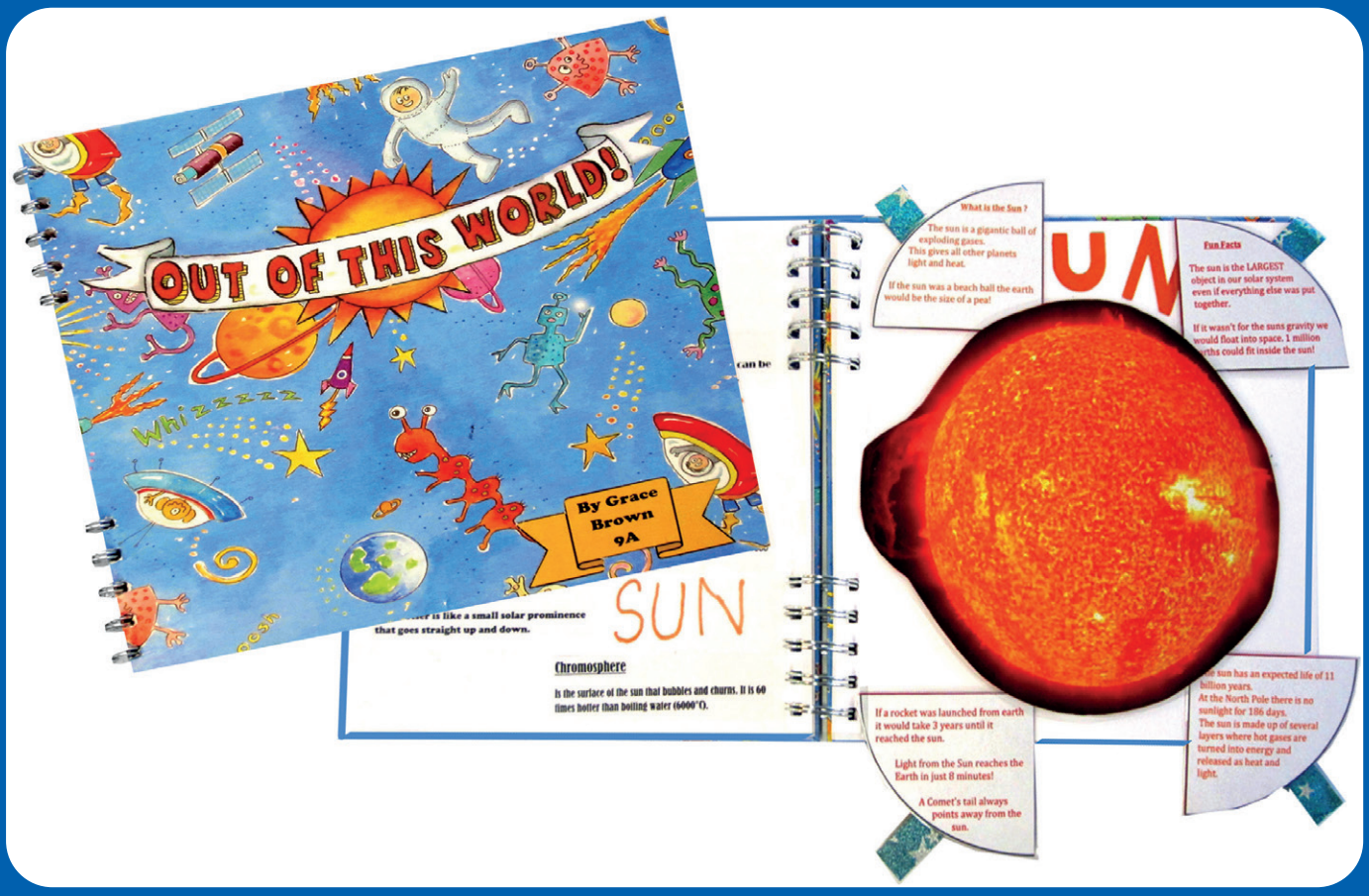
SSR

December 2020
volume 102 number 379



The Association for Science Education

School Science Review

The ASE's journal for science education 11–19

Supporting your fieldwork needs

We've identified the best ways we can support teachers and ensure students benefit from vital fieldwork experiences this term:

- **day courses** at our centres, which have been transformed to operate in a fully Covid secure way;
- visiting schools to deliver **outreach** in their grounds or local area;
- a range of new **digital packages** where face-to-face is not possible.

www.field-studies-council.org/biology FSC

Field Studies Council, FSC, is an environmental education charity providing informative and enjoyable opportunities for people of all ages and abilities to discover, explore, and understand the environment

School Science Review

The ASE's journal for science education 11–19

Editor **Geoff Auty**

Joint Executive Editors Martin Payne and Andrew Welsh

Assistant Executive Editor Helen Johnson
Book Reviews Miriam Chaplin
Websearch David S. Moore

Editorial contact ASE Jane Hanrott
Design/typesetting Andrew Welsh

School Science Review is published in March, June, September and December and sent to all Ordinary Members of the ASE free of charge. It is also available on subscription from the ASE.

ISSN 0036–6811

The Association for Science Education

Address College Lane, Hatfield, Herts AL10 9AA
Telephone 01707 283000
Fax 01707 266532
Email info@ase.org.uk
Website www.ase.org.uk

Advertising Rebecca Dixon-Watmough 01254 247764, rebecca@ase.org.uk

Printing Holbrooks Printers Ltd, Portsmouth, England

Contents

School Science Review December 2020, **102**(379)

Contents

School Science Review December 2020, **102**(379)

Health & Safety

For all practical procedures described in *SSR*, we have attempted to ensure that:
- the requirements of UK health & safety law are observed;
- all recognised hazards have been identified;
- appropriate precautions are suggested;
- where possible procedures are in accordance with commonly adopted model risk assessments;
- if a special risk assessment is likely to be necessary, this is highlighted.

However, errors and omissions can be made, and employers may have adopted different standards. Therefore, before any practical activity, teachers and technicians should always check their employer's risk assessment. Any local rules issued by their employer must be obeyed, whatever is recommended in *SSR*.

Unless the context dictates otherwise it is assumed that:
- practical work is conducted in a properly equipped laboratory;
- any mains-operated and other equipment is properly maintained;
- any fume cupboard operates at least to the standard of CLEAPSS Guide G9;
- care is taken with normal laboratory operations such as heating substances or handling heavy objects;
- good laboratory practice is observed when chemicals or living organisms are handled;
- eye protection is worn whenever there is any recognised risk to the eyes;
- fieldwork takes account of any guidelines issued by the employer;
- pupils are taught safe techniques for such activities as heating chemicals or smelling them, and for handling microorganisms.

Readers requiring further guidance are referred to:
Safeguards in the School Laboratory, 12th edn, ASE, 2020.
Be Safe! Health and Safety in School Science and Technology for Teachers of 3- to 12-year-olds, 4th edn, ASE, 2011.
Topics in Safety, ASE, latest version on the ASE website: www.ase.org.uk/resources/topics-in-safety (login required).
Hazcards, CLEAPSS, latest version, and other relevant publications, on the CLEAPSS website: www.cleapss.org.uk (almost all schools, colleges and teacher training establishments in the UK outside Scotland are members, as are many overseas).
Hazardous chemicals database, SSERC, latest version on the SSERC website: www.sserc.org.uk/health-safety/chemistry-health-safety/hazchem_database-2/ (schools, colleges and teacher training establishments in Scotland).
Preparing Risk Assessments for Chemistry Project Work in Schools & Colleges, SSERC, 2020.

Editorial Board and Associates

Contributing to *SSR*

We welcome contributions for all sections of *School Science Review*. For reference, a full page of A4 text in the journal is about 800–850 words; including two small figures on a page would bring that down to about 600 words.

These can be emailed to The Editor, ssreditor@ase.org.uk, or posted to The Editor, *School Science Review*, ASE, College Lane, Hatfield, Herts AL10 9AA. Detailed advice on the submission of articles and Science notes is available on the ASE website at: www.ase.org.uk/submission-guidelines.

Editorial

We reach the end of a year like none we have experienced before, with restrictions on travel and about six months of school closures. The efforts by teachers to manage education remotely are hard to imagine for those of us who are retired from the job. In the previous three editions of *SSR*, we managed to include some articles that were consequent on coronavirus and attempts to provide home schooling. We have none in this edition. Further related activities have been taking place, but two anticipated articles were not completed in time. Teachers have been extremely busy managing teaching under restrictions on distancing and movement, which have particularly impacted on science subjects. Practical work is much better if it is hands-on rather than being viewed on a screen. Two of my grandsons have been sent home to isolate for two weeks (one of them twice and he is now in the 'GCSE year') because they had been in the same class as a student who was later reported to have symptoms. Teachers who have managed to do creative things in their science teaching to cope with such disruption have not had time to tell us about it.

Although, at the time of writing, a limited supply of a COVID-19 vaccine has just become available in Britain, it is going to be several months before things settle back to anywhere close to the normality we used to take for granted. This applies to education and to life generally.

Without a special section, this edition has a more random spread of content, covering both science and education. All the articles came from separate individuals or small groups.

A letter from Iain MacInnes, following up Stuart Farmer's articles in the previous two editions, coincides with his own article on reflection, which has its place in the *Science notes* section along with a note on another electronic creation from Steven Weir – this time a personal alarm.

A trio of authors from the Far East offers models to illustrate how nerves convey pain, leading to quick (almost automatic) reactions.

Barend Vlaardingerbroek from Beirut examines the logos of energy regulatory bodies representing atomic structure, and how they differ from the representations taught in schools. This makes them a useful classroom resource to enhance critical thinking about diagrammatic models.

Philip Johnson, now retired from Durham University, notes that the concept of gravity is normally taught with the focus on the effect of the Earth on ourselves and on other living or inanimate objects. He argues that a better starting point would be a theoretical approach starting in space.

Education cannot escape from examinations in a normal year, and a group from the OCR awarding body next presents the results of their survey of teachers' views of practical assessment reform over a three-year period.

Ozden Sengul from Turkey explains how a learning cycle of Predict–Observe–Explain was used to develop scientific thinking and understanding, illustrated by a practical activity involving velocity and acceleration.

From Northern Ireland, Ruth Jarman and Joy Alexander follow up their article in our June edition with a survey of how their pilot project has influenced attitudes of children in lower secondary education to reading books on scientific topics for enjoyment rather than simply as required for education. They consider that introduction at a younger age is vital to the development of such pleasure. Turning from literacy to mathematics, a group from the Republic of Ireland has surveyed the level of creative reasoning required to complete questions in state examinations in mathematics and science. They found that most examination tasks require imitative rather than creative reasoning and suggest how small modifications could improve this situation.

A team of five from York, led by Lynda Dunlop, presents case studies of 12 teachers who incorporated their research-evidence-informed resources into their planning and teaching. Findings indicated that these teachers were able to develop their practice in key areas.

The sciences affect our lives more and more, and an international group has engaged students in an action science project addressing socio-scientific issues. The research methods were informed by STEPWISE, a curriculum framework developed in Canada.

In the final article, Nicklas Lindström, now retired from King's College London, makes use of another acronym. He illustrates the use of SOLO taxonomy to evaluate student progress and understanding.

All the articles in this issue been offered by the authors individually to our voluntary organisation with the common motive of developing knowledge and understanding in science education; some have had to wait a considerable time for us to have the space to include them. It means that the content is a random and diverse mixture of topics covering the educational process and knowledge of science. The content is also from a wide spread of locations abroad as well as from England, Scotland and both parts of Ireland (and one article includes Wales with England). We can never assume that all articles will appeal to all readers, but with such a diverse content, I hope and expect that everybody will find something to their liking.

Geoff Auty
Editor, *School Science Review*