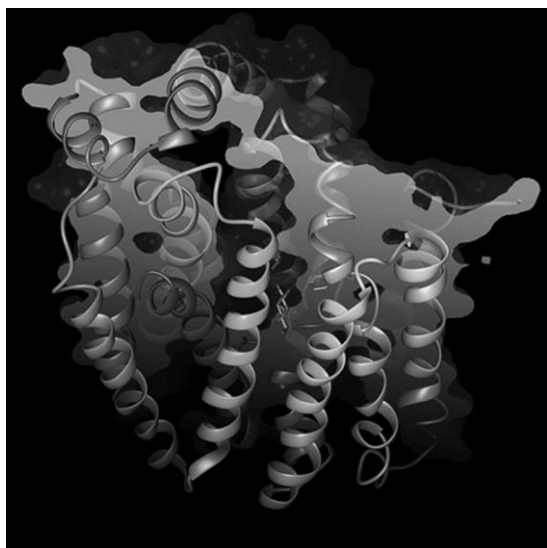


## Artist's Statement: Crystallography as Art

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Crystallography as Art

The science mastered by Rosalind Franklin, PhD, and celebrated throughout 2014 during the International Year of Crystallography continues to help researchers visualize and understand how protein structures function at the atomic level.

Franklin used x-ray crystallography to send a beam of x-ray radiation through a suspended DNA fiber. The resulting diffraction pattern was captured on photographic film, resulting in the now famous Photo 51, a crystalline image of a hydrated “B” form of DNA, which revealed the molecule’s helical structure. The image provided data crucial to the discovery of the structure of DNA—the single most important advance in modern biology.

Today, at Rosalind Franklin University of Medicine and Science (RFUMS), protein crystallography is pushing the boundaries of disease prevention and treatment. Our research teams in the department of biochemistry and molecular biology are examining the structural biology of membrane proteins, which regulate communication between cells and their environments. Understanding these structures can aid in the development of new drugs designed to interact in a more targeted and efficient way with specific receptors and cause fewer side effects.

The cover image portrays a ribbon diagram of the first three-dimensional structure of a true glucose transporter. It reveals transmembrane helices that comprise the transport pathway through the membrane bilayer. A molecule of glucose appears midway through this pathway. What drives my research is trying to understand how glucose, an essential source of both energy and carbon for living organisms, is transported inside cells. Alterations of this process play a key role in diabetes and cancer.

The data for this structure were acquired through the Advanced Photon Source, a national synchrotron x-ray research facility at Argonne National Laboratory, the top facility of its kind in the world, located

one hour from our campus. RFUMS is a founding member of SER-CAT—the Southeast Regional Collaborative Access Team—a research consortium with access to the synchrotron beamline.

Researching membrane proteins is both high risk and high reward. The glucose transporter structure and its mechanism of action represent a culmination of five years of painstaking work. I am extremely excited about the information this structure reveals and its significance for important biomedical problems. It takes a driving passion to understand, at the molecular and atomic levels, how a membrane transporter functions and how that knowledge can be used to save lives.

My RFUMS colleagues and I take pride in carrying forward the experimental science that Rosalind Franklin used to illuminate how life is transmitted from cell to cell and generation to generation. It is our deepest desire that our discoveries improve health for generations to come.

*Acknowledgments:* J. Choe wishes to acknowledge the work of his membrane protein structural biologist colleagues at Rosalind Franklin University Medical School (RFUMS), who are doing exciting work of their own. Min Lu, PhD, is studying multidrug and toxic compound extrusion transporters with the aim of understanding why patients develop resistance to medications. Kyoung Joon Oh, PhD, is researching proteins related to apoptosis or controlled cell death. Adrian Gross, PhD, is examining potassium channels, which may play a role in healthy vascular function and the secretion of hormones. Other researchers are working to discover knowledge in other areas vital to improving human health. Ronald Kaplan, PhD, RFUMS, executive vice president for research, is studying citrate transporters that may play a key role in obesity. David Mueller, PhD, is looking at the  $F_1F_0$  ATPase, an essential energy-conserving enzyme in humans. Marc Glucksman, PhD, department chair and director of the Midwest Proteome Center at RFUMS, is investigating neural processing enzymes. Carl Correll, PhD, is looking at RNA-protein complexes essential to ribosome biogenesis.