TRANSCRIPT

Vasil Yordanov (ECSA Student Ambassador) interview with **Patrick Cogez** (Technical Director at AENEAS Industry Association);

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Vasil Yordanov: Today, I am joined by Patrick Cogez, who is a specialist in innovation strategy in the field of micro and nanoelectronics. He has worked at STMicroelectronics and currently, he's a technical program manager at AENEAS, which is the Association for European Nano Electronic Activities, where he contributes to supporting industrial research and development in these fields. First off, a couple of questions about you, Patrick. I wanted to know, how did you get involved in the semiconductor industry? What drew you to it?

Patrick Cogez:

- Well, it was, I would say, largely by chance. It was definitely not my initial training. I started by doing engineering studies in France, but it was very broadly based in engineering studies I was trained to be a civil servant in civil engineering. So that had nothing to do with microelectronics. But then, during the final year of those studies, I had the opportunity to do a master's in operations research in the United States.
- So, I went to Berkeley for that, and at that time, I met a professor who proposed that I stay for a PhD. It was a PhD in industrial engineering, and he was working in collaboration with the microelectronics industry.
- I couldn't immediately do it because I had some commitments to work for the state in France. Thus, I came back to France for a couple of years, but I had this idea in mind—this opportunity. So I tried to look for a company that would be willing to support me for those studies, so for which the state would agree, and I found STMicroelectronics. At the time, the name was still SGS-Thomson Microelectronics at that time. They agreed for me to go and do a PhD in industrial engineering at Berkeley. The topic involved the management of semiconductor manufacturing plants, basically.
- So that's how I got involved in that. And as part of our agreement for supporting my studies in the USA, I had to work for STMicroelectronics for four years. It turned out I spent almost 30 years there altogether, but the commitment was four years. Then, when I came back to France to work for STMicroelectronics after my PhD, they were just starting the Crolles plant, which was, at that time, the first 200-millimetre fab of STMicroelectronics.
- By chance again, it turned out I had worked with computers quite extensively during my studies. So, I might have been, in the group, the one with the most computing knowledge. They put me in charge of information systems, and that's how it started. And yeah, then I stayed there—well, for almost 15 years—first as the one responsible for the information systems of the Crolles site, first for the 200-millimetre line, and then ten years later, we

started a 300-millimetre line. I was also in charge of setting up the information systems for that line as well.

- Yeah. And after, I would say, almost 15 years in information systems, I wanted to change a lil bit, so I went into more research and innovation. Since I didn't have the initial background, I couldn't be an expert myself, but I was in charge of facilitating the relationship between STMicroelectronics and the academic ecosystem. So, setting up collaborations, research collaborations with universities, and overseeing many PhD thesis. At one point, we had up to, I think, 140 PhD thesis running altogether with various labs.
- We also had an agreement where we would provide silicon for free to universities so they could implement the designs they had ideas for, and things like that. So, we worked with many universities across the world.

Yeah, I feel like your position is very crucial because, in Europe, these collaborations between universities and industry and academia—at least from my point of view—I haven't seen so many. Very interesting.

- Well, I think in our case, it was almost from the start because also, the Crolles site was nearby, in Grenoble. Which is one of the hubs of microelectronics in Europe. They used to call it the "triple helix"—between companies, academia, and the research community. It is very much at work there, and especially, STMicroelectronics has a close relationship with CEA-Leti, which is also in Grenoble and is very advanced in the development of technologies for semiconductors.
- So yeah, I would say I witnessed it for a long time and was indeed part of it, but it was kind of natural for us. However, I must admit that sometimes we faced reluctance from some universities. Some think that if you did a PhD thesis with the industry, it was almost like working with the devil—that you would no longer look knowledge but instead look for profit.
- That belief was wrong because we were truly supporting very advanced research. But yeah, I met some people who said, "No, I don't want to work with the industry."

Yes, yes. There's such a discourse sometimes, but it's always good when you see industry and academia collaborate. So that's great. From your journey in the semiconductor industry, I hear there were a lot of chance meetings and opportunities. A very non-linear path, I would say. So I was wondering—how can young people, like me and my peers in the current climate, build networks and find mentors within the semiconductor industry? Personally, I also had a chance opportunity to get into semiconductors—I heard about IMEC and applied. But how would you advise young people to approach this?

- Well, first of all, as you say, there's a lot of chance.
- One piece of advice about mentors—the person maybe who is best positioned to become your mentor is often your boss, especially when you're young. But you don't always have the luck of having a boss who can be a mentor. Sometimes, you end up with mediocre bosses, which is unfortunate.

- So my first advice would be—if you find yourself with a mediocre boss, try to change. Especially if you're young, you will find opportunities elsewhere, either within the same institution or company, or in another company.
- The real trap is staying under a mediocre boss who will try to take the best out of you—maybe even take credit for your work. And that's terrible for you.

Yeah, that's tough, changing your boss.

- No, you cannot change your boss, but you can leave.
- You know you cannot leave when you're 55, as it starts getting hard to find a new job. But when you're 30, you can leave. You will—I mean, in this industry, you will find opportunities. So, yeah, I would say don't tolerate a bad boss. That's probably my first piece of advice.
- Another one is to try to maximize opportunities for encounters. A potential trap is becoming so engrossed in your job that you focus solely on doing it as well as possible without looking beyond it. In a way, you might think that's good—that you're doing exactly what's expected—but in the long run, it's not. So, of course, you should aim to do your job as best as you can, but you should also make an effort to engage with the outside world. Meet colleagues, talk to them, and understand what they're working on.
- This is also how innovation happens—when people from different backgrounds exchange ideas and realise they share a common issue, or that one person might have a solution to another's problem. Building relationships and understanding what others are doing is how you grow your network. Be curious, and don't hesitate to ask questions, especially at a young age. No one expects you to know everything, so asking naïve questions is completely fine. People usually enjoy talking about their jobs, so if you ask them what they do and show genuine interest—not faking it—they'll appreciate it.
- When you do that, you'll also find opportunities to develop mentors. If you have the chance to attend conferences, take it—it's a great way to meet and connect with people. Engaging in professional organisations like IEEE is also valuable. It allows you to meet peers, connect with senior professionals who can act as mentors, and receive proper guidance.
- So network as much as possible, both within and outside your job.

OK, great! That's excellent advice. I think your suggestions apply well to people who have already been in the industry for some time—since they have colleagues to interact with and they know a bit of what's happening around. But what would you say is the biggest challenge for young people entering the semiconductor industry? What about those who are just starting out—even before they've joined? Based on your experience, or even just an educated guess, what's the most challenging aspect? What should they prepare for?

- Well, going back to what I was saying—this is a very demanding environment. It's an exciting industry with a lot happening, but it is also intense. So, for me, the biggest risk is becoming entirely consumed by the job and losing sight of the environment. Of course, you should focus on your work, but don't forget to let others know what you're doing. That's another

important point—if you just focus on hitting your targets and meeting KPIs. Fine, but also other people have to know about it, what you're doing. It's important so far that you have some visibility.

- What else? I would say, don't rush. I'm not sure where you want to go—whether it's academia or industry—but if you're aiming for the industry, for example, you still need to establish credibility. So, don't jump straight into management positions. Instead, build legitimacy through expertise.
- If you develop deep knowledge in a specific area and start getting recognised for it, you establish credibility. From there, you can build on it, and at some point, if you want to transition into a managerial role, you can do so.
- One great thing about our industry is that most, if not all, major companies have implemented technical ladders. So, if you prefer to remain an expert, you can absolutely do that and still have a strong career trajectory within large companies.
- But yes, I would say don't rush into management—first, focus on building expertise. At the same time, I know this might seem contradictory, but also stay aware of what others are doing. It's important to have a multidisciplinary foundation and then build your specialised expertise on top of that. This allows you to understand what others are working on and how you can contribute to the bigger picture.
- You're essentially adding a brick to the overall structure, so to speak.

That's a very interesting point, and I was going to ask about it later, but we might as well dive into it now. You mentioned interdisciplinary knowledge—would you say it's crucial for career growth?

- Absolutely. Multidisciplinary knowledge is the essence of our industry. If you look at the big trends driving innovation, many breakthroughs come from combining different disciplines. It's MEMS (Micro-Electromechanical Systems), for example. It brings together electronics, mechanics, and electromagnetics. Some of the biggest advancements in our field are based on this kind of integration—like combining photonics and electronics to develop integrated photonics or silicon photonics.
- It's interesting because, I think in our industry that we say, OK, we need an interdisciplinary knowledge talent, but then we also want you to be an expert.
- Unless you're a genius, you can't be an expert in all fields. But you do need to understand enough about other fields to grasp the key issues and see where your expertise can contribute. That comes from engaging with others—attending conferences, listening to talks beyond just your immediate area of interest, and actively learning from different areas.
- If you hear about a project in another field and you know that your knowledge could add value, you can reach out to the person leading it, you talk to them, and collaborate. That's how you build things.
- For example, AENEAS—it's an industry association that supports collaborative research and innovation meaning that we encourage companies, research institutes, and universities to work together by forming consortiums and applying for project funding. In these

interdisciplinary teams, everyone brings their own knowledge, but through collaboration, they develop at least a foundational understanding of other fields.

- And speaking of networks, getting involved in collaborative projects is also a great way to expand your professional connections.
- That's a great point. I think one of the exciting things about this industry is that there's room for contribution from all kinds of experts. Whether you're a chemist, an engineer, a material scientist, a physicist, or even a mathematician—everyone has a role to play because of how interdisciplinary everything is.

Yeah, that's great. So, you mentioned that you got your start when you went to Berkeley. My next question is: how important do you think internships and co-op programmes are for students looking to enter the semiconductor industry? Would you say they're essential, or can students find other ways to break in?

- Well, It's definitely a plus. Just to clarify, when I went to Berkeley, it was for my master's degree—it wasn't a co-op or an internship, it was purely academic. That said, I didn't really have many opportunities to do internships myself. Well, that's not entirely true—I did one during my PhD, and I also had summer jobs, including one at ST.
- At the time, those experiences were incredibly valuable. So, while internships aren't mandatory—fortunately, because it's not always easy to find a good one—they can be very beneficial. They help bridge the gap between what you learn in university and what's needed in the industry.
- It can go two ways. Sometimes, students feel frustrated because they're learning a lot of theoretical concepts at university, but then they don't see them applied in the industry during their internship. That can be disappointing. On the other hand, sometimes it all clicks—you realise that what you've been studying makes sense in a real-world context.
- So, I think choosing the right internship is important to avoid disappointment. If you select one wisely, it can be a major advantage.
- And, as we mentioned earlier, internships are also a great way to build your network and find mentors. They can even lead to job opportunities. If you perform well in an internship, people remember you. Later, when you reach out and say, "Hey, I've finished my degree," they might just say, "Great! Come work with us."
- So, they're good entry points—not mandatory, but if you find a good opportunity, you should definitely go for it.

Yeah, absolutely. Yeah. So next, I wanted to talk a bit more about the industry in general. So my first question was: now the industry is—I don't know if *booming* is the right word—but it's definitely on everyone's radar. So I was thinking, what opportunities do you see for innovation, and how can students best prepare for what is to come?

Now we're talking about More than Moore, we're talking about different technologies, architectures, and whatnot. So yeah, my question is: we see all these innovations, how can students best prepare, in your opinion?

- Well, first of all, you're right. I mean, it's booming. As you say, it's on everybody's radar.
- You know, ten years ago, it was mostly ignored by politicians, and then COVID happened. People realised that when there is a disruption in the microelectronics value chain, major automotive plants and other industries can come to a halt. That made them understand how crucial this industry is.
- And if you think about the COVID time, when we were all confined, what really helped us get through it was all these wonderful technologies—connectivity and digital tools. Ten years ago, it would have been much more difficult, even from psychology point of view.
- So yes, policymakers have come to realise that this is a very important industry. Now, every region in the world is supporting it, and that in itself is a major opportunity.
- So how can students best take advantage of this opportunity? Again, I would say: have a multidisciplinary foundation and then build an area of deep expertise.
- Take quantum computing, for example. Right now, there are about six competing technologies to realise quantum dots. We don't yet know which one will prevail—maybe two or three will, but it's uncertain. But what you can say is that if you have a multidisciplinary background and an area of expertise, you'll be able to adapt, steer your career, and be in the right place at the right time.
- I mean, we are really living in a time of change. For a very long time, this industry was linear, following Moore's Law. Actually, the first time we introduced *More than Moore* in the ITRS (International Technology Roadmap for Semiconductors) was in 2005. At that time, I was representing ST in the steering committee of the ITRS.
- The European companies—NXP, ST, and Infineon (and at that time, maybe it was still Philips Semiconductor and Siemens)—We're pushing for *More than Moore*, while Intel, Samsung, and others were saying, "No, no, it's all about Moore's Law." But about ten years ago, *More than Moore* started gaining recognition, and now, it's on everybody's radar.
- So yes, we are really at a time of change, with new innovations emerging. Moore's Law is still continuing, but it's becoming harder and harder, and more expensive. That's why it is starting to lose steam—because, after all, it is an economic law.
- And when a dominant design like Moore's Law starts to lose steam—if you look at the history of all innovations—that's exactly when there is room for new ideas. Before that, dominant designs tend to suppress everything else. But once they weaken, innovation starts to blossom.
- But at one point, the dominant design starts to lose steam, it stops being so self-imposing, and that's when new ideas come from. I think this is exactly what we are experiencing today. So, this is a great time to start working in this industry. Just be open-minded and very curious.
- Also, be a little naive—in the sense that you shouldn't be afraid to ask questions. Especially when you're starting out, you're not expected to know everything. It's very important to ask

your colleagues questions: *How does this work? Can you explain it to me?* People generally love to talk about their jobs. Of course, you will always find some who grumble and want to be left alone, but most people are happy to share their knowledge. So, learn from them, be open, and identify new opportunities. That, I would say, is the best advice I can give to young people entering the industry.

Yeah, that's great advice. I think I've personally gone through this—asking so many questions all the time. But people are usually great about it. They really do love talking about their work, which is nice.

OK, I have two final, small questions. The first one is about higher education. Do you have any general advice on this? Do you think people should pursue a PhD, or can they start working with just a bachelor's or a master's degree? I mean, it's possible, but looking into the future, would you recommend getting a PhD, or is it only necessary in certain cases? Yeah, that's personal—it really depends on the individual.

- First of all, it depends on whether you want to build a career in industry or in academia. If you want to work in a university as a pure researcher, then for me, it's a no-brainer—you need to have a PhD.
- Now, if you want to be in the industry, it depends a lot on the country where you plan to work. From my experience, I would say that in France, the PhD is not highly recognised.

Really?

- Yes, and that probably comes from the fact that French students have a special system called *grandes écoles*. You've been in Saclay, so you've probably heard about it. It's a system outside of the university structure, and many companies tend to recruit from there. So, I would say French companies aren't always keen on hiring PhDs. Compared to those who start working at the master's level, PhD graduates have spent three extra years studying instead of doing what some consider *real* work.
- If you go to Germany, it's a different story. Almost everybody who matters has a doctorate—it's much more recognised there. So, it really depends.
- I would say that in the long run, PhDs are becoming more recognised, even in international companies in France. But from a personal standpoint, I never really planned my career. As I mentioned earlier, it has been a bit non-linear. Still, I never regretted doing my PhD at Berkeley. On top of that, it was a great place to be.
- But yes, I was always interested in knowledge and learning, so that's why I liked it. Maybe if I had planned to climb the corporate ladder, —at least as a French professional working in a French company, even if it was a French-Italian one, my PhD wouldn't have been as useful.
- But OK, it really depends—on what you want to do and where you want to do it. To answer this, I would say it's very company specific.

OK, for our last remark—we do this for every interview. You've already answered this question in parts, but what advice would you give to young people interested in this sector? Maybe just to summarise what you've said earlier?

- Be curious. I would say, yeah—be curious, be open-minded, and ask questions.
- And one thing I mentioned earlier: if you have a bad boss, *leave*. Don't let them waste your time. As you said, you can't change your boss—the company put them there for a reason—but you *can* choose not to stay.
- When you're young, you have plenty of opportunities to leave and find a better environment. It's different when you're older, but at the beginning of your career, you have options. And being in a good work environment is *really* important.

OK. Well, all right, Patrick, this has been a great interview. Thank you again for taking the time!

- Thank you. It was a pleasure for me.