SSR Research Award *(sustaining support from NV Organon).* The SSR Research Award recognizes an active, regular member of the Society for outstanding research published during the previous six years. Criteria for the Award include the significance of problems under investigation, the breadth and depth of the analyses performed, and the level of originality manifested in the publications of this work. The recipient of the 2009 SSR Research Award is Dr. Richard M. Schultz.

The recipient of the SSR 2009 Research Award is Dr. Richard M. Schultz. Dr Schultz received his B.A. in Biology from Brandeis University in 1971 and his Ph.D. in Biochemistry from Harvard University in 1975. He then conducted postdoctoral studies on mammalian oocyte maturation at Harvard Medical School. In 1978 he joined the faculty of the Department of Biology at the University of Pennsylvania, where he is currently the Charles and William L. Day Distinguished Professor of Biology and Associate Dean for the Natural Sciences, having previously served as Chair, Department of Biology. He has served the SSR in many important ways including Program Chair for the 1999 Annual Meeting, a Director (2001-2004), and as an Associate Editor of Biology of Reproduction (2004 - present). He currently also serves on the editorial board of Developmental Biology. He was Vice-Chair (1990) and Chair (1992) of the Gordon Conference on Mammalian Gametogenesis and Embryogenesis. He has served on the NSF panel for Developmental Biology (1987-1991) and the NIH Reproductive Biology Study Section (1993-1995 and 1998-2001). He is the recipient of the Jan Purkinje Medal from the Czech Academy of Science (1994), was elected a Fellow of the AAAS (1996), received an NIH MERIT award in 1997, and was the recipient of the Society of Reproduction and Fertility's Distinguished Scientist Award in 2005. His research program encompasses the cell and molecular biology of oogenesis, fertilization, and preimplantation development. He and his colleagues have published 250 papers.

Over the course of his distinguished career, Dr. Schultz has made major contributions to our understanding of the mechanisms governing oocyte maturation, fertilization, egg activation, activation of the zygotic genome, and preimplantation development. Dr. Schultz has performed pioneering work on the experimental use of RNA silencing (RNAi) as a tool that has revolutionized research on mammalian oocytes and early embryos over the last 6-8 years. This method takes advantage of the pathways existing in oocytes, as well as virtually all somatic cells, for the regulation of transcript levels by post-transcriptional degradation of mRNA via the DICER pathway. Specificity of transcript degradation within cells is determined by targeting sequences in microRNAs. However, this naturally occurring pathway can be exploited for experimental specific transcript degradation by judicious construction of dsRNAs. Dr. Schultz and his

colleagues have harnessed this pathway to “knockdown” the levels of specific transcripts in mammalian oocytes to test the function of proteins encoded by these mRNAs during oocyte and early embryo development. Silencing protocols in somatic cells require the use of short dsRNAs to minimize interferon-based cellular responses. However, Dr. Schultz found that even long dsRNAs can be used in mammalian oocytes since they are refractory to the interferon response.

Dr. Schultz and his colleagues have validated two approaches for the introduction of specific silencing dsRNAs into oocytes. First is the relatively straightforward injection of dsRNA constructs into fully-grown oocytes maintained in meiotic arrest in vitro. The oocytes are then released from arrest and effects on subsequent maturation, fertilization, or early embryonic development are evaluated. This approach is applicable only if the encoded protein is turned over rapidly in oocytes or is not normally produced until oocyte maturation or thereafter. If not, a second approach is necessary. Dr. Schultz and colleagues developed an approach in which transgenic mice are produced that express long RNA hairpins to target specific transcripts. The Zp3 promoter, which is expressed only in developing oocytes, drives the expression of the silencing constructs early in the oocyte growth phase. Thus it is possible to prevent the synthesis of proteins that are produced and stored during oocyte development and then used during oocyte maturation or later.

These protocols can often facilitate the functional analysis of proteins produced either in oocytes alone or in oocytes plus any other cell type. In mice, it can replace the need for floxed alleles for conditional knockouts. Moreover, there are valuable applications to mammalian species where gene knockout technologies are not yet available. Furthermore, it is possible to produce oocytes expressing different levels of transcript/protein thereby producing hypomorph conditions that are often highly informative in functional analyses.

The use of RNAi in oocytes is now a widespread technology. Since its introduction by Dr. Schultz and colleagues, it has been used in more than 40 research articles using not only mouse oocytes, but also oocytes of large animals and humans. Moreover, Dr. Schultz has pursued not only its use in the functional genomics of mammalian oocytes, but he has also studied the mechanisms that make the silencing pathways work in the complex regulation of normal oocyte and embryo development.