TECHNOLOGY NETWORKS

WOMEN IN SCIENCE

Contents

Foreword

Welcome to our latest eBook, Women in Science, a celebration of the exceptional contributions today's female researchers make to the world of science. Throughout history, women have played key roles in ground breaking science, from Marie Curie's discoveries of radium and polonium, to the unearthing of HIV by Françoise Barré-Sinoussi. Despite these successes, women have, and continue to be underrepresented in STEM fields. Hurdles at all stages of education, and the struggles of juggling a family and career can limit the number of women choosing and maintaining a role within STEM.

This eBook includes thought-provoking interviews from prominent female scientists, in which they share their greatest professional achievements, personal inspirations, as well as some advice for women looking to embark on their own STEM journey.

Elodie Sollier-Christen, PhD

Co-Founder, Chief Scientific Officer and Vice-President, Research & Development for Vortex Biosciences

by Laura Elizabeth Mason

Since co-founding Vortex Biosciences in 2012, Elodie Sollier-Christen, PhD has continued to be recognized for her work within the field of microfluidics, her expertise focused on the development of microfluidic devices for biological applications.

Her passion for science, and determination to make a difference to the field of cancer diagnostics has driven her to successfully transform a microfluidic research platform in to a commercial product for liquid biopsy.

Q: What particularly inspired you to pursue a career in science?

A: Early in my life we experienced several cancer cases in my family and I was therefore aware of the term 'cancer' from a young age. This piqued my interest in medicine early on, particularly how new technologies can support physicians and patients. During my engineering program at Grenoble INP, in France, I learned about microfluidics and lab-on-a-chip concepts. I found the possibility of bringing the lab to; a patient's bedside, to the field, or to settings with limited resources, really exciting and transformative for the future of medicine. I was lucky, later on, to have the opportunity to focus my PhD work (CEA LETI Minatec) on lab-on-chips for blood sample preparation and pursue this effort with Prof. Dino Di Carlo at the University of California at Los Angeles (UCLA) for my postdoctoral studies.

Q: How has the area of microfluidics evolved since the beginning of your career, and what impact has this has on your role within the field?

A: When I started my career, microfluidics for health applications was still marginal and considered more as a fun research tool. The successful commercial transfer of some microfluidic-based medical devices has led to quite an evolution of the field. What was previously just basic research into the potential applications of microfluidics began to translate into real world products that could have a direct impact on both scientific research and diagnostics. This inspired me to take what was a research discovery and transform it in to a valuable product that could directly impact patient care. If I hadn't seen the success of these other companies I am not sure I would have seen the path to developing and commercializing the VTX-1 Liquid Biopsy System. Furthermore, these early products provided a roadmap for success – keep the clinician experience in mind and make sure the solution addresses a real market need in the simplest manner.

Q: You won the 2017 SLAS Innovation award for your presentation "Vortex Technology for fast and label-free isolation of circulating tumor cells from blood samples". Could you tell us about your talk and explain the significance of the microfluidic technology featured in the presentation and how it could help improve cancer diagnostics?

A: A liquid biopsy is an alternative procedure to traditional tissue biopsies. Liquid biopsies include circulating tumor cells (CTCs), ctDNA, and exosomes. Due to the less invasive nature of taking a blood sample, there is significantly less risk to the patient. The scientific community has confirmed that liquid

biopsies can enable earlier diagnosis, therapy selection and monitoring of the treatment. Ultimately, this highlights that liquid biopsies are expected to play a critical role in 'precision medicine' and prognosis for oncology patients. CTCs are cancer cells that detach from the tumor, enter the blood stream and spread in the body to create metastasis. These are considered the seeds of the cancer spread, which causes 90% of cancer deaths. For such reason, there is a growing interest in CTC isolation and characterization, to provide a real-time vision of the cancer for each patient.

Several technologies have been developed to accomplish this, but there is still this unmet need for label-free capture of CTCs in a simple, fully-automated manner with the cells being preserved in suspension for various downstream assays. The Vortex technology is ideal for isolating cancer cells from blood. It collects these larger cancer cells based on their size and deformability,

"Hopefully as more women truly change the world through science it will inspire others to follow in their footsteps."
- Elodie Sollier-Christen, PhD

but without filters that can get clogged or hold cells. This enables a good CTC recovery, with a very low white blood cell (WBC) contamination, to make accurate and sensitive characterization of the CTCs achievable. Cells are gently handled and remain viable such that the largest amount of information can be obtained. The process is simple, leading to a high level of reproducibility. The isolation is also robust and label-free, requiring no antibodies, chemistry, or difficult to scale processes. Finally, the trapped cells can be easily released into different containers giving a high level of flexibility to the user for the downstream characterization of the CTCs, either for research or clinical use. Ultimately, we believe all these key product features will help clinicians and cancer patients at different time points of their cancer care to improve their outcome.

My presentation at SLAS 2017 described our work to transfer the microfluidic research platform developed in Dino Di Carlo's Lab at UCLA to a commercial product. I presented some clinical case studies to illustrate the performance and the clinical validation of our platform in terms of CTC recovery efficiency, enrichment purity with a simple and easy workflow.

Q: Could you tell us more about your current research? Are there any research areas or applications you are yet to explore that you would be eager to investigate in the future?

A: The VTX-1 instrument was launched in 2017 and is initially marketed to researchers. Our main focus now at Vortex Biosciences is to push the use of CTCs in to the clinic, beyond solely research applications. We believe CTCs can play an important role, making a significant difference to patients, either at the time of their diagnosis, for therapy selection, for cancer monitoring or for the detection of cancer relapse.

To enable the development of clinical assays using CTCs, our team is collaborating with partners and clinicians, to explore and create validated assays that use the isolated CTCs as the sample input. Current projects are looking at EGFR mutations in lung cancer and in vitro expression of markers important for immunotherapy, such as PD-L1. Part of this work is, and will be, to demonstrate that performing these clinically relevant tests on CTCs is equivalent to using conventional tissue biopsy specimens.

Q: To date, what would you consider to be your greatest professional achievement?

A: The professional achievement I am most proud of is to have built the Vortex Biosciences business, gathering a team of enthusiastic and skilled experts all filled with passion for the same vision – to make a difference for cancer patients. Launching our VTX-1 Liquid Biopsy System last year was a tremendous achievement and embodiment of the hard work and dedication from everyone involved over the last few years.

Q: What can be done to encourage more women to get involved in science?

A: This is a tough question for me to answer as I have always had a passion for science. I can't point to any special program or event that resulted in me really becoming inspired by the potential that science offers. I think a lot of the recent attempts to simply help girls and young women understand that they too can be successful in the area of math and science can make a big difference. It seems to me the resources are available, it is more about understanding and reinforcing the power of science, to really change the world. Hopefully as more women truly change the world through science it will inspire others to follow in their footsteps.

Mary Beckerle, PhD

CEO and Director, Huntsman Cancer Institute at the University of Utah

by Laura Elizabeth Mason

Mary Beckerle, PhD serves as the CEO and Director of the Huntsman Institute, her current research focuses on understanding the fundamental mechanisms by which cells sense and respond to environmental signals. Her scientific contributions have been acknowledged by the National Cancer Institute, and she was the proud recipient of the latest Alfred G. Knudson Award in Cancer Genetics. The beauty of biological systems and the creativity involved in designing scientific experiments were key to establishing Mary's interest in science.

Q: What particularly inspired you to pursue a career in science?

A: I chose a career in science because science represented a discipline where I could do something I loved and could also have the potential for meaningful impact on society. I always loved biology as a young student. I was captivated by the beauty of biological systems and the creativity involved in designing experiments to answer questions about how the living world works. I remember biology lab in high school as being one of my favorite classes. At the same time, I was a child of the 1960's and was only interested in doing something meaningful where I could make a difference in society. Science also provided that opportunity which, for me, was at the interface of science and medicine. Happily, I had both an appetite and an aptitude for biology. As a result, I was encouraged by great teachers and mentors and had wonderful opportunities to explore and develop my skills. I spent three summers at The Jackson Labs and completed an internship in a laboratory at Memorial Sloan-Kettering Cancer Center while in college. These experiences solidified my love for science and medicine.

Q: Could you tell us more about your current research interests and area of expertise?

A: I am a cell biologist. Cells are the fundamental unit of life and the differentiated functions of cells underlie all of human physiology. Cells in the human body receive many types of signals that influence their function. For example, growth factors stimulate cells to divide if an organ needs to grow or be repaired. My lab is focused on understanding the fundamental mechanisms by which cells sense and respond to environmental signals. In recent years, we have focused on a new frontier in this area, the mechanism by which cells respond to mechanical cues. It is now recognized that mechanical signals exert significant influences on cells, but we are only now beginning to understand how physical forces are sensed by cells and how they impact cell behavior. So, it is a very exciting time to be working in this field.

Q: You recently won the Alfred G. Knudson Award in Cancer Genetics from the National Cancer Institute (NCI). How did it feel to win the award?

A: I was completely surprised and incredibly honored to be recognized by the National Cancer Institute (NCI) with this distinction — particularly when I saw the list of prior recipients of the award, which includes some of the most talented and creative scientists in the world today.

As I had a chance to reflect on the meaning of this recognition, I also very much appreciated that the NCI was celebrating contributions like those from my lab which are focused on

fundamental aspects of cell biology. Those of us in the cancer research community appreciate that the exciting advances that have been made in cancer medicine — including new strategies for prevention and treatment of cancers — have been made possible in large part because of our national investment in basic science discovery. We have been making great progress in applying our deepening knowledge of fundamental biological principles to clinical cancer challenges. This has led to a significant reduction in cancer mortality that clearly manifested as an increase in cancer survivors in the United States from just 3 million in 1971 when the "War on Cancer" was initiated, to more than 15 million today. I am excited that the NCI continues to demonstrate that it values basic science contributions as critical to our national cancer strategy.

"If our nation is going to capitalize on our talent, half of which resides in the female half of our population, we must have a welcoming professional environment for young women interested in science.
- Mary Beckerle, PhD

Q: Could you tell us more about your award lecture "Interface Between Cytoskeletal Dynamics and Tumor Biology"?

A: In my award lecture, I discussed my lab's effort to understand how cells respond to mechanical signals in their environment. We now appreciate that mechanical signals can stimulate changes in cell growth and cell death. And we know that tumor cells display abnormal responses to mechanical cues, which contribute to cancer initiation and progression. My lab has developed a technology that allows us to physically stretch cells using defined parameters, so we can study the response of cells to physical force under controlled experimental conditions. Using this technology coupled to biochemical analyses and high-resolution cell imaging approaches, we have identified a novel pathway by which mechanical forces are sensed at the cell surface and communicated all the way to the nucleus of the cells, where changes in gene expression can drive fundamental changes in cell behavior, such as cell proliferation or death. This pathway involves the reinforcement of the actin cytoskeleton, a major structural and contractile element of cells. I also described how the ability of cells to respond to mechanical stress is disrupted in tumor cells.

Q: Are there any research areas you are yet to explore that you would be eager to investigate in the future?

A: We continue to dive deeper in order to understand the response of cells to mechanical stress at a detailed mechanistic level. At the same time, we are interested in the application of this knowledge in the context of cancer biology. Working with a number of oncology colleagues at Huntsman Cancer Institute, we have been exploring how some of the processes we have discovered are disturbed in tumors, such as Ewing sarcoma, a childhood bone cancer. We are excited that one of our collaborators, Dr Sunil Sharma, has developed a new small molecule agent that reverses the changes that occur during Ewing sarcoma development. We are excited that we have been able to contribute to understanding the impact of this promising new therapeutic approach for Ewing sarcoma cell biology. We expect clinical trials of this new therapeutic approach to be initiated this year; we are hopeful that the promising preclinical findings of our collaborative team will be replicated in patients, bringing a new treatment to patients with a now incurable cancer.

Q: What can be done to encourage more women to get involved in science?

A: I think that one of the most important factors that influences career choice is the availability of role models. In my own case, even though there were very few women in science when I decided to go to graduate school, I had the benefit of having a wonderful female faculty advisor when I was in college. Thus, I could envision myself as a scientist and a faculty member.

Although things have improved since I was in graduate school in the 1980's, still only about 20% of full professors in science fields are women. This situation perpetuates the view that science and engineering are fields for men. If our nation is going to capitalize on our talent, half of which resides in the female half of our population, we must have a welcoming professional environment for young women interested in science. That means being attentive to expanding gender diversity within our university faculties and other scientific career roles. (Similar arguments apply to racial and ethnic diversity as well.) In addition, we need to ensure that career paths for women in science are attractive and don't force women to have to make a choice between career and family. For women who are considering a scientific career in academia, for example, the tenure clock is often on a collision course with the biological clock. Institutions that will be successful in recruiting and retaining top female scientific talent will be places where women are supported in their professional, as well as their personal, aspirations. For example, universities that support extension of tenure decision timelines for parenting or other family obligations, will send a message to faculty (both women and men) that the institution values and supports them both as a person and as a scientist.

Naomi Chayen, PhD

Head of the Crystallization Group in Computational and Systems Medicine, Imperial College London

by Anna-Marie MacDonald

Winner of prestigious awards, including Innovator of the Year, and nicknamed the 'Crystallization Guru', Professor Naomi Chayen is Head of the Crystallization Group in Computational and Systems Medicine, Imperial College London. Here she tells us a little about her career and the work her lab is doing to help advance the crystallization field.

Q: What originally led you to become interested in science and structural biology in particular?

A: I took a degree in pharmacy as I wanted a vocational subject. I never actually worked as a pharmacist since I was offered a PhD studentship in Biochemistry. I carried on pursuing research when structural biology, of which I knew nothing about at the time, came my way. With trepidation, I took the plunge thus gaining exciting new horizons to my science and life such as receiving awards from Royalty, working with Russian astronauts, media interviews, commercialisation and more…

There has been no looking back since, and three decades on I am still here with the same enthusiasm and vigour trying to come up with new innovations and ideas all the time.

Q: What have some of your most rewarding achievements been so far?

A: I would say that for me, the most rewarding achievement is making a difference to the field by developing a variety of novel methods for obtaining successful crystals that have led to structure determinations of numerous proteins including membrane proteins and large macromolecular complexes that had previously failed to crystallize using conventional techniques. Translating my scientific research into practical applications has enhanced the impact of the research.

Another satisfying aspect is leading multidisciplinary research - especially when unconnected fields are combined, resulting in breakthroughs. For example, tying together research on bone tissue regeneration or biosensor research to the crystallization of macromolecules.

"We need scientists for progress in every field. My advice for those considering embarking on a career in science is, don't be afraid of failure, persevere, use your imagination and make it fun!"
- Naomi Chayen, PhD

Q: Aside from science, what are some of your interests and passions?

A: I am passionate about skiing. It is a unique activity that enables one to keep improving but at the same time to switch off totally and relax. I also love travelling and exploring new places and cultures.

Q: Can you tell us a little about your lab's research directions?

A: Research in my lab has two main strands which are interrelated: The first is developing a fundamental understanding of the crystallization process and exploiting this to design practical methodology (including high-throughput methods) for producing high-quality crystals of medical and industrial interest. The second, is crystallizing target proteins for structure determination and rational drug design. At the moment we are working on the crystallization of proteins related to cancer, HIV, diabetes and heart disease.

Q: What are some of the challenges faced during crystallization of proteins?

A: Getting no crystals at all, obtaining tiny, low-quality crystals, phase separation or amorphous precipitate, and most frustrating: attaining large, beautiful crystals that do not diffract a single spot!

Q: What are nucleants, and how can they help the crystallization process?

A: Nucleants are materials that induce nucleation and formation of crystals. Nucleants can be made of protein or non-protein materials. They help the crystallization process by serving as an anchor or template for the protein molecules to stick to and gather around. Nucleants can be used at the screening stage to facilitate the initial appearance of crystals and also at the optimisation stage of crystallisation to aid in the improvement of crystal quality. Two nucleants have so far been commercialised, 'Naomi's Nucleant (2009) and 'Chayen Reddy MIP' (2016) and further products are in the pipeline.

Q: Based on your experiences, do you have any advice for those considering embarking on a career in science?

A: We need scientists for progress in every field. My advice for those considering embarking on a career in science is, don't be afraid of failure, persevere, use your imagination and make it fun!

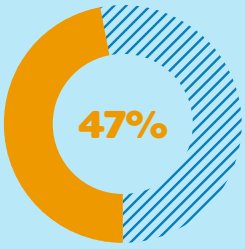
And if you can, choose the environment and the people that you work with carefully. From a personal point of view, having a superb environment to work in at Imperial College and a great team enables me to be productive and to enjoy the work.

WOMEN IN STEM

While women continue to make gains across the broader U.S. economy, they remain underrepresented in STEM (science, technology, engineering and mathematics) jobs and among STEM degree holders.

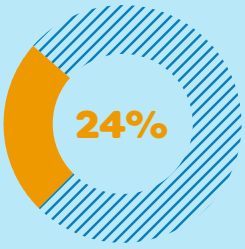
Here we take a look at some of the key stats.

In 2015 women filled



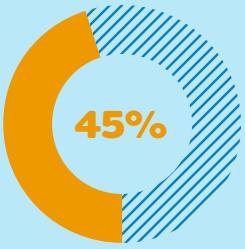
of all U.S. jobs

...but held only



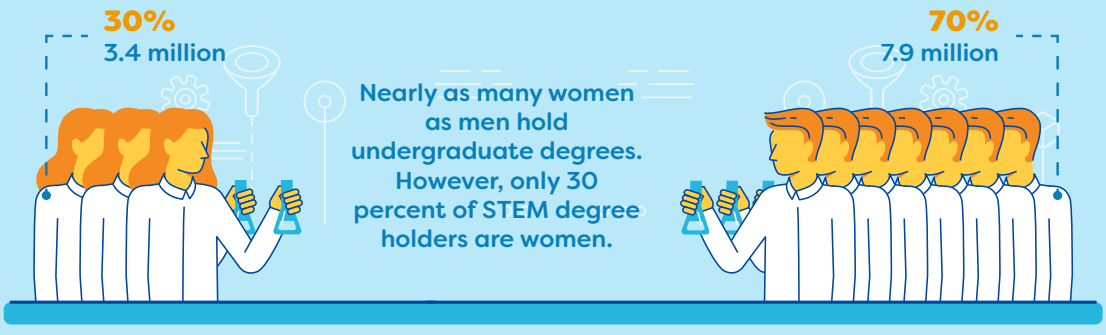
of STEM jobs.

However, women held

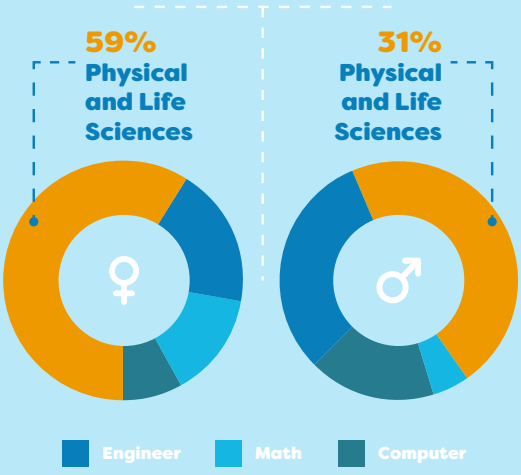


of U.S. jobs in the physical and life sciences.

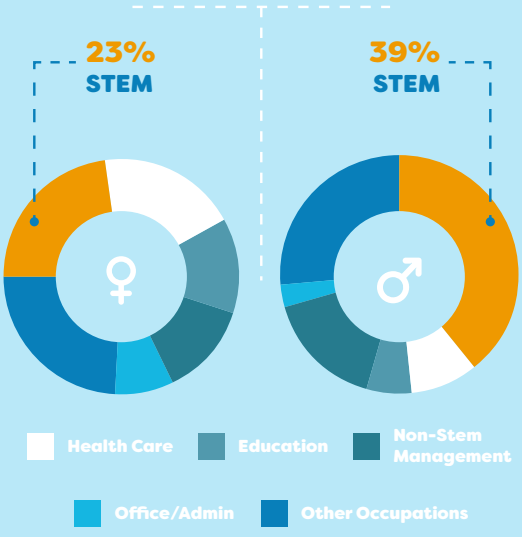
Women Men



Nearly 6 in 10 women who major in STEM fields choose a degree in the physical and life sciences, compared to less than one-third of men.



Women with STEM majors are much less likely to choose a job in STEM compared to their male counterparts.



Source: Women in STEM: 2017 Update
U.S. Department of Commerce Economics and Statistics Administration Office of the Chief Economist

Credit: Thomas Angus, Imperial College London

Shiranee Sriskandan, PhD

Clinical Professor of Infectious Diseases at Imperial College London

by Karen Steward

Professor Shiranee Sriskandan is a Clinical Professor of Infectious Diseases at Imperial College London. She leads a team focused on the mechanisms by which streptococcal infections cause serious disease. As well as her research work, Professor Sriskandan undertakes teaching within the University and is also a medic at Hammersmith Hospital.

Q: How did your interest in science originate? Were there any role models that inspired your career?

A: Despite being a biologist now, I was more fascinated by the prospect of space science as a child; I kept a scrapbook of missions and at one point started a correspondence with NASA (largely but not entirely one way). At school, I really enjoyed biology, but it seemed as though there was an awful lot to learn, while I was quicker to get to grips with physics and maths, possibly encouraged by my dad who was an engineer, a bridge designer. However, at the time I didn't know anyone else reading engineering, or physics; like most people at that age, my role models were my teachers and immediate family. My brother had done Medicine, and I increasingly began to think that I could do so too. Siblings can be subliminally very influential. I was fortunate in getting into Cambridge and had the opportunity to learn about medical sciences in an environment that encouraged learning by questioning and research. However, after qualifying, you quickly get drawn into the long hours, patients, ward rounds, choosing a speciality, and it is too easy to forget about academic research.

Q: As a medic, what spurred you on to pursue scientific research?

A: I think the major drive to pursuing a scientific career, was my choice of speciality, infectious diseases. It seemed like the perfect clinical multi-system speciality, with all types of patient. Problematically there were virtually no NHS jobs in the field, so the only career path was to either have a university position or one's own fellowship. This meant research training. So, to be brutally honest, it wasn't that I had a burning desire to do research at that time; it was more that I had a burning desire to be an infectious diseases physician! I was however lucky to get a clinical post at the Royal Postgraduate Medical School where research training was almost expected. All of the doctors and scientists there seemed to be either involved in or planning to embark on research careers, and together they were an inspiring bunch. There seemed to be a good relationship between the non-clinical and clinical academics that I enjoyed as well, although in retrospect I wonder if the emphasis on clinician scientists had unforeseen consequences for the non-clinical academics. I decided to be guided by my consultant at the time, Jon Cohen, who encouraged me to go and read about bacterial sepsis mechanisms. I think if anyone set me on the track I am now, it is Jon, as he was always encouraging, and was not afraid of starting up an entirely new research area. I was awarded an MRC Fellowship to train with Jon, and then two further fellowships thereafter.

Q: Can you tell us a bit about your current role?

A: I lead my own research group, focussed on group A streptococcus. Most of our research questions arise out of epidemiological or clinical questions that have arisen about pathogenicity, such as "why has that strain emerged in the population so rapidly?" or "why did that patient get ill so quickly?" Almost everyone is researching some aspect of group A streptococcus pathogenicity, though the projects are non-overlapping. Some of our research is partnered with Public Health England, focussing on aspects of antimicrobial resistance and healthcare associated infection, as one of 12 Health Protection Research Units. Although most of my time is devoted to running the group, students, funding applications, and publishing papers (well, submitting them...), I do teach for the University, and also contribute to clinical guidelines and patient support. I am still an Infectious Diseases physician and really enjoy my months on clinical service; the range of cases we see never ceases to amaze, and there is a steady flow of excellent clinical trainees who are occasionally persuaded to take time out for research.

Q: What achievements, discoveries or publications are you most proud of?

A: I think the discovery of a bacterial enzyme that can cleave all neutrophil-active chemokines is still my favourite. What makes me proud, is, firstly, that the discovery was unlikely to have happened without a simple clinical pathological observation which was, that patients who tragically died from group A strep demonstrated a very limited influx of inflammatory white blood cells at the site of infection. You needed to be asking the right question to find this enzyme's activity, i.e. why were there no white blood cells? Secondly, the whole project was entirely un-funded, yet it involved all sorts of people over a period of 10-11 years, from pathologists, to BSc students, to colleagues in protein chemistry who eventually managed to purify the mystery protease, that we called SpyCEP.

Q: What do you think could be done to encourage more women into science?

A: We need to reassure our daughters and daughters in law that it's OK to have a career even after having children. There is no shortage of women entering biological sciences, but there is a shortage of women remaining. We can try very hard to ease the return to work (and can do much more) but society places great pressure on women to spend a long time out of science if they have children. This pressure is exerted in many ways through peer-pressure from friends and in-laws. The other aspect is the cut throat career structure in academia; only those with highly competitive Fellowships can survive and the career post-doctoral scientist is sneered at. This is not a problem just for women but for everyone; it would be great to find a solution to keep all types of skilled academic scientist in science.

College educated women (regardless of choice of undergraduate major) earn

23% MORE

in STEM jobs than women in other industries.

Women with **STEM jobs** earn

35% MORE

than comparable women in non-STEM jobs.

As a result, the gender wage gap is smaller in STEM jobs than in non-STEM jobs. Despite this, the gap is still 16%.

Source: Women in STEM: 2017 Update
U.S. Department of Commerce Economics and Statistics Administration Office of the Chief Economist

Darlene Solomon, PhD

Senior Vice President and Chief Technology Officer for Agilent Technologies

by Ash Board

Joining Agilent when the company was formed in 1999, having been with Hewlett Packard prior to the spin-off, Darlene Solomon Ph.D. holds the position of senior vice president and chief technology officer. In a role that sees her lead Agilent Labs, Darlene helps define Agilent's technology strategy and R&D priorities.

With a bachelor's degree in chemistry from Stanford University and a doctorate in bioinorganic chemistry from the MIT, Darlene's path to her leadership role came via the laboratory.

Q: What made you decide to study science?

A: Going way back as far as I can remember, since early elementary school, I always loved math and numbers. A good numerical problem or immersing myself in prime numbers was weekend fun. As a kid, I did well in school in all subjects, but math was really my favorite class all along, followed by science. As a freshman at Stanford, I took mostly math courses and some in science. It was really in these classes that I began to think more about what I would actually do in life with a degree in mathematics. Looking back now, it's a really narrow perception, but my feeling was that I could probably become a professor of mathematics, but I really wasn't all that into teaching. Computing was also a possibility, however unlike my friends in those computer courses I didn't get into staying up all night trying to debug a computer program. So, I figured maybe that wasn't the career match either. It was clear that science was next in line.

The next couple of quarters I took a number of science classes, in chemistry, physics, and biology. But it was the chemistry problems that were the most exciting and satisfying to me. For chemistry and science, it came more down to understanding why the world is the way it is and that's really what resonated.

"I don't think there has ever been a better time to be a scientist or engineer. Our world is led by technology wherever you look around, so I say go for it."
- Darlene Solomon, PhD

Q: What was it that precipitated your move away from the lab?

A: Following my Ph.D. I went straight to Hewlett-Packard Laboratories to be part of an interdisciplinary team that was advancing sensor technology for in vivo medical products. I spent five years as a scientist "in the lab" as you say. Then there was an opportunity to try out management, I like being in the lab but project management positions, especially ones that were aligned with my technical area, don't come around very often.

I had a lot of leadership experience through the various extracurricular things that I did. But I knew I was good at being a research scientist and if management didn't work out then I would go back to the lab. But management did work out, and worked out quite well.

Q: What does your role at Agilent involve?

A: I have been in my current role as Senior Vice President and Chief Technology Officer, for about 12 years now, and it is multifaceted. There are a series of things that are in the category of more strategic leadership, technology leadership and then quite a bit of what I do is very external facing. On the strategic leadership side, I work very closely with our President and CEO Mike McMullen, as part of the executive staff more broadly leading the company. I work with Mike and with the other business leaders to help define the company's technology strategy and our R&D priorities.

I also lead the CTO office, which includes responsibility for many of our longer-range technology investments. Internally, that includes Agilent Research Laboratories, which is our centralized and more far-reaching research organization. The CTO office also includes programs in university relations and external research, and a program that's aimed at partnerships with emerging startup companies. Then, of course, I have my team and staff that I work closely with and offer help where I can on their day-to-day needs, moving things forward, helping to support their personal development and success.

Externally, I represent Agilent on a number of different academic, government and industry boards and review committees. There are often keynote presentations at conferences that are especially relevant to Agilent's areas of contribution. I spend a lot of time with customers in our field organization, especially on the academic front. I can help provide that broader view of Agilent and insight into our strategic directions with university research faculty and top administration.

Q: Considering your time at Agilent, what are some of the achievements you are most proud of?

A: I think there are two major themes that speak to what all the contributions add up to. The first is Agilent's transformation from a leading electronics company to a leading life sciences and diagnostics company. The other theme, related to this transformation, is the continued value and contribution of Agilent Research Labs as a centralized corporate research lab. Especially as many companies have not found the "secret sauce" to make such investments so worthwhile. Needless to say, Agilent Research labs have played a big role in laying the groundwork for the transformation.

Q: If you had one piece of advice for someone looking to get into a career in science what would it be?

A: I don't think there has ever been a better time to be a scientist or engineer. Our world is led by technology wherever you look around, so I say go for it. Focus on the areas you enjoy most but also try to include some biology and some data science or information science. They are going to be important and many of the advancements in capability and understanding continue in these areas.

Marina Picciotto, PhD

Professor of Neuroscience at Yale University and Editor-In-Chief of the Journal of Neuroscience.

by Adam Tozer

Professor Marina Picciotto is the Charles B. G. Murphy Professor of Psychiatry and Professor in the Child Study Center, of Neuroscience and of Pharmacology; Deputy Chair for Basic Science Research, Dept. of Psychiatry; Deputy Director, Kavli Institute for Neuroscience at Yale University. Since 2015, she has been editor-in-chief of the Journal of Neuroscience.

An award-winning neuroscientist, Marina has built her career as a pioneering force in both her field of addiction research and her community as an advocate for science communication.

Q: Why did you first pursue a career in science?

A: As a student I always liked science classes, but I didn't know what a scientist did. So, I didn't know how to become a scientist. I originally thought I should become a doctor because I didn't know how else to do science.

Out of luck, I got an opportunity to work as an intern in a science lab during high school. And once I was in a lab, I knew that I didn't want to leave.

After college, I thought about pursuing medical training or doing an MD PhD. However, I realised that would mean a lot of time spent outside the lab. Whereas a science PhD would mean much more lab time, something I thoroughly enjoyed.

So, it was at that point that I realised that being a scientist was what I wanted to do for a career.

Q: How did you come to study addiction?

A: I always knew I liked neuroscience. And I had been studying signal transduction in neurons. I wanted to do a postdoc where I could connect molecules with behaviour.

I also wanted to gain experience in another country, and my PhD advisor suggested I apply to Jean-Pierre Changeux's lab in Paris.

I went there to study how nicotinic acetylcholine receptors, the target of nicotine in cells, contributed to the behaviour of animals. Due to the advent of molecular engineering techniques that enabled the generation of transgenic mice, I could explore the impact of removing nicotinic acetylcholine receptors from neurons in mice, to see how this affected behaviours related to addiction. Meaning I could ask the question, could we tie an individual molecule to the effects of a drug at the level of the receptor, at the level of the cell, at the level of the brain cell circuit and at the level of the complex organism?

Q: Tell us a bit about your career. Were there any challenging times?

A: There were many! From the very beginning, more experiments didn't work than did. In graduate school I had to start over again with my thesis project after 5 years of work because it had resulted in a complete dead end!

So, I had to start with a brand-new project after investing many years of work. My thesis committee was not happy with me, and I was pretty sure I was not going to get a paper out of my work.

Ultimately though, I got my degree and I got papers from my PhD, and I also gained knowledge that made me much more prepared for a career in science.

For exampIe, I learned:

- How to make yourself keep going.
- How to ask for help and advice, rather than just slogging away without communication.
- How to change gears.
- And also, to know when to stop a project that isn't working.

These lessons were much more important things to learn in preparation for a science career than how to do the experiments that actually did work.

"Good communication is a crucial skill. If you make a new discovery, that's wonderful. But if you can't communicate the discovery it's effectively useless. It's like a tree falling in the forest with no one being there to hear it."

- Professor Marina Piccioto

Q: You are a Professor at Yale and also Editor-In-Chief of the Journal of Neuroscience. How do you balance work and life?

A: Well, I should also reveal that most importantly, I am a Mum. And that having a child has been an essential part of being a good human being and a scientist.

Work-life balance is something that is not easy to manage, but if you can be clear about the things you value then each time you get another opportunity you weigh it in the context of 'where is it important for me to put my efforts?'.

For example, since my daughter was born, she has been number one in my life. A close second, are the people in my lab and their work. Followed by my contributions to my department, my school or the neuroscience community.

So, whenever I get offered an opportunity, and they are often very tempting and could benefit me or my laboratory or my community, I weigh each of these opportunities against the other things that I value.

For instance, when I took on the Editor-In-Chief position at the Journal of Neuroscience, I knew that I wouldn't be able to invest time in frequent manuscript reviewing or being an editor for other journals. However, I could reason that I was still benefiting my community by taking on this role.

When I accept invitations to speak or to travel, I accept that I may have to miss things to do with my daughter's school-life for example. But I am lucky that I am supported by my partner in these cases.

In the end there is no good answer for how to balance work and life. I just try to be completely present in the place that I am in and I have learned to say no to the things that don't add satisfaction.

Q: What do you think needs-to be done to encourage more women to get involved in science and STEM careers?

A: I think it's important to highlight the advantages to women of working in STEM.

The first advantage of a career in academic science is flexibility. To have the flexibility to organise your experiments and your work-life around the other commitments in your life is a real bonus. You don't have that flexibility in many other careers.

The second is interaction. Science is an incredibly social endeavour in which you get to collaborate, work with and learn from many different types of people with different scientific backgrounds and expertise. The ability to learn from different people and negotiate and communicate with different people with different expertise is crucial to advancing a career as a scientist. Although we encourage students with good problem-solving abilities, it's the students with good soft skills, such as negotiation and communication that are most likely to thrive in science.

Q: How important is communication in Science?

A: Good communication is a crucial skill. If you make a new discovery, that's wonderful. But if you can't communicate the discovery it's effectively useless. It's like a tree falling in the forest with no one being there to hear it.

The ability to communicate clearly to the right audience is not only key to teaching, but also improving the reach of your research. Good science communicators get other scientists interested in their work, which ultimately advances the field and leads to discoveries being made faster.

Inese Lowenstein

President of SCIEX

by Ash Board

As President of SCIEX, Inese Lowenstein is responsible for SCIEX's global operations and leading the company. With 20 years of experience in the Life Science and Chemical industries, Inese focuses on accelerating innovation to obtain life-changing answers faster, advancing scientific understanding and safeguarding health.

A pioneer in the STEM fields, Inese holds a Bachelor of Engineering Science with major in Economics & Engineering from Riga Technical University, and a Master of Business Administration from Walter A. Haas School of Business, University of California at Berkeley.

Q: You spearheaded the establishment of the first-ever SCIEX Diversity & Inclusion Council, can you tell me more about the council and the role this plays within the business?

A: To put our efforts in a broader context, I have to start with the fact that diversity and inclusion (D&I) has been identified as a priority for the entire Danaher Corporation [SCIEX was founded in 1970 and acquired by Danaher in 2010]. All leaders at Danaher remain focused on increasing engagement of our associates. At the same time, we are placing a stronger focus on increasing diversity and creating a culture of inclusion in each of the Danaher companies. We typically kick off a year with a Danaher Leadership Conference, which is a forum for aligning key business priorities and for best practice sharing. This year's agenda included a dedicated session and outside speaker on the topic of inclusion. In fact, what we see is a strong link between driving improvements in both diversity and inclusion and our ability to deliver the kind of sustained business performance our shareholders expect.

Here at SCIEX, I am the executive champion of our SCIEX diversity and inclusion council. This council formed in 2017 and it includes representatives from different regions around the world. The global aspect is critical: while we are headquartered in the US, we have a global footprint and, for D&I efforts to resonate and make an impact, the local cultural and societal context needs to be considered. And, what is the role of the Council? It is a vehicle for two-way dialog and collaboration. The Council helps us connect feedback, from our associates to the leadership team, to drive positive change together. SCIEX management can use the Diversity and Inclusion Council as a place to get valuable input on planned changes. It is a way for us to also take an honest and controverted stand in terms of D&I and discuss what activities and actions we should drive to improve it.

"As we make progress, more young people will see themselves reflected and represented in STEM in a visible way. It will help fuel their own ambitions and dreams for meaningful careers in STEM more than any slogans or words ever could."

- Inese Lowenstein

Q: What do you see as some of the biggest challenges to improving diversity and inclusion within STEM?

A: I've been working in the topic of diversity and inclusion for a number of years, including at my previous companies, and what I take away is that is that there is no one fix. There's no one action

anybody can take that can magically improve the situation rapidly or permanently. So, it is really critical that there is a sustained effort and a sustained commitment from the key leaders in an organization. Companies that make the most progress are those where D&I is a personal mission for people at the top. My dream would be to make a contribution – even if it is small – towards making STEM fields more inclusive, with fewer barriers to diverse talent than the people of my generation experienced.

Why is it challenging? I think you have to tackle the topic from both aspects of the D&I equation. Diversity might be easier to achieve and to measure. Easier, not easy… it starts with an honest assessment of where we stand, reviewing our recruiting and talent development processes for hidden barriers and remaining sceptical when hiring managers find reasons for not being able to have a diverse slate of candidates. Then we can take deliberate actions to increase diversity as part of our business priorities and personal objectives for the leadership team.

Inclusion is entirely different, more subtle, yet more critical than simply having a diverse team at the table. Inclusiveness is the ultimate challenge we face in STEM and beyond because there are no easy stats that could help measure progress on inclusion. Inclusion is linked to company culture that has typically evolved over a period of time and might contain a sort of code for "how we do things here", which in some cases might run counter to a fully inclusive environment that celebrates many ways to be, think and act. On top of it, while there is a link to company culture overall, it is also about behaviour of individual leaders and how willing they are, we are, to reach out and embrace the difference that comes with diversity. Even if an individual leader supports diversity but is unwilling to adopt how they communicate or are blind to the subtle messages that their everyday behaviour sends, then the benefits of diversity might never be fully realized. I can relate to this when I reflect on the subtle pressures I've felt over my career to adjust my style. It has often been in the context of development goals that might have been well-intentioned but tainted by a narrow interpretation of what a leader looks like based on "the kind of people that get promoted here". We are early in our journey here and will be leveraging external resources to create awareness as the first step towards tuning our managers' internal radars so that we can then modify our behaviours.

Q: A recent US Bureau of Statistics report has shown that women have not seen employment growth within STEM careers since 2000. In your opinion, what do you think can be done to get more women into STEM careers?

A: Colleges and universities are striving and making progress, in terms of balancing the incoming student population more towards parity in terms of gender, but the journey only starts there. These women have to graduate and feel that the companies that they're joining are providing a welcoming environment and that they can be successful. I worry that for young girls to select careers in STEM, there needs to be more role models.

For young people these discussions start in families, in schools, in their social circles and on social media. I have two teenagers, a son and daughter, myself. I have some influence on how each of them thinks about what type of career to pursue. Our kids also see a good role model of two spouses working as a team and supporting each other in our professional careers. And they see their mother advance to an executive level position in a life science company.

So, I think what we need to do is have companies like Danaher and many others in the industry, to remain steadfastly and visibly committed to D&I. As we make progress, more young people will see themselves reflected and represented in STEM in a visible way. It will help fuel their own ambitions and dreams for meaningful careers in STEM more than any slogans or words ever could. People believe it, when they see it.

Teresa K Woodruff, PhD

Dean, The Graduate School and Associate Provost for Graduate Education, Northwestern University

by Anna-Marie MacDonald

An internationally recognized expert in ovarian biology, Teresa K Woodruff, PhD, has fuelled great strides in reproductive science. Since coining the term "oncofertility" in 2006, her work has focused on improving women's health and highlighting the importance of including sex as a biological variable in research.

In addition to being the recipient of numerous awards, including the Guggenheim Fellowship (2017), Dr Woodruff has been an instrumental driving force in education, founding and directing the outreach program, Oncofertility Saturday Academy (OSA), to encourage an interest in science among high school girls. Here we learn some more about her current research and plans for the future.

Q: What particularly inspired you to pursue a career in science?

A: I was imprinted on science by science fair projects in middle and high school - my favorite project was the impact of hen nutrition on egg shell integrity - a great project for a future reproductive scientist! But I didn't know that I'd take up that eventual career until Sophomore year in college. I wanted to be a first-grade teacher and play the cello for E.L.O. (Electric Light Orchestra). But I loved chemistry and that drew me into biology and that led me to ask how people came up with the questions that became the answers in the back of the book - my nascent way of wondering about research. After a summer internship at Cal Tech I knew science was for me!

Q: How has the area of reproductive science evolved since the beginning of your career, and what impact has this had on your role within the field?

A: I believe that the promise of basic science is that tomorrow's patient will be treated better than today's. This is particularly true for reproductive science. We understand more about the ways hormones like inhibin or estrogen act, and have invented new areas to meet urgent unmet needs - like oncofertility. And there are new treatments on the horizon, for endometriosis for example. But there are new challenges, like endocrine disrupting compounds and their specific effects on male and female infertility and the obesity epidemic in re-shaping overall reproductive health. With every new discovery comes new questions!

Q: You won the 2017 Journal of Women's Health Award for Outstanding Achievement in Women's Health Research. What are some of the most important issues in women's health today and how are you working to tackle these?

A: Inclusion of sex as a biological variable in fundamental science remains the most pressing concern and the best opportunity for radical new scientific discoveries. On Jan 25, 2016, NIH policy NOT-OD-15-102 advised all grantees that applications for federally sponsored research must 'consider sex as a biological variable'. It was a paradigm changing announcement

that is intended to have scientists think about the sex on animals (as well as subjects and cells) and justified the sex of animals in their research. I believe that sex is a fundamental variable of biology that should be tested and reported in the same way as time, temperature and dose and predict that scientific discoveries will be enabled by this attention to the fundamentals of the scientific method.

Q: Could you tell us more about your current research? Are there any research areas or applications you are yet to explore that you would be eager to investigate in the future?

A: I'm excited about microfluidics and the possibility of transplantable bioprosthetics. EVATAR - a device that connects five organs in a series of channels that move media between wells in the same way the circulatory system moves nutrients and waste into and out of tissues - is a revolution in physiology - it is a system that allows long term culture, with tissue explants, and with those tissues talking to each other in the dynamic way they work in the body. Petri dishes are now banned from my lab and I'm excited about what we can learn that was not possible with individual cells sitting on flat plastic. I'm also excited about the 3D printing revolution and the soft organs I call 'bioprosthetics'. When I first came up with that word, it did not resonate with my students - but to me a biologically active prosthetic (which is typically thought of as a knee or hip replacement) is perfect. We are creating the organ skeleton and inserting functional units that can then restore biological function. It is neat that reproductive science is leading the way in microfluidics and bioprosthetics and I look forward to seeing what we can do with these technologies as well as the impact the concepts will have on the broad world of organ level function and restoration.

Q: To date, what would you consider to be your greatest professional achievement?

A: The development of students who have gone on to populate reproductive science labs, start up companies, work in Pharma, or law and many other industries. Academics produce people and ideas and creating an environment in which faculty, staff, postdocs, grad students, masters students and undergrads are enabled to succeed is my best achievement.

Q: What can be done to encourage more women to get involved in science?

A: We need to start earlier in the pipeline and develop programs that result in high school graduates saying 'I like science. I like math.'. If we can convert 18 year olds into science friendly adults, we will change the world. Science and math are the gateways to understanding the world; questioning existing ideas; coming up with solutions; knowing when things don't add up. Some of those graduating students are going to be women who also want to move on in science. If they like science and they like math, the world will be changed.

Q: How do you think the challenges women face in STEM differ globally? Are there any similarities?

A: I've travelled around the globe for many years and am struck by the similarities, as well as differences, women face from early in their education, through graduate training and in their early faculty roles. The similarities are the excitement women have towards scientific discovery, in creating new strategies for improving health of fellow humans, and in their passion for science education. Men have these attributes, but women will go many extra miles without the exception of an 'attaboy'. I was in China immediately after the Tiananmen Square protests, teaching reproductive science and working with a female leader who had been sent out of Beijing as a policy against privileged/educated high school graduates, only to return and become the Chair of Physiology with unending passion for her students; and in Israel after the last scud dropped around Tel Aviv and talked with female students interested in reproductive science and doing novel work on steroidogenesis; I was in Brazil during the U.S. hanging chad crisis answering questions about the U.S. commitment to science and, on the border between South and North Korea with a young masters student, determined to make a difference in reproductive health for oncofertility patients.

Today, I'm writing this response from Saudi Arabia where I've been visiting the Princess Nourah Bint Abdulrahman University on the occasion of the first Women Pioneers in Science Technology award. Princess Nourah Bint Abdulrahman University is the world's largest female-only university and has 52,000 undergraduate/graduate students with ambitions to add full time research. Today I met the first undergraduates from the department of bioengineering. These award-winning undergraduates are trailblazers — but only one has a job and they are all concerned with their next steps — how will they be received in engineering firms? While the questions are acute in Saudi Arabia, they exist all over the world, including my home country, the U.S.A. These near graduates are talented, trailblazing women who love science and love math and I am convinced could contribute to a country and region that urgently needs their creative ways of thinking, they just need a chance. I believe that when we fully enable women to pursue their love of science, math and technology and provide full employment with equal salary, start-up funding and opportunities for promotion, we will make planet earth a better and healthier place to be.

Jaclyn Thomson, PhD

Director of Research and Development, Northern Vine Laboratories

by Jack Rudd

Given the rapid growth of the cannabis industry, and the upcoming legalization of recreational cannabis set to occur in Canada this summer, competent cannabis testing is now essential for ensuring the safety of medical cannabis patients and recreational users alike.

First introduced to the cannabis industry in 2014, Dr. Thomson has utilized her extensive background and experience in regulatory compliance and chemistry to shape the standard operating procedures at Northern Vine Labs. Her work has helped to ensure their cannabis testing methods meet or exceed the regulations mandated by Health Canada.

Q: When and why did you first get interested in science?

A: My interest in science developed at a very young age. I distinctly remember giving a presentation on the digestive system to my grade 5 class and being fascinated by the way the esophagus functions. Thereafter, I was keen to learn anything and everything related to science, from reading books and conducting experiments, to watching Bill Nye the 'Science Guy'. It wasn't until high school that I discovered my love of chemistry. Not only did I have engaging teachers, but chemistry just made sense to me. I suddenly had a new way to explain the world around me, and I was always excited to learn more. Given my newfound love of chemistry, it was a pretty easy choice to join the chemistry program when I started my studies at the University of Victoria (UVIC).

Q: What did you choose to study and why?

A: I obtained a B.Sc. Honours in Chemistry from UVIC, specializing in synthetic and analytical chemistries. After completing my B.Sc., I further pursued my education in chemistry, completing a Ph.D. at the University of British Columbia (UBC). During that time, I did extensive research into the development of "green" organometallic catalysts for the synthesis of biodegradable plastics and polymers, and for small molecule transformations. Throughout my synthetic chemistry research, I also continued to expand my knowledge of analytical chemistry techniques and research. During graduate school, I attended and presented at numerous conferences, and published a number of manuscripts in peer-reviewed academic journals.

During my time at university, I chose to study a combination of analytical and synthetic chemistries because it represented the best of both worlds. It provided a better base of knowledge, allowed me to learn a wider range of techniques, and was particularly satisfying to be able to make new molecules and analyze them, while simultaneously learning how those analyses worked.

Q: Tell us a bit about your career. Where have you worked and what achievements are you most proud of?

A: Following my B.Sc. at the University of Victoria and my Ph.D. at the University of British Columbia, I began my career working as the Quality Assurance Manager at a leading Canadian

natural health product manufacturer. My responsibilities there included undertaking the complete review, update, and creation of policies and standard operating procedures, as well as general quality assurance practices to ensure compliance in a highly regulated industry. In addition to quality assurance activities, I was involved in regulatory affairs, new product formulation, and research and development. I worked closely with numerous certification and licensing agencies including: the Canadian Health Food Association, the Canadian Food Inspection Agency, Health Canada, and similar agencies in the US. One of the achievements I am most proud of is the completion and publishing of a ground-breaking academic manuscript in the journal Phytomedicine, regarding the extensive worldwide problem of Ginkgo Biloba adulteration.

Next in my career, I worked as a scientific consultant to the natural health product and cannabis industries. I was responsible for worldwide quality assurance practices, lectures, research and development, communications with regulatory bodies, and assisting in facility licensing and other scientific and quality assurance protocols.

I am hugely proud of leading a team that has successfully developed analytical methodologies for the testing of cannabis, arguably one of the most complicated plants in the world!

"I believe that we all need to use every opportunity we can to inspire woman of all ages to continue the work of so many remarkable female scientists."
- Jaclyn Thomson, PhD

Q: What does your role at Northern Vine Laboratories involve and what inspired you to get involved in cannabis testing?

A: Since working as a scientific consultant, I have worked for Northern Vine Canada Inc., where I organized and set up the cannabis 3rd party testing facility, including developing and validating methods to meet all cannabis quality control testing requirements. I was initially responsible for implementing quality assurance systems for the tracking and security of cannabis in the pertinent areas of the facility, in accordance with Health Canada regulations. I currently supervise, monitor, and train laboratory staff; manage laboratory testing procedures; act as the primary resource for method development and enhancement, and regulatory/compliance matters; provide scientific consulting services for clients; and direct the Research and Development program.

I was first introduced to the cannabis industry in 2014 by my friend and Northern Vine colleague Katie Maloney, MSc who had just started working with one of our parent companies. She had so many interesting things to say, that when I was given an opportunity to consult in the industry, I was more than happy to get involved. A few years later I was approached with the opportunity to work with the team at Northern Vine, and I was really keen to set up their quality control testing lab, to service the industry in Canada and ensure access to safe cannabis. Given the increasing prominence of the medical cannabis industry, and the legalization of recreational cannabis set to occur this summer, it was apparent that a method of ensuring a safe supply for all users was going to be needed.

Since working in the cannabis industry, I have been able to see first-hand the positive effect that safe and effective cannabis has had on the quality of life of many individuals, including close friends and family members. It is the positive feedback that we receive from individual patients, and from growers who utilize our testing and consulting services, that drives us to continue our research into the unique and fascinating plant, cannabis.

Q: What can be done to encourage more women to get involved in science?

A: Thankfully, there are a number of programs available today which encourage girls and women to develop an interest in science. Teachers at all levels are in a unique position to make students aware of these opportunities, but parents, family members and others can also play an important role. I believe that we all need to use every opportunity we can to inspire woman of all ages to continue the work of so many remarkable female scientists. I know that my amazing team of female scientists and I, would love to continue to encourage women and girls alike to pursue their passions and get involved in science. From motivational speaking at schools to performing science magic shows at University alumni weekends, every little bit helps.

Credit: Antonia Reeve

Jean Beggs, PhD

Royal Society Darwin Trust Research Professor and Professor of Molecular Biology at the University of Edinburgh.

by Ruairi Mackenzie

Professor Jean Beggs leads a research group which focuses on pre-messenger RNA splicing. A long and distinguished research career in Glasgow, Edinburgh, Cambridge and London, has seen Jean be awarded the Royal Society's Gabor Medal and the Biochemical Society's Novartis Medal and Prize. She was made a CBE for services to science in 2006.

Q: When and why did you first get interested in science?

A: At school, I was interested in science and maths. There was no particular reason, they just appealed to me.

Q: What did you originally choose to study and why?

A: My family was not academic but my father (in the building trade) encouraged me to study and go to university. I attended a girls-only school, and the teachers were not qualified to teach to the level of Scottish Higher chemistry and physics, so I sat a lower grade called Higher Science (a mix of physics and chemistry). Nevertheless, I was accepted to go to Glasgow University, aged 17, and very poorly prepared for what was to come. At that time, students studying for a BSc were expected to study maths, physics and chemistry in the first year of university. It was a very difficult year for me. Many students had done the more advanced A-levels in these subjects. But then, in second year, I chose to do biochemistry and physiology as well as the next level of chemistry. This was a revelation for me. I loved biology and went on to qualify with 1st class honours in biochemistry.

Q: Tell us about your career. Where have you worked and what are achievements are you most proud of?

A: As a postdoctoral scientist in Edinburgh, with Professors Ken and Noreen Murray, I learned how to use restriction enzymes to clone DNA – a new technique at the time. I realised that the bacteria that we used as hosts to clone DNA were not ideal. I developed a method to clone DNA in yeast cells; this was a powerful approach that was soon adopted by many researchers. I then looked around for something different to do. A chance visit to the famous Cold Spring Harbor Laboratory, New York, inspired me to study how cells remove non-coding introns from RNA, a process called RNA splicing. For many years, I studied how RNA splicing works. I am proud of both of these studies because I did original research that helped to improve knowledge of how genes are expressed. My success was acknowledged by my election to Fellowship of the Royal Society (FRS), the UK's national academy. I was a lecturer at Imperial College London for five years, but my husband and I decided to return to Edinburgh, where he got a consultant job in a hospital. I resigned the ICL lectureship and moved my research group to Edinburgh, initially without a post. I was then eligible for research fellowships and obtained a series of fellowships funded by the Royal Society. This had the advantage of allowing me to focus on research, while still doing some teaching.

Q: What area is your lab at Edinburgh currently working on and what inspired you to take your research in that direction?

A: Rather than studying RNA splicing in isolation, my research group is currently studying how the processes of RNA splicing, transcription and chromatin modification are functionally linked. This is a form of systems biology; the study of how different cellular processes interact within cells to make them more efficient. This has involved a steep learning curve to become knowledgeable about these different processes and is very challenging but exciting.

Q: What can be done to encourage more women to get involved in science?

A: More parent-friendly timetabling of meetings. More childcare facilities (and more affordable ones) in universities and sympathetic attitudes to the impact of childcare on work performance. The Athena SWAN initiative is very effective in promoting changes in universities, and there are a few schemes to help support young parents, such as the Royal Society's Dorothy Hodgkin Fellowships. We need more of these.