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## Interview – Donna Strickland, 2018 Nobel Prize of Physics

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Donna Strickland was awarded the 2018 Nobel Prize in Physics for her invention of the chirped pulse amplification (CPA) technique with Gérard Mourou in 1985. This technique amounts to stretching a short pulse at low energy through diffraction gratings, then amplifying it to high energy before finally compressing it in order to get a short, high energy pulse. This technology opened the route to petawatt lasers used in high-field science, ultra-fast imaging and spectroscopy techniques, eye surgery, and many industrial applications such as micromachining, to mention a few.

The interview was led by Luc Bergé, Chair of the Equal Opportunity Committee of the European Physical Society (EPS), while Prof. Strickland was visiting France between March 18th and 22nd, starting first with The New Aquitaine Region (visit of the Megajoule Laser and the Route des Lasers) and ending her French trip with a conference in her honour given at the Ecole Normale Supérieure in Paris.

**LB:** Donna, the last time we met was in Nottingham (UK) during the 2018 Laser Physics conference held in July 2018. What has changed since then? How is your new rhythm of life?

**DS:** A Nobel prize! Since the announcement by the Nobel Committee in October 2018, my life has completely changed. This was a great surprise. I remember that when on October 2nd I received a phone call at 5 a.m.

from the Swedish Academy of Sciences, I then discovered at 6 a.m. a continuous stream of congratulatory emails scrolling down on my computer screen without stopping. In the following 24 hours I had to deal with journalists on the phone, a photographer in my home, all while renovating our bathroom! Life was suddenly changing. I have given many talks at many institutions and governmental organizations, in my native country of course (Canada), but also in the US and abroad. You need to answer plenty of journalists coming from different medias. You are solicited always and everywhere, sometimes facing 4 or 5 cameras at the same time. Shortly after the announcement, the President of my University (Waterloo, Canada) kindly asked me what he could do for me. I am the first person at the University of Waterloo to receive a Nobel prize and so we are all learning together, what is expected from a Nobel Laureate. To help me, I now have two people, one executive assistant and one communications expert. This was necessary at the beginning to handle the overwhelming number of media requests. Now it is more about travel and speaking engagements. Until the Nobel Ceremony in Stockholm (December 10th), I did not travel so much, but gave many interviews. Since then, I have been invited a lot, contributing to International conferences or to special events such as the symposium held to honour Maryam Mirzakhani, the Iranian Field Medalist. I have travelled to Ottawa, California, then London, Boston, before coming to France this week, on behalf of the Region of New Aquitaine, and also the Canadian Embassy.



Donna Strickland and Luc Bergé.

My agenda is fully booked in 2019 and 2020 as well. I understand from previous laureates that the schedule will ease eventually, although requests continue to come in.

**LB:** You are not only a Nobel Laureate, but also a woman physicist. The third woman Nobel laureate after Marie Curie and Marie Goeppert Mayer. Are you solicited so much because you received the Nobel prize in physics or because you are a woman?

**DS:** Both. I would say fifty-fifty. First, because I received the Nobel prize and because of my discoveries and expertise in physics in general, and ultrafast optics in particular. I am actively contributing to many scientific events, giving plenary talks all over the world. But it is true that, as a woman, I am also aware that I am becoming a role model for lots of young female physicists. This afternoon I was participating in a panel at the Ecole Normale Supérieure on “Women and careers in the fields of science, technology, engineering and mathematics”. Promoting a better gender balance is important: only 18 women have received a Nobel prize ... 3% of the awardees, this is not so many. For comparison, in the scientific community, around 30% of PhDs are women.

**LB:** At what point in your education did you consider a career in physics? Why did you choose to study physics?

**DS:** In high school, I was rather good at mathematics and I decided to go to Waterloo University which was –

and still is – a well-known university for maths. My best friend decided to go to Waterloo and my sister was already there. I was a very shy person and thought it best to go to a university where I didn’t know many people to push myself to meet new people so I decided not to go to the University of Waterloo. Since I wasn’t going to Waterloo, I decided not to study maths and decided that I liked physics just as much. My father was an engineer and my sister was studying engineering so I thought that might be a better choice. I looked over the various programs offered in the nearby universities and found that McMaster University had an engineering-physics program and that sounded like it was meant for me. One area of the engineering-physics program was lasers and electro-optics and that just seemed like a fun, exciting thing to study so off to McMaster I went.

**LB:** What has personally been the most rewarding experience and also the biggest difficulty encountered so far in your career?

**DS:** Without any hesitation, the most rewarding experience for me was – of course – the CPA technique which I discovered during my PhD thesis. It is rather exceptional to make a breakthrough when you are young, just graduating while having no thought at that time that you may become a Nobel Laureate for your finding.

About the difficulties, well, I did not follow the standard career which an academic scientist is expected to follow. In fact, I had to temporarily give up the idea of making an academic career. After my PhD I went to Ottawa. From 1988 to 1991, I was Research Assistant at the National Research Council in Canada. Then I joined the laser department of Lawrence Livermore’s national laboratory from 1991 to 1992. However, like many women (and wives), I met my husband and decided to start a family. You then have to deal with a “two-body” problem. My husband had already found a permanent job at Bell Labs Murray Hill in New Jersey. Therefore, I came to Princeton University where I became a member of the technical staff at the Advanced Technology Center for Photonics and Optoelectronic Materials. This turned out to be a good choice for me as I went through my two pregnancies during this time. I think I would have found it difficult teaching through my two pregnancies as I was sick through all nine months both times. In 1997, I was back on the academic track receiving an Assistant Professor position at the University of Waterloo in the Department of Physics and Astronomy and could develop my

own research group on ultrafast lasers and nonlinear optics while enjoying a well-balanced family life.

**LB:** So I understand that it was not so easy for you to find the right job corresponding to your deepest aspirations of a physicist. Were you also worried to match your family life and a career in physics?

**DS:** As I said, the most frustrating period was trying to find good jobs for my husband and I to have in the same place. My husband followed me to Waterloo and took an industrial position so that I could have my academic job. I have worked at balancing my career with my family time. I did not travel to as many conferences as I could when my children were young. I was home most evenings to have dinner with my family.

**LB:** Did you meet any difficulty in finding any funding for a PhD or a post-doc position related to the fact that you are a woman? Did you find a resistance as you were succeeding in science?

**DS:** Not really. I think the bigger problem is that women seem to be asked to do more service as every committee now needs women on the committees, but there are not many women around to fill these roles. Women are then asked to do more than their share of service duties and that takes time away from other commitments such as research.

Concerning the “resistance” I cannot remember any difficulty on this point. When I was an undergraduate, I met perhaps a few guys who thought they were better at maths and physics simply because they were male. I enjoyed proving them wrong. All of my research supervisors and colleagues have treated me fairly.

**LB:** Do you believe that physics should positively discriminate in favour of women?

**DS:** No. Certainly not. Only the qualities of the individuals should matter. Not their gender. I strongly believe in gender equity.

**LB:** Any suggestion to guarantee a balanced gender representation in physics?

**DS:** I have no magic recipe. I can say that at the University of Waterloo we are one of the universities participating in the UN’s HeforShe program. The point of this

program is to not just have women advocating for women, but men also stepping up and advocating for women. The balance between men and women is nowadays improving, but maybe still too slowly. It cannot change just with changes in schools and at work, young people are probably mostly influenced by their families. I was raised by a very strong mother who told me to do what I want and not what others think you should want. I would like everyone to get such advice.

**LB:** Do you have advice to girls who wish to start a career in physics?

**DS:** Just do what you want to do. In my childhood, I was told by a teacher that maths and physics were for boys, but I knew that I was good at those subjects so knew the teacher was wrong. Good male students were encouraged to go into engineering because it is a good career, but the female students were not told this. In my day, most of the female students in physics and engineering were near the top of their class. This is because the top female students couldn’t be dissuaded to go. However we lost a lot of good female students that should have been in the classes along with the good male students. We have lost a lot of talent this way and why there is such a strong movement now to get girls into STEM\* fields. I recently participated in a workshop on “young girls in physics”.

As a matter of fact, my main concern is that the young generations are no longer attracted by science in general and by doing physics in particular.

This is a bigger problem. And it is not gender dependent.

**LB:** Do you have any female “physicist cult figure” or “role model”?

**DS:** No I don’t. Since being asked this question over the last few months I have come to realise that it was my mother who let me know doing maths and science was a good thing to do to have a good career. Both of my parents wanted all of their children to strive to have good careers.

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\*STEM: Science, Technology, Engineering and Mathematics