

## It's Physikshow time in Germany

Particle theorist **Herbi Dreiner** describes how the Physikshow by students in Bonn is working to build the next generation of good science communicators.

We are in Munich, in the Deutsches Museum's Ehrensaal – a hall of fame of German science and engineering. Busts of Kepler, Gauss, Einstein, Meitner, and many others gaze down on us. We are: 18 physics students from Bonn University; Michael Kortmann, who is in charge of our demonstration experiments; and myself. The students are here to put on a 90 minute physics show to a sold-out audience of about 300 people. The doors will open shortly. Our host, Rainer Mählmann, is pretty nervous. At dinner later he confesses that he didn't sleep well. It's understandable – the two days of rehearsals were loads of fun, but very chaotic. I am excited and confident.

The idea for the show began when I was a graduate student in Madison, Wisconsin, in 1984–89. Prof. Clint Sprott regularly presented the Wonders of Physics, a fun show for children aged 12 and older. Six years ago, I decided to launch a similar activity in Bonn, with the difference that the students should prepare and present the show themselves. I approached the class of second-year students that I was teaching and immediately had 25 volunteers. Michael Kortmann introduced them to our extensive collection of demonstration experiments and gave them a relatively free rein. This, it turns out, is heaven on earth for a young physicist.

Over the coming months, we had several meetings discussing possible experiments and forms of presentation. Meanwhile, I gradually withdrew from the organization and development of the show and handed it over to the students. This was partly by design and partly down to a lack of time on my part. The students gladly took on the responsibility and created their show – the Physikshow. They could thus fully identify with it and they subsequently put in a tremendous amount of time and energy. I recall once being in a neighbouring room and hearing them discuss how to explain to 10 year olds an experiment on electromagnetism involving Lenz's rule.



*The Physikshow student team gather in the Ehrensaal of the Deutsches Museum in Munich, under the watchful eye of Gottfried Leibnitz. (Courtesy Michael Kortmann.)*

(In the experiment, the frozen metal ring jumps 6 m into the air.) For the students the show is a great opportunity to apply their new knowledge for the first time and outside of the restrictions of regular coursework. They are in it for the fun and the glory, and of course the great barbeque parties.

The students have developed ideas that I would never have thought of, both for the general presentation of the show and for new experiments. For example, most of the experiments are accompanied by upbeat music. This completely transforms even simple experiments. Furthermore, the various physics topics (mechanics, electromagnetism, atomic physics, etc.) are introduced by short self-made films, which are shown on a large screen. For example, a mechanics film shows a Newton's pendulum, and then switches to films of car crash tests, both accompanied by Beethoven's 9th (and now available on *YouTube* at [www.youtube.com/watch?v=vtj6Th6wb8g](http://www.youtube.com/watch?v=vtj6Th6wb8g)). For the students, it is also easy to address the children at the right level. Many of them have younger siblings or have led youth groups. The students' enthusiasm and dedication then naturally carries over to the children in the audience.

A simple experiment the students came up with was to put a pickle between two forks and apply 220V. Owing to the salt in the

pickle there is a current and a discharge: the pickle starts glowing, which is easily visible in a dark lecture hall. You can also do this with pears or other fruit. (The German word for light bulb is *Glühbirne*, or "glowing pear".) Another experiment involves a large wooden box, of about 3 cubic metres, with an 80 cm diameter hole in the middle of the front, and the back covered with a thick foil. If you fill the box with smoke and bang the back, a 1 m diameter smoke ring ejects from the front, and can easily travel 20 m across a room. One experiment, with a ship floating on nothing, has even become a hit on *YouTube*, with half a million viewings (see [www.youtube.com/watch?v=1PJTq2xQiQ0](http://www.youtube.com/watch?v=1PJTq2xQiQ0)).

The shows have become a huge success with the public. Every year for the past five years, a new group of second-year students has expertly presented a new two-hour show for children, with six performances a year and a full auditorium (550 seats). We now have a large pool of students with experience in publicly presenting science. This has enabled us to tackle new challenges with the experienced students, for example the Bonn University Science Night, or a show on particle physics for the launch of the LHC. However, despite delegating much of the work to the students, it is starting to take over my life.

Back in Munich, the students will soon have the Ehrensaal rocking. They have become complete naturals in front of large audiences and thrive on the atmosphere. Light and sound and the short films work perfectly. There are loud bangs and magically floating ships, expanding marshmallows in a vacuum and glowing pickles, and then they make wonderful smoke rings in the back – Bang! – slowly floating across the elegant room, over the heads of the audience, under the chandelier, setting it tinkling, and finally putting a flutter into the stage curtain and a smile onto Rainer Mählmann's face.

**Herbi Dreiner**, *University of Bonn.*