

Science on Stage: a Slovak-British relationship

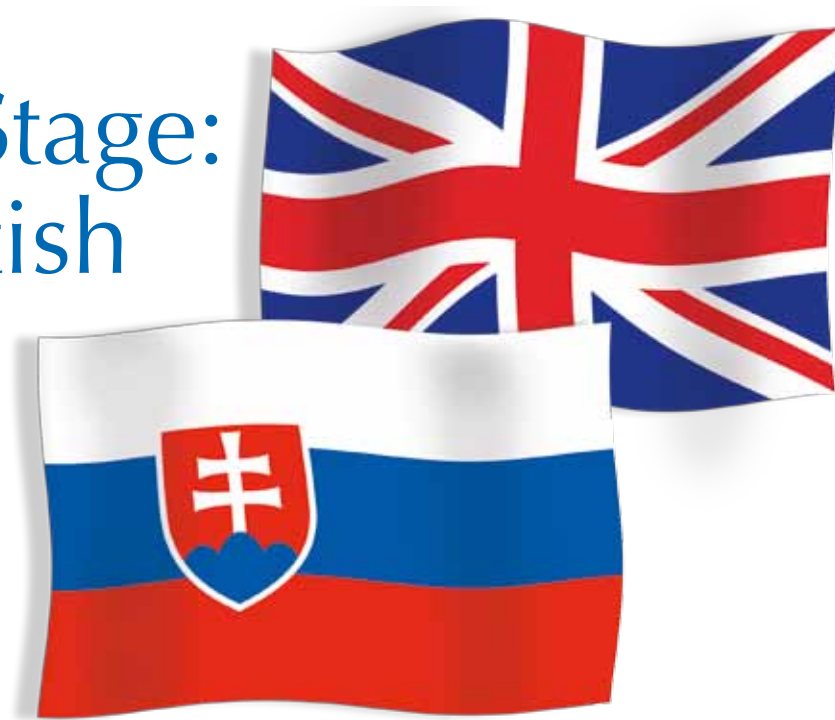


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For two science teachers from opposite ends of Europe – **David Featonby** and **Zuzana Ješková** – Science on Stage was the beginning of an inspiring and enjoyable collaboration.

Our collaboration began in 2009, when David ran a workshop entitled ‘What Happens Next?’ at the Science on Stage teaching festival^{w1} in Berlin, Germany. There, he challenged the participants to predict the results of

simple experiments that have unusual outcomes (Featonby, 2007). Zuzana was particularly intrigued by one experiment – the ‘two balloons surprise’ (figure 1) and decided to investigate it further with her students back home in Košice, Slovakia. Correspondence



Images courtesy of David Featonby

Figure 1: The ‘two balloons surprise’. What happens when the tap is opened? The small balloon blows up the bigger one, but why? The graph gives a clue: the air in the smaller balloon – which has a radius of 3-4 cm – is (counter-intuitively) at a higher pressure than that in the larger one, which has a radius of 6-8 cm. To equalise the pressure, the air rushes from one balloon to another. It is also possible for a larger balloon that has been inflated to near its maximum size to inflate a smaller balloon (Featonby, 2009; Ješková et al., in press)

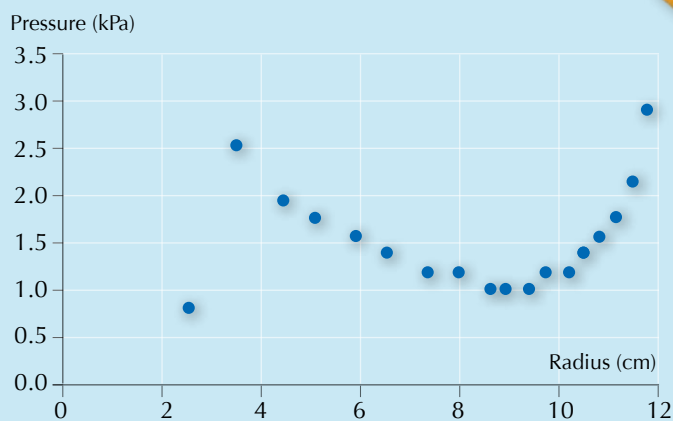


Image courtesy of Zuzana Jeskova



David and Zuzana presenting their workshop at Science on Stage 2011 in Copenhagen

flowed between the UK and Slovakia as we modified the experiments and explored more ideas (Ješková et al., in press).

As a result of our correspondence, we developed and led a joint 'What Happens Next?' workshop at the 2011 Science on Stage international science teaching festival in Copenhagen, Denmark, sharing our new experiments and results with teachers from 27 European countries.

Science on Stage festivals offer a unique opportunity for teachers from across Europe to share their experiences and develop new ideas, and it doesn't have to stop when the participants return home – as we demonstrated. To encourage even more effective exchange of ideas, participants from the 2011 festival could apply for travel scholarships so that teachers from one country could share their ideas and skills with larger groups of teachers elsewhere. We successfully applied, and in March 2012, David flew to the University of P.J. Šafárik in Košice to run a workshop with Zuzana for Slovakian physics teachers.

The workshop was part of a Slovakian teacher-training course, 'Inquiry activities in physics education', which was inspired by Science on Stage and encourages the use of interesting

and stimulating ideas, experiments and projects in teaching. Through lectures and workshops, excursions to research sites and independent activities, the participants develop their own ideas for motivating and attracting students to science. After 40 hours of direct learning and 25 hours of distance learning spread over the academic year, each participant develops a project to trial at his or her school. The course is planned to be run each year in Košice. The best ideas will be selected for the Slovakian national Science on Stage festival^{w2}. There, some of them may even be chosen to be a part of the international festival.

During the workshop in March, we challenged participants to predict 'What Happens Next?'. The experiments, which use everyday equipment, were chosen to highlight misconceptions and to develop thinking skills. In many ways, this put the teachers in the position that students often find themselves in – that of being unsure of the answers. Puzzling outcomes were then discussed; many of the Slovak teachers spoke English, but Zuzana was on hand to translate if necessary. Some of the experiments are detailed below, others can be found in Featonby (2007).

Balanced spoon

Balance a wooden spoon at its centre of mass. Then cut the spoon at that point and weigh the two halves. Which is heavier, or do the pieces weigh the same?



The centre of mass of the head is nearer to the pivot than that of the spoon's handle. Applying the principle of moments in equilibrium, the head must weigh more

Backwards clock

What happens to a backwards clock when we look at its reflection in the mirror? See images at the bottom.

Floating orange

On a balance, place an orange with a glass of water beside it. What is the reading? Next place the orange in the glass, so it floats without touching the sides. Does the reading on the balance stay the same, increase, or decrease? See images below.

Finger in water

Place a glass of water on a balance and note its mass. Lower your finger into the water without touching the sides. What happens to the mass this time? See images below.

Our Slovak-British exchange was beneficial not just to the participants on the course. Both of us learned from

Images courtesy of David Featonby



The mass stays the same, regardless of whether the orange is inside or outside the glass, so the reading does not change. This is because the same material is on the balance. The apparent loss in mass of the orange is compensated by the weight of water it displaces: the upthrust on the orange has a consequent down-thrust on the water

Images courtesy of David Featonby



The mass increases due to the reaction force acting on the water, itself the result of buoyant force acting on your finger

Images courtesy of David Featonby



Backwards clock (left) and its reflection in the mirror (right). When viewed in the mirror, the anticlockwise rotation of the hands of the backwards clock becomes clockwise and the figures' positions change to that of a normal clock

our collaboration, developing further ideas for experiments and co-operation, and also discovering different national approaches to teaching and teacher training. And to our surprise, we realised that the challenge of explaining ideas in a foreign language can actually help make the explanations clearer. We found that international co-operation between science teachers can greatly enrich the quality of teaching – and also form the basis of long-lasting friendships.

References

- Featonby D (2007) What happens next? A teaching strategy to get students of all ages talking. *Science in School* 7: 24-27. www.scienceinschool.org/2007/issue7/whathappens
- Featonby D (2009) Balloons hold the key to inflation. *Physics Education* 44: 344. doi: 10.1088/0031-9120/44/4/F05
- Ješková Z, Featonby D and Feková V (in press) Balloons revisited. *Physics Education*

Web references

- w1 – Science on Stage is a network of local, national and international events for teachers, initially launched in 1999 by EIROforum, the publisher of *Science in School*. At each national Science on Stage event, a delegation of teachers is selected to represent their country at the Science on Stage international

teaching festival. The next international festival will be held on 25-28 April 2013, in Słubice-Frankfurt (Oder) on the Polish-German border. During the festival, 350 teachers from 27 countries will share their most innovative teaching ideas in workshops, on-stage performances and the teaching fair.

Participation is free for delegates. For other science teachers, there will be a limited number of places for which a registration fee will be charged. See the Science on Stage Europe website for details: www.science-on-stage.eu

Science on Stage was launched in 1999 by EIROforum^{w4}, the publisher of *Science in School*.

- w2 – For more information (in Slovak) about Science on Stage Slovakia, see: http://ufv.science.upjs.sk/_projekty/science-on-stage
- w3 – The Institute of Physics is a UK-based society that promotes physics. The society provides resources for schools, including professional development courses for teachers, student careers resources and high-quality teaching materials. See: www.iop.org/education/teacher/resources
- w4 – EIROforum is a collaboration between eight of Europe's largest inter-governmental scientific research organisations, which combine their resources, facilities and expertise

to support European science in reaching its full potential. As part of its education and outreach activities, EIROforum publishes *Science in School*. To learn more, see: www.eiroforum.org

Resources

If you found this article inspiring, you might like to browse the rest of the Science on Stage articles in *Science in School*. See: www.scienceinschool.org/sons

David Featonby is a recently retired physics teacher from Newcastle, UK, with 35 years experience in the classroom. He now works as a teacher network co-ordinator for the UK's Institute of Physics^{w3}, and has recently become a member of the executive committee of Science on Stage Europe.

Zuzana Ješková is an assistant professor of physics at Faculty of Science, PS Šafárik University, in Košice, Slovakia. She works in physics education, dealing with pre-service and in-service teacher training.



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David in the physics lab with a group of enthusiastic Slovak teachers

Image courtesy of David Featonby

