

## Interview with Prof. Brian Schmidt

Date: April 15, 2016, 3pm

Place: room S721, Meng Mingwei South Building, Tsinghua University, China

Shude Mao: I interviewed you on August 18, 2012 during the IAU. Since then, you have become the President of the Australian National University. Congratulations!

Brian Schmidt: Thank you very much, Shude

Shude Mao: First, what brought you to China?

Brian Schmidt: So my prime minister Malcolm Turnbull is visting from Australia, and there are thousands of Australian businessmen in China this week, so I decided that I would come - I was asked by the prime minister to be part of this program - so I was at the Ancient observatory in the middle of Beijing. But it's also a great chance to come in and visit Tsinghua University for the first time, and to meet people with whom we do so many great of things with – that is between Australian National University and Tsinghua.

Shude Mao: How are you adapting to your new role as the President of ANU?

Brian Schmidt: It's very challenging. A university is a very big, complex organization compared to a research group. So I am enjoying the challenge but you know, there are good days, most days are good, and there is occasionally a bad day. You have to make hard decisions. I think, that - I having to make hard decisions is the part maybe the least fun, but I am really enjoying the chance to get people thinking about what the university needs to do in the future, rather than just going about their business as usual.

Shude Mao: Do you still have any time to do research?

Brian Schmidt: I get a little bit time. But the reality is being the president of a university is more than a full time job.

So I tried to go up to my Observatory a half day a week, but the reality is it's not a lot of time. So a little bit in, I hope once things settle down a little bit, because I have only been doing the job for three months. once things settle down a little bit, I will have a little bit more time.

Shude Mao: At ANU, I believe, you have a lot of Chinese students at ANU, what's your impression of these students? I am curious to know their strengths and areas that they can improve as a sort of statistical sample.

Brian Schmidt: So our Chinese students are diverse. They come from all over the China. They, typically, are students whose English is really good. They are often very studious, that is they like to study. And compared to Australian students, I wouldn't say they are risk takers. They tend to be very cautious. That is they like to do what they are told, but they don't as a group tend to go off and do things just for the sake of doing things. So one of the great things we try to get the students to do at ANU is to understand how Australians think and do - Australians can tend to do things that, you know, aren't planned. That is a part of the creative process in academia.

So over all, (they are) very well trained. They know their subjects very well when they come, but need to be a little more adventurous. So I think that one the great things that what we can help to bring to Chinese students is a different culture, a different way working in the world, which, you know, and our students in Australia get to see the Chinese culture as well. So it's global world and I think we can learn each other that way.

Shude Mao: Last time, I asked you about the role of international collaborations for astronomy. So this time I want to be more specific. What kind of collaborations have China and Australia developed in the last few years?

Brian Schmidt: Yeah, this is actually quite exciting. We have started working together in something, a program we call ACAMAR which is a cooperation between Australian and Chinese astronomers. So we have PhD students, coming and studying in Australia. We have Australian astronomers coming up here and visiting China. We are working on the instrumentation of China's huge new radio telescope, FAST. We are using this new technology called a phased array feed for radio that allows radio telescopes be much more powerful, essentially as a digital camera for radio telescopes. We are continuing to work together in Antarctica. And that has been driven here in China, but we, in Australia, helped with the facility down there, providing power and logistics. And we are working closer and closer together on the Square Kilometer Array. So all those things I think are a fair bit of progress since 2012. And there are a lot things in the future, for example gravitational waves.

Shude Mao: One question the Chinese scientists are always asking: how do you balance domestic projects and international projects? For domestic projects, you

can (more easily) take leadership roles. For international projects, you have to work with others. How do you think we should balance these two efforts?

Brian Schmidt: It's an interesting problem. I think it's good to have a bit of both. One of the advantages of having a domestic project is it's nearby, it's easy to work on, it's easy for students to work on them. And you need to choose project domestically which you are still world-class, they may be niche, but still interesting in the world vision. You don't want to do second-rank things. But through that knowledge and practice locally, you can take that and do things on the international stage, and do it as a partner. So I think the big projects internationally are some of the biggest and most interesting things to be involved in. But you cannot expect just go into them without having done your homework, and that domestic projects gives you the homework. It builds the base. So you want to do a bit both, I do recommend making sure that domestic projects really are, maybe very narrow, but important and nonetheless. And what you don't want to do is end up spending your money on big domestic projects which are not world-class. That's always a mistake. Everything has to be world-class.

Shude Mao: So you mentioned gravitational waves. It has generated huge interests in China, both for scientists and for the public. So what about Australia? Has the government decided to do something?

Brian Schmidt: The day that the gravitational waves was announced, Myself and Others did a presentation at the Parliament House. Australia was involved in developing the instrumentation of LIGO and some of data analysis. And my university ANU were continuing to work to do what's so called quantum squeezing of light so you can make instruments even more sensitive - but our group had helped develop the current instruments as well. So the government is interested, it had an opportunity to build a third LIGO a couple of years ago. At that time, the government decided not to spend money on that. And that instrument now is going to be built in India. Australia is a better place to put it in terms of just the location on Earth. But I think that bird's flown. But Australia is interested in because we have the expertise and may be involved in the next generation where we can use the quantum squeezing of light and other things to the full effect. And that is still interesting because you are going to be pushing the technology, and that pushing of technology allows you to do things that are interesting for the science and but also interesting within business, technology, and those types of things. Already, we have a startup out of the ANU, where we generate quantum random numbers from the technology that goes into LIGO that we had helped to develop.

Shude Mao: In that sense, gravitational waves are not useless.

Brian Schmidt: It's not useless, which is true of almost any cutting edge science question. Any time that you start to explore the edge of what we know, you have to develop new knowledge. That new knowledge is very difficult, in advance, to guess how it's going to be useful. And gravity waves is a good example where, you know, one of our more interesting start-ups, doing quantum random number generation came out of something that has no apparent direct use.

Shude Mao: I know ANU is involved in both ground and space detections of gravitational waves, where do you see the priority between the two?

Brian Schmidt: So space based gravitational waves allow you to do things incredibly accurately on waves that are very long. Whereas on the ground, you are kind of confined by the earth, so you have to look at gravitational waves that are very short. So merging black holes that are of the size that were a bit bigger than our sun is something you do well on the ground. You want to look at longer things like merging super-massive black holes or things like that, then you really need to get out into space to do it. They both have their pluses and minuses, space is really challenging and is expensive. So in the short term, I believe we need to think about how to do the space-based things. But we know we can do very well on the ground for the time being, and so I would suggest developing space slowly, but surely, and then really making sure that we exploit what we can do on the ground as well as possible in the short term.

Shude Mao: So we covered the gravitational waves. My last question to you is: Do you have any advice for kids/students who might be interested in astronomy and in science in general? How can they prepare for themselves?

Brian Schmidt: So the first thing is, if you are interested in science, don't be scared of it, it's really an education that gives you a huge amount of opportunities. There are many people who have been trained as scientists around the world. But they are also business people, politicians, you name it. Pretty much the training of a scientist is to learn how to think and solve problems, so that's useful no matter what is going to happen.

If you want to be a scientist, and train as a scientist, you need to enjoy science but you also need to do well in school. And the most important thing is your mathematics. Math is the toolbox of a scientist, so I think it is really important to make true you know your math, because that's the key building block of science. And otherwise, explore, play around, figure out, try to learn about

things on your own, start thinking about how to solve problems. Don't just do your homework; think about, when you walk around, how what you learned in school applies to the world around you. So that would be my advice.

Shude Mao: Thank you very much, Brian, for your interview.

Brian Schmidt: My pleasure, Shude.