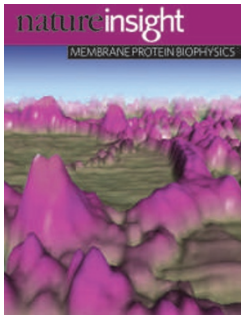

Cover illustration
Membrane proteins (peaks) embedded in a lipid bilayer. (Courtesy of H. Schillers and H. Oberleithner, University Hospital of Muenster/SPL; Artwork by N. Spencer).

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MEMBRANE PROTEIN BIOPHYSICS

Cells and organelles are enclosed by lipid bilayers, which separate them from their external environments. Embedded in these membranes are specialized proteins that span the full width of the bilayer and facilitate communication between the two sides.

These membrane proteins carry out a multitude of tasks, including signal transduction, transportation of small molecules and catalysis of enzymatic reactions. Their architectural repertoire is equally diverse, ranging from a single transmembrane-spanning domain in receptor tyrosine kinases, to the multisubunit ATP synthase.

Although membrane proteins constitute more than a quarter of all known proteins, their dependence on lipids renders them difficult to crystallize, and biophysicists have traditionally relied on indirect techniques to investigate their structural framework.

But in 1985, Johann Deisenhofer and his colleagues succeeded in solving the first atomic-resolution structure of a membrane protein — a photosynthetic reaction centre. Since then, almost 200 unique membrane-protein structures have been revealed.

This *Nature* Insight presents a snapshot of the current position of the field by focusing on a varied selection of transporters, transducers and enzymes of known structure. The Reviews discuss the intriguing mechanisms by which these molecular machines function, as well as the emerging role of lipids in these processes.

We thank all the authors for contributing their visions for the field and look forward to the multitude of molecular mechanisms that remain to be uncovered.

Lesley Anson, Senior Editor

OVERVIEW

REVIEWS

nature insight