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# Models for Biological Networks

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## What brings us all here?

We all want to get some insight into the "secret of life"

We come with different:

- view points
- level of abstraction
- reasons for being interested

But, we all want to improve the world!

## What about our different backgrounds?

- Pros: We have more tools, strategies and techniques to offer.
  - Biologists: Insight into the subject biology.
  - Chemists: Knowledge of chemistry, the language of life.
  - Physicist: Strong traditions in setting up and performing experiments.
  - Statistician: Methods to interpret data.
  - Mathematicians: Well defined and precise mathematical models.
  - Computer scientist: Computational models, ways to handle data etc.
  - etc.

- Cons: It is sometimes very difficult to understand each other.

## What can be done to improve on this?

- Offer different kinds of courses that aim at different kinds of professional profiles.

- Provide web-based teaching material (or pass it on to colleagues if we find it) suitable for self-study.

- Have more informal and not too big interdisciplinary professional meetings.

- Try to be more patient both when we are talking to or listening to somebody from a different discipline.

# My view of research

- The aim of research is to find patterns and structures in an otherwise unknown or partly known domain.

- The more tools you have for this purpose and the more patterns you already know, the better.

- A non-success story real life

## Interdisciplinary research, political problems?

Applying for grants is difficult because

- it is difficult to describe a precise goal with the research
- it is going to take a long time to produce "useful" results (we need success stories).

# Biological networks

- Static or language view:
  - DNA sequencing (the Human Genome Project) — computer science
  - linkage and association studies — statistics
- Dynamic or systems view:
  - Genetic regulatory networks,
  - Metabolic pathways
  - Signaling pathways

Models defined by means of differential equations, logical systems, process calculi, hybrid control systems etc.

# What we can learn from biology?

Fact that cannot be ignored:

- A cell acts as an information processing device with more refined functionality than any computer system.

- Nature solves computational problem that we assume to be practically unsolvable.

Leads to reconsideration of our computational paradigms.

# References

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