

Obituary

Remembering J Michael Bedford (1932 – 2018): a great thinker and scholar



Our beloved and respected colleague and friend, Dr John Michael Bedford, died peacefully in his home in Philadelphia, USA, on Saturday, 24 February 2018. Mike was born in 1932 in Sheffield, UK. He completed his undergraduate degree at the University of Cambridge (Sidney Sussex College) and continued his postgraduate training there in Veterinary Medicine and Surgery. He obtained his PhD in

Physiology from University of London and following the completion of his training held several academic positions in the UK, and subsequently in the USA. At the time of his death, he was Professor Emeritus of Reproductive Biology in Obstetrics and Gynecology at Cornell University Medical College in New York, USA, where he had also served as the Director of the IVF Laboratories between 1986 and 1990.

Throughout his distinguished career, Mike collaborated with many renowned scientists and researchers, and mentored numerous research fellows and students whom he influenced profoundly. He travelled widely in pursuit of his research interests – in the 1990s he was a Visiting Scholar in Australia (University of Adelaide) and Japan (Kyushu University) – but he also spent countless hours in his laboratory, conducting experiments on his own.

His work is represented by more than 200 peer-reviewed articles and book chapters. Many of his recent publications represent a culmination of his experiences and read, as Mike's writings often do, as philosophy as much as they do biology. He was the recipient of many awards, including The Marshall Medal from the British Society for the Study of Fertility, in 1999.

A pivotal moment early in his life in science, came when MC Chang invited him to work in his group at the Worcester Foundation in Shrewsbury, Massachusetts, in 1959, not long after Chang's success in obtaining normal, live rabbits following IVF (Chang, 1959). Mike's initial research interest was in the area of egg transfer in the sheep, and mammalian embryos in general (the photograph shows him at the Foundation in about 1962), but Chang persuaded him towards work to improve IVF in the rabbit. As he recounts in a memoir he wrote on MC Chang as a mentor (Bedford, 2016), the experience in Chang's laboratory shaped his future research interests. Although his work

concentrated on Eutherian mammals and primarily the rabbit, he came to recognize, as he put it, 'the value of comparative models in reproduction research' while working with Chang (Bedford, 2016). Thus, he eventually extended his own studies to a wide range of experimental model systems that included marsupials and primitive mammals such as the hedgehog, moles and several shrew species. Mike returned to the Worcester Foundation in 1966 at Chang's invitation, after completing his PhD, and collaborated with post-doctoral students in his lab to pursue other original research.

Mike was a deep thinker and spent his career searching for answers to fundamental questions surrounding conception in mammals. In a recent reflection on his work (R Yanagimachi, personal communication), he wrote, 'Reflected in gamete function and design, in the steps of fertilization, and in the anatomy and function of the male tract – it has been generally hard to understand why these features peculiar to the therian mammals have evolved. However, in essence it appears to me now that in the evolution of the system, the character of the eutherian zona pellucida has been a major determining factor, with a sequence of sperm- and fertilization-related features arising from this. Such questions stimulated many of the original observations from my laboratory.'

For over 50 years, Mike made truly outstanding and influential contributions to the field of mammalian gamete biology. He made numerous discoveries that broke ground and dogma. His investigations of the epididymis were extensive and established many novel aspects of sperm maturation and the extent of its dependence on specific regions of this structure. He described capacitation as a change in the sperm plasmalemma and linked it to the evolution of the special storage mechanisms in the cauda epididymidis. With respect to human spermatozoa, among many other discoveries, Mike's work demonstrated that these cells fail to attach to most foreign zonae but they penetrated the zona of ape eggs, for example, the gibbon. Mike observed that many rabbit sperm bound to the zona via the reacted acrosomal carapace, then penetrated it without association of any acrosome contents. Oscillations of sperm head with a sharply pointed edge led him to maintain that penetration of the zona by sperm may be largely a physical rather than a lytic event (Bedford, 1998).

We are fortunate to have been the beneficiaries of Mike's natural inquisitiveness, originality, love of science, eloquence, and quest to understand the 'enigmas of mammalian gamete form and function'

(Bedford, 2004). His friendship, commanding presence, wit and charm will be immensely missed.

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