Time and Length Scales in Condensed Matter

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Abstract
Time and length are related by a velocity, and the large difference between electron and atom velocities is the basis of the Born-Oppenheimer approximation. I present examples of characteristic time and length scales in various condensed matter systems (liquid-phase chemistry, surface catalysis, correlated-electron materials, magnetism, biology). A description of the solidification of a glass is one of the major unsolved problems in condensed matter science, and it leads to an overview discussion of fluctuations, dissipation, non-equilibrium thermodynamics, fractals and self-organization. The talk ends with a plea to the students to apply their knowledge of condensed matter science to address the major problem of our time: the production of carbon-neutral energy.