Canary in the Gold Mine?

Our technologies, the ones RF and microwave engineers and researchers have been working on for decades, are having unprecedented commercial success. Companies are doing billions of dollars of business selling components, sub-systems, systems, services and tools. Our technologies touch virtually every person on the planet. We've enabled worldwide connectivity, location services, acquisition of information, security, healthcare and entertainment. Our technologies have never been more relevant or valuable than they are now. And there are prospects for even more success with advanced semiconductors, greater use of mm-wave and THz frequencies, advances in materials, and new concepts in design and integration.

How did we get here? Decades ago, when I first became involved in microwave engineering, we were already successful. Built on a foundation of fundamental research in the early to mid 1900's, microwaves had found applications in communications, defense and even in household kitchens. I worked on microwave semiconductors from the beginning of my career in industry. By then research and development of microwave semiconductors had been already been underway for many years, but commercial applications were limited. I did most of my work with GaAs. The running joke was that "GaAs is the technology for the future, it always has been, and it always will be." Yet today, billions of people carry GaAs in their pockets every day.

During those times I worked in the research division of a large defense contractor. For a several years I worked for general manager who was a brilliant researcher, and who had made many important contributions to semiconductors technology. In fact, he became the recipient of the MTT Pioneer Award. He encouraged us to publish all our research. His logic was that, if we were competent, by the time the publication was seen by our competitors, we should have advanced our work substantially more. Competitors would therefore be perpetually trying to catch up. The rest of the company didn't always agree with his perspective, but fortunately for us, most of the time we only needed his approval to publish.

Our competitors published much of their work too. This was part of the competition – our papers highlighting the progress we were making, and helped us promote our work to the funders of our research. Our competition was also symbiotic. Not only were fueled to outdo each other, we also learned from each other. Each group made progress, but most importantly, as everyone made progress, the technology advanced.

That led to today's success, with our technologies being exploited in myriads of ways and being key to tremendous commercial success. But at the same time, look at what is being published now. Look at MTT's conferences and journals. There are still contributions from industry, but far from the level of decades ago. Today, most papers in our conferences and journals are academic.

With commercial success has come a culture of secrecy. Consider the mobile phone. The major handset manufacturers enforce secrecy as they develop new models with the latest new features and

capabilities. Nothing is known until the annual grand reveal. We see reports of information leaking in advance, and subsequent jeopardy to the person or company that was careless and let the information out. It's a very competitive environment.

But it's different than the competition of years ago. That was competition of ideas, and technological advancements. Today's competition is of the marketplace. There are still underlying technological advancements, but they are subservient. They aren't disclosed, even after the fact. This fuels competitive analysis – where technology companies get access competitors' products after they are in the marketplace and then carefully evaluate them to understand how they work. There are even companies that provide competitive analysis services. Eventually we figure out most of what's new in our competitors' products, but we don't learn about things that didn't work well, or technical dead ends.

Recently, I worked for semiconductor company with significant business in the mobile phone market. The secrecy of the mobile handset manufacturers percolated down to us, and I encountered a very different perspective from what I had experienced decades earlier. Our Chief Technology Officer (CTO) had a default view that we should publish nothing. The CTO even objected to our reviewing papers, arguing that by the comments we did or didn't make, we would betray the secrets of what we were working on.

I still believe that, in this case, it would have posed no risk for us to publish technical details of what we were working on. The timing would work in our favor. We wouldn't have the time to write an article until after our critical project schedules were met. So by the time we wrote about our work and it was peer reviewed and published, our competitors would have already found it in a handset in the marketplace, evaluated it, and understood what we had done.

Technical progress is enhanced by the sharing of ideas, of what works and what doesn't. The tremendous commercial success that we now see for our technologies is in large part the result of decades of what that was published, presented and shared. When people or groups work in isolation, how many times do the same ideas need to be tested? How many times must the same failures be replicated? Is the dearth of publications from our industries the canary in our gold mine? Is today's success leading to tomorrow's demise?

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