New Horizons in Time-Domain Astronomy
Proceedings IAU Symposium No. 285, 2011
R.E.M. Griffin, R.J. Hanisch & R. Seaman, eds.

doi:10.1017/S1743921312001342

Reflections on a Week in Oxford

Tara Murphy

School of Physics & School of Information Technologies, University of Sydney, Australia
email: tara@physics.usyd.edu.au

Invited After-Dinner Speech

When Bob asked me a couple of days ago to give this talk, he said it should be "pithy and wise." When I spoke to Aris the next day he said it should be "informal and funny." Then Elizabeth spoke to me and said it would be great if it was "controversial and challenging." I mentioned to Aris just before dinner that I had put a talk together, and he said "Oh, you've written a talk—I thought it would be something more spontaneous!" Faced with an obviously impossible spec, I did what any reasonable programmer would do and rewrote the spec myself. So what I'm going to talk about this evening is a reflection on my week in Oxford.

Starting in 1985 . . . 1985 was one of those years that, although I didn't realise it at the time, would turn out to be critically important in my career. Two things happened.

First, the primary school I went to decided to upgrade their computer, and so were looking for a home for their old one. Noticing that I was more than a little bit interested in the classroom computer, and obviously under the impression there was no way a primary school could sustain two computers(!), they offered to give it to my parents, hence making me the proud owner of a BBC Micro.

My first programming experience followed shortly after. My mum had a thick book of "programmes", and had obviously figured out that you had to type them in to the computer to get something to happen. Having no prior experience with technology (or maths or science) she picked a programme on "Learning French" and over the next few days we typed in a series of nonsensical lines, which turned out to be, of course, the programming language Basic. The typing was going very well until one day Mum stopped suddenly. "Oh no, Tara", she said. "This is no use. You have to type in the French answers as well as the English. I thought the computer was going to teach us French." I guess this was my first revelation about how programming worked. I suspect Mum has been suspicious of computers ever since.

The second thing that happened that year was that now I was eight years old, my grandparents gave me £5 for my birthday. As befits such an inordinate amount of money, I spent an inordinate amount of time in the bookshop, before selecting "Encyclopedia of Astronomy" from the top shelf. Again, Mum was there, being very supportive, although she did ask rather doubtfully whether I thought the book would be interesting. I can now say: "Yes Mum, it turns out astronomy was pretty interesting."

Little did I know that these two things were the first step along a path that has led me to a joint faculty position in computer science and astrophysics, speaking at a conference that is about some of the most exciting things happening in astronomy, and some of the cutting edge computing required to achieve them. And all happening in Oxford, one of the great academic cities of the world. Mum would be very impressed!

Now you can't visit somewhere like Oxford without reflecting on the past, and a beautiful way of doing that down at the Oxford Museum of Natural History is through the

One Oak project, tracing the history of everything in the life of a single oak tree. One Oak was germinated from a single acorn, just down the road here at Bladon Heath Oxfordshire, in 1788. Some pretty important things happened in 1788. According to the display in the museum:

- The Times newspaper was first published in London
- Europe saw the beginnings of the French revolution
- Mozart composed his last music, and
- Lord Byron, the English poet, was born.

All very interesting, but as an Australian, I kind of felt like something was missing from their list. Aha—the much larger timeline on the wall would presumably be more comprehensive, and indeed it was. The other really important thing that happened in 1788, the year One Oak was born, was

- The Marylebone Cricket Club issued the definitive laws of the game and was confirmed as the sole lawgiver.

At this point I decided to file a bug report in the visitors book, suggesting that the Natural History Museum rectify the obvious omission of the founding of our country!

The age of these trees is impressive, but of course in astronomy we can do much better, with supernovæ and the resulting supernova remnants giving us a history of the last 100s to 1000s of years. This kind of forensic approach was demonstrated beautifully in Armin Rest's talk on light echoes earlier in the week—an incredible way of tracing the history of long dead stars. Like the trees, supernovæ are interesting scientifically, but they also provide a great cultural connection to our astronomical ancestors, who were very aware of the transient and variable universe.

I mentioned 1788 before, an important date in Australian history that marks the founding of New South Wales as a British Colony. For tens of thousands of years before that, Indigenous Australians were looking at the Southern Sky and—like many ancient cultures—they were avid astronomers.

Our ancient ancestors were much more familiar with the sky than most of us. Which reminds me of a bizarre exchange on the way into Britain on Saturday. I was travelling on my Australian passport, so I got quizzed at immigration. The questions from the immigration official started in a fairly standard way:

What are you visiting for?
"Work, a conference"
Where is the conference?
"Oxford"
What is the conference about?
"Astronomy"

But the next question really took me by surprise:

What is the really bright star right next to the moon at the moment?

Wow. British immigration officials are seriously impressive at checking credentials. Wow. In my jetlagged state I attempted an answer. Umm. Could be Venus, could be Jupiter. Ummm. Probably a planet. Is it twinkling? No. OK, yes, its probably a planet then. Ummm. I'm from the Southern Hemisphere, the sky looks different down there. (Even as I said this it sounded weak). Stars twinkle and planets don't, that's how you can tell them apart. Double wow. I'm discussing scintillation with British immigration guy. Major outreach triumph!

https://doi.org/10.1017/S1743921312001342 Published online by Cambridge University Press

Unlike me, our ancestors were very familiar with the night sky and so when they saw a new object, a transient, it took on great mystical and spiritual significance. They of course, immediately released ATels by drawing on the closest cave wall. When I see those inscriptions I feel a deep connection with our ancestors. It's the kind of thing that makes you take a moment and forget about grant applications, and press releases, exam marking and management meetings, VO infrastructure and issue tracking, midnight telecons and unanswered emails, syllabus review meetings and new buildings, and even Nature papers. When you strip all of that away (and for a modern scientist that seems increasingly hard to do), you have the same fundamental thing:

A person. Their awe at experiencing the universe. Their need to communicate it to other people.

Jumping forward in time: our medieval colleagues were also expert astronomers, and when a transient occurred it captured everyone's attention. But oh, the stakes were so much higher. I mean, if you get your transient identification wrong now, what's the worst that can happen? Someone scoops you in Nature. OK, I imagine that is extremely stressful. But nowhere near as stressful as screwing up the King's horoscope and ending up with your head on the chopping block. Literally.

So, taking a final jump forward to the present day, we repeatedly hear that we are entering a new era of astronomy, an era of data-driven science. We also say we need new approaches to IT to deal with this data explosion.

Bob and Elizabeth wanted me to say something controversial. Now I'm not a controversial kind of person, so I asked some friends at the conference what I should talk about. They said "The SKA site decision." OK, so I'm not even going to go near that (except to say, I hope Australia gets it!) They wanted something from my perspective as a person with one foot in IT and one foot in astronomy, and something from my perspective as a person right on the edge of Generation X, the last people who can (just barely) remember a world without the Internet (and what a terrible place it was back then).

Astronomy has often been a driver for computer science. In fact Babbage, trying to raise funds for his famous difference engine, pitched it to the Royal Astronomical Society in 1822, in his "Note on the application of machinery to the computation of astronomical and mathematical tables." However, and this is the controversial bit. I think we have actually got a bit behind. We're extremely good at high-quality data curation, databases and archives. We're great at telescope and data processing software, and we seek out novel algorithms from computer science to solve our data analysis problems. But, when it comes to online communication—which is at the heart of transient science—we've missed a major revolution that's gone on around us.

That revolution is, of course, social media.

Social media. It's either "a verbal sewer that is damaging your children" in the words of a Brisbane school principal earlier this week, or it may have revolutionised the way we think, but for Generation Y and beyond (our current and future students) it is just life. We think in a connected way. We live in a connected way. There isn't "the real world" and "the Internet." The Internet *is* the real world.

Now while some of the current generation have adapted well (I'm sure Bryan Gaensler has tweeted more this week than the rest of the conference put together), we haven't fully adopted this approach when thinking about the way we communicate within science. There's a lot of rubbish out there on the Internet. Nobody could deny that. But there are a lot of brilliant things as well. I don't know about you, but I have no trouble filtering

the wheat from the chaff. Britney Spears and lolcats never get in the way of me trying to do science. Finding things we're interested in is something that us Generation X- and Generation Y-ers are really, really good at.

We need to think about automatic dissemination of transient results in the same way. A lot of good comes from codifying standards and building large-scale infrastructure. But large systems are by their nature slow moving. Transients, by their nature, are fast moving. It won't be possible for lengthy standardisation processes to keep up in this rapidly evolving field.

The solution is to develop things organically, staying as agile as possible. This is exactly what cutting edge IT companies are doing. We need to be less conservative. We need to distribute the responsibility for quality control. It sounds scary, but we need to put as much information out there as possible and let the crowd decide what is important. After all, our next generation of scientists are experts at this. They have never lived in any other kind of world.