

# **How can schools and universities cooperate to improve physics teaching in high schools?**

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In these remarks I only mention in passing the more obvious forms of collaborations discussed elsewhere in this seminar:

1. Students who intend to become teachers will in most countries receive part of their training in high schools, where they can observe experienced teachers and give trial lessons under their supervision.
2. Universities in general provide in service training for teachers as a form of continuing education, to keep them informed about new developments in physics and in physics education.

I want to concentrate on some other forms of support universities can provide for high schools and high school teachers. I shall first describe some projects at our university and then formulate some more general recommendations.

## **A. Developing material for high schools, in particular on recent developments in physics research.**

In our university, many students preparing to become physics teachers do their thesis work on projects of this kind, either developing new experiments (e.g., quantized resistance in thin wires), simulation programs (e.g., on a simple model for a catalytic converter, as used for car exhaust), or prepare surveys of new fields (e.g., scanning microscopy and other methods to “see” single molecules, especially in biological systems) in a form suitable for use in high schools, with sets of teaching aids (transparencies). Teaching students writing their thesis

on subjects in physics proper are also required to provide a summary understandable for high school teachers and advanced students (for project work), that should contain a set of references to papers accessible to this audience (Scientific American or comparable journals, in particular physics education journals). These summaries are available on the web site of our Physics Education Department, which many high school teachers consult.

**B. An effective way to interest students in physics is by stimulating contacts between high school pupils and physics students.**

This concerns not only those studying to become teachers but “regular” physics students as well. One successful initiative in this area in our University is the “Physics Oscar”. From a fund made available by our late colleague Wilhelm Macke, prizes are given each year to the three best diploma (masters) theses in physics. The three winners are then required to give a short talk on their work for a general audience, consisting for a large part of high school pupils and their teachers; the audience (except for university physicists) then determines the overall winner, who has his or her prize money doubled and receives a trophy, the Physics Oscar. The event met with much interest, both from schools and from the media. The talks are also made available to high school teachers, and some of the contestants were invited to give talks on their subject in schools.

**Recommendations:**

From these examples some general recommendations can be made.

- a) Open days and other outreach events by physics departments should be directed in particular also at high schools and high school teachers; follow up material for classroom use should be provided.
- b) Involving students in a prominent role in outreach events helps significantly in reaching pupils, since it shows physics research is not a preoc-

cupation of elderly (ladies and) gentlemen only, but within reach of the pupils.

- c) Physics departments should regularly provide high schools with material on new and exiting developments in physics research and, e.g., on web sites designed for high school teachers and pupils. Web sites at different universities, in one country and beyond, may cooperate but a “local” contact person, who is known to the teachers and can answer their questions, is important too.
- d) Thesis and other projects aimed at developing materials directly usable in schools can be beneficial both as training for the students involved and for the schools that can try them out and use them.