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EDITORIAL

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Profiles of women in science: Rae Silver, Neuroscience Program and Psychology at Barnard College, and Department of Psychology at Columbia University, New York, NY USA

We at EJN are pleased to introduce the next profile for our series of Women in Neuroscience (Helmreich, Bolam, & Foxe, 2017). We began this series to bring visibility and recognition to women scientists in our community (Helmreich et al., 2017); you can find all of the profiles here: https://onlinelibrary.wiley.com/doi/toc/10.1111/(ISSN)1460-9568.women-in-science.

1 | BRIEF BIOGRAPHY

Dr. Rae Silver is a Professor at Barnard College and Columbia University and has been a section editor at EJN for over a decade. She is currently serving as co-guest editor for the upcoming EJN Special Issue on Circadian Rhythms. Her latest publication in EJN, appearing in the special issue on Circadian Rhythms, is titled "Overexpression of striatal D2 receptors reduces motivation thereby decreasing food anticipatory activity" (LeSauter, Balsam, Simpson, & Silver, 2018).

Dr. Silver earned her BSc. from McGill University, her M.A. from the City College of New York and her Ph.D. in Biopsychology from Rutgers University, Institute of Animal Behavior. Currently, Dr. Silver is the Helene L. and Mark N. Kaplan Professor of Natural & Physical Sciences, Chair of the newly created Neuroscience Department at Barnard College, and the head of the Silver Neurobiology Laboratory located at Columbia University. Since 1976, Professor Silver has been a member of Barnard's and Columbia's faculty and has taught courses in Quantitative Reasoning, Neuroendocrinology and Behavior, Neuroscience and Psychology. The National Science Foundation, the National Institutes of Mental Health, and National Institute of Neurological Disorders and Stroke, Air Force Office of Scientific Research, and the Office of Naval Research, are among the organizations that have supported her research. https://psychology.barnard.edu/profiles/rae-silver, http://www.columbia.edu/cu/psychology/silver/

2 | CURRENT POSITIONS

Over the course of her career, Professor Silver has held many positions on committees in services to the educational community, the scientific and research community, and the Barnard and Columbia communities. Currently, she was a US Representative and subsequently served as Vice-chair and then Chair on the Council of Scientists for the Human Frontiers Science Program and a panel member of the National Academy of Sciences Institute of Medicine Forum on Neuroscience. Her work as Senior Advisor at the National Science Foundation

helped to create a series of workshops to examine opportunities for the next decade in making advances in Neuroscience through the joint efforts of biologists, chemists, educators, mathematicians, physicists, psychologists and statisticians. She served as co-chair of the NASA committee that prioritized biological research for the International Space Station. She is a fellow to the American Academy of Arts and Sciences. Dr. Silver can also be seen on the Daily Show with John Stewart (1997 & 1999) and as a TEDx speaker (2015).

Her major research areas focus on circadian rhythms, which form the basis of sleep-wake cycles and their neural bases, and on immune-nervous system interactions in the brain.

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I had the pleasure of speaking with Dr. Silver in July 2019.

3 | EJN: HOW DID YOU DECIDE TO BECOME A NEUROSCIENTIST?

R. Silver: I was an undergraduate at McGill University. At that time, Donald Hebb, one of the major founders of neuroscience, was head of the department; the field was called Physiological Psychology at that time. You cannot imagine how famous he was, he was right at the end of his career. He gave the best lectures and he didn't allow anyone to take notes. He just said "you should think," and he would explain ideas. He didn't want us to memorize facts; he wanted us to think about ideas. Peter Milner, Brenda Milner and Ron Melzack were also in the department at that time.

Brenda Milner studied and tested patient H.M., who had epilepsy and had unilateral removal of the medial structures of the left temporal lobe. That was the beginning of discovering of how memory is stored in the human brain. As part of our undergraduate Honors Psychology program, we observed Brenda Milner. The surgery team at Montreal Neurological Institute relied on her work to try to figure out where the language area of the brain was located before they did any surgery for epilepsy. As students, we watched her inject an anesthetic into the carotid artery on the right or left side and wait to see whether language was affected. It was an amazing foray into neuroscience.

Also at that time, B.F. Skinner in the United States was a dominant force in psychology and the rules for understanding behavior. And believe it or not, Canada does have some separation from the United States in quite a few cultural and conceptual aspects. Hebb would argue that we could understand behavior better if we also paid attention to how the brain works, and Skinner argued that you cannot understand behavior by interrogating the brain. Hebb wrote a brilliant paper entitled the C.N.S. (Hebb, 1955), which stood for the Conceptual Nervous System, and argued that if you thought about the brain in an intelligent way, rather than a stupid way, you could understand a lot more about behavior. With that kind of fiery dynamic intellectual atmosphere, that was the area that attracted me.

That's how I got interested in the brain, but it is not how I ended up here in New York City and at Barnard College and Columbia University. That is a completely different story. When I graduated from college, I took and passed the Canadian civil service examination. My boyfriend had come to New York, because it's relatively close to Montreal, and he got a fellowship at Columbia with no obligations—stipend, full tuition, housing, everything. And the Canadian civil service administration indicated that I could be posted to New York. But once I was in New York, they said I had to do two years of training in Ottawa—so I decided that I was not going to become a civil servant. I then found out that you couldn't just show up in the States, you had to have a visa. At that time, there was a ~5 year wait for visas, but you could get a visa by being an au pair girl, the wife of a foreign student, or go to school. So I got a subway map and said "oh, how lucky, there are three schools on my #1 subway line"; I lived right near Columbia. I immediately applied to all three schools. I was seriously intimidated when I went to NYU. I was as a very typical/discrete Canadian, wearing proper dresses when going downtown, no laughing aloud in movies, and other such proper behaviors. I was intimidated by all the people sitting around Washington Square Park near NYU with their feet in the fountain at 8:30 in the morning, drinking beer, and smoking marijuana, I thought "Oh my God, I'll get killed if I go down here every day." Next, I went to Columbia and I deposited all my forms at the graduate school office. But I had not taken the test of English as a foreign language (I didn't think of it) and apparently my application to the department was incomplete, never left the administrative office, and I never heard another word from them. When I went to City College, I noticed that the buildings were made of lovely gray stones—the stones were apparently taken out of the ground when the subway was built. The buildings looked like all the buildings in old Montreal, all around McGill, and that's what I was accustomed to seeing, gothic windows and stone buildings and I thought "oh, this is really pretty." Of course, at that time, the area was fairly dangerous and a hub of drug distribution, the asphalt in the streets was embedded with bottle caps, but I didn't see any of that. Anyhow, I went there and deposited my papers on the fourth floor and walked down this gorgeous spiral staircase. And as I was walking down, someone yelled out, "Rae Silver, you want a job?" I thought huh, nobody knows me in New York.

It was this fellow who by chance had happened to walk through the office and noticed my application lying there. He was very impressed with my standardized scores and offered me a job as a research assistant and arranged for enrollment in City College. I wasn't much interested in the courses because I had already taken virtually all of them as an Honours student at McGill. I ended up doing research

for him with Dr. Paul Witkovsky at the Columbia Medical School; his name is Dr Phillip Zeigler. I was working for him when one day when he had a site visit from NIH. Since I had been doing the work, I presented the research. One of the site visitors said "oh, you must be finishing your PhD," and I said "oh no, I'm just flunking out, waiting for my husband to finish his PhD." And so he said "Well then, why don't you join my Institute, I'll admit you as an extra graduate student." I said OK—I didn't have other more interesting options. So I joined his institute as an extra graduate student and that was a big shift. The site visitor was Danny S. Lehrman; he was a member of the National Academy, he had every famous behavioral neuroscience and evolutionary biologist in the world come through and give talks: every morning students and faculty sat around and argued about research and did a lot of thinking. Danny thought grades were meaningless; he did not admire those who had all A's because if you get all A's you're likely just studying, you're not thinking and following passions.

When I got my PhD I had to get a job to keep the visa. And—perhaps it's hard to believe this stuff—but what happened was they had a job at Rutgers Newark night school. And a short time, they wanted to put me up for tenure and I thought "uh oh, I will be working at Rutgers Night School in Newark for the rest of my life." So I quit because I thought it was a difficult commute from the upper west side in NYC and a hard place to work. I then got a job at Hunter College, and to make a long story short, the leaders in that department at the time were incredibly mean. Donna Shalala was the president of Hunter at that time, and she was trying to advance the position of women in academia, so they offered to put me up for tenure. And I thought, "uh oh, this is a miserable place to work, I'd better quit," so I quit. There's no point in staying in a miserable job. There are lots of other jobs in the world.

I was living right across from Columbia all this time, and a job opened up at Barnard. I went over and everyone was very nice, the faculty was so friendly and welcoming, and it was right beside my apartment. They thought I would never take the job because it involved a 25% pay cut, but I did not care that much about the money, and I still needed a visa. Of course, I took the job, and it turned out to be an amazing place. People support each other within the constraints of the institution. The problems at Barnard are like family issues. While at a big place that has a deep administrative structure, resources, responsibilities, and regulations are more distributed. When you go for help often someone says, oh, go somewhere else, and again somewhere else; you never get that at Barnard, the lines of responsibility are much shorter and resources are more limited. To be more specific, on the down side, an undergraduate college like Barnard doesn't have the resources of a giant university, so they can't do everything. At this point, I have a joint appointment at the two schools and I'm feeling very lucky about that. On top of that, I have great students at both institutions, and I've been externally funded ever since I started.

4 | MOVING FROM CANADA TO THE UNITED STATES, DID YOU ALWAYS KNOW YOU WANTED TO DO SCIENCE OR DID YOU JUST WANT TO GET A JOB IN NEW YORK CITY?

No, initially I just wanted a visa. I didn't want to do science as a career until I met Danny Lehrman. He actually viewed science as a creative thinking enterprise, and that's when I wanted to do it myself. As a new college graduate, I was blind, and just didn't see a relationship between the undergraduate degree and a career.

5 | DO YOU HAVE ANY ADVICE FOR YOUNG SCIENTIST OUT THERE THINKING OF A CAREER IN NEUROSCIENCE?

The short answer is: Think through how to create a reasonable balance between personal life and career.

I worry, on behalf of my children and my students that young people today think—you can have children, you can have a career, and you can get rich—all at once. You can do all these things as though they're all: A) desirable, and B) available. And much of the time, they're not. And even if they are available, they're not *always* available, maybe they're just *sometimes* available. People can set themselves up for unhappiness because they want everything, and they think that everybody should/can have everything. And they don't really think about, how am I going to balance the time that I want to spend with my friends, family, kids, cover the children's needs, and also have a career? It's really hard. A lot of pieces have to fall into place to get that to happen and the balance changes continuously over time.

When I started at Barnard, my son was born August 31st and school started the day after Labor Day (first Monday in September). So I started work the day after Labor Day. We didn't have maternity leave then, and I've fought very hard for others to get it. That said, maternity leave is fine but it just doesn't do very much for you. Even if you get a year off, you still have all those following years. My advice is, think it through and get ideas from other people. You either do everything yourself, or you have someone help you. When my son was young, I spent more money on school and help than I was earning. We kept the kids in nearby schools so that I could cover for emergencies. I never worked at night and only one day of the weekend.

You have to think through the short-term investment versus the long-term investment, and maybe it will all work out. It's not as though any of this—either the pregnancy, the child care, or the healthy baby, or the healthy self or all the other stuff—is automatic. Did I mention that I had cancer when the kids were young? And had seven miscarriages before I had kids? It is so hard to see past hard times. It's also hard to accept that this is how most lives move along—with good and bad times. That is why I sometimes refer to "life events" that somehow recede into the past—eventually. It's hard/impossible to be realistic in advance, but it's false to think other people have it easy and you don't.

6 | WOULD YOU LIKE TO ADD ANYTHING ABOUT BEING A WOMAN IN SCIENCE?

A friend of mine, who's a Nobel Prize winner, said he mostly studies male flies because female flies, once they mate, are just busy all the time—just like his wife. That point was an alert message to me. The problem that women have is they still have so many other responsibilities. There is a story in the paper today (Qin, 2019) about women in China having to declare if they're married and then having to promise not to have children. But if they have children, it's the prerogative of the company to fire them. That sounds extreme but when someone is in the laboratory, let's say you have a post-doc in the laboratory and you're spending $80-$90,000 on salary, fringe, and overhead and this person goes on a six month pregnancy leave, you're left with a huge gap in your research plus your grant/research doesn't get compensated when your post-doc gets maternity leave. I feel that as long as there are special situations that apply to women only, it's going to be hard. We have to accept that women often do have more responsibilities. And while I have focused on the special situations that come with pregnancy and child care, the unique pressures on women often extend far beyond that. My strategy has been to look at the reality, and then do my best, and then forgive the failures, both personal and by others.

7 | HAVE YOU EVER NOTICED OTHER DRAWBACKS TO BEING A WOMAN IN SCIENCE?

My sisters and friends say that I compartmentalize everything (I once actually gave this as advice at a mentoring round table). I take all the things that are my worries, or my irritations, and I put them in little boxes in my head, put them away, and never notice them again. So, all the things that I might have worried about are forgiven and disappear from my awareness.

8 | YOU HAVE BEEN IN THE FIELD FOR A LONGTIME, HAVE YOU NOTICED ANY CHANGES?

There are two that I believe are real. First, the pressures on people seem to be increasing. I don't know if that's because of the economy, because of politics, because of environmental changes. But in general, I feel that not only young people, but everybody, is experiencing much more pressure than before. The second is that there are more and more smart students and they are incredibly talented. I'm just amazed by the academic achievements that I see in young people at these elite schools.

9 | OKAY, SWITCHING TO NEUROSCIENCE, WHERE DO YOU THINK NEUROSCIENCE MIGHT BE IN THE YEAR 2030, 2040?

Well, it's always at the beginning, right? and there's always more. If you were studying something like cognition, consciousness, or feeding, those will still all be topics in the future, but the ways that one can interrogate them will be different. And the questions we ask of those topics will be different because the tools and resources we will have to investigate them will be different. I think all the practical questions will still be out there, answered in a different way. If you look through chapter headings in a psychology or neuroscience textbook, the chapter headings will probably not change much, but the content will be different.

10 | IS THERE ANYTHING YOU WANT TO ADD FOR OTHER STUDENTS OR MEMBERS OF FENS?

Well, how about this? Some students are sitting right here. Let's ask them what they would want to know.

11 | STUDENT: IF YOU DID NOT MEET THE PROFESSORS THAT YOU DID, WHAT AREA WOULD YOU HAVE GOTTEN INTO?

I don't know. As I described before, I did not have a plan worked out in my head.

I didn't know academic jobs were interesting—I really didn't know. Academic jobs seemed to require a lot of work that was not acknowledged. You just had to work, work, work, you never finished. So if I hadn't met super great people, and I if I hadn't fallen in love with the puzzle part of it by doing research and teaching, I would not have gone into academia.

I would have chosen a job that had more of a nine-to-five aspect. Also, some of the more visible parts of teaching–grading the papers, pressuring students to hand papers in on time, making—up examinations—are not super fun unless you have really good students. I dislike giving students' grades. I would rather they all did their best.

12 | STUDENT: IN RESEARCH, THERE ARE LONG PERIODS OF TIME WHEN THERE ISN'T AN ANSWER, OR EVEN AN INKLING. HOW DO YOU WORK THROUGH THAT? HOW DID YOU NOT LOSE HOPE?

The problem with research is that you never really know whether you're going in the right direction or not. So how do you keep up an interest? What I like to do is have some high-risk and low-risk work going on the same time. There is always some sort of puzzle to be solved. We usually know some part of the puzzle that we can solve and can get an answer, and then there are other parts of the puzzle where we don't know if we are going to discover anything at all, no matter how hard we are working.

13 | STUDENT: WITH THE RISE OF SOCIAL MEDIA, IMMEDIATE ACCESS TO THE INTERNET, FAKE NEWS, AND SO MANY PUBLISHED ARTICLES, IT SEEMS THAT ONE MAJOR ISSUE FOR ME IS TRYING TO FIND A WAY TO WEED OUT SCIENTIFIC JUNK THAT IS ON SOCIAL MEDIA ETC.

Right. So, this is a question that I cover in class. There is so much information out there. Students actually have a hard time figuring out what is more true and what is less true, what's a good source of evidence and what's a poor source of evidence. These questions of how confident are you in a particular result, both at the level of an individual experiment and at the level of data that you're trying to interpret from the field, are big questions. And maybe EJN, and certainly FENS, is in a position to think and talk about it.

14 | IS THERE ANYTHING YOU WOULD LIKE TO TELL EJN?

My only serious comment about journals in general is that I hope scientific journals find a way to survive at a high intellectual level in the face of current financial and open access pressures. We need journals that discriminate content on scientific grounds not just on citation index and money index. There is too much fake open access, based on money making models. I think I got three invitations to submit papers today—later they tell you that you have to pay to publish the opus.

15 | SO DO YOU WANT TO TALK A LITTLE BIT ABOUT SOME MORE PERSONAL QUESTIONS ? WHAT'S THE LAST BOOK YOU READ?

The book I'm currently reading is "My Dear Hamilton: A Novel of Eliza Schuyler Hamilton" by Stephanie Dray & Laura Kamoie. And the one I read before that was "In the Darkroom" by Susan Faludi; she's trying to sort out in her mind and in her writing, how it is that her father had a sex change operation at the age of about 70.

And when I have work to do and I'm having trouble focusing, I listen to Handel's Messiah (Joan Sutherland) and in some moods—Le Diable—par Jacques Brel.

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