

## Rural school outreach in New Zealand

# DNA, PCR and forging a career in science

**Andrew A. Cridge and**

**Belinda J. Cridge** (University of Otago, New Zealand)

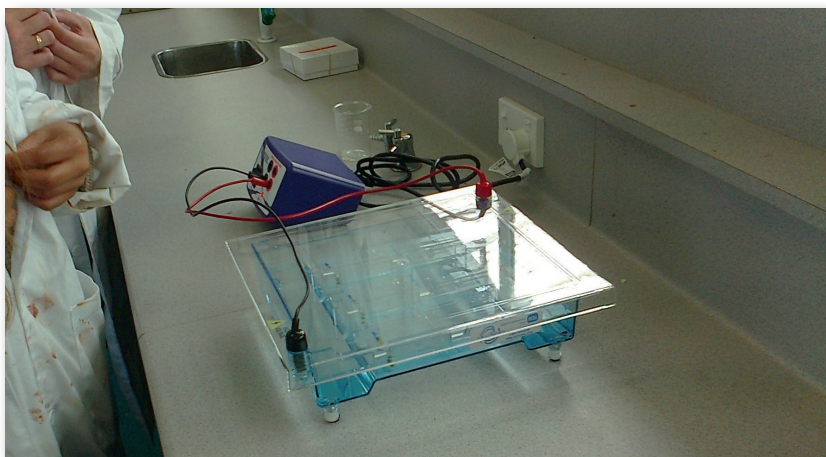
Milton is a farming town 50 kilometres south of Dunedin in New Zealand. It is a small rural service town, home to only 2000 people, despite once being a boomtown based on a local gold rush in the 1800s. These days, Milton is known as a tea stop town on State Highway 1. Travellers heading south from the metropolis of Dunedin might stop for a cup of tea and drive swiftly on. But we were travelling to Milton for a different reason: we wanted to stop and talk with the secondary school students in this town. What are their plans when they leave school? Where are they headed? What did they know about genetics? Did it affect them? Did they think science was relevant to their lives in this small rural town? As with most scientists, we went in with gadgets and experimental kits, but we were interested in talking to the students about careers and in empowering the teachers to teach genetics.

To plan the project, we talked with David, the head science teacher. Together we designed an experiment using genetics to explore disease inheritance. A week later, we arrived in Milton with equipment and reagents to run the session. The students were charming, engaged and excited about the experiments, but it was soon clear that we came from different worlds. Once we started to talk science and careers, a gulf quickly developed. A very informal poll of the students showed their career aims: John wanted to be an electrician, Zak was going home to the family farm, Amelia wasn't sure, but didn't want to end up working in the family business. These students were studying the final year of biology after many of their peers had already left school for employment. They

were bright, knowledgeable and enthusiastic students. They had fabulous teachers who were passionate, well qualified and experienced. So why were these students still not contemplating a career or a university degree in science as a possible next step? Could a one-off visit from two university researchers make a difference?

We thought that it could, but part of what we wanted to achieve was quite different from many of the other outreach programmes that we have been involved with<sup>1</sup>. We were still going to a school with the fancy gadgets and the expertise of career researchers, but our aim was not to excite or educate students about science. Instead, we wanted to inspire and educate the teacher about science and help them to develop new skills that they could use in the classroom. We also wanted to clearly link science study to jobs. We wanted to use the fun of practical science to engage the students so that we could talk specifically about careers. Could we raise their aspirations beyond the local horizon to see some of the other options open to them?

In all, we have visited six rural schools across the country using these methods and, in all cases, our main aims were to engage the teacher and highlight careers. The format of the sessions was very similar to many other outreach programmes. We provided basic gel electrophoresis equipment and samples to allow the students to run a simple agarose gel. What we did differently was to involve the teacher from the start. We had some ideas about what we could do, but the teacher ultimately decided the sessions in the classroom. Different classes ran different experiments on the basis of what they were studying or their specific interests. For example, one school had a student with diabetes so we constructed a family tree to explore how some forms of diabetes can be inherited; in other schools, we talked about breast cancer; in some, we looked at crop development using genetic techniques. During the sessions, the teacher was expected to not only be present, but also participate and contribute. This approach worked exceptionally well and, in all of the schools, the sessions were very much a partnership between the researchers and the teacher. As researchers, we found this input valuable; it helped us to understand the students we were working with and made sure that the session was relevant to them. The teacher could also make sure that we explained concepts at a year group appropriate level and with the right level of detail. In return, the teachers reported that they enjoyed the session immensely and in cases were active participants, not wallflowers.

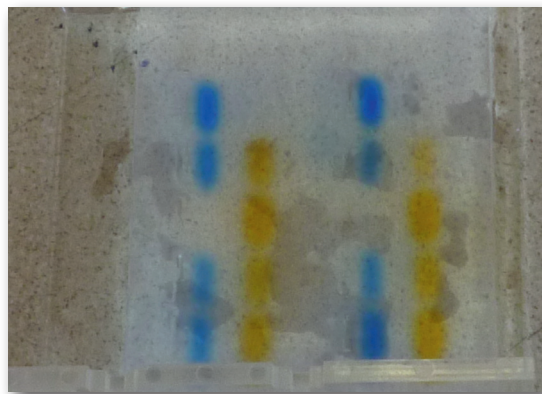


**Figure 1.** Analysis of Family Tree/Disease Inheritance Experiment. Students were encouraged to participate in the lesson by allowing 'hands-on' involvement in the experiment.

With the students, we used the practical session as an excuse to talk careers. This was discussed with the teachers beforehand. All of the teachers were also asked to participate in a research study designed to help us understand the role of teachers in providing career advice. While the gel was running, we ran a short exercise asking students to list all of the science careers they knew about, and what sort of careers would use the techniques that we were using (PCR and electrophoresis). Although the responses varied markedly across the schools, this provided the researchers with the opportunity to discuss careers and science study. Importantly, this could again be tailored to the information and interests of the students. What was gratifying at this point was some of the 'aha moments' that students experienced: you mean that I could do that with what I'm already studying? I could do that as a career if I went to university? I had no idea you could do that sort of job in New Zealand. Although the sessions were short, they achieved two aims; we expanded the horizons of the students we talked with, but we also expanded the horizons of the teachers. Although analysis of the data from the research is ongoing, talking with the teachers suggests that they learnt about new jobs, careers and study options available to their students.

The final section of the programme is to make the equipment we used available to teachers free of charge. To achieve this, we have designed a simple suitcase so that the equipment can be shipped around the country. Through ongoing support from Genetics Otago, we are now able to ship the equipment around New Zealand. The information we have learned from our initial sessions is being used to develop resources for the equipment. Our first finding was that one visit was a great start and allowed some of the more practically capable teachers to take the sessions and run them on their own. Other teachers will need assistance for a couple more sessions before they are confident to use the equipment. However, we have learned that the best way to train teachers and engage them in teaching genetics is to work with them in their classroom. Although this is more labour-intensive for those undertaking the outreach, it is more sustainable in the long term. This is also important for developing a long-term relationship between the teachers, school and university, which we have identified as being key in universities engaging school students with science<sup>2</sup>. We are now finding that the teachers are requesting the equipment to run experiments with other classes. We have trialled training sessions on-site at the university and other ways to engage teachers with the equipment-lending programme. However, nothing has worked as well as taking the time to work alongside the teachers and showing them what they can achieve.

We also learned that teachers valued our time and appreciated the opportunity to have us visit the school to work with their students. Many wanted us to come back, even if they were technically competent with the equipment.



**Figure 2.** Analysis of Family Tree/Disease Inheritance Experiment. Analysis of the results by the students reinforced the basic concepts of genetic inheritance.

The ability for students to work alongside the scientists was seen as very valuable. Also, having a university researcher visit the school helped give a human face to the institution and allowed informal discussion about the transition from school to university to take place. Taking this information on board, we are planning to build on the relationships we have developed and go back to the schools we have already visited. However, now that we have relationships with the teachers and the students, we are exploring how we can use technology such as Skype to connect better with rural schools. We have discovered that these digital technologies work best when we have already built a rapport with the students, so physically visiting the school and getting to know the students is vital. ■

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The Biochemical Society offers Scientific Outreach Grants of up to £1000 to support activities that communicate the excitement and relevance of molecular bioscience to young people and the general public. Andrew and Belinda Cridge were recipients of a Biochemical Society Scientific Outreach Grant in 2015.

For more information about the grants, including the criteria and how to apply, please visit <http://www.biochemistry.org/Grants/ScientificOutreachGrants.aspx>.

## References

1. Bray, B.J. and Cridge, A.G. (2013) *Int. J. Innovative Interdiscip. Res.* **2**, 27–33
2. Cridge, B.J. and Cridge, A.G. (2015) *Aust. Univ. Rev.* **57**, 34–44