**Ph.D. Quals Question**
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## Faraday's Law

The figure below shows the experimental arrangement that was shown to each student. The key item is a powerful horseshoe magnet (red) that is hanging by a piece of string from a wooden suspension. When the students first see it, it has a steel "keeper" across its two ends. This is the silvery colored piece of metal sitting off to the right in the figure; the instructor or student has to really wrestle with that piece of metal to disconnect it from the magnet – thus emphasizing the strength of the magnet. The student is next asked to identify the object to the left in the figure. Many say "wood," whereupon the instructor reminds them that they are electrical engineering students and in most cases they amend their description to "insulator" or better, "poor conductor." Next, they are presented with the heavy, reddish object shown here under the magnet. Better prepared. most students will say "it is copper, a good conductor." The instructor next pokes the magnet to set it in oscillation, without either the wood or copper block beneath it, and asks the student to watch its motion, which can go on, seemingly unimpeded, for a long time. Next he places the "poor conductor" under it, without any noticeable change in the magnet's oscillations. He then asks the student to put the copper under it, whereupon it stops. The student is asked to get it oscillating again, but without much success. Quite noticeably, its motion is heavily damped. Now begins the academic part: the instructor asks the student to explain what is going on from an electrical engineering point of view, with emphasis on the basic laws involved.