

**Speaker:** Prof. Yossi Paltiel (Hebrew University (Israel))

**Date:** Thursday, October 13, 2022 - 17:00

**Venue:** B228 (ΘEE02)

## The Chiral Induced Spin Selectivity (CISS) Effect

### **Abstract:**

Living organisms rely on chiral molecules, such as nucleic acids and proteins. A chiral molecule is not superimposable on its mirror image, also known as its enantiomer, just like our right hand cannot be superimposed on our left hand. Organisms contain only one enantiomeric form of a molecule, a selectivity that has prevailed through evolution. The chiral induced spin selectivity (CISS) effect studied by us can explain why enantiomeric purity might provide an advantage in biology. CISS is an electronic phenomenon in which electron transmission through chiral molecules depends on the direction of the electron spin, a quantum mechanical property associated with its magnetic moment. Thus charge displacement and transmission in chiral molecules generates a spin-polarized electron distribution. This effect; enhance electron transfer in proteins, enable nano metric charge separation, and explain biorecognition.

The effect also explain the high efficiency of multiple electrons process in biology (light harvesting and respiration). This understanding can be utilized to increase the employment of green energy by enhancing the efficiency and selectivity of the production process. Thus, improving significantly the efficiency of electrolyzers, fuel cells, batteries and solar cells.

### **About the speaker:**

Professor Paltiel is the chair of Applied Physics Department in the Hebrew University of Jerusalem, Israel. He has worked for both leading high-tech industry groups and in the academic world. The Paltiel group's goal is to establish a way to incorporate quantum mechanics into room temperature devices, for example, via utilization of chiral molecules as spin filters for achieving logic devices.

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