

## E. B. WILSON MEDALIST, 1987



**Marilyn Gist Farquhar** is honored today for her broad range of studies extending over three decades that reveal the dynamics of cellular function. Her contributions to basic cell biology can be classified into four major areas: delineation of structure and function of the renal glomerular basement membrane and related studies dealing with the nature of cell-

ular contacts in epithelia; examination of mechanisms of the secretory process in endocrine cells, with particular emphasis on the anterior pituitary; characterization of the synthesis and packaging of lysosomal enzymes in various cell types; and definition of membrane traffic and regulation of membrane recycling in endocrine and exocrine cells.

Dr. Farquhar's interest in glomerular function and structure began early in her career and continues unabated to the present. Not only have her studies elucidated, with elegant electron microscopic techniques, the structure and function of the cell types in the glomerulus, but her more recent studies have focused on the biochemistry and functional properties of the components of the glomerular basement membrane and have provided an explanation of the nature of this essential barrier in normal renal filtration. These studies have also helped elucidate the pathophysiology of certain types of nephritides, and this latter emphasis exemplifies Dr. Farquhar's wide ranging interests not only in normal cell and tissue structure and function, but also her longstanding concern and interest in experimental pathology.

Her ability to trace relationships is exemplified by her important contributions on epithelial cell interactions. While studying the reaction of the glomerulus in nephrotic rats, it was noticed that the urinary slits of the renal glomerular epithelium were completely replaced by a unique fusion of cell membranes. This observation began a long series of studies on cell contacts in normal epithelia. In this way, the classic distinctions of tight junctions, intermediate junctions, and desmosomes were studied in great detail and the physiologic function of the tight junctions as a permeability barrier was well established.

Early in her career, Dr. Farquhar developed an interest in secretory processes in endocrine tissues, particularly the anterior pituitary, and made many key observations in this gland that remain as paradigms for modern studies on the processing of peptide hormones. From her studies came the

concept of the interplay of the lysosomal system as regulator of endocrine cell secretion. These experiments showed that pituitary granules may fuse with lysosomes under particular conditions that serve to dispose of excess secretory products when the stimulus for discharge is lacking. This normal regulatory process is now known as crinophagy.

Again, early in her investigations, Dr. Farquhar devoted a significant effort to understanding the synthesis of specific and azurophilic storage granules in neutrophils which began her longstanding interest in the cellular localization, biosynthesis, and function of lysosomal hydrolases. This theme is clearly evident in her most recent work, where she used state-of-the-art immunochemical procedures to trace for the first time the intracellular receptor responsible for targeting lysosomal enzymes to their final destination in the cell.

Finally, a major focus of Dr. Farquhar's research is her interest in the sorting and membrane traffic among intracellular compartments and between them and the cell surface. In experiments using the rat vas deferens she established the importance of coated vesicles in protein absorption and endocytosis. This work is frequently cited by current researchers in connection with the now popular concept of "receptor-mediated endocytosis." Basic to her studies on intercellular traffic control has been the identification of the Golgi complex and its subcompartments in membrane traffic regulation in the cell. These areas of research, basically initiated by Dr. Farquhar, have become intense areas of interest in contemporary cell biology.

Throughout her scientific career, Dr. Farquhar has utilized with elegance, novelty, and exquisite attention to detail a wide variety of cell biologic techniques, ranging from classical cell fractionation to her most recent use of recombinant DNA procedures. But it is important to emphasize that the *sine qua non* of Dr. Farquhar's research in cell biology has been her elegant use of the electron microscope. Aside from the aesthetics of the micrographs she has published, Dr. Farquhar has consistently recognized the power of this instrument as an analytic tool in cell biology, as evidenced by her use of it for enzyme cytochemistry and immunolocalization of enzymes and antigens in intact cells, to her application of electron microscopy for quantitative analysis of isolated subcellular fractions. In this way, Dr. Farquhar has consistently utilized and refined this technique which has contributed so importantly to the birth of modern cell biology.

It is with great pleasure that I present the 1987 Sixth E. B. Wilson Medal in behalf of the Society to Dr. Marilyn Farquhar.

*Dr. Farquhar is with the Department of Cell Biology, Yale University School of Medicine.*

**These remarks were made by Dr. Frank Ruddle, Past President of the ASCB, upon presentation of the medal.**