

Complex or Complicated

The 1 billion € question

For brain research

Extract of the Presentation given during the
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[To download the complete presentation](#)

Manuel GEA
CEO BIO-MODELING SYSTEMS

Bio-Modeling Systems SAS
Dr. François Iris (PhD), Chairman & CSO
Manuel Gea, Chief Executive Officer
Paul-Henri Lampe CIO Integration Systems Director
Dr. Gérard Dine (MD, PhD), Chief Medical Officer

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To contact us
Bio-Modeling Systems SAS
3 rue de l'Arrivée- 75015 PARIS, FRANCE
manuel.gea@bmsystems.net
www.bmsystems.net

What type of Systems are we talking about?



Complicated Systems



Complex Systems

Two systems with completely different behaviors
The biggest is not necessarily the most complex!

The nightmare of new mums.

The mission: build a model to simulate the behavior of spaghettis to prevent spots



The right question is: how does she protect clothes from spaghetti sauce ?

The discovery of the BIB concept by Mum:
A non-cartesian discovery but a Cartesian production process

The Life-modeling issue

If you dream of creating the first operational bird model...



... a "basic" living Complex system that not only flies...

Be sure to use the appropriate modeling concepts & tools. If you don't ...

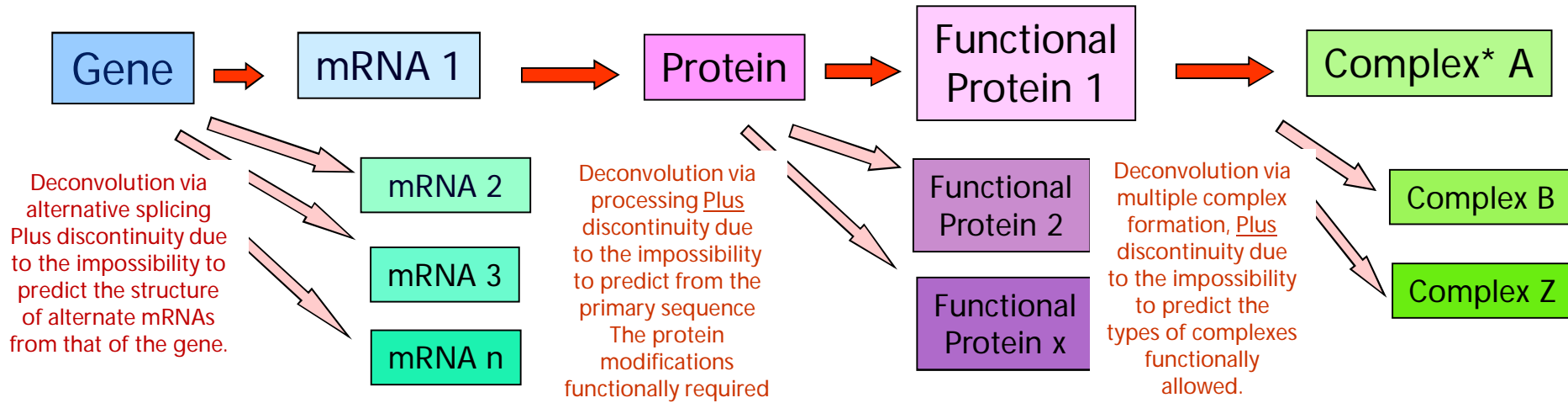


...you get a Complicated "Cartesian" system. It does fly, but... it will never lay eggs! May be bombs!

The challenge is clearly not a question of technologies only
Models are Aids to thought NOT a replacement for it!!

From genes to physiological functions: Four series of deconvolutions and discontinuities:

One gene = several different physiological functions



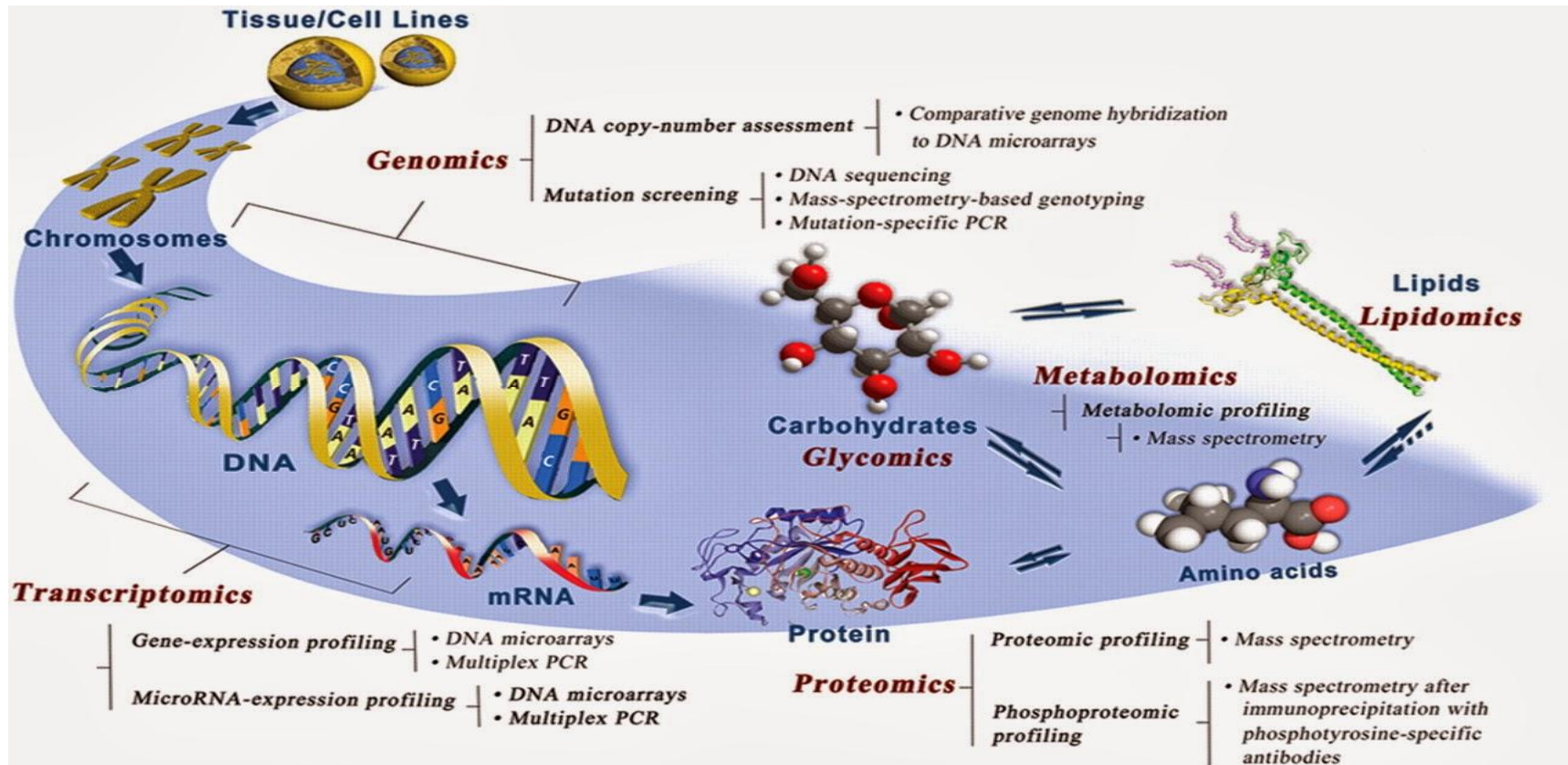
A non-linear integrative system.

At each step, the alternative options are context-dependent AND cannot be directly predicted.

25 000 genes for more than 600 000 proteins functions

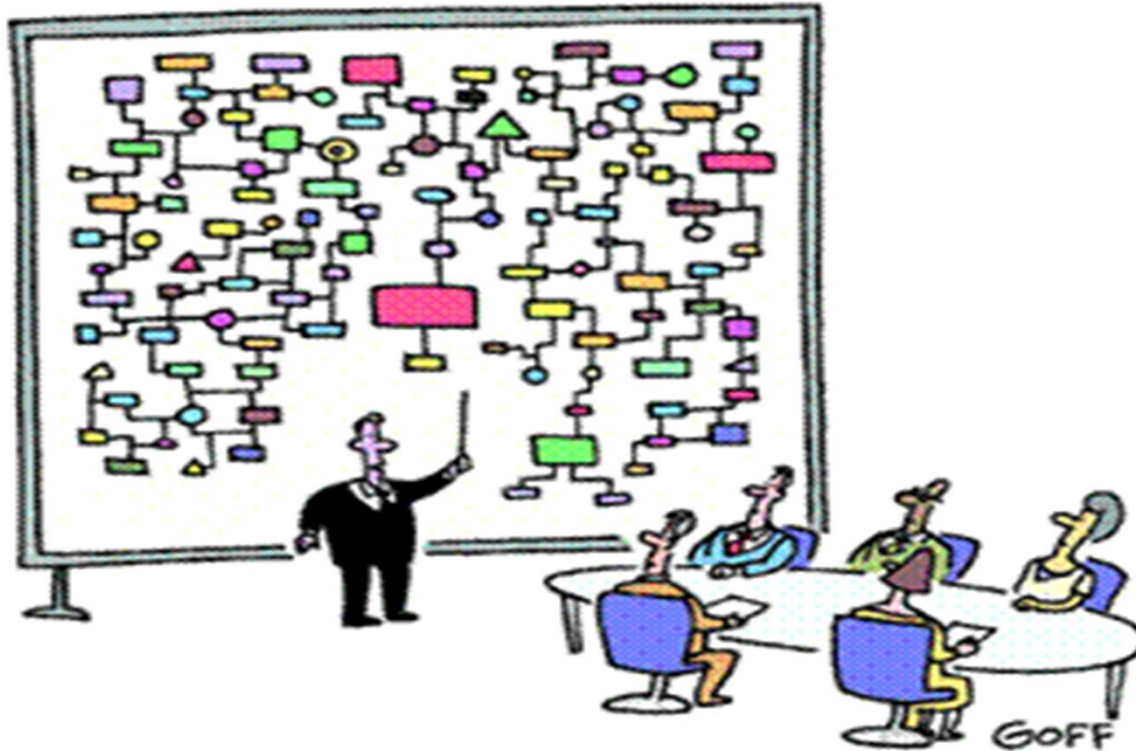
DNA alone cannot explain life functions

The Endless Omics Story started in the 70's



Medical research focused on patient's diseases became life sciences research driven by technologies and IT outputs

Floods of heterogeneous data under exponential growth



« And that's why we need a computer. »

Integrative biology became "bio-informatics"
 The new Eldorado for IT and technology sellers
 IT, HPC, Big Data Big Knowledge or Big Garbage?

The mechanisms of the brain



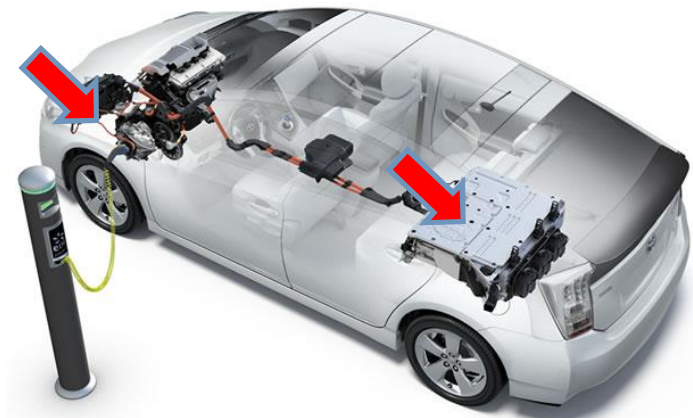
The goal is to simulate the complete human brain functions on supercomputers to better understand how it functions.
They will simulate the neurons only.

Which mechanisms ? Is the brain Complex or Complicated ?
1 billion € invested for which practical end point?

Imagine experts trying to understand the mechanisms of this car in a world where electricity is unknown



For dominant thinking,
This is a car* !



A lot of components
are of no interest**
for the experts.
No real innovation for them!

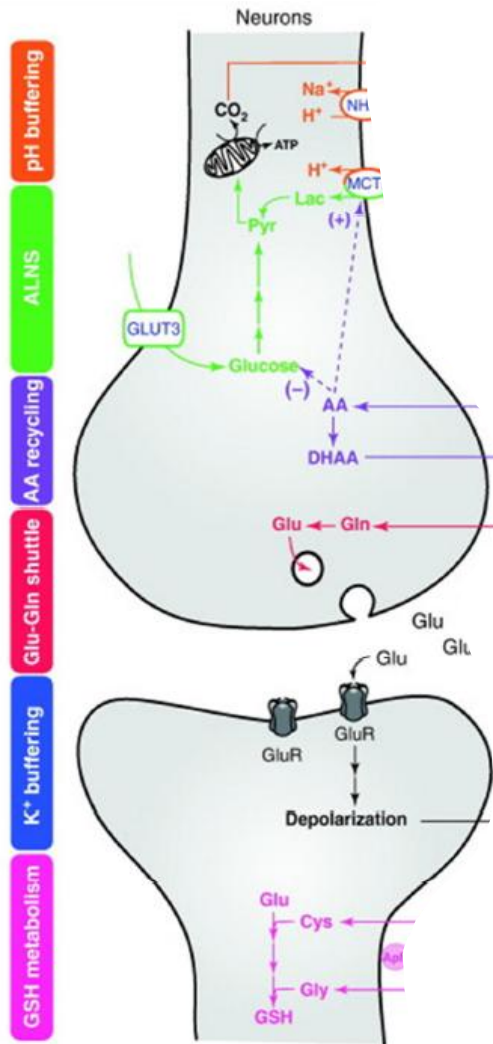
What is unknown may be of some interest and must be integrated at the beginning to have a chance to really understand the global behavior of the system !

“Billions of investments will never explain why when the engine is off the car still moves!”

* Internal combustion engine

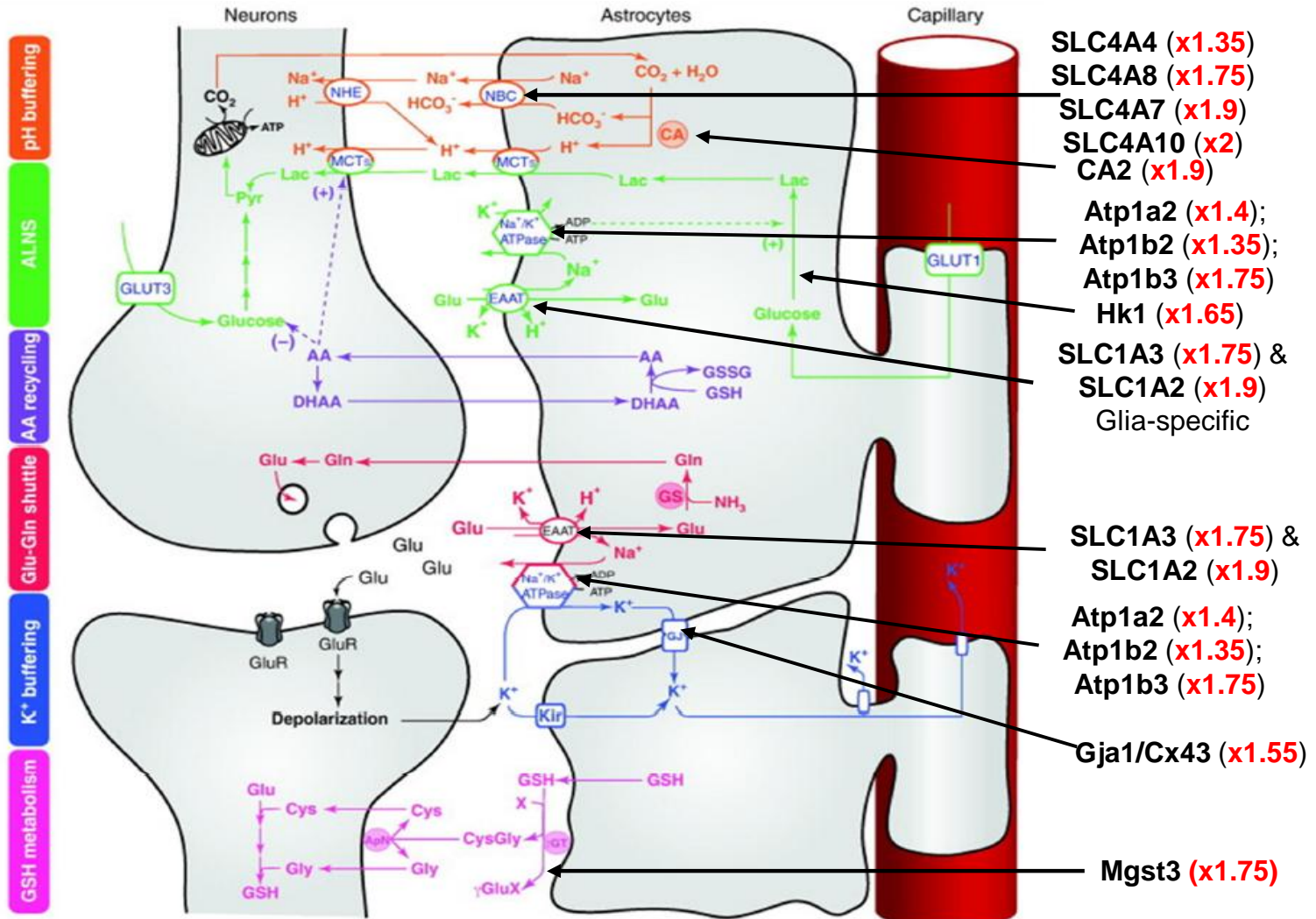
** At the beginning of genomics, the noncoding DNA (98% of the total) was named “junk DNA”

The classical vision of the brain: it's made of neurons ...



Multiple Systems: clearly the brain can't be reduced to its neurons only!

Simulating the neurons only will never explain the Creutzfeldt-Jakob Disease*, nor novel psychiatric treatment** combining an anticonnexin on astrocytes and psychotropic drugs to reduce side effects !



In Chronic Anxiety: Reinforcement (x A.XX) of astroglial-dependent metabolic maintenance of neurotransmission

* 2012, CNS Neurodegenerative & Psychiatry: Pharmacopsychiatry; **WO 2010/29131 A1 - "class" therapeutics patent.

The mechanisms of life deciphering dilemma

- The mechanisms of life **are complex, non-linear and integrative**.
- In “living complex” systems, the functions of biological components and mechanisms are **event and context-dependent**.
- Classical “Cartesian” modeling concepts & approaches, valid for the majority of man-made artifacts, imply the concept of a “blue-print”. But this concept is at the opposite of biological reality.
- While “Cartesian” Bioinformatics and Mathematical tools have proven to be **efficient to collect, structure, analyze, simulate specific functions** to test or generate innovative hypotheses, yet...
- The “**garbage in, garbage out**” reality, tells us that the information produced and published (even in leading scientific journals) is necessarily **ALWAYS incomplete, biased and erroneous to unknown extents**.
- **Big Data**, due to life sciences reality, does not necessarily means high value **Smart Data**, if not **contextualized, without patients base-lines, and not related to biological mechanisms**.
- **Finally, statistics, serendipity or big data** cannot be the “only” medical research answers to deciphering the mechanisms of complex diseases.

Clearly, we need to revisit the current R&D paradigm if we want to address the challenge of therapeutic success

More information and downloads

- [Our publications and our contribution to reference books](#)
- [Our Press-releases](#)
- [BMSystems Scientific Presentation \(IDDST conference China 2012\)](#)
- [What are the differences & synergies between Heuristic and Mathematical approaches? \(EPA conference Europe 2011\)](#)
- [Case study: Mechanisms-Based Medicine applied to Psychiatric disorders](#)
- [BMSystems selected in the Europe-wide inventory of industry involved in Systems Medicine by the EC Directorate of Research network "Coordinating Action Systems Medicine" \(CASyM\) \(see page 31-32\)](#)
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Do not hesitate to contact us: Manuel Gea: manuel.gea@bmsystems.net



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