Science & Technology Facilities Council

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Final Report and Evaluation for a STFC Science in Society Award

1. Project Details

Project Title The planeterrella - the aurora at our fingertips	STFC Ref. RP16G0452
Principal Applicant Gabrielle Provan	Institution University of Leicester
Start Date 01.09.2010	Finish Date 31.08.2011

2. Achieving Objectives

Please list the original objectives stated in your application and, against each one comment on how they where achieved. If any of the objectives changed or were not achieved please state why.

This has been a highly successful project which has far and beyond fulfilled its objectives. Furthermore, the project is ongoing with the planeterrella proving extremely popular with local schools, science clubs and national science festivals. Below the original objectives are presented in red and our achievements in black.

1) To purchase a planeterrella, a modernised reproduction of Birkeland's terrella.
The planeterrella was designed by Jean Lilensten from the Université Joseph Fourier, Grenoble, France. Accessing the plans involved signing a matter-transfer agreement between the University of Leicester and CNRS. By signing this agreement we promised to always credit CNRS when displaying the planeterrella. This relatively simple process enabled us to gain access to the plans in a straightforward manner. The planeterrella was built in France. Additional resources, eg the vacuum pump, was purchased in the UK and the experiment was assembled at the University of Leicester by the technical staff.

2) To demonstrate the planeterrella during 'ten' auroral shows to held at the University of Leicester, local schools, colleges, community settings and the National Space Centre. The shows will be presented by scientists and engineers from the University of Leicester.
The planeterrella has been presented to pupils at the IOP plasma conference, at ten schools in the midlands, at three university open days, to the university of the third age and at the Royal Society Summer Exhibition (RSSE). The planeterrella was presented as part of 'auroral shows' incorporating a mulii-media presentation on the aurora presented by a scientists and/or engineers.

3) The total audience number to exceed 1000 during the project.
The visitor number to the RSSE was ~13700. Approximately1000 pupils observed the planeterrella during school visits, and another 150 at university open days. The planeterrella was also exhibited to a further ~100 visitors from the University of the Third Age. So the total audience number was ~15000

4) To forge strong links between scientists and engineers at the University of Leicester and local schools and colleges and the general public.
We contacted STEMNET who helped advertise the planeterrella widely, as did the IOP. We also wrote letters to local schools (see appendix). Scientists and engineers from the University of Leicester visited a number of schools and institutions, and these collaborations are on-going. The planeterrella is clearly becoming known locally, and we have been invited to demonstrate the planeterrella at a number of schools and youth groups this autumn. We have also been asked to provide science posters for classrooms and further advice on science materials.

5) Our overall objective is to enthuse and inspire the general public in the wonders of solar system and space science

We interviewed a focus group of pupils at one school. Of the respondents, 100% of the pupils either 'strongly agreed' or 'agreed' with the statement 'Science affects everyday life'. 75% of the respondents strongly agreed with the statement 'I would like to find out more about careers in science'

3. Size of Audience Reached

Please give your estimate of the numbers actually reached in each category

aged 5-10 ☐ 11-16 ☐ 17-18 ☐ Family ☐

General public ☐ Teachers ☐ Other Group (specify below) ☐

Can you provide us with some insight into the gender split, ethnic make-up or socio-economic background of your audiences?

We are not able to provide this information in any meaningful capacity, as the Royal Society has only informed us of the total number of visitors to the RSSE and has yet to provide a further breakdown of numbers. However, all the 10 schools we visited were state funded. 9 of the schools were secondary school and 1 was a primary school.

Please give details of any particular group targeted (e.g. a particular ethnic group)

How did these figures compare with your target (as noted in your application)?

Our original target number was 1000, so this has been exceeded by ~14000

4. Further Statistical Information

If you have gathered statistical information about your project (e.g. audience satisfaction or hits on a website) please give a summary here.

We did not have the resources to perform a thorough visitor analysis for all ~15000 visitors. Instead we held a focus group of school pupils at one school, where they were asked to fill out a questionnaire. Of the responds:

100% either 'strongly agreed' or 'agreed' with the statement 'I found the presentation interesting'
100% either 'strongly agreed' or 'agreed' with the statement 'Science affects everyday life'
75% agreed with the statement 'I would like to find out more about careers in science'

5. Lessons Learned

If you were to carry out the project again, what, if anything, would you do differently?

I would:

- Commission a larger terrella. The planeterrella proved to be an extremely popular exhibit with many people crowding around it. A larger chamber would not only allow a greater number of spectators but would also allow more complex configurations to be explored
- Use triaxial electromagnets instead of rare-earth magnets. Employing electromagnets would allow computer control of the terrella's local magnetic field. Subsequently, real geomagnetic field data could be used to shape and direct the auroral display.
- Computer interface to the chamber power supply. An interface of this kind would allow dynamic control of auroral intensity, which, when couple with the aforementioned magnetic field control, would allow the recreation of real events using observed auroral luminosity data.
- Backfill with different gases thus creating different coloured auroral lights. Experimentation, conducted by our team, with nitrogen and helium proved this concept to be viable. However, time and cost precluded this function from permanent inclusion in the terrella's setup
- Provide funding for educators to assist us in developing auroral shows and supporting material targeted specifically at each key stages (from 2 to 5). These auroral shows would present the planeterrella and auroral science within the context of core STEM subjects in the National Curriculum.
- Request additional fund for travel, demonstrators and educational materials.

6. Summary

Please provide a summary (not more than 250 words) of your project which we may post on the web for the information of others (this is the only section of the Final Report that is made public).

Please send any resources or materials produced which may be made available to others to Chris.woolford@stfc.ac.uk

Thanks to an STFC small award the Department of Physics and Astronomy and the Department of Engineering at the University of Leicester have been able to purchase a planeterrella experiment, allowing the creation of artificial aurora in a laboratory setting. Over the last year the planeterrella has been demonstrated at local schools, university open days, to the University of the Third Age and at the Royal Society Summer Exhibition. The planeterrella has been exhibited by scientists and engineers in conjunction with multi-media shows on the aurora. All-in-all approximately 15000 pupils and members of the public have been given the opportunity to view these amazing illuminations. The project is on-going with further visits planned to local schools, youth groups, the Manchester Science Festival and the British Geological Survey.

The Northern Lights are nature's very own beautiful and dynamic light show. We believe the planeterrella builds on the enduring appeal of the auroral lights and provides a unique inspirational hook with which to capture the next generation of scientists and engineers. We hope to build on our current success by further promoting the planeterrella, and liaising with educational experts to present auroral science within the context of the national curriculum.

8. Feedback to STFC

Please make any suggestions as to how we might improve the STFC Awards Scheme.

Additional documents required:

- **Any evaluation undertaken as part of this project, for example, if formal evaluation were commissioned - a copy of the evaluator's report; if questionnaires were distributed – a summary of the results.**
- **An example of any resources produced, for example, links to a website; copies of printed materials; photos of events taking place.**

Thank you for participating in the STFC Science in Society awards schemes. We hope you found the process straightforward, the staff helpful and well informed and the project development p rocess engaging and stimulating. We look forward to working with you again in the future.

APPENDIXES

1. An example of the questionnaire distributed to our focus group.

2. Presentation results from the focus group.

3. Photos of planeterrella showing the artificial aurora produced, the planeterrella at the Royal Society Summer Exhibition and school children observing the planeterrella.

4. Example of the letter which was distributed to local schools and colleges.

5. Link to the University of Leicester's web page advertising the planeterrella.