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An interplay between the atomic and high energy physics: An update

It is well documented that electrons and all particles (even as heavy as fullerenes) produce the same interference patterns as photons in the two-slit experiment. Nevertheless, the description of these patterns remained markedly different thus far. The difference was studied in detail by David Bohm. Recently, Sanz and Miret-Artes were able to squeeze it to zero. Fortunately, they left some room for further improvements. They are going to be presented in the talk. In it, we observe that in the absence of sources the electromagnetic field can be described without loss of generality in terms of the complex scalar field. Previously, the electromagnetic field was described either with help of the massless Dirac-type fields or via complicated matrix (Duffin-Kemmer) Dirac-like formalism developed by Harish-Chandra. As noticed by Freeman Dyson, such a formalism is useful for description of meson-nucleon interactions in Yukawa-style calculations. Use of new complex field not only simplifies these and other calculations considerably but also allows us to demonstrate field-theoretically its equivalence with the complex scalar field entering the non-relativistic Schrödinger equation. Such a coincidence is not fully unexpected in view of the fact that both the electromagnetic (Maxwell) and the Schrödinger equations are invariant with respect to the action of conformal group O (2, 4). Upon development based on ideas by Nambu, this observation is used for development of the Regge mass spectrum formalism for hadrons.

Biography

Arkady Kholodenko was educated as a physicist in the USSR, receiving his M.Sc. (1976) from Kiev State University. He came to the United States in 1978 and received his Ph.D. (1982) in physical chemistry from the University of Chicago. After two years of postdoctoral research at the James Franck Institute (Chicago), he joined Clemson in 1984. His group conducts research in the following areas: 1) Theory of liquid crystalline semiflexible polymer solutions; 2) Statistical mechanics of disordered systems, including glasses and random copolymers; 3) Theory of knots and links with applications to condensed matter and biological systems; and 4) Theory of quantum and classical chaos.

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