Of Cremona Violins, the ear, and peer review

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letters

Of *Cremona Violins*, the ear, and peer review

Gabriel Weinreich's review of Kameshwar Wali's book *Cremona Violins: A Physicist's Quest for the Secrets of Stradivari* (PHYSICS TODAY, October 2010, page 54) makes one wonder whether Weinreich thinks Wali wrote about the wrong physicist. In any case, the review seems to miss the point of the book by concentrating on minor issues while ignoring Jack Fry's beautiful, comprehensive, mechanical theory of the violin, discussed thoroughly in chapters 3, 5, 6, and 7. Especially telling is Weinreich's catty remark that Fry did not publish his stuff in *refereed* journals, as if that would guarantee its virtue.

Wali's book appeared at an opportune time for me; I had recently started to build a pipe organ and became interested in how musical instruments produce their distinctive sounds. I remember Fry giving two truly memorable colloquia when I was a graduate student at the University of Wisconsin–Madison in the early 1970s. In the first he touted a hokey theory that aging of the varnish made old violins superior. In the second he started developing the theory discussed in Wali's book, of the violin as a system of driven oscillators.

*Cremona Violin*s is actually excellent and well written; it gives a general reader some insight into how a scientist thinks, how knowledge develops, and how basic research transforms into engineering. Fry's quest is a study in microcosm of how we do science, with false starts and incremental advancements. Wali's book explains how such diverse disciplines as acoustics, hydrodynamics, and human perception determine the quality of musical instruments. It also gives us a flavor of how different groups of intelligent people, in this case scientists and musicians, use different language to explain the same things.

Kudos to Wali for documenting this remarkable work for posterity.

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I found the book review by Gabriel Weinreich of Kameshwar Wali's *Cremona Violins* particularly interesting. Although I agree that the book could have been written a little better and terms defined more carefully, one should not be dismissive of a lifetime's work by a dedicated individual with solid credentials. Reductionist methods will probably not, at any time in the near future, be able to describe the acoustics of an instrument as complex as the violin.

The human ear is a far superior judge of sound quality than any measuring device. When an expert violinist says a Stradivarius sounds better, I am sure she means it. Being an amateur violinist myself, I can easily tell the difference between good and mediocre violins, even though I may not be able to quantify my assessments or communicate them to others. Science is only one part of human intellectual experience.

In my view, *Cremona Violins* is part science and part subjective experience of individuals who possess skills that should not be dismissed by snooty scientists like ourselves. Hence I find Weinreich's concluding remark that the book is one of science's notable aberrations especially uncharitable.

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In his review of my book *Cremona Violins: A Physicist's Quest for the Secrets of Stradivari*, Gabriel Weinreich dismisses Jack Fry's violin research, saying Fry never published anything on the subject in a refereed scientific journal. I am surprised, since in my extended conversations with Weinreich on 7 December 1996 he said, "Violin physics [we both understood that to mean physics published in refereed scientific journals] is directed by its very nature toward an understanding of how a violin works, by definition. And it is addressed to an audience of people who are excited by the prospect of finding out how a violin works. Violin physics perhaps can be, but certainly need not be, directed to the question of what makes violins good."

Fry is interested in what makes violins good. Although based on sound physics principles, Fry's decades of semi-empirical research on what he calls "old junk violins" from the 19th century is motivated toward unraveling what Weinreich calls in a 1993 article[1] "a tantalizing new secret of Stradivarius." Over the years, Fry has designed numerous experiments and tested the changes in the acoustical properties brought about by varnish, asymmetric thickness variations inside the bottom and top plates, changes in shape and size of the bass bars, and graduations in localized critical areas. During the past two years, he has focused his attention on duplicating the subtle tonal qualities generally attributed to old Cremona instruments.

Perhaps Fry's most important innovation is based on the observation that the thickness graduations made in the plates and the associated normal modes change significantly in the completed varnished instrument. Using simple scraping devices, Fry can change the timbre to achieve a desired tonal quality. He calls it fine-tuning. He has provided guidelines for making good violins, and many of his modified and transformed violins are now in the hands of young and upcoming violin players. Fry's kind of research, a convergence of art and science, is neither amenable to nor acceptable in the conventional "refereed scientific journals." It has to be judged by violin makers and violin players.

Regarding the DVD included with the book, Weinreich is right: It is not an objective demonstration of the proof of Fry's ideas. It was intended to illustrate some possibilities for violin makers who, perhaps with better understanding, can make consistently better-sounding instruments. Rosemary Har-

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bison was not sought out for the demonstration. She, along with other violinists, has been working with Fry for the past several years. Fry is leaving more than 600 pages of his notes and his experimental records to the rare books and manuscripts section of the University of Wisconsin–Madison Libraries, with free access to anyone interested. Also, a video book on the simple physics of violins is in preparation.

Neither Fry nor I claim to have a precise mechanical method for turning out great violins, each sounding exactly alike. However, a violin maker who understands the science of his instrument can make consistently better ones, perhaps eventually even better than those of the Cremona masters. Fry's effort, like any scientific and artistic inquiry, is a quest for truth, enlightenment, and beauty.

Reference

1. G. Weinreich, *Am. J. Phys.* **61**, 1067 (1993).

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Oil sands and the environment

The December 2009 issue of PHYSICS TODAY (page 8) had an interesting letter exchange on environmental effects in the Alberta tar sands—especially on the impacts of oil development on birds. In response to a letter, Murray Gray, Zhenghe Xu, and Jacob Masliyah, authors of the original article on the subject (PHYSICS TODAY, March 2009, page 31), wrote that claims of the specific adverse effects on birds and bird habitat were "grossly exaggerated," as though the claims focused only on the effects of mining and the tailings ponds that store waste products. Yet the Natural Resources Defense Council study to which the article authors seem to refer also reviewed the current and potential future effects of fragmentation from in situ drilling, water withdrawal, air and water toxins, and global warming.[1] The harmful effects of tar-sands operations on birds nesting in the region are very real and will grow if the oil-removal operations continue along their planned path of rapid expansion.

The public in the US and Canada needs to understand the real, long-term ecological costs of tar-sands oil development and determine whether petroleum from that source is what people want fueling their motor vehicles. Birds are telling us it is time for a change in North American energy policy. Better energy options are available, options that do not foul our air, poison our waters, or kill our backyard birds.

Reference

1. Natural Resources Defense Council, *Danger in the Nursery: Impact on Birds of Tar Sands Oil Development in Canada's Boreal Forest*, NRDC, New York (2008), available online at http://www.nrdc.org/wildlife/borealbirds.

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Gray, Masliyah, and Xu reply: Readers who are interested in the environmental impact of energy supply need to ensure that they consider accurate information, and avoid the kind of hyperbole presented in the above letter. On the specific issue of the Canadian oil sands, readers are encouraged to examine the recent impartial report from the Royal Society of Canada, which details the shortcomings of government regulation, the need for the oil industry to improve its practices, and the exaggerated claims of environmental groups.[1]

Reference

1. For the news story, see http://www.theglobeandmail.com/news/politics/oil-sands-report-criticizes-all-stakeholders/article1838315. The original Royal Society of Canada report is available at http://www.rsc.ca/expertpanels_reports.php.

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Multiferroics erratum

We wish to correct an error that appeared in our article "Multiferroics: Past, Present, and Future" (PHYSICS TODAY, October 2010, page 38). Hans Schmid's work on multiferroics and magnetoelectrics was funded not by the Swiss Post Office but initially by the French National Center for Telecommunications Studies in the early 1960s and later in the 1980s and 1990s by the Swiss National Science Foundation. We apologize for the error and thank Schmid for bringing it to our attention.

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