

## Interview: Industry or Academia, Where to go?

R. Hiptmair<sup>1</sup>

An interview with Ralf Hiptmair, associate professor at the Seminar for Applied Mathematics, at the Federal Institute of Technology, Zurich (ETHZ), Switzerland

*Bogdan Cranganu-Cretu*

I've got to know professor Hiptmair during my stay at the ABB research center in Switzerland as a post doc. We collaborated on a topic concerning high frequency electromagnetics over a period of one year and a half. We discussed many subjects beyond research. And as for the moment I am on the industry side (due to my actual position at ABB) and he is on the academic side a lot of discussions evolved around the subject of similarities and differences between research performed in these two environments.

*Bogdan Cranganu-Cretu:* Is there a similarity between research in industry and research in academia? Or are they just separate worlds one doing almost only product development and the other doing almost only fundamental research?

*Ralf Hiptmair:* Maybe I should start with an observation, my personal observation and other people might not share this view. But I've noticed that there are certain parallel trends affecting research in both university and industry, and the trend is that research is less and less valued or appreciated in its own right but it's supposed or expected to be useful. In industry this is hardly surprising because the main rationale behind the operations of a company is to make a profit. However, maybe a few decades ago most companies were proud of funding research centers that did not directly contribute to the business of the company but were rather dedicated to basic research and fairly independent of everyday business. There were all these famous labs around (maybe I should mention the Bell labs, and laboratories of other big companies) - and it was sort of consensus that a company is also obliged to support long-term research oriented towards gaining knowledge and not towards boosting business profitability. Of course when profits come under pressure these noble goals are the first to be abandoned. So it was rather generosity from the side of industry to support such research. Now I think there are hardly any of these facilities left.

Of course there are still research centers but they are kept on a short leash, and they have to respond to the needs of business units and they have to produce results that translate into new products or improved procedures - you know what I mean.

*BCC:* Definitely. A lot of research in industry is now product driven. And with even big companies struggling to stay into black figures as you said hardly surprising. But is this the whole truth? Just bad economics?

*RH:* What is carried out in industrial research centers is more and more product development and less and less research - and this is a trend which maybe is also due to a change in the background of many top executives. Whereas in the past many had an engineering education, now more and more come from business schools and, of course, they have always been trained to maximize profits, whereas engineers are trained to develop optimal procedures and to come up with smart designs. So

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maybe this big influx of MBA's into executive offices has contributed to the diminished appreciation of the research. And, as I have mentioned in the beginning, there are some parallel trends going on at the universities. At university pressure is mounting to "do something useful". Now I am speaking from the perspective of a mathematician.

*BCC:* When you say useful....

*RH:* Let me define what is "useful". It is defined by - say - the university administration, politicians and the government agencies who fund universities and science foundations and it seems that they are adopting a point of view where usefulness has to do with relevance for the politics or industry. So research is no longer valued as a source of knowledge or insight but it is just a means for an end. This is clearly reflected in the ongoing debate about evaluation criteria: it has been suggested many times that, for instance, the amount of external funding should be a key factor in assessing the quality of research. Of course, research is more likely to attract substantial external funding, when it's considered useful - or maybe with a different term - relevant (relevant sounds more positive, I agree). When I say useful research, I mean that the results can be turned into profit by some company or can be used to bolster a political agenda - this kind of usefulness. In a sense, research at universities is moving in the same direction as research in those industrial research centers. The basic funding gets slashed all the time and the money is shifted to or funneled into project-oriented schemes. So some political agencies or universities administrations create special programs and pay the researchers with plenty of money to contribute to these programs. And, of course, the programs are designed to encourage useful research. And thus, more and more resources are dealt out through these special programs or through funding agencies that focus on project oriented research.

*BCC:* What impact has this on the quality of the research performed?

*RH:* Of course when you have to pursue project oriented research you have to be more efficient as a researcher. You have to meet deadlines; you've got to focus on things that must not be too bold or there should be a guarantee for success. And this is a sort of contradiction - because when you launch research you can never be sure about the outcome. When you depend on projects you'll be more inclined to pursue incremental research - so to investigate issues that are not particularly risky. For instance in mathematics, you won't try to prove a grand theorem, you will just try to improve existing theory a little, because you cannot afford to fail and you are to submit a success report at the end of the project. In this sense researchers at the universities now confront pressures that are familiar to people that work on the industry research centers.

*BCC:* Well so much about this parallel trends. What about the collaborations between academia and industry? How do you seem them?

*RH:* Of course for engineering institutes it is fairly common to have links to industry - because their research is rather close to product development. And the results of many doctoral theses can be directly put to use to develop a new product.

As far as mathematicians are concerned I think it is not so common that there are long-term cooperation. Anyway, cooperation depends on people - and it often arises from personal relationship, and can be maintained only on close relationships. And since companies hire university graduates, the relationships do already exists when the people start working. The graduate will still try to seek advice from former advisers or colleagues at the university and this can get a collaboration going. It should also been emphasized that for the companies it is a fairly inexpensive way to acquire expertise compared to hiring external consultants. And since the researchers at the universities are under pressure to launch such collaborations, they will be very

eager to jump into these project. Secondly, they will charge fairly low fees. As pursuing useful research is becoming more and more important as well as raising funds from industrial research, now industry has more leverage: in the past it wouldn't have mattered for researcher at the university, now they will be asked by the university administration about the fate of their collaboration. As universities are more concerned about external funding and their public image, they will frown upon their own researchers cutting ties with industry.

*BCC:* Having sketched this picture, let us turn now to the situation of a young, graduate, aspiring researcher? What are the options in front of him? Academia or industry?

*RH:* If you are a young guy that wants to do research - then probably my assessment is fairly daunting. Because it seems that there is a general trend away from clean and "pure" research towards, say, useful research and development. Since I have emphasized that there are parallel trends, it would not be consistent if I said that research can only be pursued at universities. Because if you don't like most of the aspects of an industrial environment, say the deadlines, the pressure, the projects, the fact that other people have a say on what you do, then, of course, you will find better conditions at the university. But it won't be paradise. You will discover that similar grievances - but of course these are only grievances for people that want to do independent research - will also be encountered at the university. On the other hand, when you have proved that your research and your findings are of considerable value to the company, then, I think, you can also enjoy some freedom in the industry.

But, of course, there are strings attached. Some short-term change in the management or a general change in the company's policy can rob you of this freedom in no time. This is probably a major drawback of doing research in the industry. There is no long-term security for a researcher. It might even be the case that they will decide to scrap the whole research department, and a researcher gets assigned to a totally different position. A good research environment can quickly be destroyed. So, when you join a company and find that they are doing incredibly interesting research in their research centers, five years from joining the picture might be very different. This is a risk that you will not face when you've got a tenured position at the university. However tenured positions at the universities are very hard to get.

*BCC:* Well yes, especially that most young people are not in the position to be tenured...

*RH:* Permanent positions below professor level at the universities are about to disappear, it seems. So all these mid-level research staff won't be continued. This is a fairly general trend that I have observed in Germany and also applies to this university (ETHZ n.a); so it's a big gamble to bet on a career at the university. In contrast it's easier to find a position in the industry even if you are not among the top 5% of researchers. Because in industry they need many people contributing to research projects, whereas at universities such activity has been shifted onto the shoulders of temporary staff (PhD students and post-docs). So, when you are a young guy, you should always be aware that an academic career can come to a sudden end – end then you need other options. Being only focused on an academic career can turn out to be a big personal disaster. You find that you can't continue at the university and face unemployment, and there were many cases when people at the age of forty suddenly had to leave the university and then they were regarded as too old to start with a company. Many of them are having hard times to make ends meet.

*BCC:* So what is a safe course of action for an young assistant?

*RH:* When a young person decides to pursue an academic research career, then I consider it vital to explore other options from time to time: maybe to acquire some extra skills, or maybe to be

involved in an area that is of interest to industry. Then one can be more relaxed. It's like in the film business. Thousands of people want to become a star and only a few will succeed. This is particularly true in areas that are no longer expanding, and where there is a fierce competition.

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#### Short biography of Ralf Hiptmair

Since October 1st, 2001, Ralf Hiptmair has been associate professor of Mathematics at the Seminar for Applied Mathematics at the ETH Zurich. His field is the numerical solution of partial differential equations, in particular the design and analysis of mathematical models and numerical methods for the computation of electromagnetic fields.

He was born in Pfaffenhofen/Ilm (Germany) on May 10, 1967. He studied mathematics with secondary subject electrical engineering at the Munich Institute of Technology (TUM), where he graduated 1992. He was employed as researcher with the Bavarian Consortium for High Performance Computing (FORTWIHR) until 1995. Then he moved to the University of Augsburg, where in 1996 he finished a thesis on "Multilevel Preconditioning for Mixed Finite Elements in Three Dimensions" and earned his doctorate under Prof. Ronald H.W. Hoppe. In 1998 he left for Tuebingen to lead a group of young researchers in SFB 382 "Computational Physics". In 2002 he did his habilitation at the University of Tuebingen submitting a thesis on "Numerical Methods for Computational Electromagnetism". Soon after he accepted a professor's position at the Institute of Applied Mathematics, University of Bonn. In the same year 2002 he was also named Associate Professor at the Seminar of Applied Mathematics at ETH Zurich.

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