My CV

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(auto-caricature, MsPaint,
128x128 pixels, 2 colors.)

Contrary to the widespread belief, when I was born, back in 1954, I was very young and inexperienced. It took me four years to recognize that the world as we know it was not well designed from the beginning (if you ask me, I think that the beginning of everything was due to an experiment that went out of control - otherwise there wouldn't be any Big Bang in the first place!) and that we should do something to improve it.

I started the improvement by educating people that were close to me - my parents. But after two years of unsuccessful trials I finally gave up and decided that social engineering is definitively a blind alley.

So I started experimenting with things and I remember how enthusiastic I was to discover that things didn't complain when you smashed them. Better still, things didn't complain even if you left them alone. It was a nice discovery.

My parents noticed my interest for things and soon I was receiving didactic toys for birthdays, New-years and other holidays. For my eight birthday I got a big "Electro-pioneer" box. For a while, I enjoyed playing with the magnet and iron dust. Pretty soon there was iron dust everywhere, but, fortunately for me, it could be collected easily - with the magnet, of course. Too easy and not much fun.

But then I found a battery and a 3V lamp and - there was light ! Now, that was something. But not for long. The battery was out in less than an hour. I went to sleep that night thinking how wonderful would it be to have an inexhaustible power source.

At five in the morning I was up with a new idea. In less than ten minutes I put together the lamp and the socket, the switch, the wires and a plug and connected it to the 220V ac mains. Then I pressed the switch.

The effect was, well, lightning. But I was disappointed. Certainly, the makers of 3V lamps should be forced by law to put on a warning to the customers that they will be violating the user license if the lamp was exposed to higher voltages. But, hey, that was in early sixties, when nobody cared much about anybody's rights anyway.

The bang of the lamp and the 10A fuse woke up my mother and she came to see what the hell our neighbors were up to. I told her it was nothing and that she could go back to sleep and I will clean up the mess.

Then my mother gave me the first lesson on electromagnetic theory. It was a painful experience, but it was worth it, otherwise you wouldn't be reading this and gaining from my experience. Clever people do learn from experience of others and not their own, I was told. But that was on another, less dramatic occasion, and I never thought twice about that. Until it was too late.

I remember how happy I was whenever I could have a firsthand experience of anything in connection with electricity. Most of the time I got smoked-up with blown

electrolytic capacitors, burned by touching hot resistors, electronic tubes and later transistors, shaken a few times by touching the ac mains, destroyed a few pieces of furniture with the soldering iron and a few carpets with solder drops. I was making all sorts of errors, so I was learning very fast. Only much later did I realize how thoughtful of me it was that I did not follow the wishes of my father to go for a medical profession, or became a chemist, like my mother.

Later in school, my learning pace slowed down considerably, since all my teachers were trying hard to discourage that kind of acquiring knowledge. And they almost succeeded. But in '68 I joined the orthodox rocker movement and adopted the flower-power philosophy. I was playing a guitar, daydreaming of making my own amplifier, with all the psychedelic sound effects built-in that even Jimi Hendrix himself would envy. Then the Manson "family" killed Sharon Tate. Of all the flower-power, only the flower powder remained. But I was still making amplifiers. Gradually, I became an "audiophile", a Hi-Fi fan, but with a highly technical inclination. I think I have spent more time listening to amplifier distortion than to music. Which is a shame!

At that time oscilloscopes were a rare commodity, even among professionals and like the rest of my colleagues, most of my experience came from my ears and from a modest AVO-meter. But I have managed to build a few circuits (one of them was the differential distorton measurement circuit, published by Peter J. Baxandall in Wireless World) which have expanded the instrument measurement capabilities and resolution enough to do some serious distortion analysis.

In 1981 I started to work at the Jožef Stefan Institute (http://www.ijs.si/), with a group of scientists doing research on liquid crystals, a very promising new technology. I was involved in building driving electronics and various optical measurement equipment for our experiments.

I have witnessed the early success of LCs : initially, the cost of a wristwatch with LC display was nearly two monthly wages of a general manager ; three years later, you could get a pencil with a built-in LCD watch for US$ 1.95 and without the watch for 2.95 ! And I wouldn't be surprised if the present mobile phone frenzy ends up by having a mobile phone as a surprise present in a detergent box !

No, we were not responsible for this market overflood. We were busy doing research on multiplex LCD driving and in 1982 we have demonstrated a world's first 200×120 dot display. No one we have spoken to knew that what to do with it, so we have agreed to make a small portable oscilloscope to show the money-people more clearly what they will be investing into. Iskra, the Slovenian electronics giant, was interested and in autumn of 1983 we had a working prototype, named the Iskra-Scope, on a local electronics fair.

Unfortunately, the German Metrabyte came up with a similar thing some two months earlier, so they collected the cream of interest, because they were selling ! Next year, we came with a new model, 8-bit resolution, 2 MHz bandwidth, 2 M samples per second in real-time, 10 Msps in equivalent time, microprocessor controlled, with a membrane keyboard, 2 k signal memory length, 10 screen-length signal memories, to which you could apply some rudimentary math, a built-in $3\frac{1}{2}$ digit DMM, XY-plotter (analog) and galvanically isolated RS-232 (digital) output, with a 6-hour battery autonomy and a mass of 2.5 kg. Again, it was a fine prototype. But Metrabyte was still selling strong its last year 250 kHz model. For the next few years, people of Iskra-Commerce went from one fair to another showing prototypes, but they never knew what to say to a potential customer asking by what time they could make

1k pieces and for how many kUS$. Then, Sony came in with their 50 MHz handheld model (later sold under the Tektronix trademark) and we were out.

Moral : never show a prototype to anyone but your own boss !

Although we have tried to revive the project, first as an optical time-domain reflectometer (we could measure 0.5 dB optical mismatch in a 50 km fiber and locate it with 1 m resolution in real time) and later as a data acquisition unit with a small nuclear magnetic resonance imaging device, Iskra was never interested enough, mostly due to general financial crisis and a galloping inflation in ex-Yugoslavia.

It was in those years that I got to know Peter Starič, who was then also working at IJS, but at a different department. Since I was involved mainly in designing the analog input and the data acquisition part of the 'scope, his fresh memories of what he was doing at Tektronix, as well as his rich library, which he was sharing generously, helped me a lot.

Later, Peter went to the Electro-Institute Milan Vidmar (http://www.eimv.si/), where he started working on a project of renewing the then manually adjustable Marx generator (no, not Karl, but Ernst !) and turn it into something that could be remotely controlled. For those not familiar with Marx (no, not Karl !), his generator is a cascade of capacitors, charged in parallel to some 100 kV and then connected in series by a series of firing spark-gaps, producing about 800 kV, 1.2 μs rise, 50 μs decay, multi-megajoule impulse, by which the electrical power insulators are tested for breakdown under lightning strike conditions. Knowing of my work on digital data acquisition, Peter decided to invite me to help him, as digital electronics was out of his domain of interest (mine too, but I had to become acquired with it out of sheer necessity).

A few years later, Peter retired and I took over. You can not imagine how nice it was to revive my memories of the unfortunate 3V lamp, but on a much, much larger scale ! When the isolation being tested breaks down, the Marx generator flashes a 60 cm (about 2 feet) long arc with a bang of a small thunder ! The problem with recording any event with such a signal is that there is no "ground" reference - everything floats on many kilovolts, depending mostly on the inductance of the particular ground path and the capacitance of a surface. You can not just connect two instruments together - the transients in the loop, formed by the connection and grounding power cables, can be enough to destroy both instruments. And we did not have just two instruments : there was the motor and electronics servo-control driving the variac for the high-voltage charger, the stepper-motor and a 13-bit position measurement for the spark-gaps, the DC HV-meter, the high-speed digital oscilloscope, the laser trigger, the PC which was controlling everything and a number of safety devices, the most important of them was the short-circuit discharge, driven pneumatically. Now try to imagine the network of control signals and power supplies forming whatever loops they can, on a half a basketball field area !

No wonder it was a miracle that on the first test no instrument failed - Edsel Murphy must have been sleeping after a hard day ! But the EMI generated was such that it span some 7 'scope screens at nominal resolution - clearly too much grass and no signal to measure. It took me and a colleague, Marko Janša, nearly two years of painstaking trial-and-error to find a configuration of connections, decouplers, filters, grounding and shielding by which we achieved an EMI attenuation of 130 dB, needed to make the measurements with 1 % resolution.

Then, in 1994, I returned to IJS, this time to the Experimental Particle Physics Department and became involved in an international collaboration at CERN, Geneva

(http://www.cern.ch/). I joined the LEP/Delphi experiment where I was involved in designing and testing the hybrid electronics for the "Very-Forward Tracker" detector. Presently the LEP (large electron-positron collider) is being dismantled to make room for the new LHC (large hadron collider) and the Atlas experiment, for which I have designed some power distribution and detector-electronics protection devices. In a few years time, somewhere around 2006-7, the collider will be ready to recreate (in part) the conditions present at the birth of the Universe.

If you will then hear the news that "the scientists at CERN have made a Big Bang again", you will know who is to blame !

Erik Margan
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