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European Universities Public Relations and Information Officers  
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Conference theme: 'The social contract between universities and society'

## **“Isaac Newton as an Inspiration for School Children”**

Prof. Sheila Galt, Chalmers University of Technology, Göteborg, Sweden

In this workshop we will discuss the use of science theatre as a method of inspiring youngsters and creating a bridge between local schools and the university. As an example, we will look at the theatre production on the life and work of Isaac Newton held at Chalmersska Huset during the past school year. This play includes numerous hands-on experiments and demonstrations, many of which the children are invited to participate in actively. We will step into and out of the play, pausing to reflect together on the various requirements for success in such a project. This play is written and performed by Sheila Galt, designed for visiting school classes in grades 4 to 6.

This work is motivated by a number of goals, all of which can be viewed in the context of the social contract between the university and the surrounding community. One of the goals is to aid in the teaching of physics, as a service to the schools, discussing concepts such as gravity, acceleration, planetary motion, optical spectra, and derivatives (the mathematics of change). Another, equally important goal is to give the children a good feeling about math and science, connecting the school subjects with fun during the play. The teachers visiting with their classes are also given inspiration to include similar activities in the classroom. Attitudes towards higher education within math, science and technology are also addressed, disarming some of the misconceptions about professors in their ivory towers.

We will discuss who should be doing this sort of project – school teachers, professional actors, university students, professors, or public relations and information officers. In the example I give, it is of utmost importance to create a two-way communication with the school children. They need to be engaged in a conversation about the subject matter – asking questions and questioning the answers they get, declaring their guesses (hypotheses) and stating their observations, and going off on side-tracks that can lead to spontaneous new content in the lesson. For this to work smoothly, the actor needs to have a broad and solid understanding of the subject matter, and a good ability to answer the children's wonderings in a clear and correct manner. Training these abilities is not generally included in the curriculum for our students, nor in the staff development programs with a few wonderful exceptions.

A short synopsis of the play is given below:

The life and work of Isaac Newton is the theme for a short theatre production at Chalmers in the form of a school lesson for classes in the 4th to 6th grade. This one-woman-show, written and performed by Sheila Galt, has been developed to inspire school children in the areas of math, science and technology. 12 classes have been invited, one class at a time, to shows given during the autumn of 2011 at “Chalmersska huset” where a copy of Newton's Principia is on display.

The content of the show introduces such concepts as acceleration, gravity, force, and inertia in the first section. Apples and paper muffin cups are dropped after the children have had a chance to state their hypotheses. Newton's cradle, toy cars and a whirling eraser give many chances for interaction with the children, with their questions and ideas giving rise to many interesting digressions from the main script. The big question in this section of the play is "Why doesn't the moon fall down like the apple does?"

After a trip out to the end of the solar system the play then turns back to address one of the technical problems that Newton faced – a bad telescope! Newton's experiments with light, showing the spectrum of white light after passing through a prism, then link to the problem of lenses not being able to focus all colors of light to the same spot. Newton had to abandon the use of lenses and replace them with curved mirrors to make himself a good telescope. The school children then borrow one CD each to use as a diffraction grating and explore the spectra of the light sources found in the room.

The final section of the play focuses on the mathematics that Newton developed in order to be able to describe rates of change. The derivative, or rate of change of speed is experienced by the children riding on a "derivative wagon". The controls can be set for constant speed, constant acceleration, or increasing acceleration. After the rides, the children link pictures representing these different modes of motion to the motion of the falling apples and muffin cups.

Many teachers express their sincere gratitude after the show, mentioning how well the children listened and concentrated. Hopefully, many of these children will remember their feelings of pleasure and fascination in the background when continuing with these subjects in school, and when making critical decisions for their future directions.