

# Molecular Electronics from a Time-dependent Perspective

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## Abstract

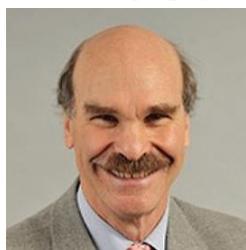
Molecular electronics, the study of molecules under electronic charge application, is a very widely examined phenomenon. Essentially all the papers treat the behavior from viewpoint of an electronic system, discussed in energy space. In this work, we examine how charge moves starting from a particular *time-dependent* point in a photo- excited molecular entity. The time dependence is very helpful in understanding the actual behavior, since it tells us about the sequential motion of the electrons.

Once the molecule has been examined and the pathways noted, it is possible to introduce a Buttiker probe, which can be placed at any point in the molecular moiety. At each point, the time-dependent analysis shows us the pathways by which the charge is moved. It is also possible to observe and understand the interference in the molecular pathways, which can be controlled by the Buttiker probe. The probe can act as a tool, to control the pathways, and the interferences, in the molecular entity.

Given the understandings that arise from the time-dependent analysis, is possible to design new structures, which can be controlled and can act as Full photonic agents

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## Short Biography



Mark Ratner is a materials chemist, whose work focuses on the interplay between molecular structure and molecular properties. This includes such aspects as molecular electronics, molecular optoelectronics, molecular systems design and biomolecular behavior, as well quantum and classical methodologies for understanding and predicting molecular structure and response. The major focus of his research for the last three decades has been the understanding of charge transfer and charge transport processes based on molecular structures, ranging from nonadiabatic intramolecular behavior to aspects of molecular devices, including photovoltaics, conductive polymers, molecular transport junctions and molecular switches.

His professional history involves undergraduate work at Harvard, graduate work at Northwestern, postdoctoral work at Aarhus and Munich, and faculty positions at New York University and Northwestern. He is currently Professor Emeritus in the Department of Chemistry at Northwestern. Ratner recently served as Interim Dean at Weinberg College, Dumas University Professor at Northwestern and Co-Director of the Initiative for Sustainability and Energy at Northwestern (ISEN). He has very active international collaborations, particularly in Denmark, Israel and the Netherlands. He has been awarded the Feynman Prize, the Langmuir Award of the American Chemical Society, the ACS Peter Debye Award, the J.W. Gibbs Award and is a member of the National Academy of Sciences, the American Academy of Arts and Sciences, the International Academy of Quantum Molecular Sciences, and the Royal Danish Academy of Sciences. He has an annual canoe trip which puts all things back into perspective.