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Book Review: *Dynamical Processes in Condensed Molecular Systems*

Dynamical Processes in Condensed Molecular Systems. J. Klafter, J. Jortner, and A. Blumen, eds., World Scientific, Singapore, 1989, 314 pp.

This book is comprised of 14 articles which represent the proceedings of a meeting held in Jerusalem in April 1988. The articles are arranged in four categories: Glassy Materials, Random Walks and Their Applications, Restricted Geometries, and Molecular Liquids and Crystals. The general themes which connect all the papers are the concepts of disorder and randomness. Stochastic processes also play a dominant role in many of the articles.

One example of a stochastic process is the ancient topic of random walks, which seem as healthy as ever with new applications and generalizations. The random walk makes its appearance in this volume in several articles. Weiss *et al.* study the random walk paths of photons (injected by a laser at a point on the surface of a biological tissue) scattering in a tissue to generate light intensity at other points on the surface. Such optical measurements can be used as noninvasive probes, e.g., of blood flow. Hilfer and Orbach treat random walks in dynamically disordered materials. They calculate the ac conductivity for beta-alumina superionic conductors when mobile Na^+ cations must contend with the movement of slower (but not frozen) Ba^{2+} cations. Havlin discusses random walks in random local fields, where diffusion can be slowed so that mean square displacements only grow logarithmically. The Sinai random walk is the classic model of this type. There is a good discussion of the typical average versus the configuration average. In the latter case, rare improbable events can dominate the average. Blumen *et al.* consider coupled space-time memory random walks to treat a wide range of behaviors from sublinear to superlinear time dependences of the mean square displacement, and provide interesting numerical simulations.

Bassler gives a review of charge transport in random organic materials, stressing the role of energetic disorder over geometric disorder.

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Theory, experiment, and simulation are discussed to try to unravel the anomalous transport and relaxation phenomena of dispersive charge transport, with an emphasis on explaining a puzzling transition from dispersive to simple behavior which is specific to polyvinylcarbozole. Friedrich and Kohler use spectral hole burning to probe relaxation in glasses and proteins to find that they have more similarities than differences, while Fleurov describes biopolymers as ordered (structured) glasses in his article, which emphasizes dynamics over structure. The role of postulated two-level systems in influencing optical impurities in glassy hosts is discussed by Reineker *et al.* The treatment of the vibrational character of tenuous structures (e.g., a percolation cluster) can be found in the article by Entin Wohlman and Orbach. In a magnetic system they are able to make a connection to stretched exponential relaxation for the recovery of magnetization by studying the Raman mechanism for spin–lattice coupling. Lemaistre *et al.* study vibrational relaxation in orientationally disordered molecular solids via Raman detection of vibron modes.

Kopelman *et al.* show that even simple reactions lead to self-ordering if they are diffusion controlled and the dimensionality is low. These condition allow for the exisence of depletion regimes. Drake *et al.* use time-resolved optical probes, such as direct energy transfer via excitons, to investigate restricted geometries, such as pore networks in Vycor glasses. Huppert reviews, in the picosecond time regime, the influence of solvent on electron transfer to show that the solvent motion can limit the transfer rate.

The authors and editors have taken care in preparing this volume. Although the papers are all independent, taken together they present an impressive array of phenomena and approaches for understanding the role of disorder in molecular systems.

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