Elizabeth Blackburn: Because science is worth it

Blackburn is one of this year's laureates for the L'Oreal-UNESCO Women in Science award.

Elizabeth Blackburn is the leading lady of telomere biology. Her discovery of telomerase with her graduate student Carol Greider in 1985 revealed for the first time how the complex, repetitive ends of chromosomes—regions that normal DNA replication machinery can't cope with—are maintained (1).

Without telomerase, our chromosomes would shorten incrementally with each cell division, thereby putting telomere-adjacent genes at risk of being gradually eroded. Indeed Blackburn showed that telomerase activity is necessary for the indefinite replicative capacity of cells (2), as shortening telomeres initiate cellular senescence. This work led to the suggestion that cancer cells, which replicate excessively, might be tamed by curtailing the action of telomerase (3).

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Blackburn has published over 150 papers on telomerase and telomeres and has won numerous awards for her work, including the Lasker prize (often referred to as the American Nobel). She's a fellow of the Royal Society and an associate of the National Academy of Sciences, and she's also a wife and mother.

Each year, the L'Oreal cosmetic company pairs up with UNESCO (United Nations Educational, Scientific and Cultural Organization) to present awards to outstanding female scientists around the world. The aim is to highlight these women as role models for a younger generation of women scientists. In a recent interview, Blackburn explained what it meant to her to receive this particular award and why she'd urge more women to stay in science.

EARLY INFLUENCES

Do you think your parents' careers as physicians influenced you toward science?

In my mind, science and medicine were very different. A number of my other relatives were also in medicine. So, science was somehow almost a rebellious thing to do.

The main influence my parents' careers had on me was that it gave me the idea that women and men were equivalent in careers. They were both physicians, they grew up at the same time, and they trained at the same time.

Elizabeth Blackburn looks at a chromosome's telomeres (not to scale).

Probably, the other influence it had was showing me that motherhood and career can go together. My mother worked part-time much of the time, as I was one of seven children!

Wow.

I have to say, none of us kids ended up having more than one or two children each. So, we kind of equalized the gene pool contribution again.

Another thing that I think was helpful was that I went to an all-girls school. Although I despised the idea at the time and thought of it as very fuddy-duddy, I think it was a somehow liberating environment—you could be an academic girl, and there was no social pressure on you to not be.

You've won tons of impressive awards for your research. What does this particular award mean to you?

This one really spoke to me, because over the years it became more and more obvious to me that, for women, the world of science is often difficult.

As a younger scientist I just didn't think about it a whole lot, and I think that was the way I survived. But then as I became more senior and more confident, I realized this was something I cared about very much.

I could see my own women graduate students and postdocs feeling that they would not thrive in the world of science, despite the fact that they were, and are, wonderful scientists. They clearly love science and are fabulous at it. But at some point the world of science becomes very difficult for them.

Some of the issues are not unique to science. But they're exacerbated in science, because of the way that science has been done over the years.

At undergraduate and Ph.D. levels, there's a fairly even number of males and females.

Oh yes, and indeed, even at the postdoc level. The real difference is at the stage when people are moving from postdoc to faculty positions. That's the really interesting thing: if women are not applying for these positions, but they've done extremely well up to that point, then aptitude doesn't have anything to do with it, something is just putting them off, right?

I think that's a sad thing, because they are also cutting off the joy of doing science. After all, we love this job (even though we complain).

So, I think it's wonderful that L'Oreal and UNESCO are saying, "Hey, gender diversity in science is good for science!" It's a very clear message that they're sending by giving these prizes. And I'm happy to be part of it, and to be visible. I'm saying to other women, "Look, hey, there are lots of women who do very well in science. Look, here we are, we're okay."

Text and Interview by Ruth Williams
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You don't have to be a superwoman or somehow extraordinary. It really is within the reach of the good postdocs and students out there.

MANAGING MOTHERHOOD

The transition from postdoc to faculty happens around the age when a lot of women are considering motherhood.
Exactly, and that's a huge thing. Quite rightly, women sometimes feel that if being a scientist means working 16-hour days, seven days a week, then that's not compatible with having a family. It's not stupid to say, "Well, I don't want to do this."

But actually, I don't think it's necessary to do science that way. I learned that lesson when I was a young assistant professor at Berkeley. There was a postdoc in another lab, and she would go home at four.

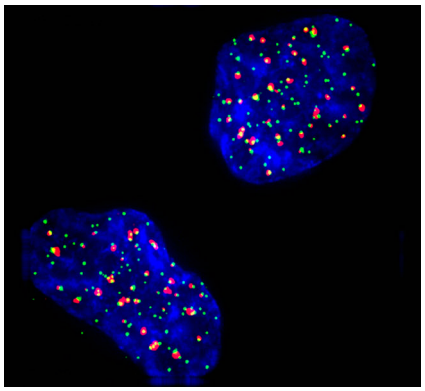
I thought, "What? She's going home at four? How could this person be a serious scientist?"

She was coming in at eight, going home at four. She had a young baby, and she was just super organized, incredibly productive, and she ended up getting an assistant professor job. To me, it was like, "Oh, there is another way to do science and be very successful. It doesn't have to be this non-family-oriented model."

I realized that in fact science doesn't have to be done at some breakneck pace all through one's life; it could actually happen in long waves of high activity and then less activity, if for example you have children at certain stages.

You don't think it would be hard to keep up with the competition during the less-active waves?
On the contrary. Janet Rowley, who won the National Medal of Science and who discovered the recurring chromosomal translocations that characterize leukemias and other cancers, actually made this discovery while she was working part-time.

She's said that in fact this is *why* she made the discovery. She said, "Because I was working part-time, I actually had time to think." We don't necessarily think that being part-time can actually confer an advantage in science. But in Janet's case, she made it help.



Damaged telomeres (green) bind damage–response protein (red) in cancer cells.

How did you personally juggle motherhood and career?
I was in my late thirties, an associate professor at Berkeley, and I was working crazy hours—just insanely working and working. Then suddenly, within the same week, I was made a full professor and I became pregnant! I thought, "Whoa, okay."

I did have the comfort of having a functioning lab with lots of momentum, as well as the resources to have child care, so that worked out for me. But I don't think mine is a template that one should necessarily follow. It might not be biologically the best idea to wait, because fertility does go down later on.

Do you think it's more difficult having a child in the Ph.D. or postdoc years when your future is less certain?
There's no easy time. I know examples of wonderfully successful women scientists who've had children at all different stages. Certainly, it's not helpful for a woman to be made to feel that by deciding to have a baby she's doing a bad thing for her career. I think it's good to say, "Hey, I have my right to have a family. I'm not a failure as a scientist because I want a child." It's a very important message to send.

Of course, it's always difficult, it's always very hard work, but it's always going to be that way, regardless of when you have your child. It'll just be a different set of factors that are being juggled. It's not easy, but it's rewarding. The family is very rewarding, and science is very rewarding.

RESHAPING SCIENCE

Is it true that the telomere field has an unusually high proportion of women?
In my lab, the ratio of women fluctuates up and down. But actually it's always roughly the biological ratio of women. So, the question that really ought to be posed is why do the other fields not have the biological ratio of women?

The fact that it's unusual that the telomere field has the normal biological ratio of women I think says volumes about what's happened to women in research in general.

How do you think other fields could encourage women to stay?
There isn't a single magic bullet, but one interesting thing I've seen happening in our institution is postdoctoral associations. They run courses and workshops to teach you how to do things like manage complicated lab dynamics, manage grants, write grants, and negotiate with colleagues.

"If more women stay in science, they will reshape how science happens."

I've watched my postdocs going through these courses, and I think it gives them confidence. They knew they were really good scientifically, but they're daunted by all the other factors that accompany the job of leading a research team or institute. I also think that joining the American Society for Cell Biology is good. It was the first professional society in which I could see women being treated in a very inclusive and welcoming way.

I think these sorts of things make a big difference to young people who are uncertain about themselves.

I'm also hoping that if more women stay in science, they will reshape how science happens. I don't think that the way science has happened for the last 100 or so years is necessarily the most successful model. I'd like to see an infusion of new ways of doing things. JCB

1. Greider, C.W., and E.H. Blackburn. 1985. *Cell.* 43:405–413.
2. Yu, G.-L., et al. 1990. *Nature.* 344:126–132.
3. Blackburn, E.H., C.W. Greider, and J.W. Szostak. 2006. *Nat. Med.* 12:1133–1138.