

135-George O Zimmerman and Lawrence Sulak, "The Advanced Laboratory: beyond the 'black box' to real Physics", APS April Meeting 2008, p. 207

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The Advanced Laboratory: beyond the "black box" to real physics

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The balance between theory and experiment in present physics curricula is too heavily weighted towards theory. Our physics majors do not realize that "truth in physics" depends either on experimental verification of theoretical predictions or on serendipitous discovery. Nor do they appreciate that most theories originate to explain experimental facts. They regard instruments as "black boxes" (although usually they are painted a different color). The Advanced Laboratory is essentially the only place in the curriculum where students confront the link between theory and experiment. In this age of disposing of (rather than repairing) equipment, Advanced Lab gives students insight into the inner workings of instruments and essential hands-on skills exploiting them: soldering wires, transferring cryo liquids, achieving high vacuum, acquiring reliable data, evaluating errors, fitting data, and drafting a PRL. Students learn techniques critical to several branches of physics, leading to different experimental approaches in their eventual work. If a student pursues theory, AdLab teaches her how to evaluate experiments, experimentalists, and their data. The basic skills learned, and the resulting understanding of physics, will be illustrated with the experiment on the Quantum Hall Effect from our AdLab.

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