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| **Focus Group 4 – 31.10.19** | |
| Aantal minuten: | 61 |
| Aantal sprekers: | 5 |
| Taal: | English |

SP1: So, I will just record. We start with a very easy but important question: Can you briefly introduce yourself by telling us your name, your discipline and your research interests?

SP2: My name is [name]. My discipline is neurobiology and my research interests are on the dopamine system. This is what I work on. Also, my main interest is the dopamine and reward systems in the brain and how the release of dopamine in the striatum is regulated. Then I also have another research interest that I don’t work on but I want to work on and that’s the mechanisms of action of psychedelic drugs in the brain.

SP3: My name is [name] and I am a neuroscientist by training and my background is in visual neuroscience and my main topic of research these days is visual neural prosthetics so how it interfaces with the visual prosthetics

SP4: My name is [name]. I am elective (? 00:01:13) by training but now we do lots of different things, basically all the techniques you can imagine using in neuroscience. I am interested how the retina works, how the retina copes with information which it receives and how the brain processes that eventually.

SP5: I am [name], a post-doc in neuroscience and my discipline and my main research interest is how to encode information in the central nervous system so how to encode artificial information into the nervous system similar to [name SP3] research. Also, another topic of mine at the moment is to study how neuromodulators such as acetylcholine works in terms of the sensory processing or reward or reinforcement learning.

SP1: There's one thing I forgot to mention, for the recording it's important that we don’t do the pen all the time or move things because then we won't hear what you say, so maybe if I ask you stop anything then it's just because of the recording. Other than that, feel free to take some of the snacks or drinks whenever you want. Would you say your research is mostly group work or do you work individually?

SP2: My research in my PhD was mostly individual and then at the beginning of my postdoc it was also almost entirely individual. I did have some technical support from the technicians but for the past few years I've been supervising a team of master’s students and so it has become group work because there's not enough time for me to do it all on my own so I need to be able to delegate the simpler tasks to students.

SP1: Is this for you the same or different?

SP4: Many of the experimental work is, of course, in group work so people will be working on the project for days or weeks just doing that, but eventually all the data I get in one big group effort in the institute but also with scopes outside.

SP5: Yes, it's pretty typical for us. If we have a topic, usually several people work on it at the same time maybe using different techniques but it's all more or less the same project.

SP3: Yes, I definitely see over the years, especially with trend towards larger grants and consortia that the group work is not just more of your colleagues within the same institutes but also with collaborators across institutions.

SP1: So also different disciplines?

SP3: Yes.

SP2: Yes, I actually agree as well. In the past year, I started up a collaboration with researchers at [Dutch research institution] who have a different type of expertise than our lab and so they can do experiments to complement to make our project better.

SP1: Could you outline what are your thoughts or your first associations with the topic luck in science today? I will try to make some notes just so we have a-, anything that comes to mind?

SP3: Educational and economic background that allow you to have more opportunities more or less opportunities.

SP2: Yes, I agree with that. There were some periods in my career, where I was working for free and my parents were helping me out financially, and that would not have been an option for people who came from a less affluent background.

SP1: How does that relate to luck?

SP2: Because you're lucky to be born to people who made good decisions and like them to have a high income.

SP4: I question whether there is luck in science. It's more being very sensitive to opportunities you are given and might more identify interesting objects less than something that comes-, it's more-,

SP1: So, is it a skill?

SP4: Some people are luckier than others but it might be they are more aware of the possibilities.

SP2: I agree that luck favours the prepared. I definitely agree with that.

SP3: And the motivator and perseverance; there is definitely an element of luck. You apply to X number of universities to do our PhD or our postdoc and you just happen to get accepted by one that can completely change the trajectory of your life.

SP5: And if you choose the wrong one, or if the right one you chose somehow turns out to be not the best option for you, that can be quite detrimental sometimes.

SP1: If I understand correctly, you say this is something that might help. You don’t really have maybe much choice in that, but here I get the impression there are things you can do to become lucky. Do you all agree on that?

All: To a certain extent.

SP5: Maybe a little you might be able to influence 20 percent of the overall luck that you have but I think luck is still luck at the end.

SP2: Yes, and I think also it's not only sensitivity to opportunities but your ability to pursue those opportunities.

SP1: How does that relate to luck?

SP2: I guess especially at more junior stages of your career you may not be able to assess all the factors of a potential workplace or mentor that could either facilitate your scientific progress, or get in the way of that progress, and so this is something that I think for most people can only really be mainly be built through experience. So, I think as you become more experienced dealing with people, more experienced and hopefully more emotionally intelligent, then you can get a better feel for who would be good people to work with and who would be a good match and who wouldn’t. But at a earlier stage of your career, at least for me, I didn't really have that sense was not very well developed, certainly not as well as it is now. I think then maybe luck may have played a big role.

SP4: But then I think we are talking about two types of luck: luck in a career path and luck of finding scientific breakthrough or a scientific topic, and I think these are different things.

SP2: I agree.

SP4: Indeed, for the career path I see the luck. For the other one, I am less convinced that is luck.

SP1: Why do you think that?

SP4: Imagine you’ve talked to somebody and he has this specific thing you need, and then you can say: Oh, I was lucky, but basically you’ve talked to thousands of people and in those thousands of people there will be somebody who will have that knowledge. Is that by luck or is it just part of the process? You have to talk to many people otherwise everything becomes luck, everything interaction.

SP1: I have the impression we talk about luck about something as something mostly positive, so I think you can say luck you can also have bad luck. Do you think it's different if we talk about bad luck or do you think all the things we’ve just said before relate to bad luck as well?

SP4: I think the career path there is bad luck involved totally. Totally. The other type, I don’t know. You can, of course, talk to somebody and he comes with an idea and it turns out to be a crap idea and you’ve spent a lot of time.

SP3: We've had really bad luck in experiments and an animal dies for no reason and you’ve trained it for two years, definitely I know people who quit their PhDs after this.

SP2: I have a similar story also related to animals. Let's say, I can give an example from my own career. I had a side project in grad school and I was given really interesting data and I was interesting pursuing and my advisor was interested in pursuing it but I had to leave before I could wrap the project up, and then this double transgenic mouse line we were using stopped breeding and they died out then my interesting data couldn’t be followed up so I lost the first half the paper because of that.

SP1: So, because the circumstances are in a certain way bad luck happens. Actually, I think this is a good start.

SP5: Another area where I think luck plays a bigger role than a lot of people like to acknowledge is in securing funding because it is so competitive. The consensus among most of the PIs I've talked to is there are way more fundable proposals, like proposals good enough to fund them, there is money to fund them, and so my interpretation that is, therefore, then a lot of them must come down to luck. Even something as simple as: Was your proposal reviewed before lunch or right after lunch?

SP4: I once proposed because there are so many good proposals that we just skip the whole reviewing and just completely based on luck.

SP2: I like that idea.

SP4: Because it's now very political, and all kinds of things interfere which should not interfere and basically everybody agrees always it's about the 30 percent less proposals and then stop discussing it. So, the dice is-,

SP3: We need to expand the sources of funding and tap into more private money but that’s not really related to that. But I agree, related to funding it's also fine to look at the political climate because there you could be lucky or unlucky if your government is more or less supportive of research or certain types of research.

SP1: Is that an expert career in finding breakthroughs and funding, would that be an extra or does it fall under one of those?

SP3: I hope it's an extra.

SP4: And I think the environmental thing, dying animals, is another level.

SP5: You could argue in the dying animal case that you think it is bad luck because you don’t have an answer for their death but if you do know why they died and later you realise why they died then it's no longer just bad luck, maybe it's because you forgot to do something or did something wrong.

SP4: During hurricane Katrina in Houston, all the animals in the basement and the whole basement flooded and they were doing aging experiments with monkeys and they had been sitting there for years and years and years and they all drowned. I think that is really bad luck. Maybe it was stupid to have the animals in the basement.

SP1: A good example.

SP2: Yes, a very good example.

SP1: So now we’ve had a bit of an overview, I am also interested to hear a bit more about your own experiences. We’ve already touched upon a couple of those. Would you say you have ever come across luck in your own scientific work or career and would you be willing to say something?

SP2: I already told you about this bad luck for my PhD, where I lost something that probably would have turned into a (? 00:15:51) paper if the mice had continued to breed. Then I came here to work on a high-risk high-reward project and so risky that according to a former trainee of my boss that he said he would never have chosen to do a postdoc with such a potentially career-killing project. So, I think a lot of the experiments in the first two or two-and-a-half years were ‘I hope we get lucky’ types of experiments.

There was clear hypothesis but there wasn’t that much evidence to really support that we would get the result that we wanted, and so I tried it. I didn't have a single positive result from my main project for more than two years because we were trying one thing and then tried another thing, and because they were so risky my mentality of that was these experiments are ‘I hope we get lucky’ and get what we want because we had so little knowledge of the underlying circuitry.

SP4: But you continued. There was knowledge and reason to continue.

SP2: Yes, of course.

SP4: So how much of it is luck? It's very estimated. It is what you took. It's not just doing experiments and see what works, there was thought behind it.

SP2: Yes, there was definitely thought behind it. Yes, I guess so.

SP1: Do you mean to say like it could’ve turned the other way even with the same hypothesis?

SP2: Yes, we could’ve. The first line of research I tried, the results were all negative so it didn't go the way I wanted. Then that lasted for about a year and then we started to do other things and those panned out but it took also months of technical optimisation and troubleshooting to make them work.

SP1: You also nodded. Did you also experience luck in your work?

SP3: I feel if I look back at my life it's been a charmed life because I've been lucky in every hospital, you know, branch from my gain a scholarship to my undergrad degree and then finding a very good PhD mentor to finding this position here. It's been a series of really fortunate events. I often send out a bunch of applications and there was exactly one success, so I just went down that route. I think in terms of funding, that has been a little less more of luck because I wrote about 10 or 11 grant proposals in the first couple of years of my postdoc and then once we got enough funding I stopped for a while, because we had one successful proposal. So, in that case, it's more that you go on until it works. But I was also fortunate that my professor was supporting me writing all these proposals.

In terms of animal experiments, I've worked with monkeys throughout my career, and there I was definitely fortunate I never had any really serious issues. Some of them you can mitigate by doing a lot of preparation getting plans in surgery but some of that is like rolling a dice.

SP1: Would you say that it's because you all work with animals, I think? Does that make your work more or less luck prone than working, for example, with mice?

SP3: Some of the other models, or something. Yes, I think so, for sure. There's an extra level of complication there, uncertainty.

SP1: Do you see that as precedence?

SP4: It's a technical challenging thing but that is also-, yes, you have to learn the techniques and then you become better and better. So, is it luck? I don’t know. A speed-skater will be lucky to become world champion but he has to put a lot of effort in it and then there is still a little bit of-, I think I can say the same for my career as you said, so every step I was very lucky. On the other hand, when I did my masters, I applied for three positions for PhD and there are five open positions and I could get all of them so I had to choose five PhD positions and I took this one and I am very happy that I went in this direction. But I often think that it wouldn’t have made much difference because then I would have worked in a completely different field. So, it's difficult to say whether it's luck or whether you can basically survive in any environment.

SP1: Interesting.

SP5: One of my advisors in rat studies, who is a historian, he always said before you discuss any sort of topic in humanities it's important to come up with operational definition. So, here what do we mean by luck? I notice we have different definitions of luck and different interpretations.

But back to my personal career. I think it's been a mix of good and bad luck. It's kind of balanced out. I had my lucky moments and I also had lots of very unlucky moments that’s completely beyond my control. For example, I took an exam in the United States, MCAT for placing rates to (? 00:23:04) medical education and in this exam I took, somehow there was a computer problem on that testing computer and so there was 10 questions that were not showing to me, so I was surprised this time I finished so quickly but then it turns out at the end there were 10 questions somehow the program didn't show. That’s really bad luck. That was my last MCAT attempt in the United States so I thought I would give it one more try, if I don’t do well, also don’t do well in this one that’s it. Actually, I did pretty well in all the sections I completed but then there were just 10 questions that somehow didn't show up. It's for sure bad luck but on the other hand I could obtain some other scholarship to study in Europe. I came here.

Also, in my PhD, I had pretty bad luck for quite a long time and suffered quite a lot. We had very nice projects but funding wise it was very difficult. We didn't make it. Although all the reviewers of our grant application said this grant is 9 out of 10 by the NIH standard, it's very high, so everybody rated very high, but at the end it was still killed by the committee. So, that was bad luck. I had to struggle with funding for many years so that was pretty difficult but at the end I didn't give up and pushed it, a lot of suffering but in the end, it worked. I could finish my work.

And then after I left, they got the funding so the second round of application turned out to be successful but I had already come here and I didn't want to stay in Germany at that lab anymore because there were too many horrifying moments. So, you can say that’s also bad luck.

SP1: So lucky that you came here.

SP2: Your MCAT story reminded me of another incidence. I think everybody at the table will agree this is bad luck because this is purely a genetic event that I had that I had no control over. I was making viruses, making viral constructs as part of my PhD to do genetic manipulations on mice, and usually as part of the process of testing, I can do viral construct for specific genetic manipulation, you will sometimes test it in a report mouse line where if your viral construct works then the cells you're targeting will turn a certain colour, and in this case, if you put on a chemical, the cells will turn blue. So, I was testing my viral construct in these mice and then when I put on the chemical most of the brain turned blue and I was like: What's going on here? Something must be wrong? Then I got another report line and that worked more in the way I expected and then our conclusion was probably what had happened in the first report of mice we had got is there had been some random, genetic combination event where the DNA had rearranged during the reproduction of the previous generations of mice so that the mice I got didn't have the normal genetic restrictions on the expression of this enzyme that made the chemical blue. So that was definitely something, where there is no way to control over it, because that’s just what happens in reproduction, it's like the chromosomes switch DNA and sometimes these things can happen.

And the same thing also happened to another friend of mine who was working with transgenic mice. But I only lost a few months because of that so it wasn’t that bad.

SP4: So that had no scientific significance what you observed?

SP2: Yes.

SP1: Have you or any others experienced any other surprising findings or you did an experiment and the outcome was completely different than you anticipated?

SP2: Right now.

SP5: Recently in our acetycholine project there is some very surprising findings that is completely different from the existing literature. We used this new type of retina sensor to sensor extracellular acetycholine concentration, and supposedly when the animal is engaged in locomotion, like starts running, the acetycholine level in the brain should actually increase because of enhanced arousal or engagement in running, but that was actually reported by many other groups using another method. So that was different from what we are testing. But in our testing, what we saw is consistently the opposite, so we always see a decrease in extracellular acetycholine level. That really bothered me and my team for a while but now we started to see maybe there is another possible explanation so as you can see, maybe the bad luck can turn into something good if you seize the opportunity.

SP4: But I think there is an aspect of risk-taking there. In 1982, there were papers showing that neurons in the (? 00:29:43) retina project backed photoreceptors via diverging pathway and everybody tried to repeat those experiments. Everybody would do the experiment and everybody thought it was logic and it should be like that. Then everybody tried and nobody could repeat it, but everybody kept quiet about it because the results that were published were so clear. Then finally, after my postdoc, we started looking in that question and we found completely different mechanism which was not at all depending on gamma and gamma did not play a role there, and then I presented that. And it was a new scientific medicine. Somebody came to me and asked me: Are other people working on this topic? I said no, it's very exciting, isn’t it? He said: I would never have done that because he didn't want to get out of the mainstream, it was too risky. He said: If you are wrong, then your whole career is gone. Eventually, it was published it in [name of high ranked journal] so it was good.

But for me it was so incredible that somebody would say: I would never have done that, because it's one of the highlights in my scientific career to do that and to find that. And so, is it luck? Is it risk-taking? What is it?

SP5: For our project, we want to study something else using those sensors regarding acetycholine and we just wanted to validate these sensors not by some already published knowledge so if we see the same pattern, but actually we don’t. So, are we wrong? Is the sensor wrong? Or they’re wrong or there is something new because the previous studies all measure the release, the presynaptic release of these neurotransmitters while we actually measure the postsynaptic monitoring or the concentration in the postsynaptic space. So, there might be a difference there. But it was bad luck to us, because we couldn’t continue what we wanted to do because this little problem was not something that we expected. We want to use it for something else and now we encounter these problems. Yes, either good or bad, we will see.

SP2: But it could turn out to be very good if it turns out to have biological significance. I have another example of bad luck for my PhD. I had to switch labs almost three years into my PhD because things weren’t really working out with my first advisor and project, so at the previous thesis committee meeting to the one where I was told I had to switch labs and start my dissertation research over, we had agreed that in order to be rigorous about the project it was important to establish a technique for measuring dopamine in the lab I was working in so I could use it in my project. We made arrangements for me to go to my current advisor’s postdoc advisor’s lab for me to train and also borrow the equipment from them but, unfortunately, there was, at least a six-month long waiting list for this equipment, but one of the things my thesis committee had mandated was that I would have to have this technique set up and working before the next committee meeting. So, the equipment came in two weeks before the committee meeting so just didn't have the time to set it up. That was one of the reasons why my committee told me to switch labs, maybe not the main reason, like me and my guys cost a lot, and my first advisor costs a lot, and that was probably the main reason they told us to switch. But that was very, very bad luck. We just couldn’t get the equipment I needed for my project in time to fulfil the mandate of my thesis committee.

SP5: But, also the personality clash with your advisor. That’s also bad luck.

SP2: Yes, but there were red flags during the interview and I disregarded them because I was so enthralled by the idea of working at [name research institute], this very prominent research institute, where I did part of my PhD, or where I tried to do my dissertation research and then it didn't work out.

SP3: I think sometimes it's hindsight; things look like red flags but it's hard to say there and then. They could have been surmountable red flags.

SP2: Yes, we tried hard to make it work between us me and my first PhD advisor. I think during the interview, I got this feeling like something’s a little off here. But I disregarded it.

SP1: You just explained an example of how the outcomes or the things you measure might not really match up to what you imagined would happen. Are there any other examples where experiments or part of your research where the outcome was very surprising? Or funding could also be one of the things.

SP4: I have one example. Again, about this specific (? 00:35:55) connection. There was a model for this (? 00:35:57) connection between horizontal receptors and photo receptors, and we tested that and that didn't function. Then I wrote a paper about that and I had one sentence in there: It can only function if the one option could be-, and then I mentioned another buying channel. The reviewers were very strongly opposed to that sentence and I had to remove that from the paper until finally I did it because I wanted it published. Then I visited a collaborator in [name of city], and he said to me: We have been working on this protein on this ion (? 00:36:47) we expect it over there and look at what we see. So, it was exactly on the position I suggested in the paper. So, I said: oh well, I know what to do, and they were completely amazed: What is this? They hadn’t a clue. And then I asked the (? 00:37:09) to block those channels. Yes, yes, we have it; you can give it to me. I took this with me and the next day in [name of city] we did the experiment, and it was spot on. Maybe you can call that luck. It was very exciting, at least. It was completely unexpected on the one hand but on the other hand fully predicted.

SP1: With all these things in mind we've just discussed would you say scientists and engineers are entirely in control of their work, their results and their resulting products?

SP2: It depends on your level of seniority. Even at the most senior level, you are still subject to the vagaries of the funding process. Definitely, as quite a senior postdoc I am not in control. My advisor makes most of the important decisions about the direction of my project.

SP1: You think no?

SP5: I think science by its definition is about to explore the unknown and that always comes with uncertainties, also the things that you don’t understand, so in this type of scenario that when the uncertainty comes in, there is going to be good or bad or as expected, or not expected, outcome. So, just purely in sciences it's going to be good luck or the bad luck. They are either good luck results or bad luck results. It's just part of science and exploring the unknown.

SP3: I look at the big picture of all the scientists in the world. You can see it as foot soldiers going into battle; some people get shot down and others make it through and because we’re all specialised in particular bits of research, no one knows exactly whether their individual project will work or fail, but collectively we do have faith in the assumption that science is continually going to progress and we will collectively make steps forward. So, it's like a probabilistic thing.

SP1: You are unsure whether there is luck?

SP4: I think maybe there is a bit less luck to scientific outcomes. For instance, the malaria part of science. People were studying the bugs is one of the interest in malaria but on the other hand they had the capability of making that step to realise they had something interesting. So, I don’t know whether you call that luck or they were just very good scientists; they could look further than their own project.

SP1: So, they have control over that, at least.

SP4: Yes, whether or not the experiment fails or doesn’t fail, basically you have a hypothesis and you test it and there is a positive or a negative outcome and both you are in control because you do the test. I think there is a lot of control.

SP1: Do you want to ask anything further?

SP5: Not yet, maybe later. It's very exciting and interesting all the stories.

SP1: Do you think scientists can be proud of their achievements or should be ashamed of their failures even if luck has been playing a role in their work?

SP2: As I said earlier, I think luck favours the prepared so I definitely think a scientist should be proud of their achievements. I definitely think they shouldn’t be ashamed of their failures because science is really hard and sometimes when you fail it can be due to factors that are mainly outside of your control.

SP4: Getting back to the example you mentioned before where you said there was a long period where you had no positive results from your research, would you describe the eventual success then that the project had to your perseverance?

SP2: Yes, I guess so. It was something that we had been planning to do at some point and the alternative would have been to quit the lab.

SP4: Was that ever on the table?

SP2: No. The project the still interesting enough to me despite the frustrating, negative results from extremely risky experiments that I chose to continue. But the other option was quitting my job because there really was no room for me to do an alternative project. That would not have been allowed by my advisor so it was either persevere or quit.

SP1: Do you have any thoughts about being proud of achievements or ashamed of failures? Do you see that the same way?

SP3: I think because the luck in achievements in failures are and how much of an influence you have over those, and definitely the more effort you put in the more people automatically feel they can take the credit in it and revel in it. But definitely in science because of the uncertainty involved and the high risk of failure, it's important to keep bolstering ourselves and stay emotionally resilient. So, I think it's actually advantageous to be optimistic also to reflect back on your achievements regularly and not beat yourself up too much over the failures because if that stops you from moving on and persevering then you're not going to get anywhere.

SP4: We have a rule in the lab that you have to beat the experiment and so the first experiment, if that comes out with a very nice and a very nice result, then I always say: Now we have to celebrate that, because there are so many failures and even if you can't repeat it four or five times still then we have a celebration of that particular experiment. Scientists are a number of things: Basically, it's always a co-effort. The results are not a person, it is a group and because it is also the discussions. Maybe somebody comes with the idea but the ideas bounce around and so the ideas are shaped by the group. That’s one thing.

And the other thing is that basically we are rated on the number of publications and the number of grants we get and I think that’s a wrong thing because that pushes people to a relatively safe area; if you are working in a mainstream area, you get lots of citations and so you do better than you are on the edge of an area. So, I think it would be extremely important to grade scientists on a kind of risk-taking. We want to have scientists that take risks - and that’s nowhere an evaluation of scientists. I think that’s the thing especially in an institute like we are. That’s what we need the risk-taking, and then if it fails, yes, that’s not a failure it's just you took a lot of risk and that’s a positive outlook.

SP1: Do you mean we should do that because it would be good for science?

SP4: I think it will be very good for science because now everybody, the grants and stuff like that, everything is moving to the middle. Everybody looks at his career: I need so many papers and so many citations, and if I go in that direction, I might fail and I won't get all the citations so I will stay a little bit in the middle. And that’s the thing we don’t want in science.

SP1: Does fairness play a little in it, too? Would you say it's fairer to give people who are willing to take risk?

SP4: What fairness? They don’t have enough money so good people will fail anyhow in their career somehow because what you said about being shot. But I think at the moment the evaluation of the scientists does not encourage exploring new directions. It's just too dangerous.

SP3: But at the practical level would you add the risk-taking elements?

SP4: I don’t know. If you fail five times, yes. So, I don’t know.

SP3: One way that HH and I tried to address this is by having grants allotted to people based on their believe that individuals are good enough so they have more leeway to experiment and more time before they are evaluated on their output as opposed to grants getting allotted on the project basis it's more on a person basis.

SP4: Yes, so you see many people, of many friends of mine who became professors in the US and they start their own lab, they got a big NIH grant and lots of people came in and wanted to do everything and basically, they didn't get the work done, they were too much busy building their labs and so then the grant ran out and they didn't have anything to show. You have a long, long start-up time for a lab and if you also train students and basically dive in the whole academic thing at once you won't do it. You won't be able to get enough (? 00:48:33). But I agree, that’s because it is a relatively short funding period and if you prolong it will be better. But I have no idea how to implement this.

SP5: Can I ask individually because you talked about this [name high ranked journal] paper that you had before, and you said even your peers said that you took a massive risk when you did. Are you proud of that research?

SP4: I think I took the risk because I was completely naïve and still quite naïve in that respect. I didn't consider it at all. This was how I thought it was working in the system. Of course, I'm proud enough of that paper.

SP1: Understandable. So, imagine there are two scientists who work equally hard and are equally talented, and one comes across a ground-breaking finding and the other one doesn’t. Do you think it will be fair to grant the discover a prize and the non-discoverer not a prize?

SP2: Yes, I think it's absolutely fair.

SP1: Why?

SP2: Most prizes are awarded based on the impact of the discovery rather than the effort that went into it. Results aren’t everything but the results do matter a lot especially for these prizes.

SP1: Do you agree or do you have any other intuitions?

SP5: Sometimes the highest impact findings are incidental. So, maybe you're just driving home from the airport and then all of a sudden, some strange ideas pop up in your mind and you thought: Ha! I'm going to test this out of curiosity, and then they turn out to be something very big or it turned out to be just completely trash – which happens more often probably than the great moments. But I agree with [name SP2], these prizes are judged by the impact and the impact sometimes is not completely proportional to the amount of effort you put in. Sometimes it's just the moment, the epiphany or whatever, the luck. That comes.

SP4: And politics in the prizes.

SP2: Yes, that’s true. I didn't consider that.

SP1: In ethics and philosophy you make a difference between saying things are this way and then should they also be that way? If we could change it, should we change it because, for example, it's not fair or because there's a better way of doing it?

SP4: I'm not very in favour of scientific prizes.

SP2: Me neither.

SP4: It's a group effort. It's a process. There are so many people around you that helps you follow the ideas and now one person is putting some (? 00:52:20) in the world. That’s the biggest (? 00:52:22) I don’t like it very much.

SP2: I completely agree with you but that’s the way some rich people like to support science.

SP3: I'm sure scientists feel uncomfortable when they're put on this kind of pedestal because they appreciate how much work other people put into it.

SP4: But it gives the wrong message to the public-,

SP2: Definitely.

SP4: - and the message should be that this is a group work and that’s the group in the institute but there's some bigger groups worldwide. This is much more a global effort to solve this issue and we should celebrate the discovery, the vision (? 00:53:11) knowledge and not the scientist who do this.

SP1: We have a scientist who finds, based on luck, something ground-breaking. Would have make a difference for awarding this prize that it's based on a lucky insight like the scientist that [name SP4] described on the way home from the airport?

SP5: A lot of the Nobel Prize findings are kind of like that, right?

SP3: It's creativity.

SP4: But having an idea during the shower or on the bike, there is so much unconscious going on I don’t think it's by accident. It's not that everybody can have that idea. So, is it luck? No.

SP5: I feel we’re getting into that free wheel. It's just deterministic.

SP3: I feel people are intrinsically motivated to achieve certain milestones and get results and success. The person who theoretically didn't get some interesting results will still continue until they reach that point.

SP2: We might not have your lab anymore, if you do not get that result. Or you might not have your career anymore because you did not publish in *Nature* or *Scienc*e or whatever high impact journals.

SP3: You need enough time to be able to fail several times and keep going and then keep going.

SP2: Yes.

SP3: But imagine you put in an equal amount of effort, you didn't get results and your colleague does but then you still get a prize, what would that prize be for? For putting in as much effort? I mean, not for getting results because you didn't. So, what would that prize look like? It will be a bit strange, too.

SP1: Is there anything else that we haven’t discussed yet or that we have discussed too briefly for your tastes on this topic that you still want to add? Or do you still have further questions?

SP4: So, we had various. We had the career-,

SP1: Finding a topic or breakthroughs, external for funding.

SP3: All three have been there. Interesting.

SP1: Good. I think we should wait for [name SP2]. But then I think that’s all that we prepared, at least, so thank you very much for your contribution. It was really an exciting discussion. It really touches upon so many aspects and it was for us really valuable. We plan to write a manuscript based on the findings, maybe publish in *Nature* or *Science*.

SP5: Or journal of luck.

SP1: We now have all your tips on how to get lucky. So, if you are interested, we will be happy to share it once it's published. And in case you’re intrigued by the topic of luck in science and the philosophy behind it, I can really recommend you to follow [name research project leader] work. We’re just closing the discussion, [name SP2]. Is there anything you still want to add? I've already thanked the others for their contribution and a very interesting discussion.

SP3: Just one thing I thought of which is when you're at conferences and you're meeting people, sometimes there's an element of luck there but you can really get profound insights like who you talk to, and like you said earlier, you need to network a lot, you need to have those thousands conversations, but if you happen to have good conversation early in your career rather than later, that can also be pivotal.

SP2: Yes, as [research project leader] said, my strategy is just to talk to a lot of people, to visit every single post of interest that I can try to fit into the schedule.

SP4: What many people do is being very protective of their own thoughts and own data, and then those conversations don’t work and the more open you are-,

SP2: Yes, I agree.

SP4: - and that is so different by some people. Some people just don’t want to say anything and then basically it's a kind of interesting conversation but to get the real value you have to be very open.

SP2: And that’s a good way of making your own luck.

SP4: And I think don’t be too afraid that people will scoop you because ideas are ideas in the lab and the lab is this group of people and if somebody takes an idea that goes to another lab, there’s a lot of people, a lot of brains and will be a slightly different outcome.

SP1: Do you think that specific for more experiment scientists?

SP4: Yes. Maybe yes. If you are a geneticist and looking for a gene for a certain disease, you should not mention the gene because they could do it immediately, but if you are talking about a concept of how neurons encode information, that costs a lot of time to do those experiments with a lot of thinking of what it means and you can talk about ideas and so people will take the idea with them to their labs and they might come up with a completely different thing.

SP1: Alright. Then thank you again. If you're interested, if you want to leave and have a lot of work to go back to, I understand if you want to immediately leave otherwise Martin could explain a little bit about his insights and the theory behind this but don’t feel obliged to stay. We’re already happy you took the time so far.

(End)