Comment on "Participatory Lecture Demonstration with an 83-Ton Bar Electromagnet"

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(Received 27 April 1973)

The desirability of making physics dramatically real for learning purposes can be easily recognized. Nevertheless there are limits, and I submit that Reines and Ballard have transgressed these limits.[1]

The authors conduct demonstrations of magnetostatics and magnetic induction with the entire class of students actually in the magnetic field of an 83-ton bar electromagnet. The students are given appropriate warnings concerning their watches and camera exposure meters, but apparently no warnings are given concerning the possibility of physiological effects. There is more than ample evidence in the literature to raise the possibility of magnetic field effects in biological systems.[2,3] In view of the possibility that our grandchildren may yet discover that short-term exposure of experimental subjects to high-intensity magnetic fields causes some undesirable biological change, how can the authors justify the risk they lead their students to run, merely for the purpose of having Lenz's law come alive? Furthermore, there is a well established common-law principle that one takes his plaintiff as he finds him. If some student were particularly susceptible to a high magnetic field and "injury" resulted, the legal complications might be extraordinary.

The use of an available apparatus for the purposes of physics teaching in new and imaginative ways is to be encouraged. Nevertheless, in teaching physical principles one is not justified in ignoring biological principles.

[1] F. Reines and R. Ballard, Am. J. Phys. **41**, 566 (1973).
[2] *Biological Effects of Magnetic Fields*, edited by M. F. Barnothy (Plenum, New York, 1964).
[3] R. O. Becker, Med. Electron. Biol. Eng. **1**, 293–303 (1963).

Reply to Comment by A. A. Marino

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We thank you for your comments received *via* the Editor on our article, "Participatory Lecture Demonstration with an 83-Ton Bar Electromagnet," [Am. J. Phys. **41**, 566 (1973)]. You indicate a concern regarding the physiological effects of magnetic fields and call our attention to the relevant literature. The point you make is without question a good one, and any future demonstration lecture of this type will be preceded by a statement regarding conceivable hazard. We considered and dismissed the possibility of significant biological effects in our demonstration, but most gratefully acknowledge that a reading of the Barnothy collection, to which you refer, indicates the possibility of harmful effects if the fields are sufficiently intense and prolonged.