ENGLISH FOR INTERNATIONAL STUDENTS UNIT

KIBBITZER 9
Can a superconductor expel an electrical field?

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At this time of year the number of students we continue to see on a one-to-one basis is sharply reduced, so I *make no apology for using a point from the writing of the student we have already met in Kibbitzers 5, 7 and* 8. The following sentence from his dissertation on Superconductivity gave me pause:

> The applied magnetic field was **expelled** from the superconductor when the superconductor was changed from the normal state to the superconducting.

The problem was that I was not sure whether **expelled** was the most appropriate verb here. In its ordinary use, it seemed to me, if A is expelled from B, it exists (even if momentarily) outside B after the expulsion: but would a magnetic field still exist after 'expulsion' from a superconductor? Post-expulsion existence of the expelled object seemed to be supported by the majority of the 15 citations for **expel*** in my *New Scientist* and *Nature* files: **electrons** (1), **CO2 burps** (2), **German speakers** (6), **academicians**, (7), **water** (9, 12, 13, 14), **fetuses** (10) and **volatiles** (14) certainly fit the ordinary sense of the word:

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1. change. Ashoori and his colleagues first expelled all electrons from the dot by raising
 2. While humans are fortunate to be able to expel an accumulation of C02 by burping, appar
 3. i enzyme): in the T structure, these are expelled and direct hydrogen bonds (Fig. 2a) f
 4.  created by fusion inside stars and then expelled back into space. The carbon atoms tha
 5.  certainly knew the pain of love. He was expelled from the Ecole Normale in Paris and t
 6. nnexed in 1938 and from which the Czechs expelled German-speakers such as Langer after
 7. to the constitution, academicians can be expelled if they act in a manner detrimental t
 8.  the coal beds themselves. Much of it is expelled into surrounding rock formations wher
 9.  water on the flanks of ocean ridges and expel it at the ridge axis. In the 1970s, mari
10.  to induce contractions and the fetus is expelled. Hoechst has declined to market the d
11. es having no resistance, superconductors expel magnetic fields, a phenomenon known as t
12.  its own volume in just five seconds and expel that water in a stream that moves almost
13. er from the lithium chloride. It is then expelled through a pipe to the outside of the
14. ases6. Open-system degassing occurs when expelled volatiles are able to escape, causing
15. ogen was produced by the reaction of the expelled water with uranium. The uncertainty i
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However, the clinching citation was 11, which showed a use of **expel** that appeared to be exactly the same as the student's: a glance at the wider context using the View feature of MicroConcord confirmed that the citation was from a text that, like the student's, dealt with the Meissner Effect:

> Nevertheless there are some materials in which superconductivity is seen at nonzero temperatures, although for most of these materials these temperatures are extremely low by any normal standards. Besides having no resistance, superconductors expel magnetic fields, a phenomenon known as the Meissner effect. What makes superconducting materials particularly intriguing is that these properties are unrelated to one another by conventional electromagnetic theory.

Reference to Terry P. Orlando & Kevin A. Delin *Foundations of Applied Superconductivity* (Addison-Wesley 1991, p. 4) indicates that **expel** is indeed used as a specific technical term (possibly as the translation of a German term?) in relation to the Meissner Effect:

> In 1933, Walther Meissner and Robert Ochsenfeld made a significant superconducting discovery using single crystals of tin. They found that for low magnetic fields, a superconductor does not *conserve* the amount of flux inside it (as a perfect conductor would), but instead *expels* the flux.

The moral of this short tale is familiar but may bear repeating. One of the most difficult tasks for the general-purpose EAP teacher who cannot hope to acquire authentic expertise in every subject-area of his/her students is to acquire a sixth sense in distinguishing between the language 'oddities' that are specific to the learner and those which are specific to the field of study. An appropriate corpus of texts can form an invaluable aid in developing such a sixth sense!

Further confirmation of the use of **expel** in this context has been kindly provided by Professor George Pickett, of Lancaster University, who assures me that the field continues to exist after it has been expelled from the superconductor.
