

Towards Systems Biology: Opening Remarks

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Grenoble, France

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Welcome

- ▶ Welcome to the second workshop *Towards Systems Biology*
- ▶ I would like to thank the speakers who found time to prepare excellent and comprehensible presentations
- ▶ Also thanks to my colleagues Eric Fanchon (TIMC) and Alexandre Donze (VERIMAG) as well as the administration of VERIMAG for their help in handling the program and logistics
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- ▶ The complexity of certain academic systems can compete with that of living organisms..

Some Personal Notes

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- ▶ It was triggered by a French-Israeli collaboration project between UJF and Weizmann Institute:
- ▶ *Computational Modeling of Incomplete Biological Regulatory Networks*

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- ▶ I would like to dedicate this conference to their memory

Towards a Paper without the word *Towards* in the Title

O. Maler and A. Pnueli

Abstract. With the advent of post-genomic buzzword-driven big science a need was felt to moderate the level of hype and optimistic false promises in scientific papers and research proposals. In this paper we do not provide a comprehensive and complete solution to the problem mentioned in the title but nevertheless make a promising step towards the fulfillment of the goal.

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- ▶ The word *towards* indicates that we are not yet there
- ▶ But where is *there* ?
- ▶ Different people will interpret the term *systems biology* (especially when loaded with money) in their favor
- ▶ Arguments over the meaning of words are often the most fierce (and the most stupid in some sense)

Systems Biology: a Cynical View

- ▶ Systems Biology: the current *gold rush* for many mathematical and technical disciplines looking for nutrition (funding, self-esteem) in the scientific food chain
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- ▶ I do X
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- ▶ ... fortunately X is very useful for Biology

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Systems Biology: an Arrogant View

- ▶ Biologists are essentially very *concrete* beings, spending most of their time in the kitchen doing low-level stuff
- ▶ They were not selected (initially) based on ability to manipulate imaginary concepts or creativity and rigor in the abstract world of ideas but rather..
- ▶ ..based on their rigor and efficiency at the bench

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- ▶ ..based on their rigor and efficiency at the bench
- ▶ Now when they need to make a *real* science out of their details they need more noble white collar brahmins, namely..
- ▶ ...mathematicians, computer scientists, physicists, to guide them
- ▶ Like monotheists converting the pagans, these merchants of abstract methodologies try to impress the poor savage with their logics and miracles

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- ▶ Living systems are more mysterious and primordial than the *prime numbers*, the *algebra of Boole* or the *free monoid*
- ▶ If some of our sterile tricks can help them, even a bit, in their grand march *toward..*
- ▶ ..understanding something about *Life Itself* or helping doctors killing less patients
- ▶ We should be very happy and proud for doing, for once, something meaningful

Systems Biology: a (relatively) Sober View

- ▶ The dynamics of a scientific discipline may have different periods with various *trends* and *fashions*
- ▶ This dynamics not always optimized for moving *towards* truth
- ▶ Many aspects (politics, social dynamics, commercial interests, cognitive inertia, media distortion) play an important role
- ▶ Maybe most of what is published today in top journals will go to the garbage can of history

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- ▶ Few centuries ago, the science of this guy (chemistry, medicine, metaphysics) was debated extensively in prime time



Systems Biology: a Sober (subjective) View

- ▶ Right now there is an over emphasis on doing something with data provided by new experimental machinery (omics)
- ▶ The main question about “knowing” all the low-level details is whether this knowledge:
 - ▶ Is *sufficient* for understanding and learning something about underlying mechanisms ? (certainly not)
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 - ▶ Is *necessary* for that ? (very hopefully not)
 - ▶ Is helpful or counter productive ?
- ▶ Systems Biology is about seeking some clearer (conceptual and mathematical) models of *dynamical systems* at various levels of abstraction
- ▶ These models, if thoughtfully constructed, may help reducing the gap between cellular biochemistry and physiology

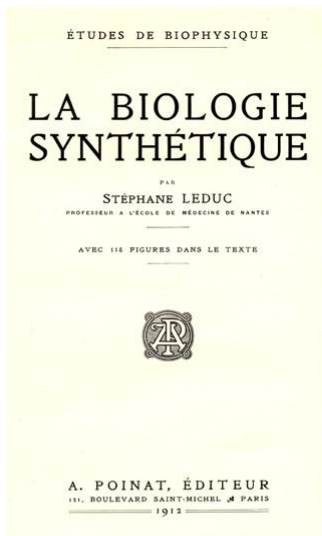
Some Local Remarks

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- ▶ Our university, is named after *Joseph Fourier* who on top of his ingenious math, was also the governor of Grenoble

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- ▶ Our university, is named after *Joseph Fourier* who on top of his ingenious math, was also the governor of Grenoble
- ▶ So for our modeling oriented workshop let me mention:
- ▶ In a meeting of the French Academy of Science, Grenoble 1904, Stephane Leduc (Nantes university) presented his ideas on “synthetic biology”
- ▶ How to emulate “life-like” processes (growth, mitosis) with combinations of chemicals, osmotic forces, etc.
- ▶ He was practically mocked at in France but was more popular in Britain, inspiring, D’Arcy Thompson’s *On Growth and Form*
- ▶ This piece of history is told in the book *Making Sense of Life* by Evelyn Fox-Keller

Synthetic Biology



Synthetic Biology

