Introduction to Bioinformatics

Biology is Data

What is a computer?

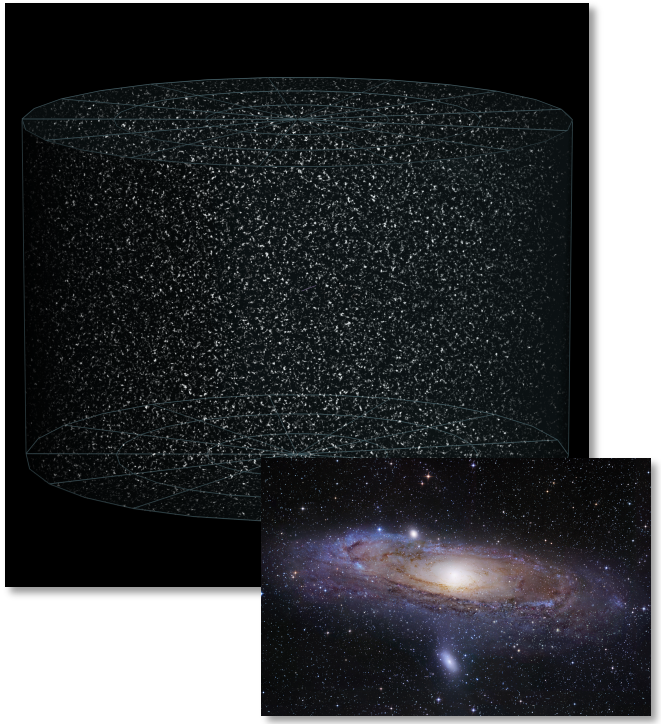
A **computer** is a general purpose device that can be programmed to carry out a finite set of arithmetic or logical operations. Since a sequence of operations can be readily changed, the computer can solve more than one kind of problem.

- http://en.wikipedia.org/wiki/Computer- retrieved April 23rd 2013

What is a computer?

an Abacus

A. thaliana



the Universe

an Orchestra

What is a computer?

an Abacus

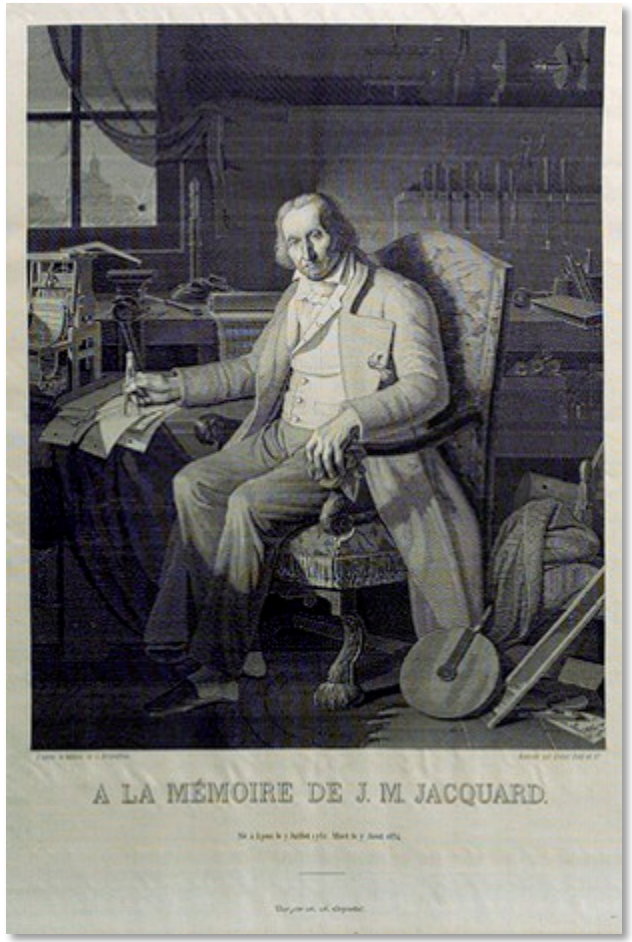
an Orchestra

A. thaliana

the Universe

What is a computer?

The Jacquard Loom
c. 1801



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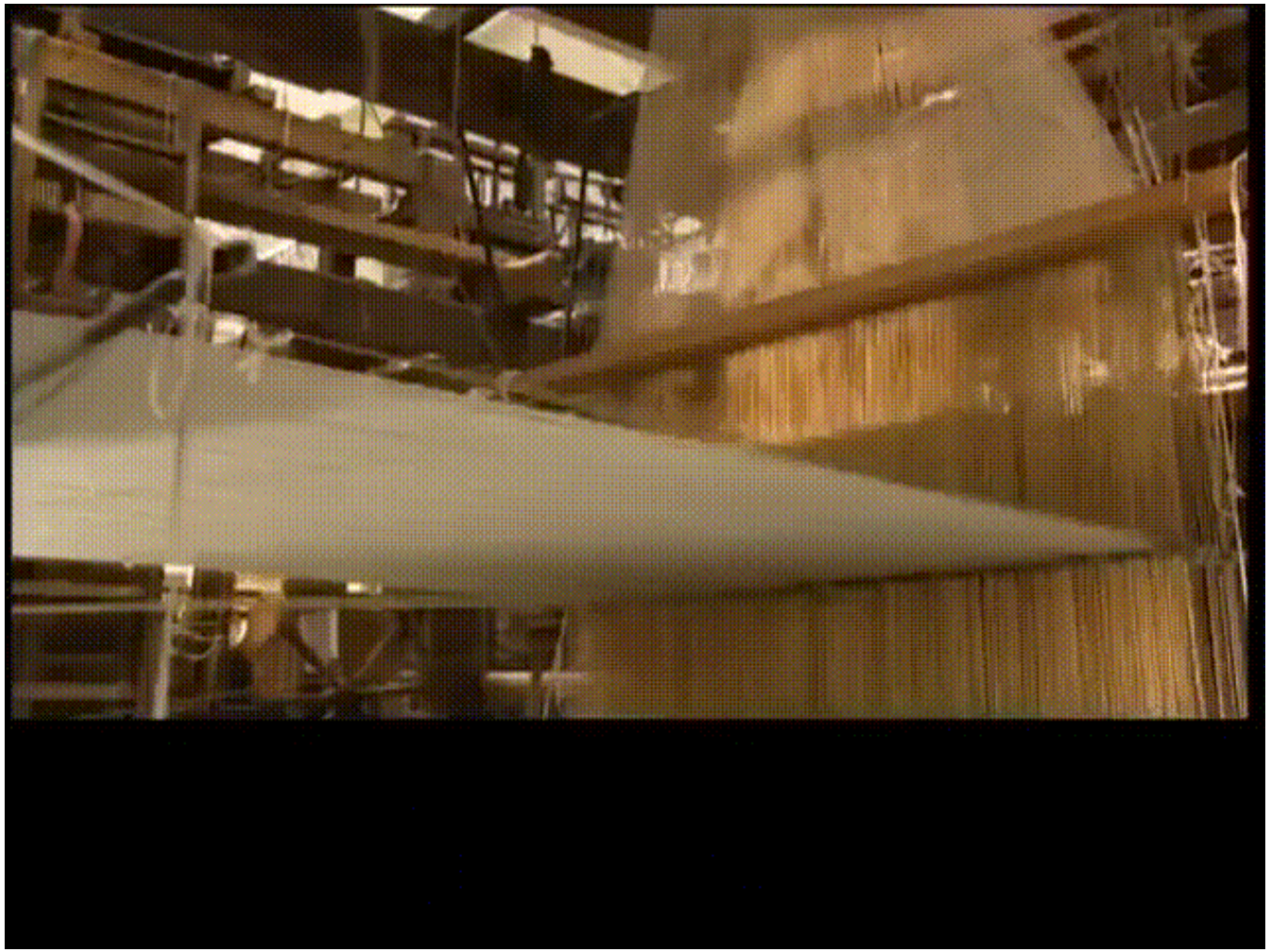
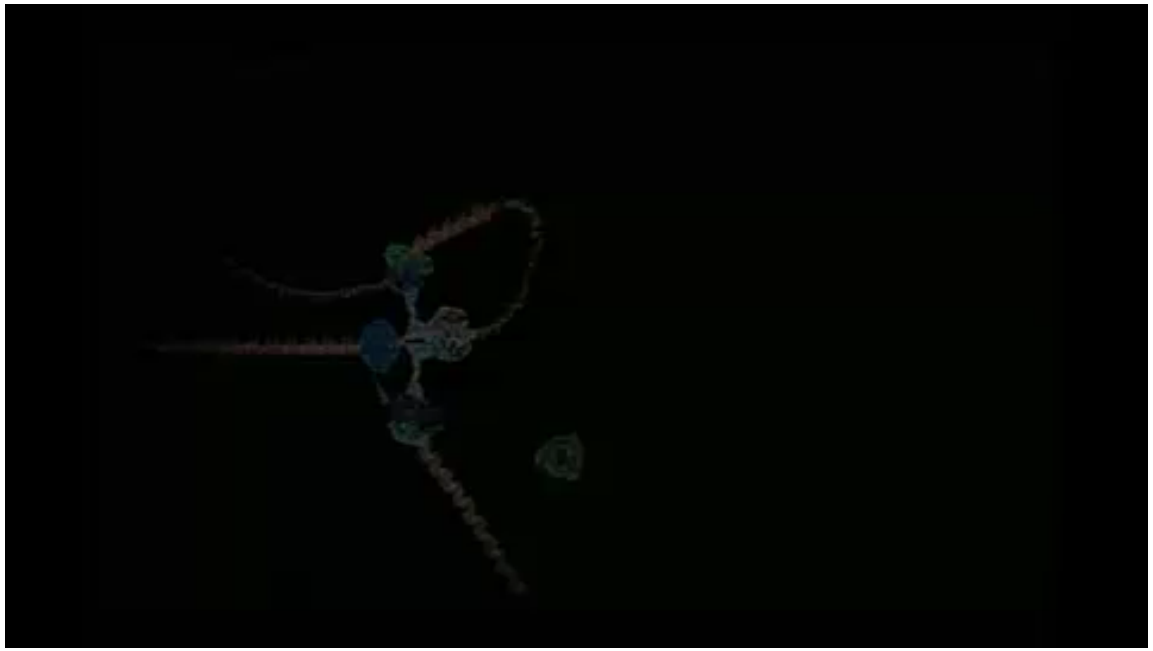


What is a computer?

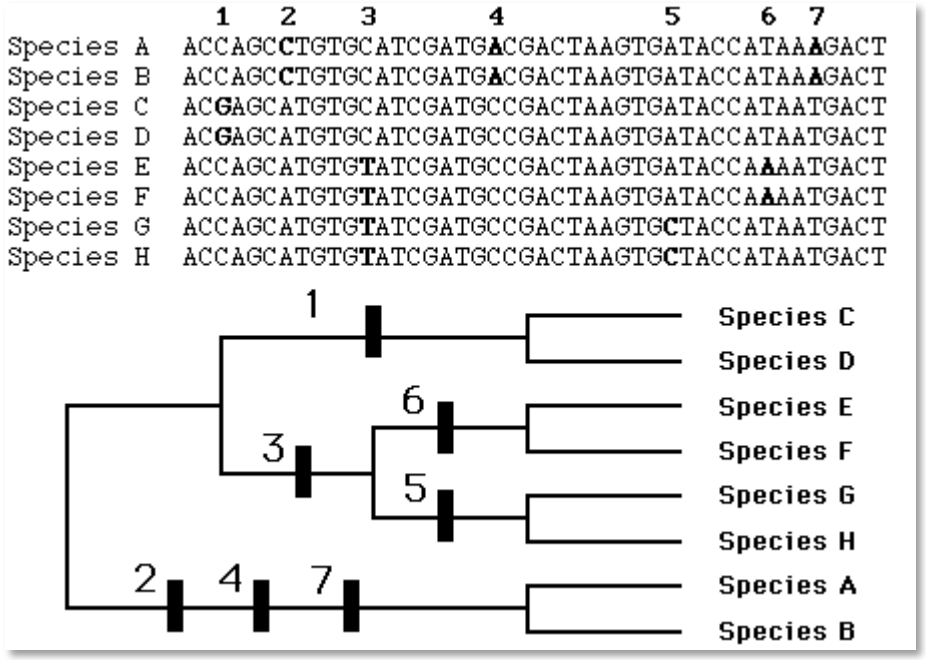


What is Bioinformatics?

In biology, **Bioinformatics** /ˌbaɪ.oʊˌɪnfərˈmætɪks/ is an interdisciplinary field that develops and improves upon methods for storing, retrieving, organizing and analyzing biological data. A major activity in bioinformatics is to develop software tools to generate useful biological knowledge.

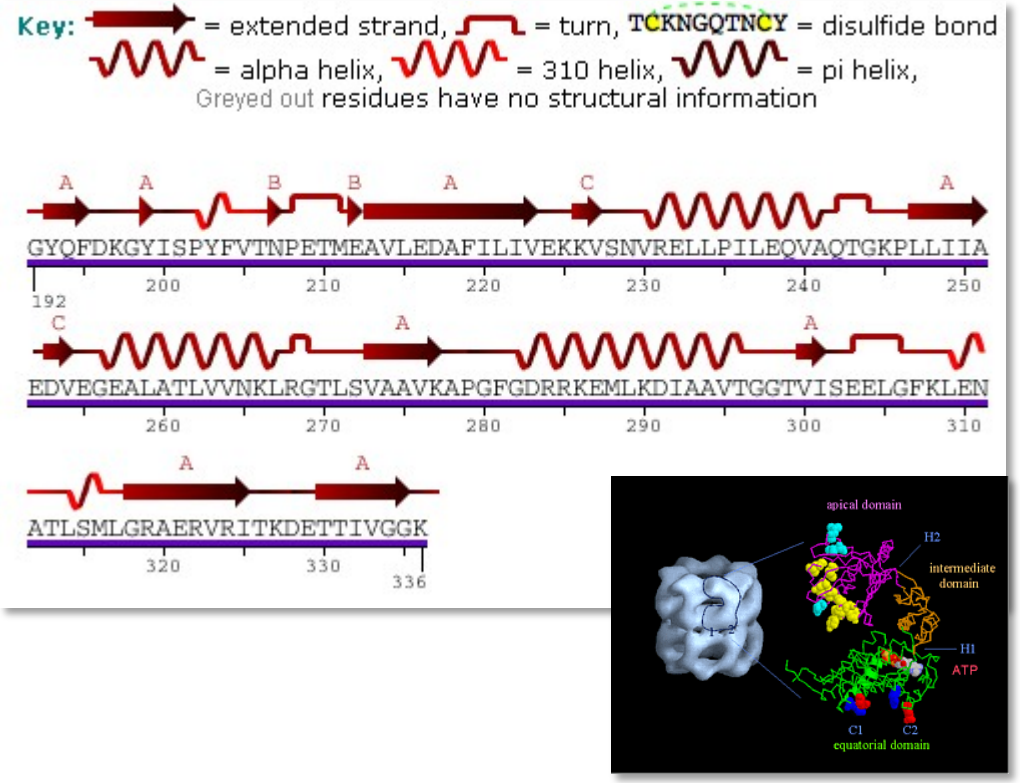
- http://en.wikipedia.org/wiki/Bioinformatics - retrieved April 23rd 2013

What is Bioinformatics?



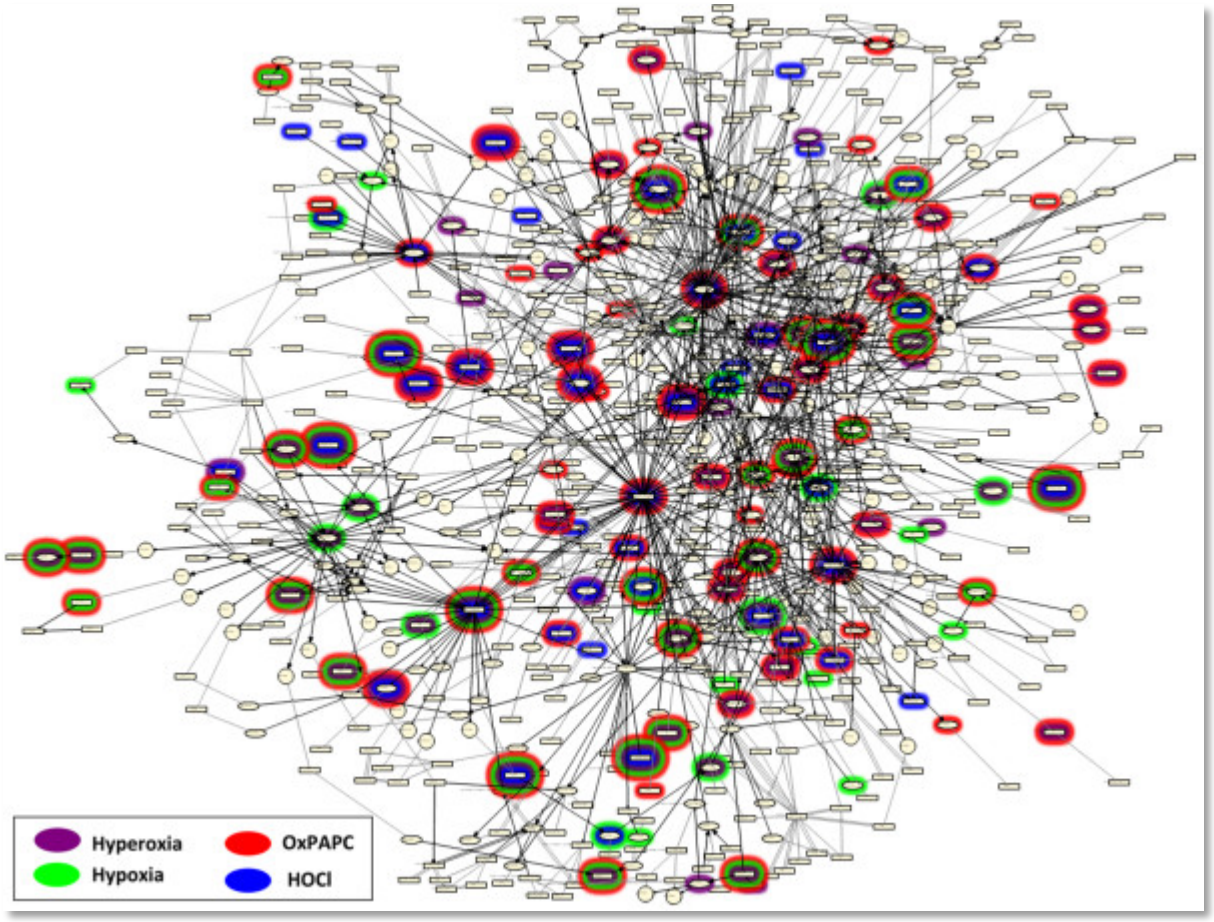
a Phylogeny of 8 species

sequence and structure of HSP60



http://people.cryst.bbk.ac.uk/~ubcg16z/hsplec.html

What is Bioinformatics?

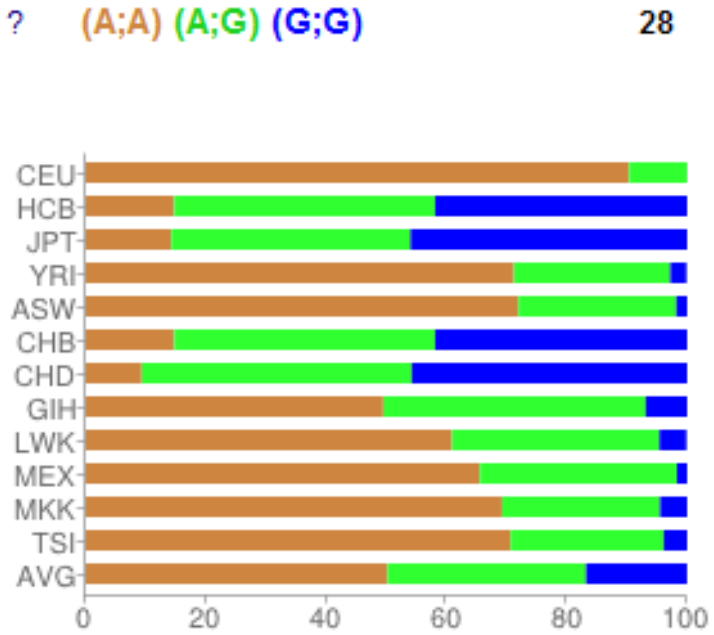


The Cellular Stress Network.
Highlighted nodes are Reverse Causal Reasoning (RCR) hypotheses, predicted to have increased or decreased abundance or activity, in the indicated cell stress data sets.

Schlage *et al. BMC Systems Biology* 2011 **5**:168 doi:10.1186/1752-0509-5-168

What is Bioinformatics?

Eye Colors
Strum and Frudakis (2004) Trends in Genetics 20:327



A;A Blue/Grey more likely
A;G Blue/Grey less likely
G;G Blue/Grey less likely

There are very few “always” statements in biology; very few unbreakable rules
To draw useful ~~conclusions~~ hypotheses, data may need to span many individuals, time points, and scales

NCBI Quick Tour

- NCBI Homepage https://www.ncbi.nlm.nih.gov/
- Human Genome: https://www.ncbi.nlm.nih.gov/projects/genome/guide/human/index.shtml
- Corona Virus Genome: https://mra.asm.org/content/9/11/e00169-20

Mitochondrial DNA analysis using DNA Subway