

ASA Early Career Researcher Mentoring Workshop – Session summary

Session Topic: Navigating Career

Discussion Leader: Tara/Peter/Brian

If you only remember three things from this talk, remember these...

1. Everyone has difficult times – always go with gut feeling
2. Don't sacrifice your life for your work – it is possible to do both.
3. Opportunities often come when you least expect them – make sure you grasp them!

Session summary/notes

(Expand as needed)

Session start: 09:00 – acknowledgement of the local indigenous owners; 2nd ecr workshop, first two years ago in port stevens, north NSW, and now we're up in Queensland... next one in Darwin, perhaps? Wifi password is that, but not working at the moment... facilities through door, round corner and round back. If want to live tweet, use hashtag #ECR2014ASA ; organizing committee are David, James, and Sarah, who all waved. Fire to keep people warm in back corner...

First up Tara – wanted to do a quick poll to start us thinking about careers, and see where people want to go. Poll is what is ideal job in 5 years time... Tear off a strip and write a number down so we can plot it up...

1. Science in non-astronomy
2. Research only position in uni
3. Telescope support/observer
4. Academic (faculty) in uni
5. Astronomy Outreach
6. Astro Software or engineering
7. Career outside science
8. A non-science position in science (e.g. Journalist)
9. Research position in government lab

Answers to come at the end of the session. Now hand over to Brian....

An Academic Journey; Brian Schmidt...

Peter and I will start off in a similar way, with a nice broken projector...

Workshop is going to cover a whole variety of things – start off by telling us a philosophy which underpins my academic journey. Relevant to most of you, since I was once an ECR, similar state of affairs to how you were. See how my life panned out, as an example, but also the philosophy I've followed to stay sane and employed.

Brian born to two 19 year old undergrads in Montana, USA. Very pretty place. Rough part of world, but schools OK, and was a good life. Lots of time camping. Then moved to Alaska, father had a chief fishery scientist in Alaska until annoyed governer. Grew up in Alaska. Had telescope, but mainly for wildlife stuff. Was a good student at school, but not one of the best in the year, and decided to do astro because didn't know what else to do, knew astro would give lots of options, but didn't think it would give a career, since only 2000 in the world doing it, and it attracted the best and brightest, so do enthusiastically, but no belief it would lead to a career. Undergrad in Arizona, was a socially unhappy time, as he worked whilst lots of people didn't. Spent lots of time learning about lots of things – lots of stuff. Breadth is important in life... particularly when talking to non-astronomers.

Build relationships with people as working as an undergrad; the people you build relationships with are the things that build your career, since people who understand you can advocate for you and mentor you on the way. Built up substantial debt as an undergrad. PhD – chose Harvard due to gut feeling that it was the best choice, against all advice. Really enjoyed the visit pre-PhD; visited Caltech, Berkeley and Santa Cruz, and didn't like any of them – so went Harvard. Gut choices are really important – follow your own instincts. Larger-than-life supervisor – his thesis was his own, but the supervisor provided inspiration, overarching advice, and connections to rest of the world – it was perfect...

Supervisor gave him a topic he didn't like, so Brian gave him a new idea, and supervisor said 'that's much better', so do that. A plot per day to the supervisor, who didn't initially like it, but in the end thought it was his own idea! Final plot of thesis was $H_z = 73$, not a bad tshot.

PhD was very social time – work hard, but good time too. Closest friends weren't astronomers, but many astro friends. Social activities with lots of scientists, relationships that continue to this day...

Met his wife, and put PhDs in within three weeks of each other. Getting first job was very challenging – each got two jobs, wife in Washington or Sydney; Brian in Boston and Pasadena. Decided to start family in Boston, but agreed to get job in same place within two years, if not as Astronomer, as something else. So Brian would find a job where she found a job.

Postdoc was at PhD institution – some advantages, but also meant remained firmly coupled to PhD supervisor, led to strong, but inevitable interactions within a year or so... talk more about that in a second. What to work on – decided to change from thesis and work on something less broadly appealing than the thesis – this was a mistake – big area now, but not in 1993. Need to work on stuff other people are excited about as well. Brian went into measuring nucleo-synthetic output of type 2 SN – people care now.

Year inside postdoc, saw opportunity to do a research project to look at the deceleration of the universe. He was 27, and needed more resources than anyone had asked for, and had a fall out with PhD supervisor. Visited Chile and started the project there with the staff of the US observatory. Added European Astronomers, and used the High-Z team as peac deal between

supervisor him and US NO staff. He was appointed team leader at 27 of the team, where he was 2nd youngest person on the team. Dropped everything else I was doing and concentrated on this one project 100%. So dropped it all and hammered on the project. That was a smart thing to do, and did it naturally – was just so excited to do the project that it was a natural consequence.

Move to Australia – at end of 1994 – three months after High-Z team was formed. ANU provided the environment and small amount of resources he needed – travel money. Most valuable resource was TIME. Time to do three years of hard work. Time is most valuable resource as young faculty or postdoc – you're most able to do stuff you want to do, so you need time. Came to ANU at level-A position, a difficult time in lives as both him and wife worked v.hard and had two small kids. MSO Director asked why bought a house, and he said 'I'm not messing with my life because of Astronomy'. Good outlook – made decision that I wasn't going to leave Canberra.

1997 co-erced to interview for tenure track job at CalTech (one of two interviewed) – was sure after visiting CalTech that didn't want to disrupt my life and move, so told them I wanted to finish 2nd, but I didn't have a job. CalTech is a great place to visit, but not to stay. Had to be very firm when telling the panel that he wasn't going to take it. But they knew he didn't have a job – Jeremy Mould had told him he didn't have a job. Applied for two level B positions at Stromlo. Finished 4th in full research competition, 1st in the teaching position. Made decision that pure teaching position wasn't what I wanted to do in life at that time, and was looking at a career change, then three people turned 1st job down, so Brian was able to take it.

1998 – Accelerating Universe announced in Feb, science breakthrough of year in December that year, 2000 Malcolm McIntosh award, continuing position in 2002 (deferred), awards for getting awards, and finally got a permanent position in 2010.. was still level B on uni books, and had to promote from B to E in 2010, which required uni council to actually do something, which is interesting...

Always go with gut feeling in life pursuits, not expected success. Give best shot and see what happens. Always made sure that therew as an acceptable Plan_B. Back myself that my skills will enable me to do something interesting.

Academic Career should be seeking to do cutting edge research. Take risks to find your niche. If it doesn't pan out you'll end up having to find a less interesting job, but if you don't find niche you will end up there guaranteed.

Work on something safe whilst also working on risky or controversial. Credibility is important. Don't get too obsessed on working with a problem every things you're wrong on – work on it, but work on more conventional things too.

Doing too many things is a common failure mode for many bright young people/. It's OK to work on a few projects, but you must finish them in a timely manner (where timely means an appropriate amount of time). High redshift supernovae was a 3-5 year project, and got finished in 3-5 years. Make sure you actually do finish things. Common way for some of the brightest people to fail.

Positivity in face of adversity is important. People will treat you badly and you'll have bad luck. Move on and foorward with your career when this happens. Do anything else sets you back and can kill career. If people are treating you really badly, report issues, get uni involved, and let people

work on your behalf. Justice isn't your job. Rising above adversity can give you leverage later on...

No matter what happens to you, if you don't rise above adversity, people just don't respect you, and we all have adversity in some ways, though some get it much worse than others... All you can do is try to be positive...

Life-Career balance is really important. Academia is flexible, uncertain, but that's not going to change. There are times you have to work intensely, but that isn't all the time. Lots of face time not essential, but have to work efficiently, effectively and get research done is important. Two postdocs on part time, which works for them.

Losing life-career balance in pursuit of career is misguided, won't make/break career.

Be excited about what you do is far more effective at promoting your career than being scared about the future. Work hard when need to, but work normally when not.

Am I happy what I'm doing – if NO, then look for a change, or even change career. If YES, then challenge yourself, learn new things, take risks, and remain happy. Brian used to teach himself a new computer language per year. Don't be scared of change in the future.

Academia is producing many more PhD students and Postdocs than there are academic positions available. It is very difficult to figure out far in advance who'll get one. To be successful you need to learn to thrive in face of this uncertainty.

Wouldn't want to pick the winners way in advance. Can't predict future. There is ALWAYS a plan B – there are no shortages of positions for smart, capable people in the world. Work for success, knowing at some point a change of direction might be required. While such change may be scary now – it can be exciting and rewarding too. Once change has happened it's not so bad. Stop there.

Next up is Peter Quinn, UWA, ICRAR, thoughts on the career in astro. Very much a double act with Brian. Underscore the whole thing about can't predict the future – but don't turn your back on opportunity – things will present themselves that sound really mad/stupid, but don't turn your back on them – think about them, consider, and maybe even take them.

Bit of background – different kind of career – parents very simple people – father used to work with a lathe and repair steam engines. Mum was a doctor's receptionist. First person in family to go to uni. Can't predict, but astro was what I wanted to do. Got into it because I had a teacher in school who was really inspiring when I was about 12. Science was great fun. Grow up in Woolloongong. Did Physics at Uni, since the others weren't as good – Physics was what it should all be about. Got to year 3 at undergrad, was going to be a particle physicist, then bumped into the postdocs in Astro, and they sold astro to them, real chance to do something really interesting. Astro >> particle physics, and they persuaded him – you can do stuff yourself and make interesting things happen. Very appealing to be able to contribute to give something to a subject as a person. Then they took him up to Stromlo and introduced him to Ken Freeman, who was hugely inspiring, and he was the one who basically said try something for PhD and take it from there.

Worked at Stromlo and did PhD from 1978 to 1982. Day he arrived there said don't unpack the bags, you're leaving here in 3 years time, you're going overseas to do a postdoc after you finish

your PhD. Astronomy in his mind was all about working overseas e.v. the states. So you're out of here in three years time. Other shock, about two days after arrived, used that telescope in winter doing photometry, changed opinion of astro hugely. Didn't enjoy it. It was really cold. Can't do this. Then I talked to Ken – I need to do something that involves numbers, maths, physics etc. So got into interactions between galaxies i.e. colliding galaxies. So did some of the first really simple toy models of galaxies colliding together, doing computational modeling. Great time doing this stuff.

Went through PhD at Stromlo, came to end of it, applied jobs, two job offers, Princeton and Caltech – Alex Rogers said if you don't go to Caltech, I'll take this axe to you, so I went to Caltech. I've got to admit to emotional crisis at that time, floated into PhD without much idea of what might come after, and then realized I hadn't done much with my life other than physics and computers, and friends around me were married and had kids, and I felt I'd missed out – without making a conscious choice. Took me a while to get around to thinking this PhD would affect my life and change it for the better. Don't worry if you go through crisis at end of phd – it's perfectly normal!

I went to Caltech 1982-1985, postdoc. Couple of stories. I got to Caltech bright sunny day, went to astrophysics group, sat down for coffee, and they asked what I did. Worked on colliding galaxies, and they're all good fun, and first comment was "doesn't sound right to me". From day 1, was a battle, because anything I'd done was clearly wrong, since it hadn't been done at Caltech. Baptism of fire that was part of US academic ethic of trial by fire. Very combative environment – considered wrong and had to prove yourself right. Considered bad and had to prove yourself good. If survived, very formative, made you very certain of yourself and your work. Really hard to deal with, and depressing, but if you got through, you were made.

First colloquium at Caltech, Physics colloquium. Had to talk about my thesis work. In front row were three Nobel Prize winners in front row – Feynman asked a question, which was really terrifying. But this was part of the formative process if you go to the best places in the world, you expect examination by people like this, but it's part of your growth as person and scientist – don't expect to be looked after – be strong as you'll have to deal with it.

Caltech had lots of great people and you formed relationships that spawned all the academic interests I have. Incredible experience in creating ideas and networks. Met people doing computational cosmology – next step from galaxies. Needed huge computing power → Los Alamos labs. 5,000 PhD students on one site, biggest concentration of supercomputing in the world at the time. Very lucky to be able to go there, before 9/11 caused problems, and all the spying problems etc., so young people were welcome there. Got up close to some of the really nice machines.

Got to do some cosmology in competition with gang of four, and it was great fun, and great time to be doing science.

Kept idea of trying to go to places with lots of really good people → NASA STSI 1985-1989 – this was when Hubble was about to be launched. Sat in office and had awesome people walking past all the time. Great scientific time in my career – but also got me thinking about big science – things like Hubble don't happen easily – need to have a big group of people working on them. Part of something like that takes a lot of people a lot of time. People had spent 20 years putting Hubble together, but it worked out that it was more than worth it. Be aware that science is a big, international enterprise.

After that, I decided time to go home – hit the career path issue of trying to find a jumping point at which you couldn't land back to an equivalent place in Aus – so decided to come back to Aus. Accepted a level B position at Stromlo, and was there from 1989-1995. Idea of doing the MACHO project, so took old telescope and made new, and looked for microlensing, and even got on front cover of Nature, which was great fun. Spent three years, maybe four, with head under floorboards pulling wires, filling dewers, writing code, dogsbody for the important project, doing things that someone had to do. One of the first big data projects at the time – 1 Tb scale. Really a project that required all hands to the deck, 20-25 people who had to pitch in with whatever was needed. Did this for three or four years, got the result, applied for promotion from level B to level C. This was in 1995. Was turned down, no clue where came in the ranking. The reason it was a no was that I didn't have enough publications. Didn't make any papers whilst in bowels of the machine, but the institution didn't recognize the importance of the non-published contribution. Very publication oriented. Be aware of the publication issue/bar. In this case, it cost me a promotion, and I was very unhappy. Stormed out of the room, went to my office, and at that moment an e-mail had come up from Bob Fosbury, works at ESO – Peter, we have a job going to be head of a new division at ESO that deals with data – would you be interested? This was clearly a great opportunity. I asked two questions – am I happy? Clearly no, after refusal. Can I do all I want to do where I am? Answer here informed by time in US – been to the US, seen big science, seen Hubble project – clearly ESO was a better place to go for me to achieve what I could never had done in Stromlo. So that was easy, packed up family and bags, and moved to Munich – ESO, 1995-2006. Was there whilst the ESO was built.

I was a level B postdoc, then arrived at ESO day one, and this lady comes up introduces herself as Executive Assistant – and had to decide on a 2 million Euro contract day one; first six months was real out of body experience, I had no idea what I was doing whatsoever. I had to learn about projects, I had to learn about people, money, Gant charts, risk management, all stuff I'd never have learnt at Stromlo as a level B/C person. Why bother? I think being part of science and being a scientist requires you to get involved in this stuff. Can't ignore or turn back on it, it's part of how science gets done. Thrown in deep end, which wasn't easy – second day I was there I had to fire three people, but it was very formative – no regrets, gave me skills, experiences, and chance to learn skills I'd never have learned any other way. Don't go into shell at difficult times.

Didn't get to do much science, but contributed. Was very rewarding, and as BIG SCIENCE. Did that for a while, then in 2006 an opportunity came along again – what's the next big thing? One of those funny circumstances, next big thing might come in Australia – SKA; WA government good at providing cash to support people, so I thought here's a chance to build something big in Australia. Things have a habit of working out. Went back to WA in 2006 – there is a future to build one of the biggest things in Aus – Murchison Radio Astronomy Observatory, 2020. Was astronomy does things now is different – acquire skills, do things through really large projects. Australia is a great place to be – graph on impact etc. Australia punches way above its weight – very high impact papers etc. The career isn't simple, straightforward, or predictable. Things just happen, doors close and open, you have no clue at times what you're doing, but you tough it out.

Believe in yourself, and be accepting of opportunities. Future of astronomy is all about big stuff.

Q+A for Brian & Peter now, before Tara's activity:

James – question for both – as you progress through career, less and less time for science, have to deal with other things. Were you aware of this happening, how did you come to terms and manage

time etc. How did you set aside time for things.

Peter: Have to acknowledge fact you'll have less time for science. No point beating yourself up if you can't do something, you can't. That's a work life balance thing. Not run myself into the grave and not see my family again to just get another paper out. Yes, its disappointing, but you can't beat yourself up about it, accept it as part of the world you're in. You have to focus on getting the project started – these things chew up your time, but remember that's part of the bigger picture, and you're still contributing, even if you're not doing the research itself.

Brian: You do have some sort of choices to make in life though they'll creep up on you. If you apply on a large grant for a centre of excellence. Realise you'll be managing a team of 5-20 people – that's very different to just having student/postdoc. If you decide to do that, you're making a decision to take more of a managerial role. Most don't realize that when they apply, but I decided to do Skymapper, and needed more people, so applied. Be aware of decisions you're making. There are different roles for scientists. Until 2011, I did manage to make time to code etc., but that's eroded away – that wasn't really a decision I made. You'll see people and they're great astronomers and scientists who continue to be quite active, but typically have small groups. So it's a choice you have to make. Some like to stay really close to the science (probably most of us) but that keeps them from being part of these bigger things.

Sarah – both spoken about choosing institutes/locations where to work, and the expectation to travel and do international postdocs. What does it do for credibility to stay in Aus, for example?

Brian – I would say things have changed a bit. Certainly in Peter's era, it would have as Australian astro was so small. Now we have 15 places doing good research now, and we have a good culture. But staying here makes it hard to build international linkages that are very important for you to do science. Big problem is that – you need the international linkages – so you're making life difficult if you don't go overseas at some point.

Peter: I agree – linkage thing is something that is really important – sooner you develop some links the better. Marketing too – nothing better than putting yourself in front of people.

You mentioned not publishing when building instruments – do you see any way we can change culture of astro to recognize people whose contributions aren't papers etc.

Peter: Universities are universities and won't change – but international organizations and projects now have a bigger role, and they are aware of how these things work – again, the linkages are important – people will know you for what you've done and are interested in – so don't think of uni channel as the only one/important one

Warwick – promotion process in universities is moving a bit in that you take an individual's case for the committee – and you take all the things they've done in hand, not just papers. It's getting more open. But papers in last five years is always big factor.

Brian – converting non-permanent to permanent in uni sector is still hard.

Tara – you're not ranked in how many papers you have, so long as you have enough to get over the bar, then other things come into play.

Richard: Its commonly given to people at these stages that you fire out as many papers as you can – but now pointed out that next stage is management etc. – wondered to what extent those experiences have become selection criteria for higher jobs – so how much do we need to learn demonstrate management skills when applying for higher jobs from postdocs.

Brian: Peter's case is really unusual. Looking for you taking scientific leadership on a project, then you transition. Leadership stuff comes out as part of leading science investigations. That said, there're plenty of opportunities to formalize some of that stuff. That's where things are much better than they used to be. Being trained as a leader is pretty tough – often don't know until

someone is thrown in how they would work. Wouldn't worry too much for most of you. Get on with your business, take opportunities, but wouldn't be premier focus at this point.

Peter: wouldn't suggest go off and do course, but showing interest in and embracing of teamwork and taking roles etc., applying grants etc., this distributed managed research process is very important to demonstrate. Keen to find people involved in that kind of stuff already.

Tara: Two things – first – results. Mainly people want to be either Academic or Research only position in 5 years time. More than 75%. Add research at CSIRO or AAO is almost everyone here.

Half of astronomers in Australia employed by CSIRO and AAO.

Not talk further now, but useful context for rest of two days.

Questions we should answer, then quick activity.

- 1) What is your 5-year career goal? Very specific.
- 2) Do you know what your ideal job involves?
- 3) Do you know what you need to do to get there?
- 4) Do you have someone you can ask about the next step?
- 5) Do you have a plan B?
- 6) Do you enjoy your current job?

Academic job – Tara – 40% teaching, 20% service, 40% research; Research = leadership, planning, grants, supervising, managing, and doing science – i.e. not a huge fraction of time sciencing...

Now get everyone up talking to people, and network ☺

Always talk to people at conferences – ask about their work, talk about yours, and talk to people you want to about their science. Don't have to be good at socializing to do it, but you can make it work.

Interesting quotes from the discussion

(Expand as needed)