"Metallic Glass" or "Glassy Metals"?

To the Editor:

First let me support you in two matters discussed in the April 1995 *MRS Bulletin* [Letters to the Editor]. Yes— please do continue to print all types of opposing views without prior censorship. And newly coined names are always a problem. This is even true of older ones. For example, when one finds a non-metal glass having metallic-like properties, one cannot call it a "metallic glass," because this term has been preempted by an incorrect use for a group of materials properly called "glassy metals." The adjective should describe the unusual characteristic, while the noun should indicate the essential nature of the material, e.g., "mink-dyed rabbit fur" as per FTC rulings.

Nevertheless, I would like to comment on two instances of a lack of proportion in the same issue. If Prof. J.F. Chiang ["Chemist Converts Coal Ash into Impervious Glass, p. 15] really has made an "Impervious...shiny glass that could not be bent, broken, or scratched," then he has clearly made his fortune and would deserve a screaming headline on the cover!

And in D. Beason's history on "Insulating Electric Cables" (p. 60), the 1956 reference is no doubt a good source for early history. Yet, since recent insulating techniques are also briefly mentioned, an additional reference less than 39 years old would, in my opinion, have been appropriate.

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Editor's Note: Another, more recent reference used by D. Beason is Robert M. Black, The History of Electric Wires and Cables *(P. Peregrinus, London, 1983).*

Music Issue Strikes a Dissonant Chord

To the Editor:

In spite of its frequent exposition, the state of violin research as practiced by Carleen M. Hutchins and her colleagues (*MRS Bulletin* **XX**, No. 3, pp. 29–31) remains unsatisfying.

A case in point is the insistence of Hutchins to press on with free plate studies as an essential paradigm for the scientific planning of the violin. This line of research is by now over 160 years old, and has been tried again and again without notable success. The new twist by Hutchins, the definition of five eigenmodes and their tuning to prescribed frequencies, is arbitrary. This would be fine if the results were truly significant; however, violin makers have concluded that such tuning makes no difference (Joseph Curtin, in *J. Violin Soc. Amer.* **XII**, No.3, p. 25, 1993; Peter Prier, *ibid.* **XIII**, No.3, p. 63, 1994). The investment of time and effort in free plate studies is a waste considering also the lack of theoretical justification. To my knowledge, Dr. Jack Fry, a highly respected physics professor at the University of Wisconsin, was first to point out that the violin—as an asymmetric and nonlinear system—is too remote from the state of its free parts to be predictable.

I also have problems with what I suspect to be an imprecise view of the violin, shared by Hutchins and the acoustics community. In a very simplistic way, described in several textbooks of acoustics, the violin is pictured as an odd-shaped box driven into vibrations solely at the bridge. The most obvious flaw of this model is that, in reality, the box has a sizable neck-pegbox assembly attached to it. Thus, the violin represents a lever with considerable transverse seesaw motion, which is driven at both ends of the vibrating string. (Just how significant the lever motion is can be shown in a simple experiment with a tuning fork on a violin after removing its A string. Hit the fork and touch it first to the bridge; then hit the fork again and touch it to the neck on the nut: The latter sound is louder in most violins!) This is hardly a secret to violin makers and players, who place high premium on the tactile sensations felt by the left hand. Neither is Hutchins unaware that the weight, stiffness, and the angle of the neck are important determinants of tone quality, but she fails to realize that these factors may override and obviate any previous fine-tuning effort.

This all has remained hidden because of the unnatural way the frequency—response curves, used by Hutchins and her colleagues as their principal means of quality control—were generated: without actual bowing and often with the strings damped. Thereby the significant contribution of the neck was eliminated from these data, and the response curves revealed only an artifact, i.e., a distortion of what remains of the strongest resonators. In fact, when violins are bowed, they exhibit significant neck-body contributions even in the lowest notes.

Hutchins's account may represent the progress of her own Society, but it is hardly informative of the enormous contribution of materials sciences. It is amazing that so much intricate work was done by the old school of violin researchers which has little practical relevance. There is a definite need for re-directing the research efforts from the study of the components to the understanding of the whole violin. This should begin with the realization that the very idea of violin quality is inseparable from the subjective process of playing the violin.

Our interdisciplinary program for the description of the Cremona violins at Texas A&M University has taken the more expedient, holistic approach, which began with the study of the primary quality standards of the violin: the "open tone," the tone color, and the role of non-harmonic resonances. Materials science has emerged as a key to reproducing the tonal effects unique to good old violins. Progress reports of our research were presented in 1994 in a dozen lectures for the American Chemical Society (and MRS in San Francisco) under the title, "Decoding the Stradivarius: The Materials, the Sound, and the Mystique," part of which was published in German translation (*Das Musikinstrument* **42**, Heft 6–7, pp. 107–111, 1993), and in *Chem & Eng News*, May 23, 1988. A comprehensive new view of the violin will be offered in an article which will appear in an upcoming issue of *The Chemical Intelligencer.*

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MRS MATERIALS RESEARCH SOCIETY

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