ATTRACT: Disruption, collaboration and competition

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Exercise for this afternoon (1)

First, thanks to all for "volunteering as Guiney pigs" for testing ATTRACT proposal submission philosophy and template.

The exercise of this afternoon is about collaboration and competition underlined with disruptive innovation in detection and imaging technologies for science, industry and society…

…such is the ATTRACT philosophy

Exercise for this afternoon (2)

After the previous talks you will divide yourselves in teams of 5 to 7 members.

Each team will elaborate "a project proposal" as if it was going to be submitted to the ATTRACT call.

After that, the team will present the proposal in front of a really "tough jury".

The time to elaborate "proposals" ends at 15.30 h.

The presentations should last max. 15 min. Format is free.

Exercise for this afternoon (3)

In line with the spirit of ATTRACT and the proposal template, your presentation should address three fundamental questions:

1. Why your idea and technology is disruptive? Or… what is the "wow!" factor behind it? (i.e. think about orders of magnitude in better performance).

2. How will it advance scientific and industrial knowledge beyond today?

3. Will your technology contribute to solve a problem for us, as citizens? (i.e. pollution, traffic, health…etc)

Exercise for this afternoon (4)

Since "disruptive technologies" could be a very broad concept, please let me quickly set an inspirational context.

What will happen if we scale our chip technology to its ultimate limit?

Let's suppose that we can make electronic devices, such as transistors, reliably very small, ultimately exhibiting feature sizes of ~5–10 nm nanometres.

And what if we imagine that we build a "small robot" with them? Let's say of ~1μm^3 volume…the typical volume of a biological cell.

This would be the result

Parameter	"Ultimate Si µ-Cell"		Real µ-Biological cell	
	Logic	Memory	Logic	Memory
Density	10^{17} cm^{-3}	10^{16} cm^{-3}	10^{18} cm^{-3}	10^{19} cm^{-3}
Energy/bit	10^3 k$_B$T	10^8 k$_B$T	<10 k$_B$T	$<10^4$ k$_B$T
Power	10^{-7} W		10^{-13} W	
Heat Flux	1 W/cm^2		10^{-6} W/cm^2	
Energy per 10^{11} output bits	10^{-2} J		$< 10^{-9}$ J	
Time to compute 10^{11} output bits	10^5 s		10^3 s	

Overall, is clear that Mother Nature is beating us badly on density of memory and logic elements, operational speed and operational energy.

Billions of years of evolution led to cells…which are still orders of magnitude beyond the performance of the electronics we can dram about.

But these billions of years of evolution resulted in our brains, which are superior to any computer we have built until now…and probably we may build in some years to come.

Who knows what ATTRACT proposals can bring!!!!

Thanks for your attention

I hope it was fun and inspiring.