RESPONSE TO “THE SCANDAL OF QUANTUM MECHANICS,” BY N. G. VAN KAMPEN [AM. J. PHYS. 76, 989–990 (2008)]

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RESPONSE TO “THE SCANDAL OF QUANTUM MECHANICS,”
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Kudos to N. G. van Kampen for his authoritative commentary on quantum physics. It is indeed a scandal that there are still so many “interpretations” of quantum physics when the theory actually provides a complete and adequate description of phenomena. Van Kampen correctly attributes these unnecessary interpretations to the difficulties experienced by “someone who still thinks of electrons as individual particles rather than as manifestations of a wave function.” Indeed, electrons are not individual particles.

I would add only one point to van Kampen’s remarks. It’s a point only about van Kampen’s (and most others’) choice of words, but I think it can make a big difference in the pedagogy of this difficult, nonintuitive subject. “Manifestations of a wave function” leaves the reader to question what is meant by the “wave function.” It would be clearer, and more consistent with quantum field theory which is our mature form, the idea of quantum fields are the basic ingredients of the universe, and the particles are just bundles of energy and momentum of the fields. Thus the nonintuitive aspects of quantum physics, in particular quantum uncertainty and quantum entanglement, result from the circumstance that the fundamental constituents of the universe are fields, not particles. These fields are, however, quantized, which implies that they exhibit many particle-like aspects.


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DIET SODA AND IRON FILINGS

Many thanks for the article by Tonya Coffey, “Diet Coke and Mentos: What is really behind this physical reaction?” [Am. J. Phys. 76(6), 551–557 (2008)]. The work presented in that paper has greatly enhanced my explanation of that experiment. It is an excellent investigation of how many different liquids react to Mentos, as well as how different substances, from baking soda to sand, cause carbonated diet cola to explode.

I would like to offer my discovery of an excellent method for doing this activity that is cheaper and easier than using Mentos or any of the substances explored in Coffey’s paper. Iron filings have sufficient surface area to cause the rapid nucleation typical of the Diet Coke/Mentos reaction, with the added benefit of being magnetic. While the release of Mentos into several bottles of soda requires advance preparation of the Mentos or a fancy contraption, you can release iron filings more easily. Simply make a hole in a bottle cap, fill the cap with iron filings, place a magnet on the outside of the cap, and screw the cap onto the bottle. When you pull away the magnet, the iron filings drop into the bottle, setting off the reaction.

Not only are iron filings less expensive than Mentos and easier to use, they are also reusable. If you place a second magnet underneath your bottle of soda, the iron filings will stay at the bottom of the bottle, making retrieval and reuse straightforward.

Anders Liljeholm
Program Developer,
Oregon Museum of Science and Industry