Data Analysis and Modeling Techniques
Microarray Technology

Haibe-Kains B[1,2] Bontempi G[2]

[1]Microarray Unit, Institut Jules Bordet

[2]Machine Learning Group, Université Libre de Bruxelles

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Microarray

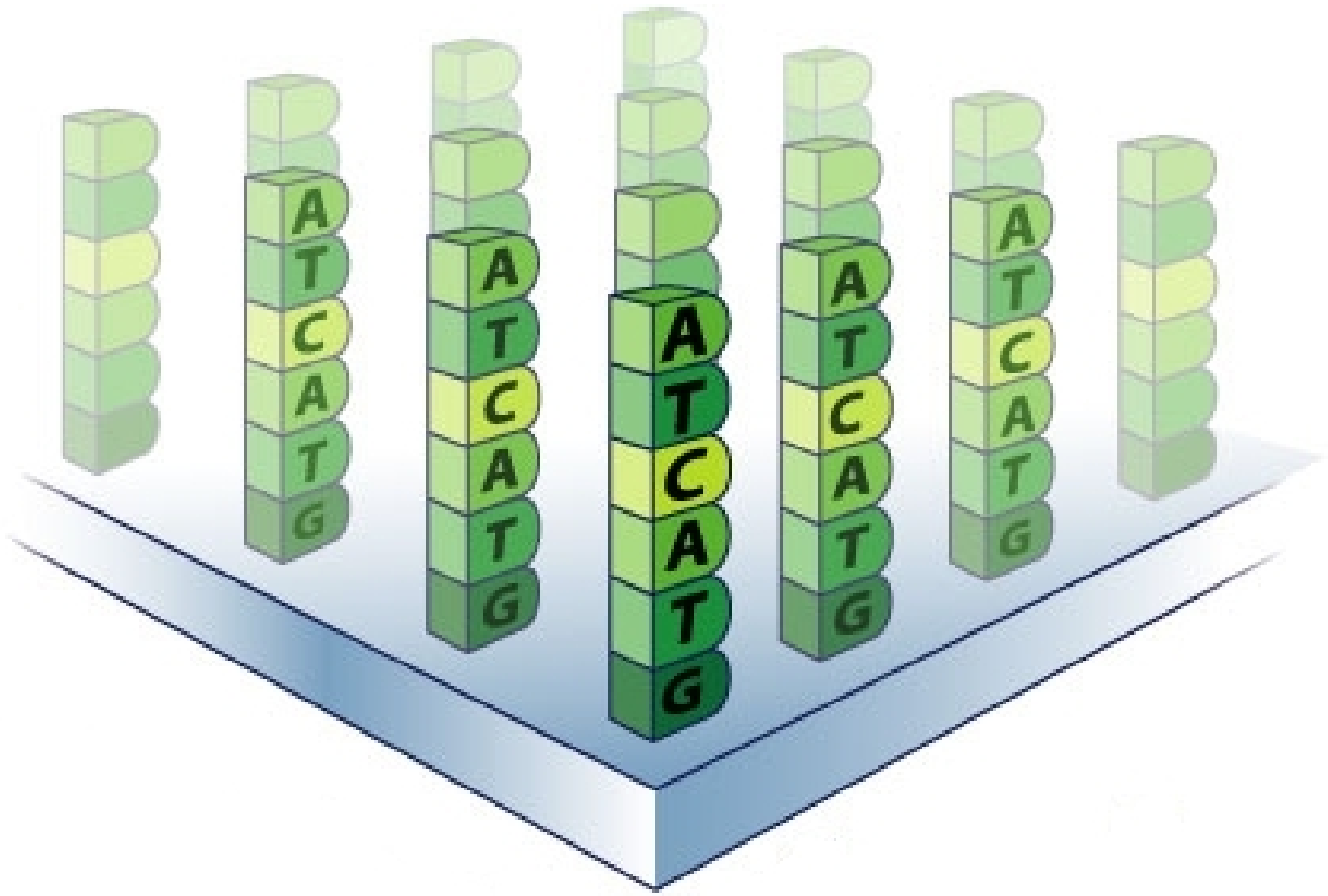
A *microarray* is composed of

- DNA fragments fixed on a solid support
- ordered position of probes
- principle of hybridization to a specific probe of complementary sequence
- molecular labeling

➥ Simultaneous detection of thousands of sequences in parallel

Microarray

Probes



Microarray

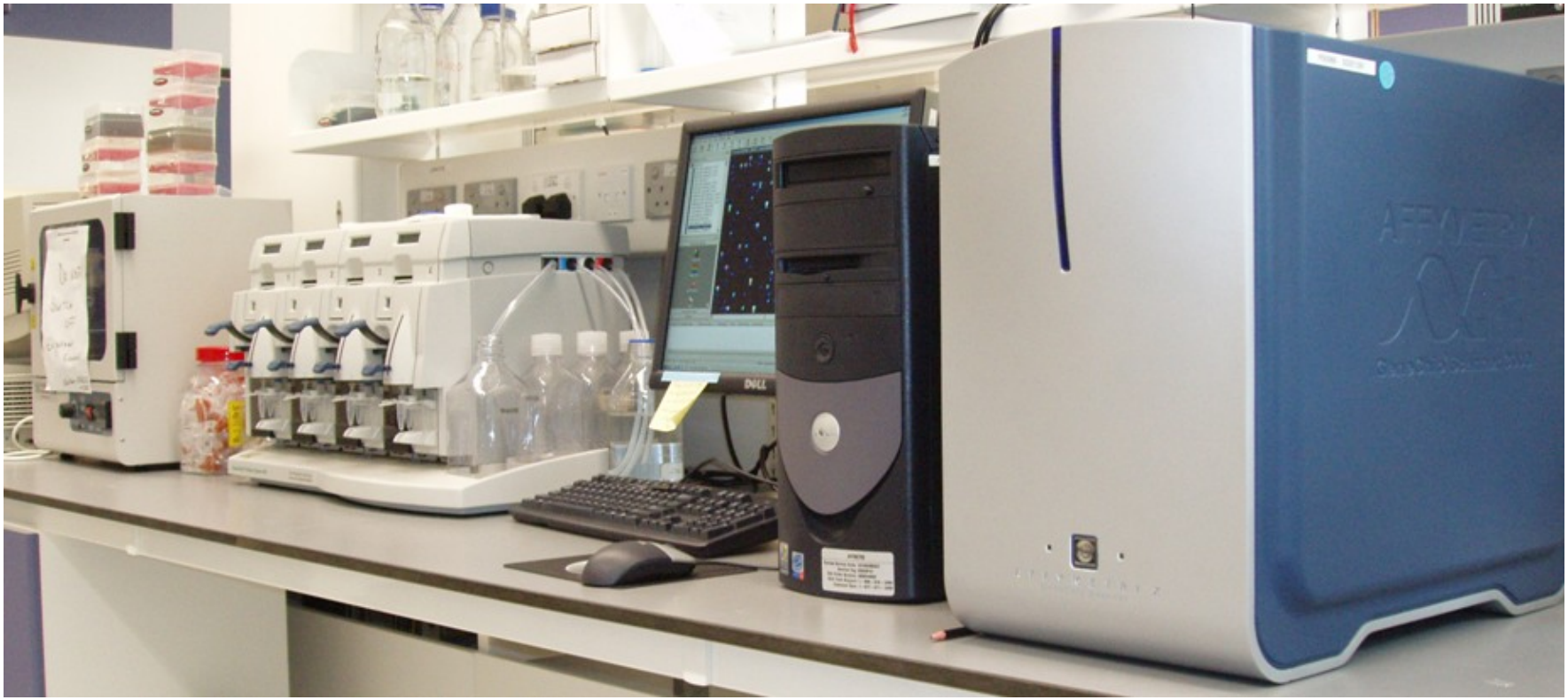
Technologies

There exist several high-throughput methods to simultaneously measure the expression of a large number of genes :

- cDNA microarray
- oligonucleotide microarray
  - short oligonucleotide (Affymetrix©)
  - long oligonucleotide (Agilent©, CodeLink©)
- multiplex quantitative RT-PCR

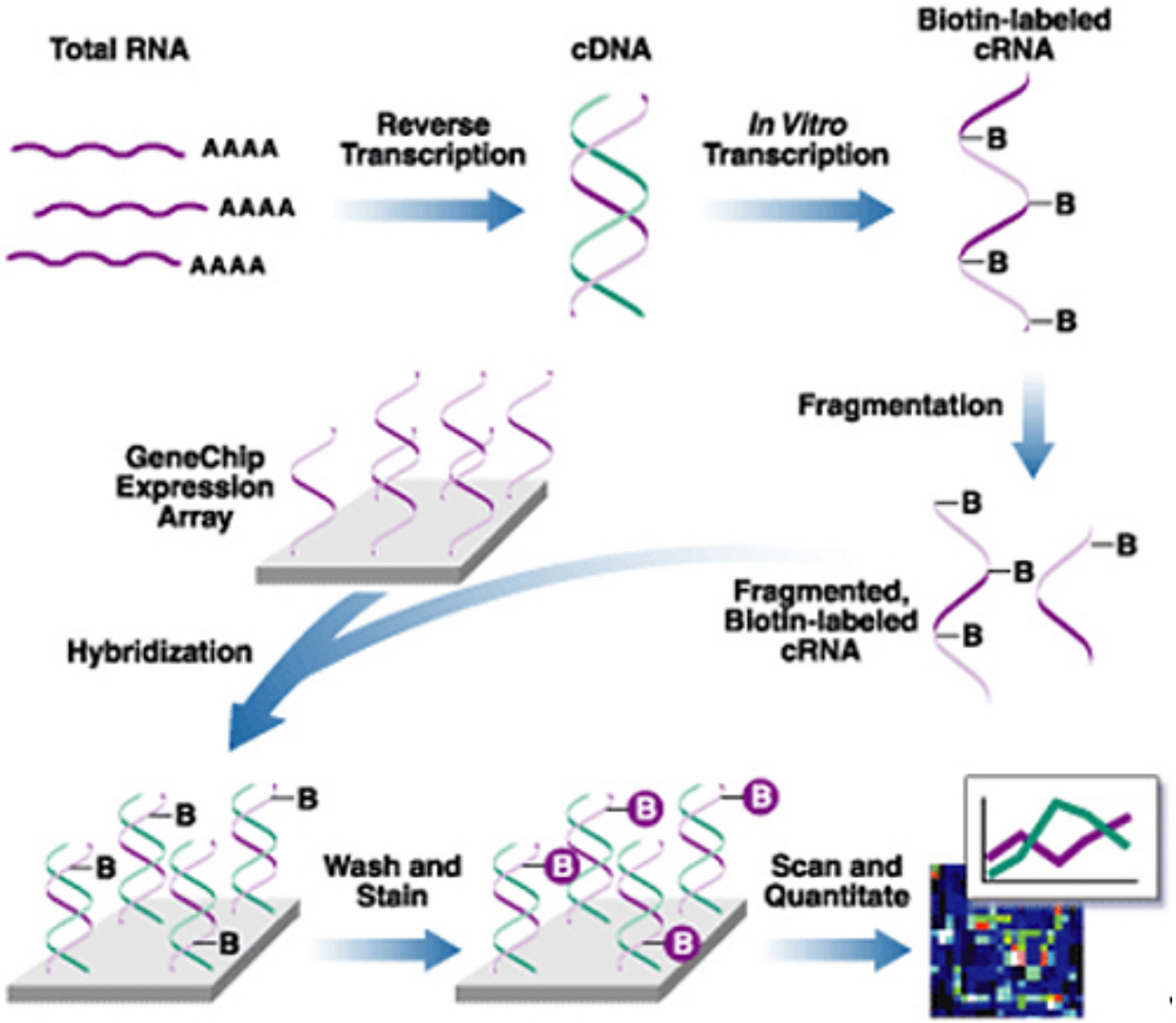
We will present the Affymetrix© platform in order to overview the main characteristics of microarray technology.

Affymetrix© Equipment



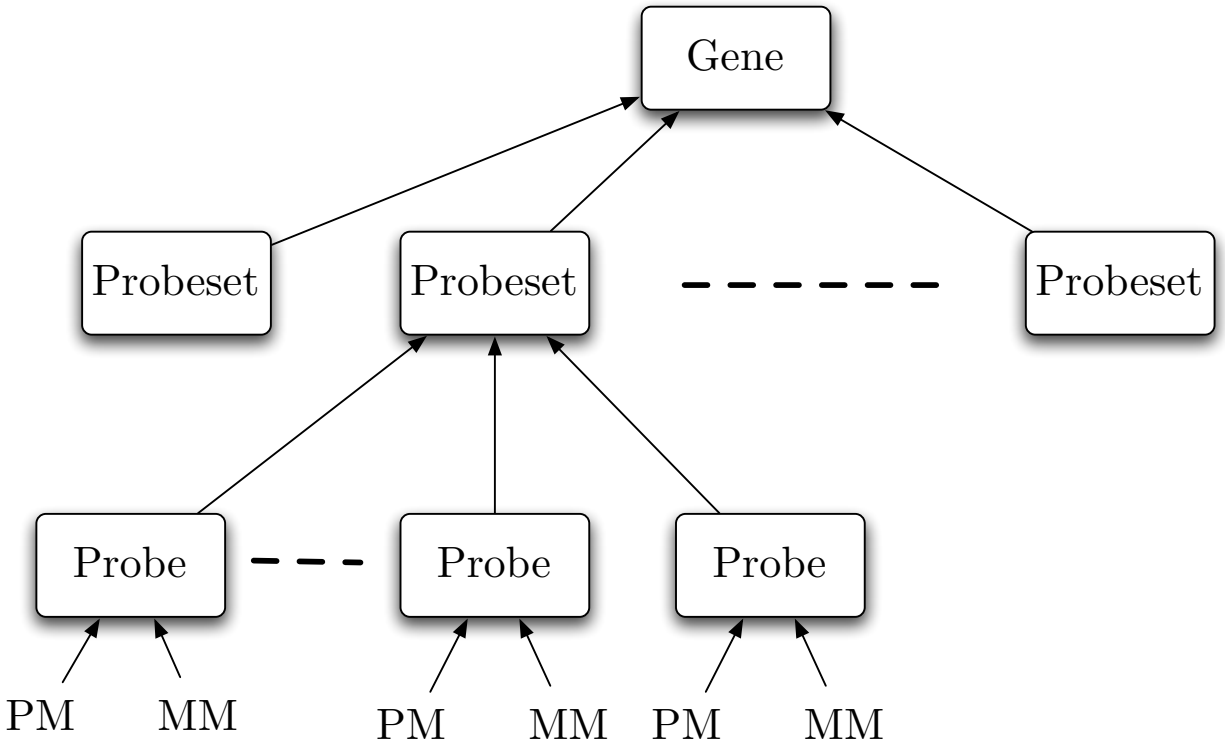
Affymetrix© GeneChip

Affymetrix© Design



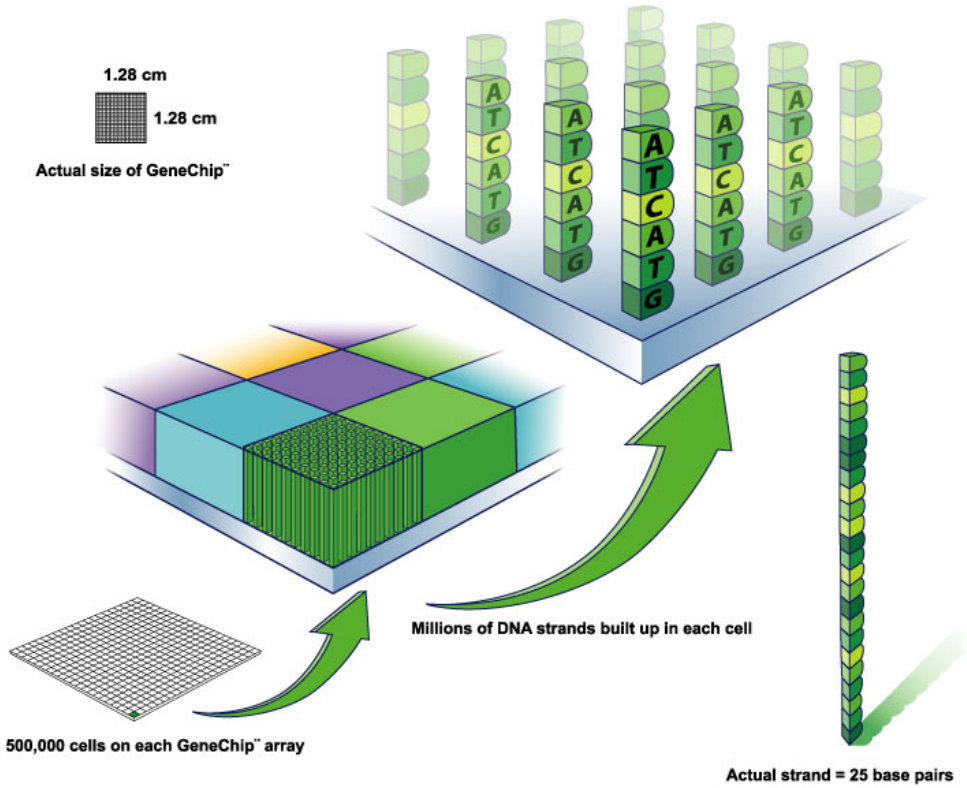
Affymetrix© GeneChip Structure

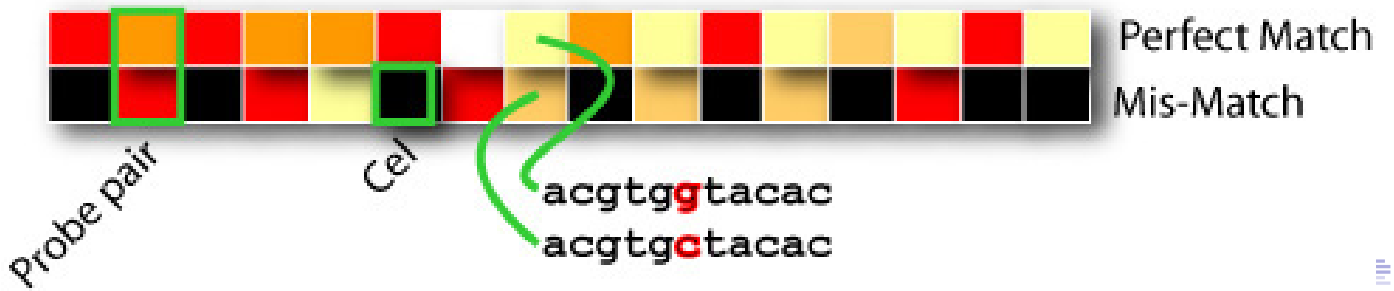
- 1 gene is represented by 1 or more probe sets
- 1 probe set includes 11 to 20 probe pairs
- 1 probe pair includes a Perfect Match (PM) value and a MisMatch value (MM)



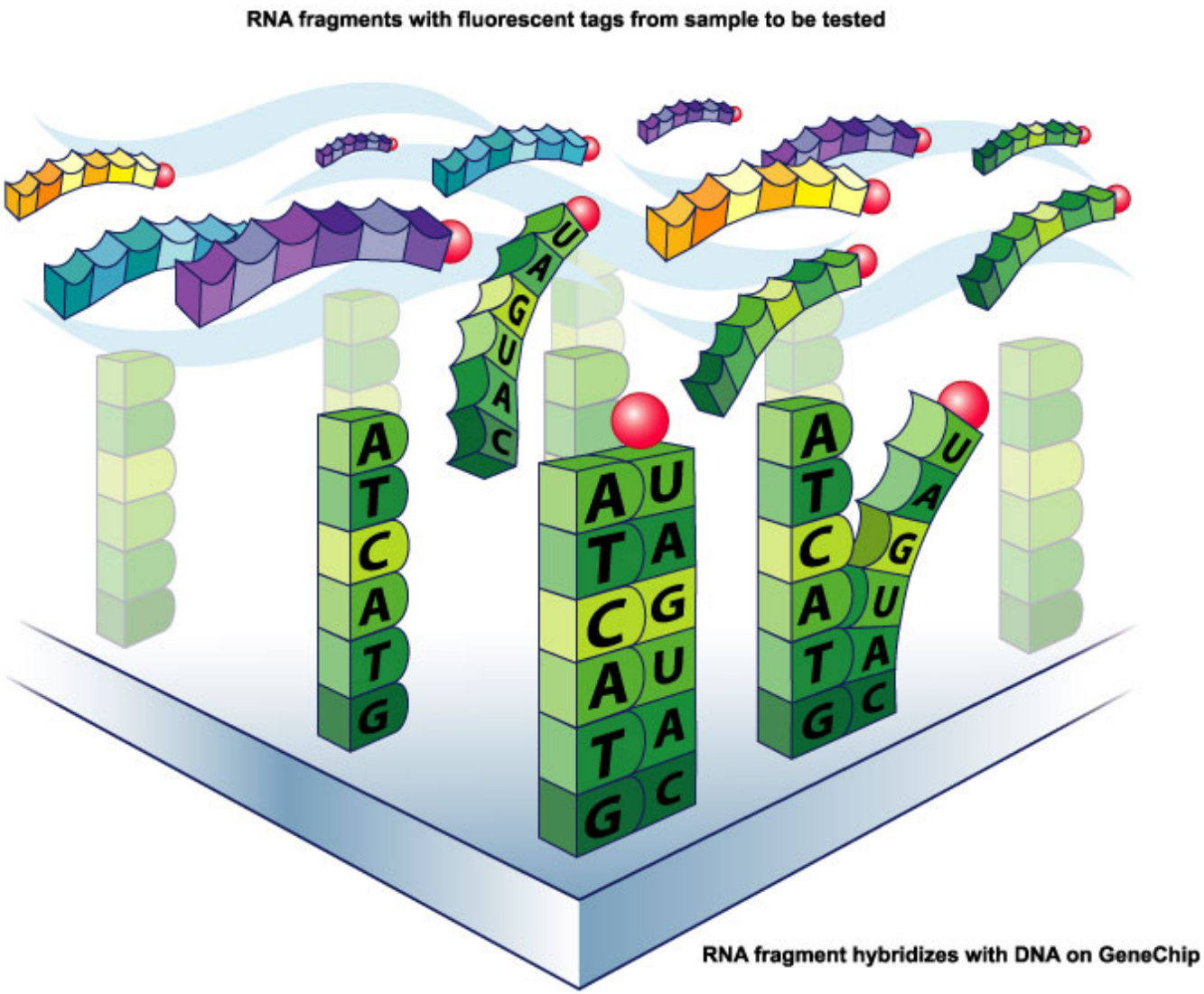
Affymetrix© GeneChip Structure

Suite

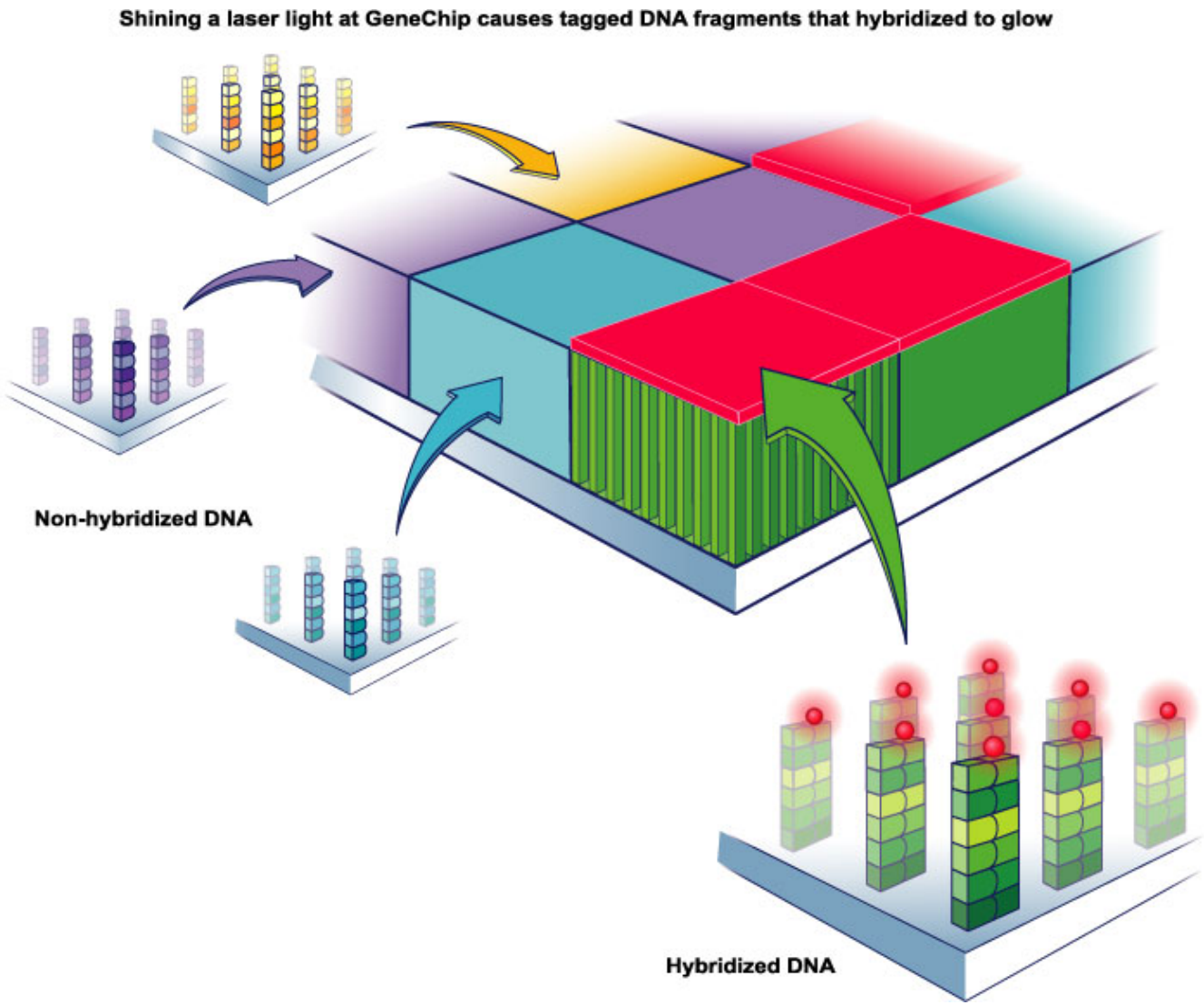




Affymetrix© Hybridization

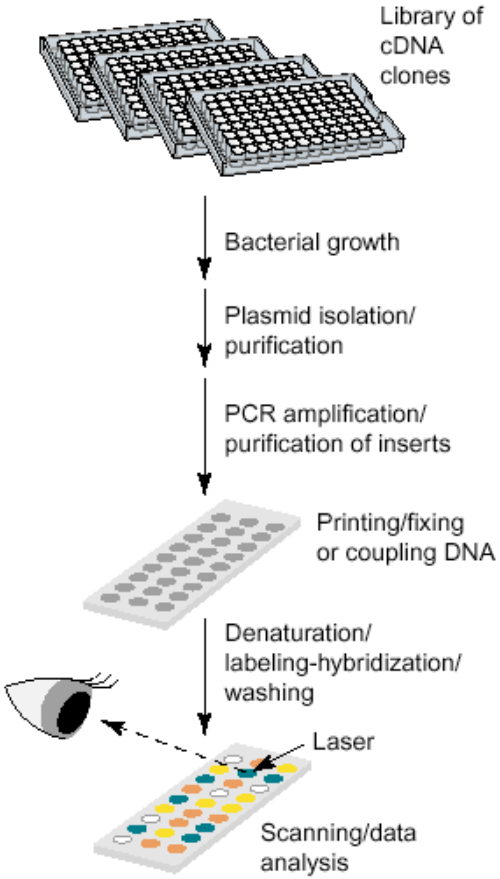


Affymetrix© Detection

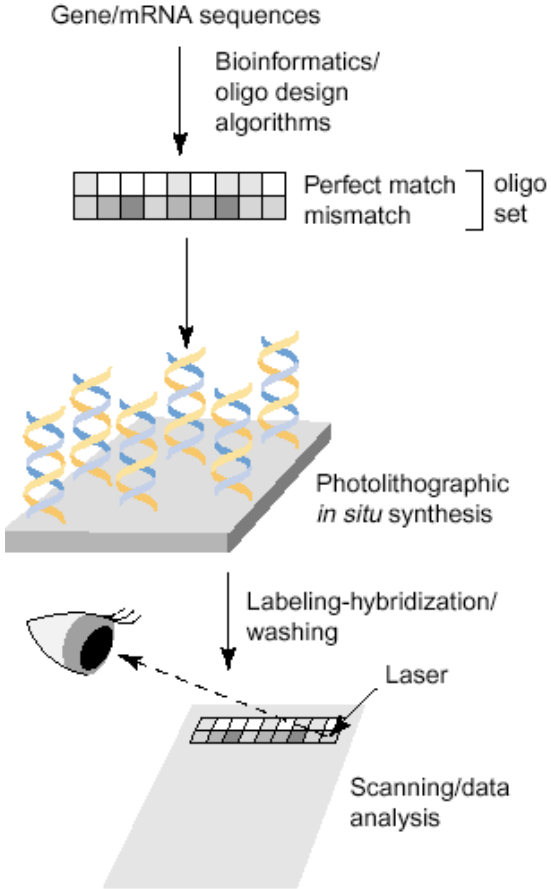


Microarray Comparison

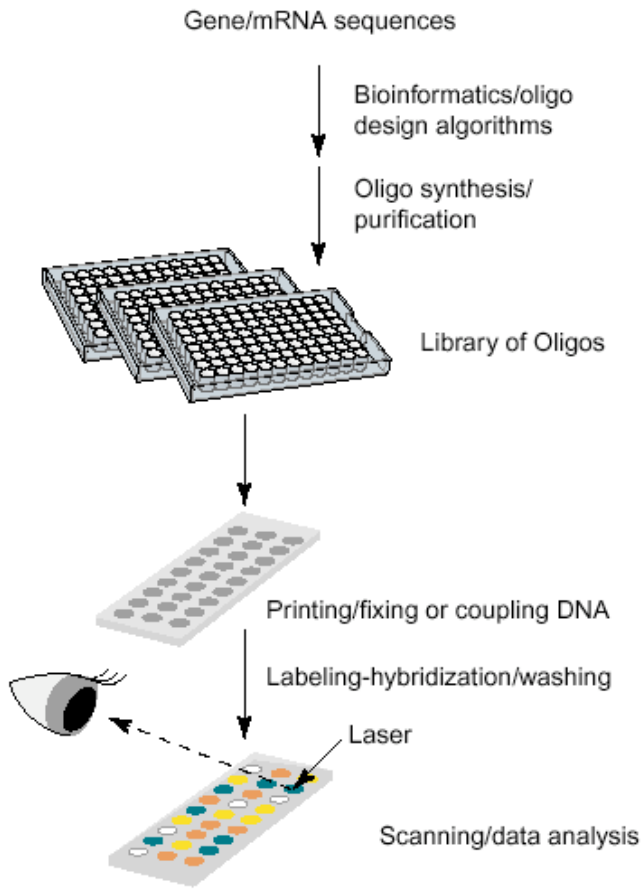
cDNA



short oligonucleotide



long oligonuleotide



AFFYMETRIX© advantages :

- commercially available for several years (strong manufacturing)
- large number of published studies (generally accepted method)
- no reference sample $\longrightarrow$ possible comparison between studies

AFFYMETRIX© disadvantages :

- cost of the devices and the chips (but easy use)
- changes in probe design is hard (but new program permits to create his own design)
- short oligos $\longrightarrow$ several oligos per gene, specificity/sensitivity trade-off (complex methods to get gene expression)

Links

- Course web page : http://www.bioinfomaster.ulb.ac.be/cursus/index_html/en#DATANA
- Personal homepage : http://www.ulb.ac.be/di/map/bhaibeka/
- This presentation : http://www.ulb.ac.be/di/map/bhaibeka/bioinfo_courses/microarray_pres_hkb.pdf

Thank you for your attention.