Impacts of Bioinformatics

Landmarks in Bioinformatics
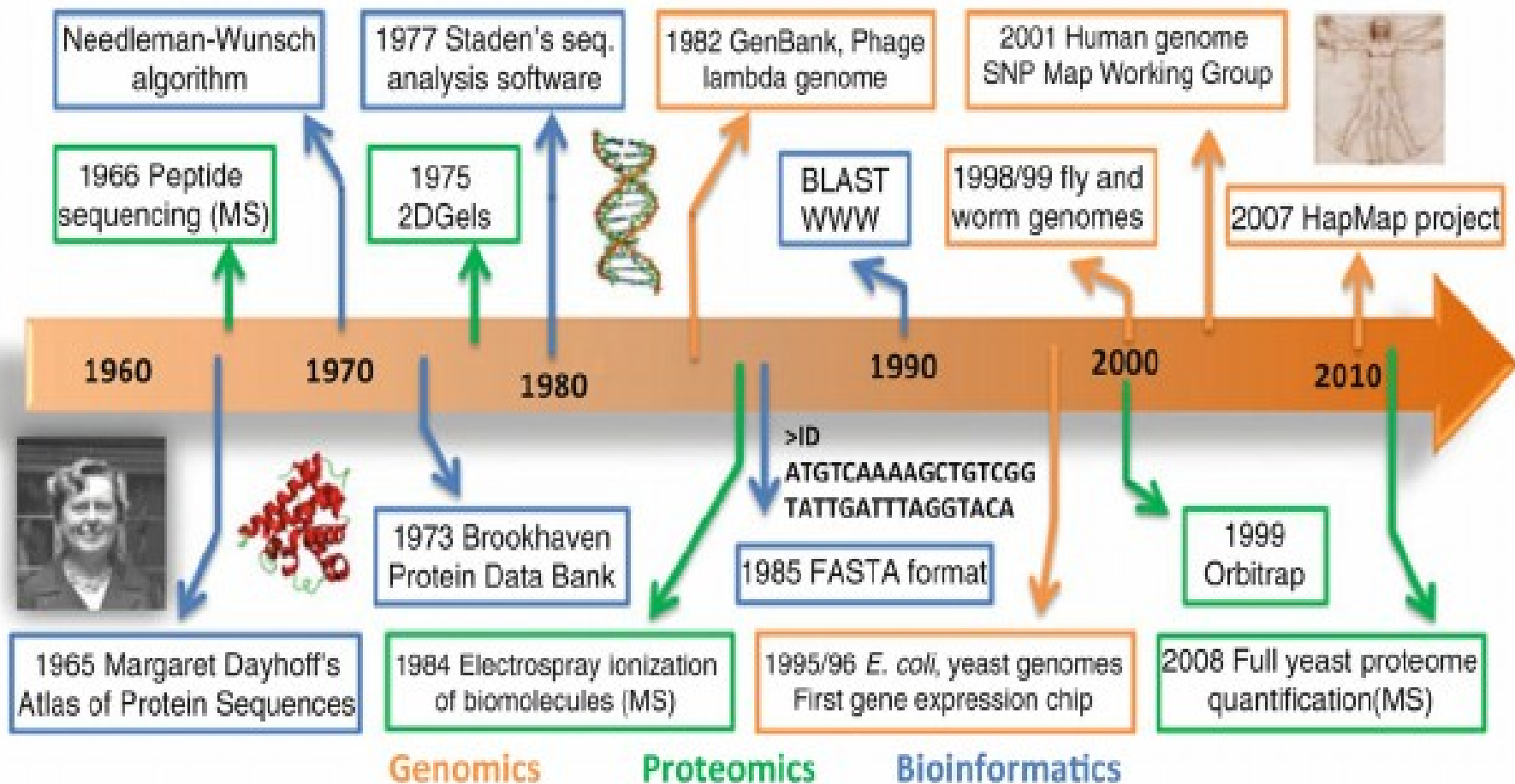
Bioinformatics here to stay?
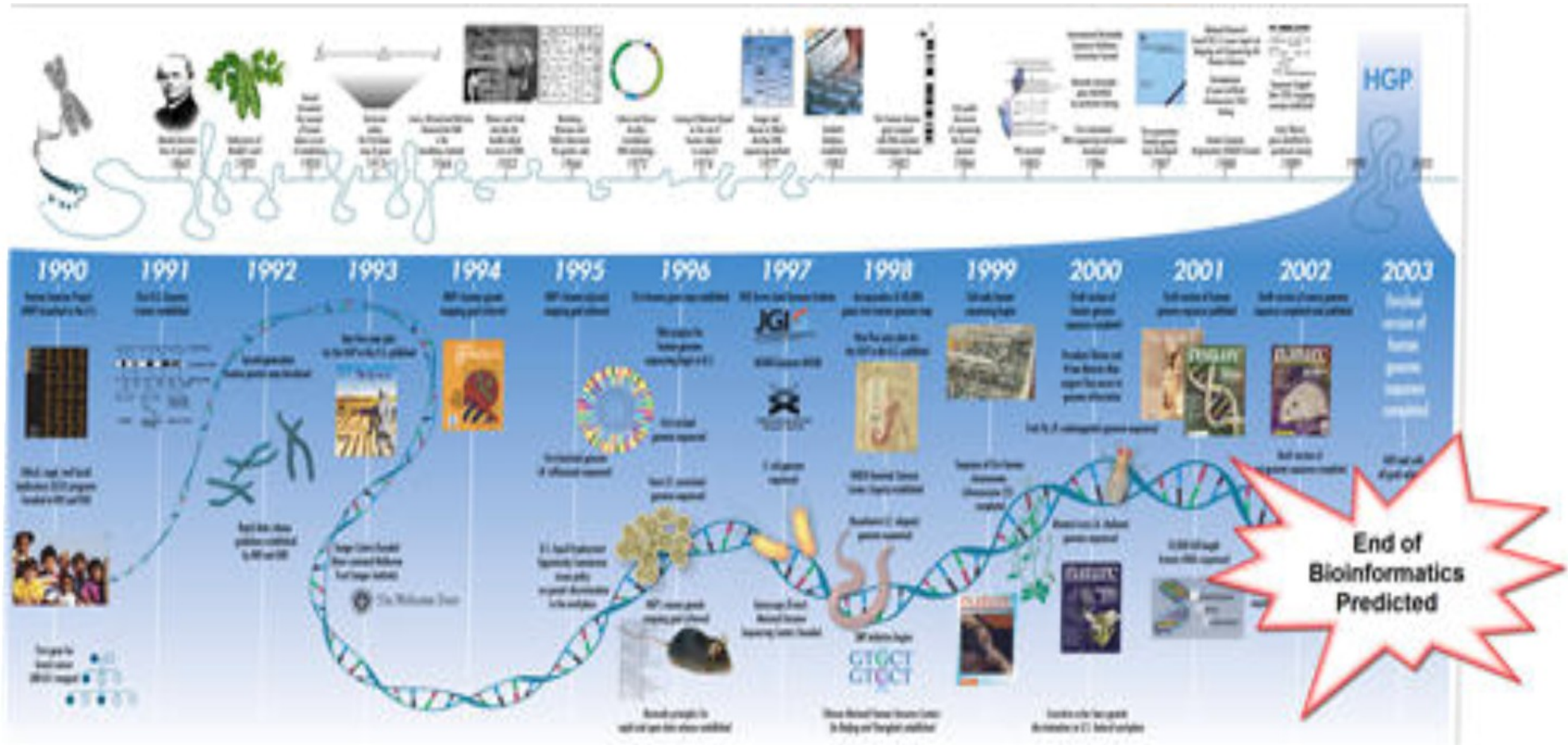
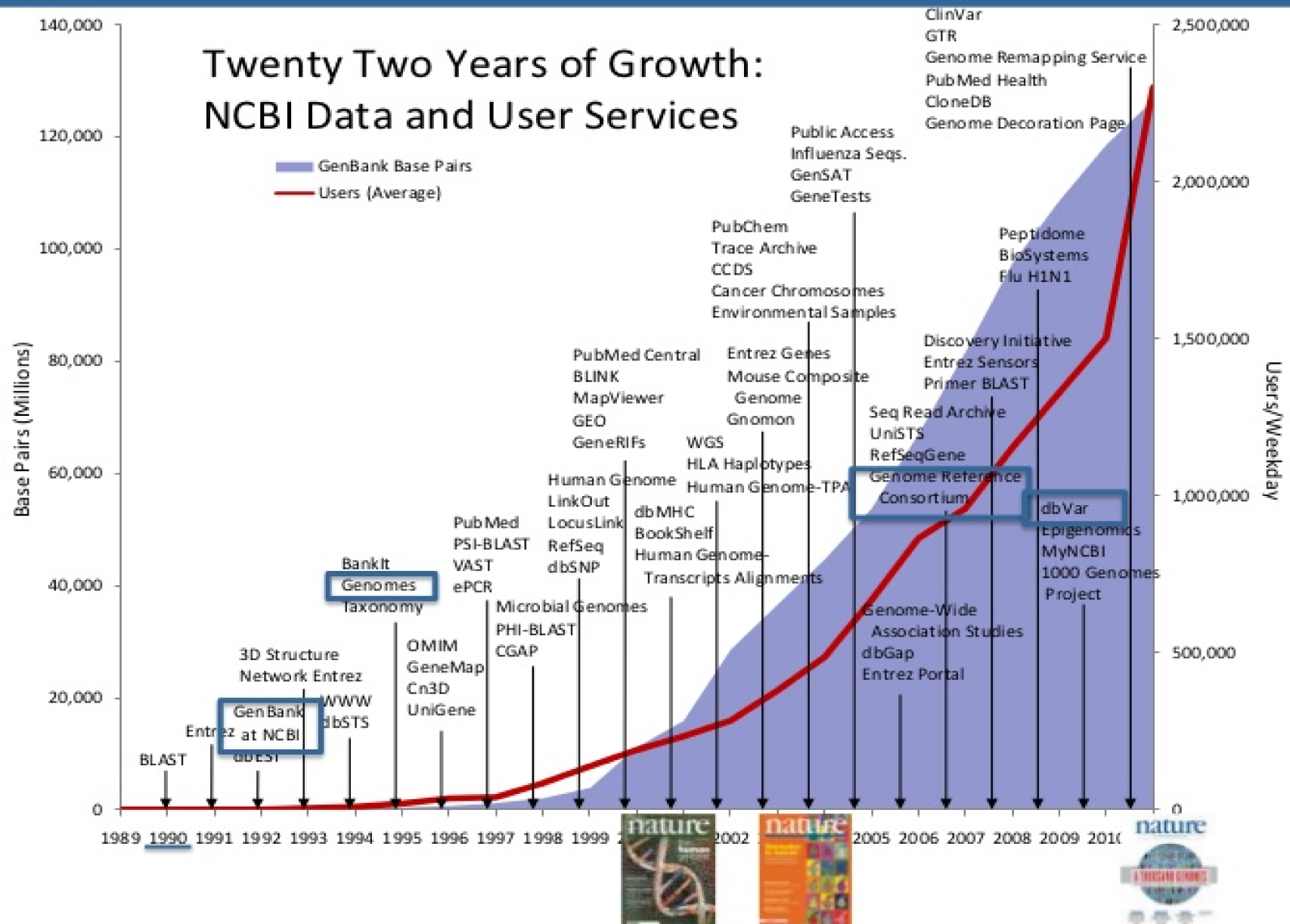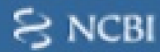Lincoln Stein's prediction, Feb 2003_   **Bioinformatics: Gone in 2012**

In 2008 he published a correction: **Bioinformatics: alive and kicking**
Genome Biology 2008, 9:114 (doi:10.1186/gb-2008-9-12-114)

Growth of sequence data and users

# Socially, what drives the process?

Some of the priority areas of investment that have triggered developments in Bioinformatics

- 1985 Biotechnology

- 2000 Personalised Medicine, Genomes & Health.

- 2010 Environmental Issues. GMOs & Food controls.

- 2015 Precision Medicine & Systems Biology

- 2020 … Immunotherapy. Ecosystem (remediation?)

Where is Bioinformatics heading?

- Coping with the Omic information deluge and growing service needs is a big challenge in itself

- But it is relatively small compared with what we anticipate will come in what concerns the need to

  - better interpret research data (recognise conserved domain architectures, use systems level reasoning in Biology and Medicine)

  - make more accurate predictions (inference)

  - understand complex genetic traits in health and disease

From data to curated models
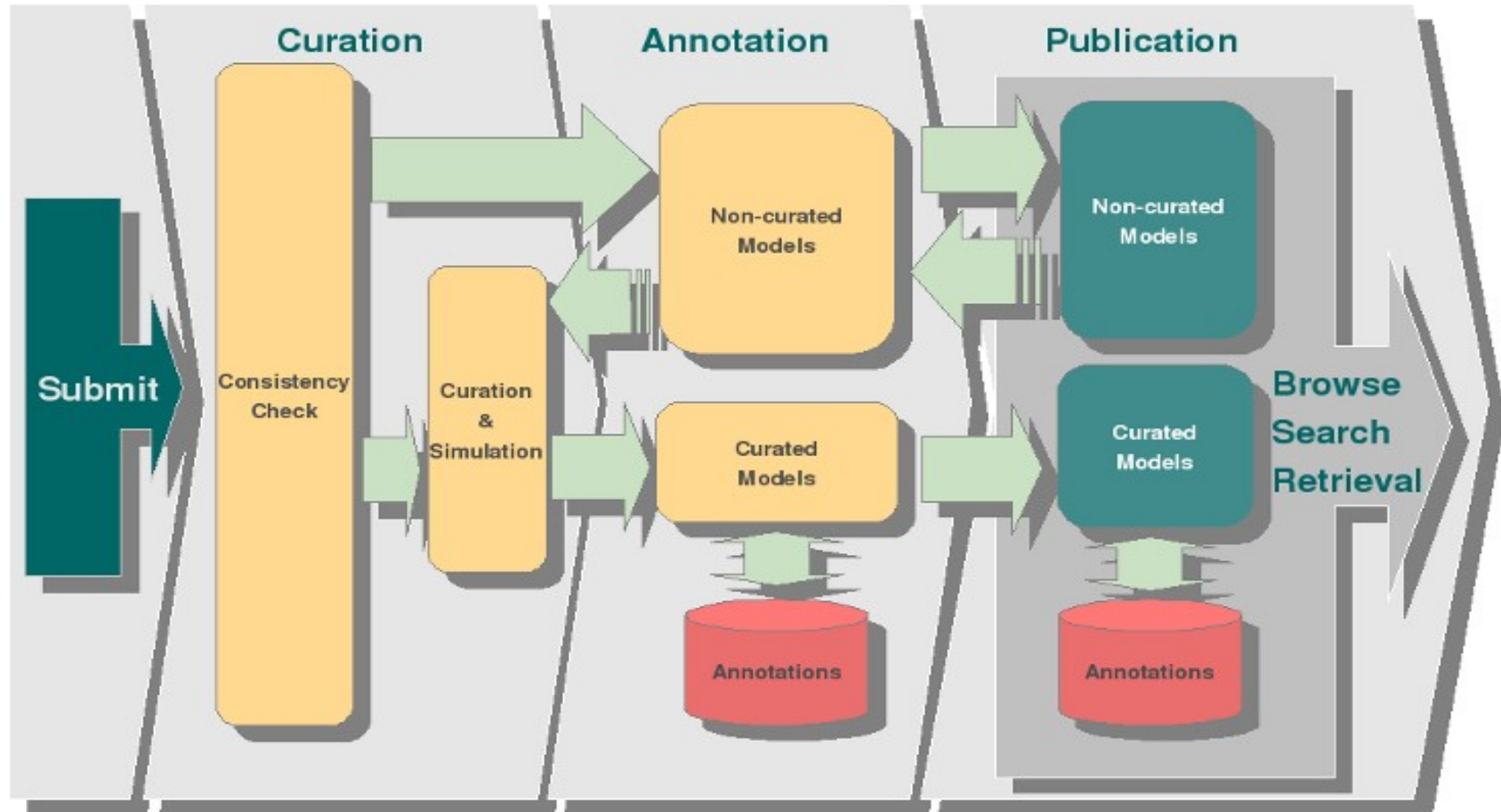
Curation and annotation pipeline in the BioModels Database
Source: European Bioinformatics Institute
http://www.ebi.ac.uk/biomodels-main/develop

Gains in knowledge via integration
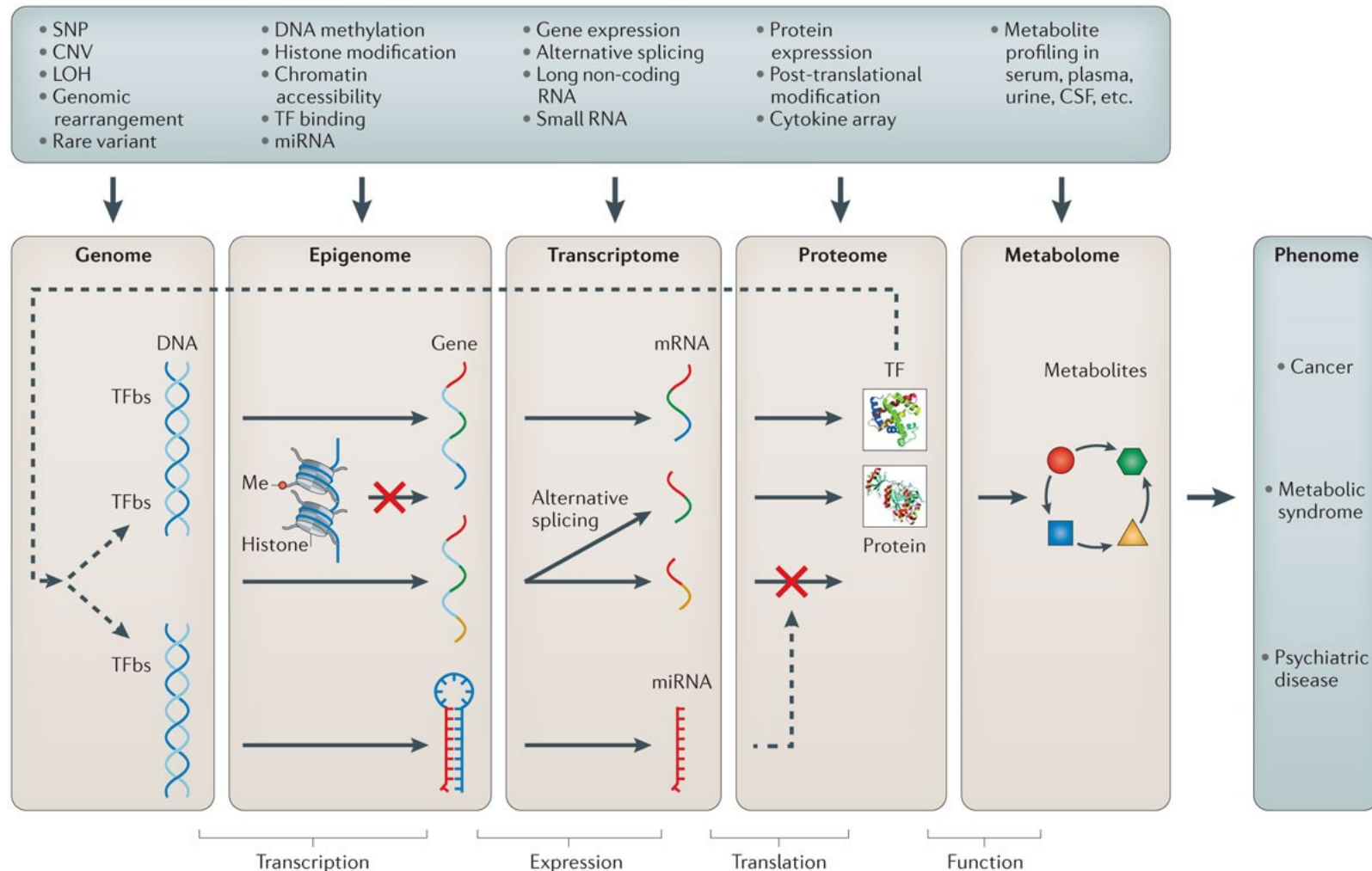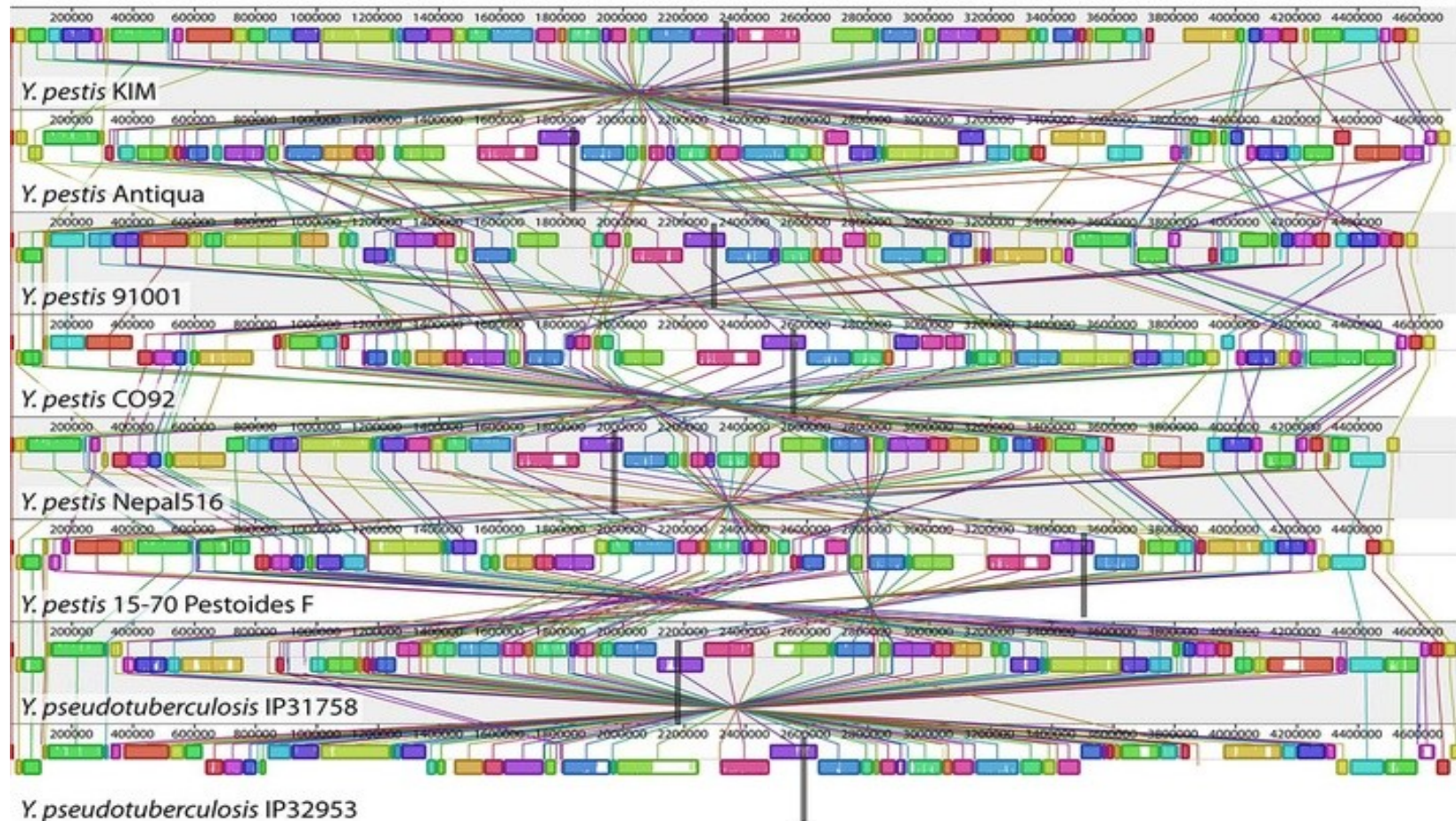

Source: **Methods of integrating data to uncover genotype–phenotype interactions**
Marylyn D. Ritchie,   Emily R. Holzinger,   Ruowang Li, Sarah A. Pendergrass & Dokyoon Kim
Nature Reviews Genetics 16, 85–97 (2015) doi:10.1038/nrg3868

Understanding to fight disease

A genome alignment of eight Yersinia isolates.
(source: PLOS Genetics on Wikimedia Commons).

Deep learning meets genome biology
An interview with Brendan Frey about realizing new possibilities in genomic medicine.
https://www.oreilly.com/ideas/deep-learning-meets-genome-biology

Using large datasets

Using large datasets together with powerful analytics and machine learning allows for generating and testing hypotheses in unprecedented ways

It does require specific skills but the most serious bottleneck is still.. human!

The human resource issues

Education

- The need for Bioinformatics-aware biomedical professionals is horizontal.

Training

- Bioinformatics tools and data resources evolve rapidly and their correct usage requires skills.