Interview with **Mr. Philippe Veber,** *Senior Researcher*

We would like to start by appreciating the time you are offering us today and to tell you a little bit about our center which is the Counseling and guidance center for research careers that envisions to encourage young people to pursue research careers and to foster interest in Romanian research among citizens. Through these interviews such as the one we having today our goal is to make the world of science more accessible to those who may have difficulty understanding its importance in our lives which is very common. We also aim to provide examples for young people interested in pursuing a research career. And you would be a great example.

Thank you!

To start off, we all know that researchers are usually people lost in their studies speaking a language that only they can understand, we always feel so disconnected with them because it's so difficult to get close to their hearts. Do you feel like this description fits you as well?

In general, yes, there are some people who are completely lost in their studies. They are flying far above the sky with a very high level of knowledge and expertise. They are passionate people, but sometimes the vulgarization is not their main skill. After all, there are different types of researchers. Concerning myself, I am more of an experimentalist, so I try to live in the real world that we can touch with hands. OK... theories and equations belongs also to the real world and describe the real world, but I'm not a specialist in that. I understand and I use the equations I know and try to apply all the physical concepts to our reality for growing crystals. So, for me, no, I don't think that I'm lost in my studies.

Of course, it is a job that I could say is not for everyone; you do need some basics and fundamentals. However, it is very difficult to vulgarize, to make yourself understood. At some point, I need to enhance the level, especially for PhD students. At the beginning, I try to speak like I'm on TV, in a way that even your grandmother or grandfather can understand. After, we focus on particular phenomena, with sometimes some abstract concepts. I really try to use the devoted technical words. We have a rich and accurate vocabulary; we have a lot of specialized terms. A cat is a cat, a dog is a dog; they are all animals, but all animals are not only cats and dogs. There are many logical things like that, such as for mathematics.

Do you remember the moment you realized solid-state physics chemistry was your path to follow? Was there someone who guided you towards this?

Completely yes. I've had in the past two really great professors. One was in my first year of my bachelor's degree, he was professor in chemistry. I was a bit scared of all these experienced men and women with their equations at my beginning at university. Suddenly, I was amazed when he talked about the relative notion of pH related to acids or basics. You know, soda is basics, vinegar is acid and so on. The pH ranges from 0 to 14 because we live in a water world. But if we would live in an ammoniac world, pH would range from 0 to 29, so all would be entirely different from a chemical point of view. It was, for me, the beginning of understanding the relativity of our world through the eye of science.

So, the first one was this chemistry professor, the second one was a professor in solid-state physics. It was my first year of master's degree, I was 23 years old, something like that and this was the moment I said "Yes, I want to do science!".

You've only discovered your passion for science in college on the master's degree?

Yes, before this I was in a engineer school in France and most of my fellow colleagues don't do so much science anymore now. You know, they are all project managers, and I respect that, but it's another job. I'm also a project director in this PNRR but I have kept the contact with science and this is very important for me. I'm not only a manager. I'm more a scientist than a manager.

To talk a little bit more about what you do study. We, the common people, tend to look at a shiny rock, put it on a ring and call it a day. What's the secret you found behind the shine that blinds the rest of us?

Why is a rock shining? Because, sometimes...often, it's a single crystal. Firstly, shape is important. The diamond is cut with special angles so that the light coming inside will shine away with a maximum of efficiency. That's why it's really bright. Also, diamonds are beautiful because they are not perfect. We know how to grow (in laboratories) perfect diamonds. But, a perfect diamond is not so beautiful. It looks like a vulgar piece of transparent glass in a way. What is important in diamonds is to see all their colours due to impurities that make the special colours such as green, yellow,... and sometimes they give the impression of sparkling with a slight movement under the light. So ultimately, maybe perfection is non-perfection.

You've practiced in Germany, Czech Republic, Japan, and France (obviously) what has drawn you to Romania, and specifically the West University of Timișoara?

It is a matter of opportunity...and because of my relationship with Dr. Gabriel Buse.

We have worked together in France, in Bordeaux, for 4 years, in the framework of two different projects. We are good colleagues, and even better. So in 2021, he said to me 'Are you interested to come in Romania for a big PNRR project with a budget of €1.4 million?' and I said 'Yes, of course!'.

So, there are two reasons. Firstly, West University of Timișoara is worldwide famous for crystal growth of fluorides performed in the past by Professor Irina Nicoară and her husband Mr. Dumitru Nicoară. So, I knew that by coming here, I would learn many things that I am not familiar with. In the past, my work was almost exclusively devoted to oxide compounds and today I work more on fluorides, which has enabled me to broaden my knowledge.

And secondly, there is also human relationship. Sometimes you can go in a very important institute, but there are only tough researchers acting as 'sharks' with professional ethics that leaves much to be desired sometimes. It is difficult to work because there is a big competition. Well, sometimes there are some bad, unnecessary and counterproductive behaviors due to competition.
But, I knew Gabriel and also a bit Dr Maria Poienar and Dr Marius Stef (my colleagues of the crystal growth team at UVT), so I knew already that we all fit together, and I knew that the mood would be good, so science would be carried out in a good relationship with the people.

This definitely shows not one of those typical researchers we've talked at the beginning of the interview, lost in their studies – you love to have that connection.

Yeah, yeah, sure! It's important.

I would love to ask you what a day in your life looks like. What do you actually do?

I read and answer my emails...Even at home, when I'm having my coffee in the morning, I'm already reading my emails.

For example, just before you came in, I was in one of those emails because one paper of ours has been accepted so I have to proofread it. First, I take care of the papers we have to publish, then I meet students and I follow their work in the lab. Also, I give some small seminaries, often on Tuesday morning during the weekly team meeting. Basically, I'm a crystal grower, but I'm more of a chemist than a physicist. Even if my PhD is in physics. I'm both... or neither of them. Here, in the Faculty of Physics, I have to teach a bit of chemistry.
So that's what I do: emails, experiments, teaching...

And repeat?

And repeat, exactly.

As I told you before, for us, these crystals are just pretty rocks. How else can we see the results of your research in our day-to-day lives? What can crystals do outside of looking pretty?

Ah, applications! Here at UVT, we are mainly focused on optical and laser applications. For example, not us particularly, but in general, maybe you know there are new lasers, For example there is Safe-eye laser, for people with myopia for example. You can have surgery with a dedicated laser, my aunt did it in the past. She had 2 or 3 out of 10 for each eye. Now, she's 8 out of 10, and she's over 60 years old. It's a revolution! Also, laser can be used for their high output power for cutting a steel plate or for cleaning historical monuments for example. Finally, crystals are also in your phone! You have silicon single-crystals in your phone! So, in fact, there are a lot of single-crystals everywhere.

In this research, what do you find to be the biggest challenges you have to overcome?

Ough... that's a question. We endeavor to find outstanding breakthroughs in our research. But, it is more usually a step-by-step process. At the beginning of the 20th century, with Albert Einstein, Marie Curie, Werner Heisenberg, Paul Dirac et caetera, there were big theoretical breakthroughs, and I feel that, now, we are mainly living on this legacy and try to put them into practice.
But I don't forget new emerging technology like Artificial intelligence for example.
Now, we have to find a new crystal that we can grow easily, not expensive, not hazardous, sustainable, in the framework of green energy, ...etc.... I guess the biggest challenge is finding something good for everyone, and to try to make it a real application. The first step that's the first problem in science: finding something good, smart, reproducible and reliable. Then, the next problem is to find the human beings who want to take that idea forward.

I understand that a breakthrough is not the main goal for you right now?
Now, if I achieve a breakthrough, I will be very happy. But, I try to stay reasonable as well, I'm just a researcher who is making his contribution. Maybe one day something will go wrong with a crystal growth machine, and suddenly, unexpectedly, we will get something completely different, new and amazing. Sometimes, that's also how science progresses, with accident!

Then what is your next goal?

As a general goal, at my modest level as an experimentalist, I try to follow and teach a Cartesian way of understanding the world of science, in particular to avoid any obscurantism. For example, I keep seeing, on the Internet, a lot of people who claim that certain crystals have this magical power that can heel you and relief your stress... But, I grow crystals since 2001 so more than 20 years of working in this field. When people speak like that, and use our scientific words, understanding nothing of what they're talking about, I think it's dangerous. That's what I mean by obscurantism.
I think that a large part of scientific processes, which are often complex, have to rely, first, on common sense, which is simply less developed these days. The way of teaching science is changing. Some, but more and more, students about 15-20 years old simply don't know how to begin to think, to be logical, or to manage ideas in a Cartesian way. It is terrible.

We have to teach them how to use their brains, then their hands for performing experiments. The problem is often related to logics. For example, if it's raining, do you open your umbrella and walk until you get home, or do you walk to home, and when you are at home you open your umbrella? OK, at the end, the umbrella is open and you are at home. But in one case, you are wet, and in the other you are not. Simple and logical. What is worthy for umbrella, is worthy for electron and photon behavior.

You've been researching since 2001, is there anything left to discover?

Yes, of course YES. If I would be pretentious I would say 'Of course not, I know everything! You are all Padawan, like in Star Wars' but I'd never say that. I don't know who said : 'the more you know, the less you know', but I deeply believe in this proverb. The more you discover the wideness of the space, the smaller you feel.

You said that the research in physics is constantly changing. Thirty years ago, it was something, twenty years ago it was something else. Now it's quantum physics and artificial intelligence. Can you tell us more about artificial intelligence?

Yes, artificial intelligence is something completely newly developed, it is very promising. Not for everything, of course because Artificial intelligence will never replace real workers making real things in our physical world....at least in a close future.

AI will change a lot of things. As usual, a lot of people will be in denial or a bit angry that science is evolving in this way. In the past, when we had the first calculator, for addition, division, and so on, people said 'It's horrible! Nobody will know how to divide any more...'. But, finally, it turned out okay.

Have you used artificial intelligence in your research?

In one of my project at UVT related to AI, I'm the engineer who will test the artificial intelligence software implemented on a crystal growth furnace. I will disrupt recurrently the artificial intelligence software, and each time in the same way. I want to see how it will react, and if really it is intelligent. I mean, I want to see if it will react faster and better after each same disruption. You know that in English language, intelligence doesn't mean smartness, it means to gather a lot of data (like in CIA). Basically, artificial intelligence needs a lot of input data in order to generate, then predict coherent results. That's why now students can make a report so easily (laughs). For student papers there is a lot of input data, but for crystal growth not enough until now.

What about you, personally, have you seen an improvement since you used artificial intelligence?

Not strictly on a personal basis, but in general. For example, when we have electronic microscopy images or for echography photos. Sometimes AI can detect, when well trained, quickly what we are unable to detect directly (or due to a lack of professional staff and a lack of time because too many cases to manage) such as infant malformations in pregnant women. But artificial intelligence in practice is really new. In a close future, I don't think it will be like in the Kubrick's film, "2001: Space Odyssey", where the computer takes over the space station. That's just science fiction.

After all, what's the most rewarding aspect of your research or your career in general? What keeps you motivated?

To achieve a goal! We target this crystal, this property, this quality. There is a lot of excitement sometimes, on a Monday morning. We let the crystal cooling down over the weekend and we are eager to open the furnace, to see, how is the crystal ? Just like children on Christmas morning!

Crystal growth is a special field, where sometimes (often !) growth attempts fail and you are disappointed. But, when one attempt has worked, you forget all about that and you are happy. To grow a crystal it takes time, several weeks, sometimes months, so performing a step toward the success, even a small step, that's the most rewarding aspect.

Our project's main goal is to attract interest in young researchers or young researchers to be. What would be your advice for them when it comes to pursuing a career in physics and material science?

Be obstinate. I like what Churchill said, 'Success is the ability to go from failure to failure without losing enthusiasm'. Even if you failed, you learned something new.

Do you see this enthusiasm in your students? Are they open to get into this field?

I think so, yes. Or else they wouldn't study for a PhD in this field, there are easier ways to make money.

Well, this interview is definitely going to push them a little bit harder to start researching more.

Yes, I hope so!

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