Reaching for the STARS

Dr Gaensler at his graduation ceremony in May.

At just 25, Bryan Gaensler has been awarded his PhD by the University of Sydney, become only the second Australian to win a Hubble Fellowship, and started work at MIT. To top it all off, in January he was named 1999 Young Australian of the Year. In this article, he reflects on the motivation behind his stellar progress.

If there is one word I could use to describe my educational and career path to date, it would be "fulfilment". For in late 1998 I began my career as an astronomer, working for NASA at the Massachusetts Institute of Technology (MIT) in Boston.

While now at the very bottom rung of my career, and hopefully with forty or so years of discovery ahead of me, I feel fulfilled because I have reached a goal which I set myself more than twenty years ago, when I was just three or four years old.

It all began when I first started to read. Back then (and perhaps still now), I had a chronically short attention span. *Spot* and *The Cat in the Hat* were quickly put aside in favour of stories about dinosaurs, volcanoes and inevitably, space.

The book that started it all was one my parents gave me, simply titled *Album of Astronomy*. Full of artists' impressions of planets, galaxies and spaceships, it drew me in with its incredible descriptions of all the things that had been discovered out there, and, even better, all the things we still didn't know about.

My schooling began in 1978 at Mimosa Public School on Sydney's northern beaches. A typical Sydney public school, it exposed me to the beginnings of many of the things I still feel passionate about today – music in all forms, cricket and rugby league. But astronomy was my true obsession.

At the age of seven or eight, my parents gave me a small telescope for my birthday. From then on, my evenings would often be spent finding craters on the moon, or looking at the rings of Saturn. It was also around this time that I learnt that astronomy didn't just have to be a hobby, that there were actually people who studied the stars for a living. Just what this involved or how one got there, I was not really sure, but I decided immediately that this was what I wanted to do.

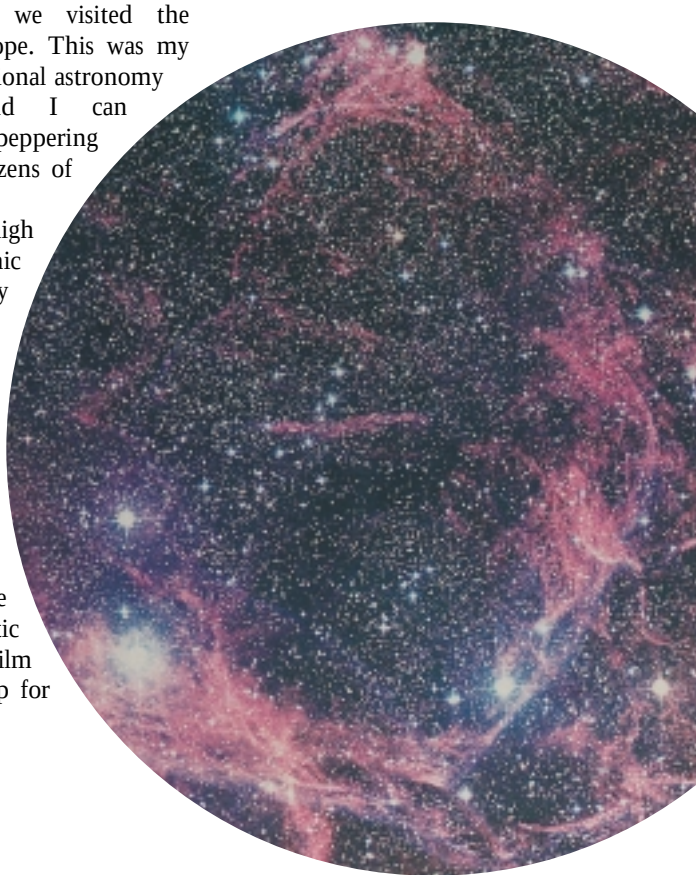
In 1983, I changed schools to join the fifth grade Opportunity Class at Chatswood Public School. Being surrounded by similarly gifted children proved to be incredibly stimulating, and I am still close friends with many of these former class-mates more than fifteen years later. My passion for astronomy continued.

I can vividly recall a school trip to Coonabarabran, where we visited the Anglo-Australian Telescope. This was my first contact with professional astronomy and astronomers, and I can remember vigorously peppering our poor guide with dozens of questions.

In 1985 I began high school, on an academic scholarship to Sydney Grammar School. I was still as keen as ever on astronomy, physics and mathematics, but now discovered my affinity for languages as well. I was really overwhelmed by the diversity of academic, sporting and other stimuli. Rather like the hyper-enthusiastic student in the recent film "Rushmore", I signed up for everything – I worked in the library, was a flautist in the school band, was scorer for the First XI cricket team, and of course was in the astronomy club.

One of the highlights of my time at Grammar was travelling down to a holiday house near Kiama owned by the then headmaster, Alistair Mackerras, for a weekend in April 1986. This, of course, was when Halley's Comet returned to our skies for the first time in 76 years. The view from Kiama, while maybe not particularly spectacular, is still something I cherish.

As the HSC begins to loom, one begins to think about the logistics of a career and of life beyond school. This was something I had never given much detailed thought to – I certainly loved astronomy, but had no idea how one went about actually becoming an astronomer. When I began to talk to people about it, the messages were discouraging: astronomy would take many years of study and involved long hours, poor salary and lousy long-term job prospects. One of the great things about



astronomy is that it can be a fulfilling hobby as much as it can a career, and I began to wonder whether I was best-suited to go into medicine, law or engineering, and save my astronomy for the weekends.

Of course this is not what happened, and to this I must give credit to the science staff at Sydney Grammar, who made science relevant, exciting and challenging.

In the end I nominated just a single preference for my tertiary admission, a Bachelor of Science degree at the University of Sydney. Looking back, the four years of that degree were probably my most enjoyable to date – even considering the demanding 35–40 hours per week of a science degree. There is something indefinable about undergraduate life – it is a gentle transition period between the intensity of high school and the responsibilities of adult life.

On the academic side of things, I found chemistry too hard and computer science too easy, but maintained the affinity I had always had for physics and mathematics.

But Sydney University has an impressive astronomy program – they have four separate research departments working in the field. Once I got a taste of real astronomical research, which bears very little resemblance to my times spent in the backyard peering at the moon, I was hooked!

I began with a small research project on twinkling in quasars (distant and incredibly bright galaxies) as a third-year undergraduate, as part of the University's Talented Students Program, and followed that with a three-month summer scholarship at CSIRO's Australia Telescope. I spent this time at Parkes Observatory working on pulsars, the incredibly dense collapsed cores left behind when a massive star explodes in a supernova. Having now got to feel the pulse of astronomy by getting to observe with a "real" telescope and by working on areas of current research, my path was set.

I decided I liked what I had been doing at CSIRO, and for my honours year in 1994 I chose another pulsar-related topic for my thesis, although now considering things from the theoretical, rather than observational, angle. Honours was an extremely intensive year, in which we had to combine a heavy course and exam load with the research work for our theses. I think I really blossomed in this high-pressure environment, sinking an enormous amount of time into my studies and being rewarded for this effort with the University Medal.

After a brief holiday at the end of honours, I went straight back to Sydney University to start a four-year PhD. The topic I had been working on until now, that of dead stars, continued to fascinate me. The Sydney area is certainly a good place to be for this work, because there are a number of experts at the various local institutions.

For my thesis, I decided to work on the exploding stars themselves rather than the pulsars they leave behind, focusing on the expanding rings of gas, "supernova remnants", formed by these explosions. For this project I made extensive use of the Narrabri Observatory of CSIRO's Australia Telescope, and was jointly supervised between the University of Sydney and CSIRO.

"I am regularly motivated by a pair of powerful ideas."

A PhD is hard work. There were several times when I was convinced that I just couldn't do it. I would find myself thinking that this was all just going to prove too hard, that I didn't have what it takes.

The real test of character is in finding something deep within yourself at these times. You can so easily convince yourself that a problem is insurmountable, only to find that a few weeks of hard work can turn things around. The other thing I hadn't yet realised is that if you set out to discover new things and answer unanswered questions, then of course it is going to be difficult at times.

I am regularly motivated by a pair of powerful ideas. The first is that if the task were easy and straightforward, then somebody would already have done it! And the other is that when things get really, really hard, it's usually a good sign that you've almost cracked the problem. It's hard to describe in words the supreme sense of satisfaction and fulfilment one can get from scientific discovery. There's not always that "Eureka!" moment – sometimes advance can be long and protracted – but the knowledge at the end of it that you have done something completely new is a thrill that no scientist ever tires of.

By late 1998, I had written my thesis and sent it off to the examiners. A large part of the will and motivation required to finish my thesis was the expectation I had set myself over the previous 20 years – I had always wanted to be an astronomer, and the thought of turning back at this ultimate

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hurdle was simply unpalatable. By now my understanding of the field was beginning to mature, and I was really beginning to get a feel for all the things that remained to be discovered. As a consequence, I eagerly began to get involved with big overseas projects, telescopes in space, and some exciting international collaborations.

By this stage I had received a number of job offers, all of which sounded very exciting. It was a difficult choice, but certainly the pick of the bunch was the Hubble Fellowship, the NASA-sponsored position which I chose to take to MIT. It was a difficult, but necessary, decision to leave Australia – there are so many topics and techniques in astronomy, and I could only get breadth and diversity in my understanding by spending some time somewhere else. The move overseas has certainly been vindicated – I have been almost overwhelmed by the plethora of conferences, projects and fellow scientists.

Being named 1999 Young Australian of the Year was hugely satisfying – I see it as an endorsement from the entire nation that what Australian scientists are doing is worthwhile and important to our country. I hope I can use the opportunities given to me by this award to show people what an interesting universe we live in, and to highlight the hard-working, and largely unsung, heroes of Australian science who make a vital contribution to our culture and our well-being.

If I can offer some thoughts on how I have succeeded, it is simply to have an abundance of determination, persistence and most importantly, enthusiasm. Don't let anybody tell you that you can't do something. There surely cannot be any better feeling than knowing that I have finally reached the goal that I set myself as a little kid staring at the stars, all those years ago. I hope that other young children out there persist with their dreams, and one day see them realised.

This article first appeared in Gifted, *the newsletter of the NSW Association for Gifted and Talented Children. The Association's Website is at www.nswagtc.org.au.*