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Weinan E*, Princeton University, Department of Mathematics, Fine Hall, Washington Road. *The density functional theory of electronic structure.*

Density functional theory (DFT) has become a very popular tool for analyzing the electronic structure of materials and molecules. What has attracted less attention, however, is that it is also a very interesting and challenging area of research for pure and applied mathematics. In this talk, I will discuss some of the basic mathematical issues in density functional theory, including the different equivalent formulations, existence and uniqueness of solutions, structure of solutions, localization, and the continuum limit. If time permits, I will also briefly discuss the main issues in designing and analyzing numerical algorithms. (Received June 18, 2007)