

without requiring renormalization.

The e-index that Cardona and Marx mention is for excess citations⁴ and is not to be confused with my E-index. It recognizes the seminal-paper problem by counting all citations in the author's most cited h papers to come closer to the total citation count.

The E-index is proportional to impact and can be measured in milli-Einsteins (mE). C. V. Raman is high, but when people mention Raman spectroscopy in titles or abstracts, it's hard to argue they aren't referring to his Nobel Prize-winning work. The 20th- and 21st-century physicists and astronomers I've found with the top E-index values are Raman (1468 mE), Enrico Fermi (1277), Einstein (1000), and Edwin Hubble (815), using the SAO/NASA Astrophysics Data System (ADS) database. (On ADS, Einstein's h-index was 27, as I reported, and is now 28. On the larger ISI database covering all science, it is 50.) *Time* magazine selected Einstein, Fermi, Hubble, and William Shockley as the most influential 20th-century physicists and astronomers, three out of four in common with the E-index.

The E-index's linear scale allows comparison of magnitudes of impact, something that Lev Landau was interested in.⁵ He estimated that physicists of class 1, like Werner Heisenberg, made $10^{-0.5}$ of Einstein's contribution (or an E-index of 316 mE, close to Heisenberg's E-index of 417 mE); class 2, $10^{-1.5}$; class 3, $10^{-2.5}$; and class 4, $10^{-3.5}$. Landau had a class 5, for those making negative contributions—where Ravi Rau clearly thinks those working on citation indices belong!

References

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Science centers: Ambassadors to the public

I would like to comment on Alan Friedman's article, "The Evolution of the Sci-

ence Museum" (PHYSICS TODAY, October 2010, page 45). Colombia has several major science and technology centers that feature interactive exhibits. The Maloka Museum in Bogotá opened in 1998 and the Children's Museum, also in Bogotá, was established in 1986. Explora, in Medellín, opened in 2008. Still, most of the population in smaller cities and in rural areas will have, at best, only limited encounters with those institutions.

In our experience with the Fundación Museo de Ciencia y Tecnología in Popayán, Colombia, a local science center having occasional budgets and no endowment, we have been able to engage enthusiastic and receptive audiences across socioeconomic and ethnic groups—if we can reach them. In such an environment, science centers have the opportunity to contribute substantially to public education by developing and disseminating projects, demonstrations, and educational materials for science teachers who often work in isolation and for young people who are anxious for hands-on experience.

Although topical education is important, primary emphasis should be given to the promotion of the scientific worldview—careful observation and reasoned analysis. Science centers ought to be careful not to "stray far from the core content interests" of science and technology and present themselves as centers for entertainment; it is as specific channels to understanding the scientific way of thinking that local science centers uniquely serve the public.

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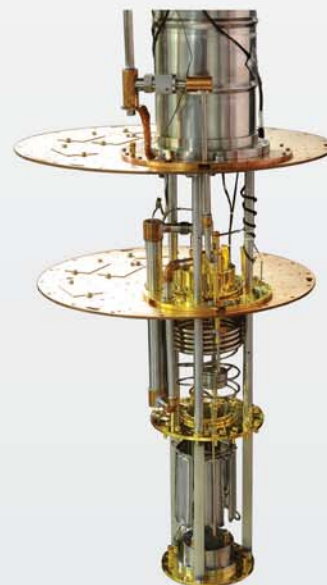
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