

NZ science teacher

2011

Featuring: (bio)diversity

Microbial life on surfaces

Life at high temperatures

NZ's marine biodiversity

Conversing at home
about science

Alpine cress reveal
evolutionary secrets

Everything you need to
know about Fungi

Ecology at a crossroads?

Advancing primary
science

Conversations at science/
education interface

And more...



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Front cover: Sponges and gorgonian octocorals at 68m depth north of Cape Reinga, photographed using NIWA's Deep Towed Imaging System (DTIS) during a recent Ocean Survey 2020 biogenic habitats' voyage by RV Tangaroa. Reproduced courtesy of MFish and LINZ.

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Aspiring to excellence

Recently, I attended a symposium where an organisation was talking about its pathway to a silver award in business excellence. To date, a diverse range of NZ organisations have achieved silver and gold business excellence awards including: Rio Tinto Aluminium (Bluff), the NZ Navy and a healthcare provider. Yet, in spite of their diversity, all met the same prescribed criteria. And within science education there is a diversity of providers and yet all have the same aspiration to excellence.

In this issue...

We bring to your attention the diversity of articles in this issue of the NZST. We hope you find something of value both professionally and practically, and that its content inspires you to aspire to excellence in science education.

Students are not islands unto themselves, and parents can be useful in helping them to develop an interest in science, as Miles Barker and Claire Donaldson note (p.34). Alison Campbell enthuses about how pseudoscience can be a great context for teaching critical thinking skills (p.38); and Rob Julian writes about teaching science in a refugee camp (p.41). And for our primary sector colleagues there are two dedicated articles: one on the nature of science and the other on a primary science strategy (pp.30-33).

This year we have been striking up a conversation with the science community. In this issue Ally Bull and Rose Hipkins talk with marine scientist, Dennis Gordon (p.22); and Anne Hume writes about her conversation with Eocene climate modeller, Duncan Ackerley (p.40).

Did you know that this year is the centenary of Ernest Rutherford's Nobel Prize? John Campbell has written a wonderful article celebrating Rutherford's contribution to physics and notes that Rutherford's achievements are: "Not bad for a young fellow who failed to get a school-teaching job in New Zealand." (p.4).

While many conservation programmes have been successful there is still some uncertainty about why some fail. Kevin Burns writes about the challenges facing ecology (p.7) and following on from this Rex Bartholomew discusses whether ecology is at a crossroads (p.8).

Have you ever wondered about the microbial life on your teeth? Jon Palmer shares with readers how a better understanding of microbial life on biofilms, such as teeth, has transformed microbiology (p.10).

In our geothermal areas, thermophilic bacteria thrive in temperatures in excess of 120°C. Hugh Morgan describes how these bacteria are helping scientists to better understand the evolution of life (p.12).

NZ is dependent on agriculture and there has been an increasing demand for it to be sustainable. Louise Malone writes about the biodiversity of arthropods in two agroecosystems: pine plantation and kiwifruit orchard (p.15).



About 40% of marine species in NZ's EEZ are endemic and it is vital we conserve this genetic diversity. Also, we are discovering new species faster than we can name them. Dennis Gordon's article is a tour de force of NZ marine biodiversity and includes an excellent table of data for students to analyse (p.18).

Peter Heenan describes the importance of studying the origin and evolution of the native alpine cress to gain a better understanding of adaptive radiation and speciation in NZ alpine plants (p.23).

All too often fungi are omitted from school science programmes, yet life as we know it would not be possible without them. Peter Buchanan brings to your attention the missing f-word: fungi, and in so doing gives you a newfound respect for this often maligned group (p.26).

This issue also features reports from: BEANZ – biology (p.42), chemistry (p.44), physics (p.45), and ESSE (p.46). There is also an illuminating article from science technicians in Christchurch who are being innovative and creative post-earthquake (p.48).

Lindsey Conner, outgoing NZASE President, writes about the future of science education and how members can/must engage in the process (p.4).

And finally...

I would like to extend a warm thank you to all the contributors – your generosity of spirit and commitment to science education is encouraging and most gratefully received. Thank you.

I would like to extend an especial thank you to Rose Hipkins and Miles Barker, members of the NZST editorial review group, for the huge amount of planning they undertook to ensure that we were able to bring to your attention so many excellent science education articles. I would also like to acknowledge the work of the editorial review group, their generosity of spirit ensures the highest standard of article is published in the NZST. Thank you.

And I extend a very warm thank you to the NZST production team; you are all great people to work with: Teresa Connor, Philippa Proctor and Raymond Jones. Thank you.

With such a diverse range of articles in this issue of the NZST we are certainly aspiring to excellence. I hope you enjoy another rollicking great read. Happy summer holidays everyone.

Kind regards

Lyn Nikoloff
Editor, NZST

impacting the future of science education

In a previous issue of the NZST, I discussed the importance of Sir Peter Gluckman's document *Inspiring Science* and how it provided a beginning for conversations about what science education could, and should, be in New Zealand. The NZ Royal Society (RSNZ) has now held two forums in Wellington enabling many stakeholders including teachers, members of NZASE, Ministry of Education, Ministry of Science and Innovation, and NZCER personnel, science advisors, science teacher educators, and other interested people to discuss their ideas. While the purpose was to engage in purposeful and informed visioning, the participants also came up with practical strategies to advance these.



The secondary school forum grouped these under the themes of science for citizenship, systems' thinking, visioning as a society and equipping teachers. Therefore, I have collated the main ideas from both forums and summarised these using these themes since there was overlap between the ideas from both forums.

Science for Citizenship:

1. Assemble a working party through NZASE and RSNZ to create a definition of science for citizenship. This might include evidence-based decision making, inquisitiveness, curiosity, critical thinking, empathy, how scientific process works, risks and hazards, understanding the world around us, considering other views besides the traditional 'Western' view.
2. Work to ensure all science teachers have a common understanding on the Nature of Science (NoS). There is a need to tease out examples and possibilities for including aspects of NoS for all levels of the curriculum.

Systems Thinking:

3. There is a conflict between assessment and science education; there is a fragmentation of science caused by structural thinking that delimits science domain knowledge; we need to identify the levers for the necessary permissions to engage and explore and use an integrated approach to science education.
4. Establish a process for dialogue between the secondary schooling sector and the tertiary sector.
5. A recommendation for Ministry of Education, Ministry of Science and Innovation, RSNZ, NZASE to undertake a co-ordination of science education resources and initiatives.

Visioning as a Society:

6. Wherever possible, creating and highlight stories about NZ as a nation of scientists; we need high profile promotion of science as an integral part of our national identity.
7. A national conversation on Science Education. The greater populace needs to be engaged in this more in an effort to bring science to the fore in the media, and recognition of the importance of science in our daily lives. RSNZ should investigate strategies which might be

useful that other sectors have used to raise awareness about issues such as human rights, smoking etc.

8. A recommendation to RSNZ, NZASE, and the Office of the Prime Minister's Science Advisor to work with the media to raise the issue of science education within the wider community.

Equipping Teachers:

9. A national focus on science teacher professional learning and development for primary and secondary sectors to bring about cultural change in every classroom – focus on NoS.
10. A recommendation to the Ministry of Education to re-evaluate the positions of Science Advisors or similar positions in the future to ensure teachers have professional development and assistance/advice when needed.
11. Expanding on the activities already available on TKI, a recommendation to MoE that a teaching and learning guideline be developed to unpack the Nature of Science from Levels 1 to 5. It was further recommended that this should be accompanied with sufficient professional development to ensure primary teachers have an understanding of the key concepts.
12. That further work be done regarding the place of Maori in science, and the unique contribution traditional knowledge makes in our school curriculum.
13. Recommendation to NEMP (or its replacement), RSNZ and NZAPSE to further work on the profiling of a Year 8 graduate and what they should have experienced during their schooling in science.
14. Recommendation to New Zealand Teachers' Council to investigate the pre-service preparation for the teaching of science to identify minimal standards for effective primary science teaching and learning.
15. Recommendation to New Zealand Principals' Federation, NZEI, RSNZ and the Office of the Prime Minister's Science Advisor for a mechanism to recognise and reward primary science 'champions'/effective primary science educators.
16. Work on developing new Levels 2 and 3 Achievement Standards which have more of a NoS flavour.

These are very strong statements. Science teachers, as members of NZASE and the wider science education community, have been tasked to take up the above. It would be great to hear from you and your colleagues about how you can contribute to making these recommendations come to fruition. At the NZASE AGM this year we will be discussing short- and long-term planning and would welcome your suggestions.

Noho ora mai

Lindsey Conner
President NZASE