the Mesoscopic Neuro Symposium in Tokyo in July 7, 2012

Concluding remarks transcript (Gilles Laurent)

Toshi asked me to deliver some concluding remarks. I do so with great pleasure.

The first thing I would like to express, on behalf of all the external speakers, is how honored and grateful we all for this invitation to Tokyo and to speak at this Symposium. Many thanks again.

The second thing I'd like to say is that summarizing a meeting that covered synaptic mRNAs, C. elegans chemotaxis, fly locomotion, primate motor cortex, rat hippocampus etc., is not an easy task. So I will not even try to summarize and synthetize.

Rather I'll try and indicate some salient issues that I think characterize the times we are in:

1. I'm glad to be in neuroscience rather than in particle physics –particle physics seems to be essentially over, victim of its own spectacular success. By contrast, neuroscience is really just in its infancy.

2. Neuroscience is changing. We have seen several decades of incredibly successful reductionist studies of the components of the brain: Basic anatomy of the brain, signalling molecules, ion channels, synaptic machinery, biophysics of membranes, synaptic transmission, etc. But we are now reaching some asymptotic level, and the future will be different, conceptually as well as experimentally:

3. We are entering the era of systems. This is true at all scales: that of molecules as well as that of cell networks.

4. When there are interacting parts, as in any system, there usually are dynamics: things happen over time, according to rules that can be complex but are usually deterministic. This means that we have to adapt to this reality, and import into our thinking a number of concepts, develop an intuition, which are not yet completely natural in traditional neuroscience, which tends to be static.

5. There is an issue of scale. We can now sample the activity in hundreds of actors, and will soon (hopefully) be abe to do so with thousands of neurons. What will we do with these data? What will an experiment consist of? Will manipulating an element in the system be sufficient? Useful? Will „necessity" and „sufficiency" be appropriate criteria to estimate the way in which the systems under study operate?

Finally, the brain is by its very nature, adaptive – it is so at all scales of space (molecules to large networks) and time (sub-ms to decades). In fact, many plasticity rules to which we often want to assign roles for memory, may be there mainly to enable this adaptation. We can manipulate or silence a single neuron in a brain, but how does the conclusion of such a reduced experiment apply to conditions where thousands of neurons are normally active? Large systems are rarely linear.

So, to conclude: this is a very exciting time for neuroscience, and our students will likely see a remarkable evolution of this science over the coming decades, and they will have to lead the way:

- Invent new techniques
- Form new conceptual framework
- Develop different notions of what understanding really is.

This is a really big deal. And terribly exciting.