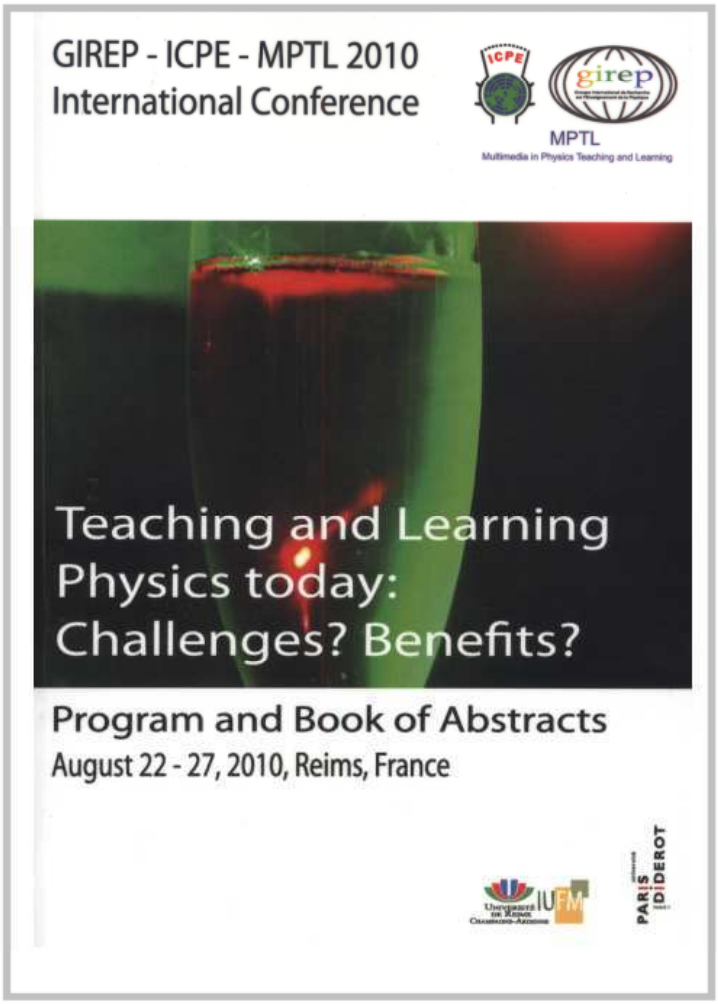

Electromagnetism - seeing and calculating

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Teaching electromagnetism is not an easy task. In Polish basic-level Physics curriculum for instance, this section is practically neglected. While present in the extended course, it is often excessively formalized and not sufficiently illustrated with simple examples. Left-hand rule of induction and Oersted experiment dominates over the concept of energy conservation (i.e. Faraday- von Neumann- Lenz principle) or the continuity of magnetic lines (i.e. the inexistence of magnetic monopoles, or in other words difficulties in defining magnetic field lines in the same way as the electric lines). Some textbooks reduce magnetism to the relativistic explanation by Einstein, not giving a single bit of information on permanent magnets, coils, wires and so on. On the other hand, precise calculations of two interacting permanent magnets is not trivial, either [1].

In our previous collaborations at the EU level [2] we have developed some experiments illustrating Lenz law, magnetic interactions qualitatively and quantitatively, diamagnetism, Earth's magnetic field [3] and electrostatics [4]. The experimental kits (40 experiments) are under didactical testing in upper secondary schools all over EU.

In present work we suggest some of experiments in electrostatics and magnetism, both with real objects as well in interactive ways [5], but now tightly connected with problems selected by our Czech collaborators from Prague University [6,7].

The well known problem of two electrically charged balls [4] is illustrated in our Christmas glass balls experiment [5]. Interaction of a magnetic-dipole coil with the static magnetic field [6] forms the basis of another simple experiment [8]. Altogether, these materials form an important step towards understanding electromagnetism both experimentally as conceptually.

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