Jocelyn Bell Burnell

Jocelyn Bell Burnell is a well known radio astronomer who discovered pulsars in the late sixties. This discovery of pulsars led to the first Nobel Prize in Astronomy in 1974. The award, however, was not given to Burnell; instead it went to her Ph D supervisor Antony Hewish and to Martin Ryle. Bell Burnell was President of the Royal Astronomical Society and the first woman President of the Institute of Physics until 2011. She delivered a Centenary Lecture titled 'Reflections on the discovery of the pulsars' on 9 January 2014 at the Indian Institute of Science (IISc), Bangalore. Soon after the talk she spoke to *Current Science* about her interest in astronomy, role of mentors in science and what can be done to engage more women to do science.

What got you interested in science, particularly astronomy?

When we started doing science at school, which in Britain is age 12, it became clear quickly that I was good at physics, okay at chemistry and bored with biology. So I was going to head towards physics. And then there was a question of what kind of physics I would do? My father got a lot of books home from public library. One day when I was about 14, he brought some astronomy books and I read these from cover to cover. They were very good books and I am grateful to Fred Hoyle and Dennis Sciama for writing these books, because they showed me that the physics I was learning at school could be used to help understand big things like stars and the galaxy. And I decided, if I could I will be an astronomer.

Did you have a mentor? Do you think it's important to have one?

No, I didn't. I believe that mentorship actually helps people enormously. And mentors for young women need not necessarily be a woman. It sometimes is quite good if a more senior man can see things through the eyes of a younger woman.

How much has changed in the way scientific establishment treats women?

Certainly yes! Astronomy today in Britain, has quite a lot of women. This is at the research level. It is interesting because most of us have obtained physics degrees. But the number of women doing research in physics is much fewer than the number of women doing research in astronomy. So, we have come through physics to get to astronomy. Most of the women have moved to astronomy, relatively few stayed in the rest of physics.

Why do you think fewer women are opting for a career in science or opt out of doing science?

I think it is very important to gather the statistics about the number of women, including the number of women who apply and the number who get selected. And collect them year after year to see any trends. We have been doing this in Britain for a while.

I think most important is to collect statistics and monitor them, because we are scientists, we like statistics. So that's a huge help. The other thing that can help a lot is to have some senior women around to help support graduate students; to be role models and mentors for them are important things as well. It is not an easy problem to put it, right, because you're changing society and changing society is slow and uncomfortable for everybody. So there is a limit as to how fast you can go.

Based on your interaction with students in India, do you think the problems faced by young women aspiring to become scientists are similar in India and the UK?

Yes, I've been meeting, although briefly quite a lot of research students as I have gone to different institutes and it has been one of the best bits. I hugely enjoyed it. I relate particularly to women grad students and maybe I flatter myself. But I think they are quite pleased to see a women scientist come in. But it's been a great joy meeting all the grad students and hearing what they do. One of the things that particularly struck me is that the students are very good at explaining in just 2 or 3 sentences what their research project is. So they must have a clear understanding of what they are doing. It's brilliant. It's very good.

You have been helping the Royal Society of Edinburgh, UK to suggest better ways of engaging women scientists. Would you extend your experience to India?

It would be better if Indian researchers did it, but I would be very happy if I can talk about what was done in Scotland. It was very instructive.

What can India learn from Britain to attract more women to do science? Would you have a few suggestions for India on promoting women in science?

I get invited to go and give talks at other institutes. I talk about what we learnt through the Royal Society of Edinburgh study, what I have learnt through a lifetime of being involved with women in science. And, what is very interesting is to compare conditions in different countries. There are differences; they are quite strong cultural differences. In Britain, we have problems getting enough women doing engineering and physics. But, for example, I went to Malaysia. I was visiting a science university there. I was talking on getting more women to do physics and they said why? Why? So I explored a little bit further. It turned out that the undergraduate physics class in the Science University in Malaysia is 60% female. The culture is different. It is perfectly okay for women to do physics. On the contrary, in my country it is regarded as slightly odd if a woman did physics.

What according to you are the reasons for this cultural differences and what can be done to overcome the situation?

I cannot explain the differences in culture in different countries. One reassuring thing is that in some countries there is a large proportion of women doing astronomy and physics and science in general. It demonstrates that women can perform well in these subjects; women's brains can do science perfectly well. But the problem is that older women tell younger woman like you: Oh! You don't want to do physics. You wouldn't enjoy it, it is a man's subject, don't do it. Go do languages or something like that. And changing that kind of culture is a very slow job, but it can change, and it is gradually changing in Britain. If you change it too fast you get a pushback or a reaction, so go steadily and gently.

Importance of science communication

We have started doing more science communication in Britain and we are learning how to talk to media, how to talk to the public. It is very useful. Some people I think will never be good at communicating. They just aren't made that way; but fair enough there will be others in their research groups who are. They should be encouraged to do so. It should be recognized that they do the work of communication on behalf of that group.

Do you think that there is a need to change the way prizes are given?

You can't change historic prizes like the Nobel Prize because the prizes are awarded to a maximum of 2 or 3 people in a particular field of science. There is no way today we can change that, as far as I can see. But what we can do is that we can create prizes that go to whole teams; maybe that balances things a bit.

How is the pursuit of astronomy different from other sciences?

Astronomy, geology, earth sciences and archaeology are sciences where you observe more than experiment. You cannot go to a star and turn a knob to change its brightness. In geology you cannot see, you cannot re-run the processes that laid down the rocks and in archaeology you cannot say to the skeleton, 'would you mind dying again because I want to see your burial ceremony'. In all those cases you have to work with what you're given. In most of the sciences you can experiment, you can change the condition. In that sense astronomy along with earth science and archaeology is different from the other sciences and perhaps you have to be a bit more ingenious, because you've got to work in astronomy with the photons you're given; there is nothing else that you've got. So you have to be clever about how you process them and so on.

Would you like to tell us about your interests outside physics?

One of my hobbies or recreations is that I collect poetry. Poetry with an astronomical or space theme and I find quite a lot of poetry written around astronomy and space. I have co-edited an anthology of those poems. Poetry is a very good way of bringing people who may be scared of science, towards science. If you are going to read them a poem about radio astronomy, you have to say little about what radio astronomy is, or if you are going to read a poem on black holes (there are some poems about black holes), you have to say something about black holes. You teach some physics or astronomy under the heading of poetry. I find that in a talk on astronomy and poetry, my audience is mainly female. When I do a talk on astronomy my audience is mainly male. So through doing those astronomy and poetry talks, I am reaching women who perhaps had a bad experience of science at school and are a bit scared of science.

Would you have a message for women in science?

It can be quite difficult for younger women, because they are starting or soon will start having a family and it's quite hard to combine family and research career. So their research career may have to go slow for some years. I think it is always important to do the very best work you can. Always do quality work. Keep your contacts with the place you have worked before. Maybe they will allow you to be a visiting researcher if you cannot get any other job. But today with internet and lots of large databases, women who have some training in research, may be able to keep going with research, working at home on some of the databases.

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