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JACOB N. ISRAELACHVILI

Citation

Dr Israelachvili completed his PhD in the Department of Surface Science at the Cavendish Laboratory with Professor David Tabor in 1971. There he refined and developed new techniques which enabled him to measure directly and very accurately the forces between macroscopic objects at short distances in vacuum. This work, regarded as one of the landmarks of experimental colloid and surface science, early marked him as an outstanding experimentalist, and finally confirmed the Lifshitz theory of molecular forces. Subsequently he worked on adhesion and friction.

Later he spent 18 months at the Karolinska Institute in Sweden where he worked on biological membranes using electron spin resonance.

He joined the Department of Applied Mathematics at ANU in 1974 in the Research School of Physical Sciences, and holds a joint appointment in the Department of Neurobiology, Research School of Biological Sciences, where he is intimately involved with research in vision and membrane biology.

At the ANU his experimental work has been devoted to the construction of a completely new apparatus and the development of new techniques which enabled him to measure with great precision forces between solids in liquids from several thousands of Ångströms down to contact. This problem is an order or magnitude more difficult than his earlier work. For the first time, theories of van der Waals and double layer (electrostatic) forces have been subjected to quantitative verification. Characteristically these techniques required the simultaneous solution of three problems: (1) the preparation of atomically smooth surfaces; (2) the control and measurement of distances to an accuracy of 1 Å; (3) measurement of very weak forces to high accuracy.

His techniques are of the highest importance to surface science and open up a wealth of possibilities in the areas of soils, polymers, in mineral flotation, biological cell adhesion and specific ion adsorption at membranes, in electrolyte chemistry, in fundamental problems of interaction of radiation with matter, and in adhesion studies.

Not content with a unique series of experiments, Dr Israelachvili has also carried out theoretical work of the highest calibre in vision research, and especially in the problems of biological self-assembly of lipid molecules into micelles, bilayers and vesicles. Into this completely new area he has injected key ideas which have enabled a major synthesis to be achieved.

As a biologist, chemist and physicist, both a theoretician and experimentalist, Israelachvili has outstanding diversity, imagination and ability.