal of Developmental Biology is dedicated to honoring the life and work of David L. Garbers, a reproductive biologist of enormous stature who will be remembered by all because of his passion for science, good nature and humility.

Preface

There may be as many as 14 million species on Earth and approximately 99% of them reproduce sexually. By the late 17th century, naturalists, including R. De Graf, W. Harvey and A. van Leeuwenhoek, were aware that females produced eggs and males produced sperm. From the fundamental contributions of Th. Boveri, W. Cruickshank, H. Fol, O. Hertwig, E. Strasburger, E. van Beneden and K. von Baer, by the late 19th century it became known that "an essential phenomenon of normal fertilization is the union or close association of a sperm-nucleus, of paternal origin, with an egg-nucleus, of maternal origin, to form the primary nucleus of the embryo" (Wilson, 1925). The subject of fertilization continued to be of considerable interest to cell biologists into the 20th century. Notable among these were J. Loeb and F. R. Lillie who proved to be particularly influential in the early 1900s. Loeb (1916) was probably the first to state that "proteins" on gamete surfaces must dictate species-specific fertilization. Lillie argued that the interaction of sperm with eggs was analogous to that of immune sera with bacteria. His "fertilizin-antifertilizin" theory dominated fertilization research for about 60 years; it was hypothesized to be "of wide, if not universal occurrence" (Metz, 1967; Farley, 1982). In time, lack of hard experimental evidence and results of modern research bypassed this theory and it was laid aside.

The molecular mechanisms involved in fertilization remain unresolved fundamental biological problems. But there is great hope for future discovery and we are secure in stating that today fertilization research is alive and well. It employs all fields of modern experimentation, such as ion physiology, genomics, proteomics, molecular biology and, most recently, stem cell biology. In this context, it has been noted that "the *PubMed* database lists 46,203 publications on *fertilization*, of which 254 appeared during the decade 1950-1959 and 874 were published in 1960-1969, while in 2004 alone there are 2,022 citations" (Florman and Ducibella, 2006).

As documented in this Special Issue of *The International Journal of Developmental Biology*, fertilization research is an endeavor carried out on a variety of plants and animals by investigators addressing the subject with different goals, perspectives and experimental approaches. Fertilization research is largely curiosity-driven, because gametes themselves are fascinating cells and their union gives rise to a new individual with all the genetically hard-wired potential of its species. From studies of gamete transport and chemotaxis, sperm capacitation, maturation of oocytes and egg activation, to studies of the molecules involved in sperm-egg binding and induction of the acrosome reaction, as well as the evolution of these molecules, investigators are tackling some of the most interesting and challenging questions in biology. In addition to greatly expanding our knowledge of the process of fertilization, answers to these questions are likely to impact on practical issues that bear on the welfare of mankind.

We wish to offer sincere thanks to the authors who contributed to this special dedicatory volume on *Fertilization*, and to Professor Juan Aréchaga, Editor-in-Chief of the Journal, and his editorial team who made it possible. It was relatively easy to recruit authors for a volume dedicated to the memory of the late David L. Garbers, a friend of many of us and a leader in fertilization research. We hope that this Special Issue will serve as a valuable resource to those currently active in fertilization research, as well as to those future generations of investigators who want to gain some perspective of what went on in our field at the turn of the 21st century. Lastly, we hope that these articles may stimulate young investigators, with their careers ahead of them, to consider entering fertilization research. Our field has a bright future and we look forward to many new and exciting discoveries in the coming years.

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