Solving the Quantum Many-Body Problem at the Limits of Spatial Dimension

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Many-body problems in chemistry and physics are notoriously challenging to solve. The atomic quantum mechanical many-body problem requires substantial computation, partly due to the difficulty of calculating the correlation energy, which has been called the single greatest challenge to quantum chemistry since the subject's inception in 1927. I will review a dimensional scaling method for calculating the exact and correlation energies of two-electron atoms in their ground states. Taking the dimension of space as a variable is standard practice in statistical mechanics and particle physics, but not in atomic and molecular physics. The goal is to show how a dimensional scaling treatment can give chemically accurate results for 3D atoms using a simple mathematical algorithm.

Biography

Wilton L. Virgo graduated from Princeton University with an AB degree in chemistry in 2000. In 2005, he received his PhD in chemistry from Arizona State University for his state-of-the-art laser research on molecular catalysts in electric and magnetic fields. Dr. Virgo has conducted cutting-edge laser spectroscopy and molecular quantum theory at Brookhaven National Laboratory, Wellesley College, MIT, Texas A&M University and Harvard University. His book, "Quantum Mechanics in Everyday Life", takes graduate and advanced undergraduate students through the basic mathematical principles of quantum mechanics, and explains quantum as the basis for modern technology that we use every day.