

describe the wide applications of Casimir or van der Waals forces and their generalizations—for example, books by Milton,<sup>1</sup> by V. Adrian Parsegian,<sup>2</sup> and by Vladimir Mostepanenko and N. N. Trunov.<sup>3</sup>

As to the reported accuracy of various experiments, I prefer to not second-guess those authors, including myself. I have no illusions about the perfection of my own work, but I was careful and found the data internally consistent at the level of error I reported. I did find one calibration error and published an erratum. Given the attention I have paid to other corrections, the recent Drude-model finite-conductivity thermal correction appears incompatible with my experimental result.

A different analysis, done independently by me, Mostepanenko, Giuseppe Bimonte, and others, in which the metal plates are treated as a conducting waveguide, shows a relatively small correction and good agreement with my experimental result. Until the differences between the theoretical approaches are resolved, rejecting experimental results is premature.

As to the experiments that have yielded a 1% level of agreement with theory, the authors of those papers ap-

pear insistent that they have used no adjustable parameters. That work has gone largely unchallenged because the level of accuracy, at submicron plate separations, has not produced significant theoretical controversy; for example, the Drude-model thermal correction becomes very small for plate separations that are significantly below one micrometer.

## References

1. K. Milton, *The Casimir Effect: Physical Manifestations of Zero-Point Energy*, World Scientific, River Edge, NJ (2001).
2. V. A. Parsegian, *Van der Waals Forces: A Handbook for Biologists, Chemists, Engineers, and Physicists*, Cambridge U. Press, New York (2006).
3. V. Mostepanenko, N. N. Trunov, *The Casimir Effect and Its Applications*, Oxford U. Press, New York (1997).

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SSC price tag rose from \$3 billion in 1986 to to \$5.9 billion in 1989 to more than \$10 billion in 1993, it steadily lost political support—which was quite strong initially—and was finally terminated by Congress.

With such a track record lurking in its recent past, the US particle-physics community can ill afford to start down such a tortuous (and torturous) road again. We need to play the costing game straight this time and be honest about what the ILC will really cost, or it won't have a chance of getting off the blocks—at least not in this country.

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## Randomness and strong disorder

The elegant experiments on photonic localization in randomized photonic crystals (PHYSICS TODAY, May 2007, page 22) raise an interesting question: What happens when an electronic system is strongly disordered but not random? Traditionally, “random” has been thought of as a convenient mathematical tool that gives a good approximation to any strongly disordered system, but a series of experimental studies, beginning in the 1980s with the metal-insulator transition in semiconductor impurity bands, have shown many properties that are inconsistent with random models. Thus the photonic experiments have confirmed idealized models of strong disorder and have simultaneously emphasized just how rare such idealized disorder really is.

Why shouldn't random models work just as well for electronic as for photonic systems? Electronic interactions are normally much stronger than photonic ones, but they often are also randomized by strong disorder. That is especially true in the presence of several kinds of incoherent disorder—for instance, mixed impurities, or impurity clustering, in the case of semiconductor impurity bands. For a long time it was thought that strong disorder is always incoherent, but modern materials science has become so sophisticated that it can produce not only rare examples of ideally randomized materials but also, and much more often, the opposite extreme: self-organized networks embedded in, and actually made possible by, strong disorder.

The classic examples of strongly disordered materials are found in network glasses, which William H. Zachariasen

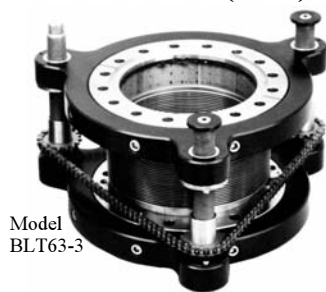
## The true cost of the ILC

In his story on the proposed International Linear Collider (ILC), Bert Schwarzschild does his usual meticulous job of reporting the news on particle physics and cosmology (PHYSICS TODAY, April 2007, page 26). But behind the cost figures presented, there's a deeper story that he did not discuss.

The \$7.5 billion total estimate cited is what such a collider might cost according to European accounting practices, assuming it were located at an existing laboratory, like CERN, that could absorb much of the construction management, R&D, and other costs into its normal operating budget. Nor does it include the costs of experimental detectors, contingency, or inflation. Adding those costs would push the total well north of \$10 billion, by my calculations. If, as many of us hope, the ILC were to be built in the US, the Department of Energy would insist that all of the other costs be included, making it—as correctly reported in *Science*—a \$10 billion to \$15 billion project.

Advocates of the ILC are taking a risky path that resembles all too closely the one followed by promoters of the Superconducting Super Collider in its formative years. In that case the additional costs were ignored, and only that of the collider itself was given during the early going. Thus the project initially seemed much less expensive than it eventually turned out to be. But as the

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