SEPTEMBER
2023

Microarrays

Functional genomic data analysis: transcriptomics

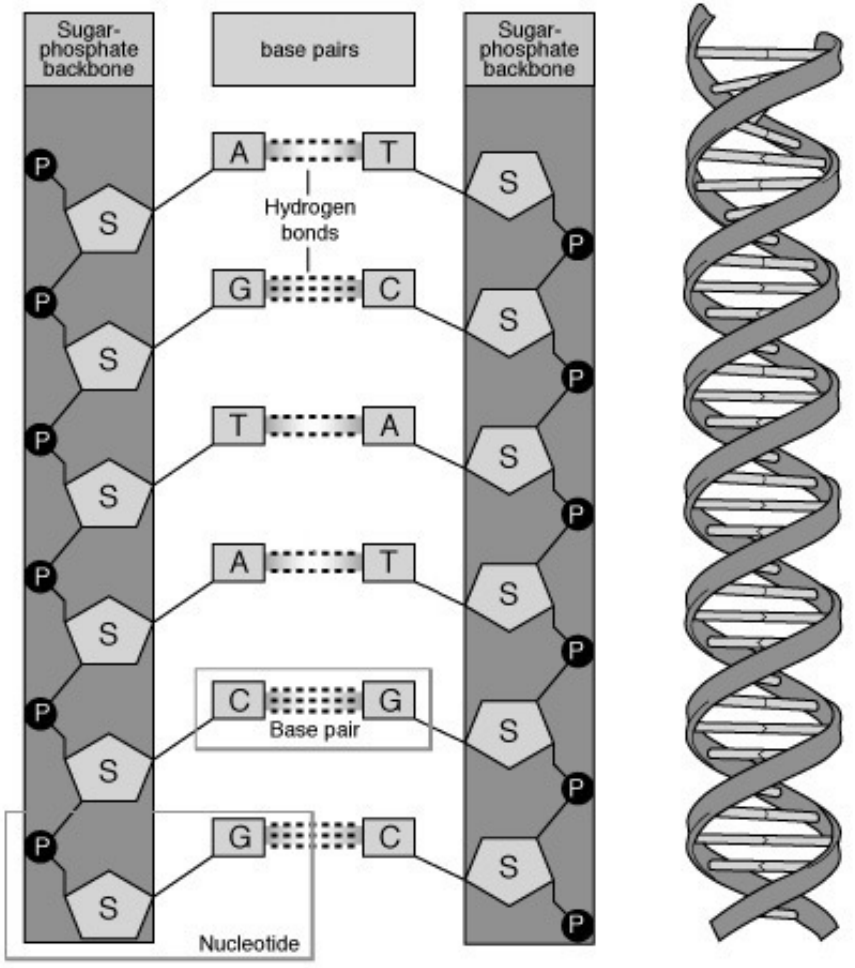
Nucleic acid hybridization

Two complementary sequences can hybridized together.

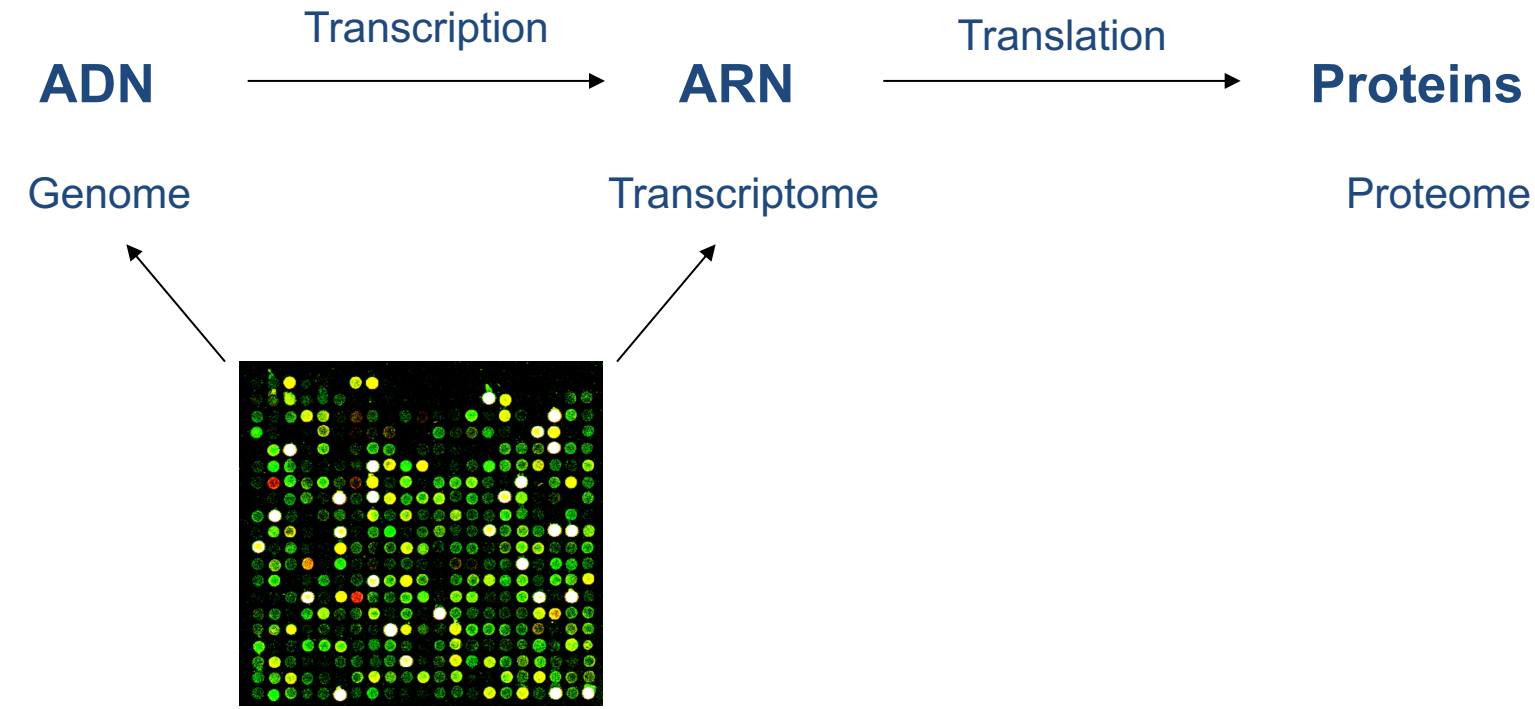
Hybridization is influences by several parameters:

- Specificity (cross-hybridization)
- Sensitivity (Tm, secondary structure, …)
- Sequences (size, base composition)

Some parameters can be controlled by hybridization buffer stringency (temperature, salt concentration and H bond destabilizing agent like formamide).



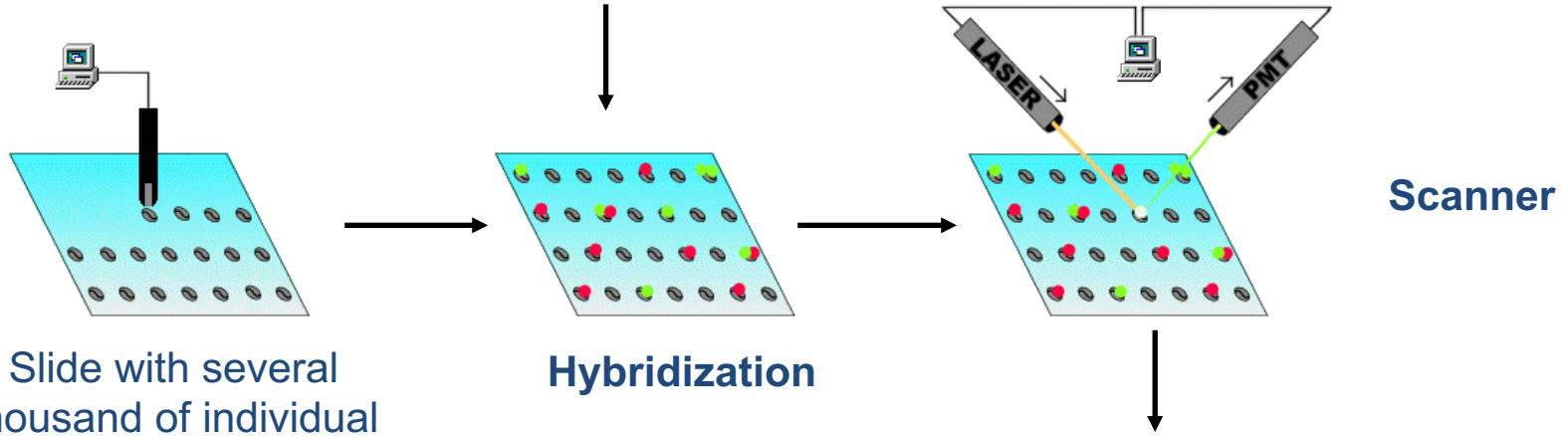
The molecular biology central dogma



DNA microarray is a functional genomic technique that allows for the analysis of genome and transcriptome of cells

DNA microarray general principle

Sample (target) = mix of complex nucleic acids labelled by one or several dyes



Slide with several thousand of individual nucleic probes (probe)

Hybridization

Scanner

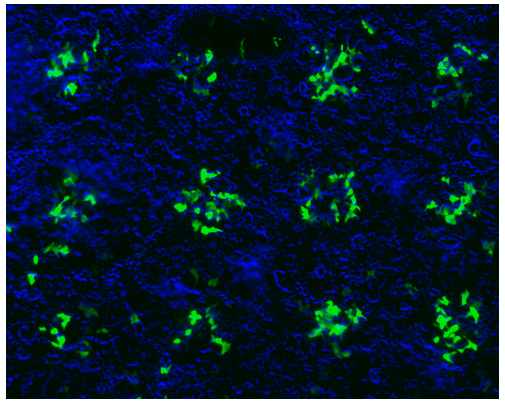
Quantification of the hybridization signal for each probe

Microarray application examples

Genotyping
- Polymorphism detection (SNP)
- Mutation detection
- CGH array

Gene expression profiles
- Compare expression levels between various biological conditions
- Transcription and replication dynamic
- RNA stability and maturation study
- Nucleic acids and proteins interaction studies
- Diagnostic (identify pathogenic strains, …)
- Whole genome expression profile analysis = Transcriptional fingerprint

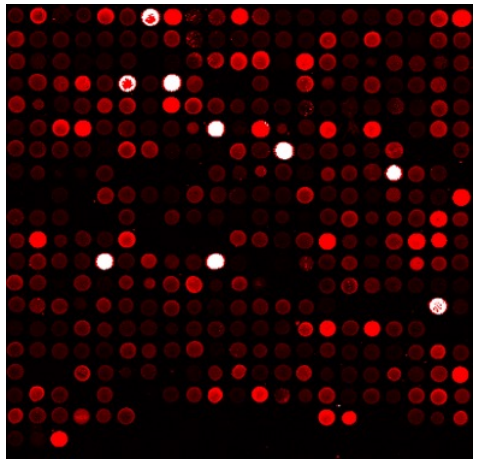
Tissue samples



Cells

Image acquisition

Condition 1
Cy5 wavelength



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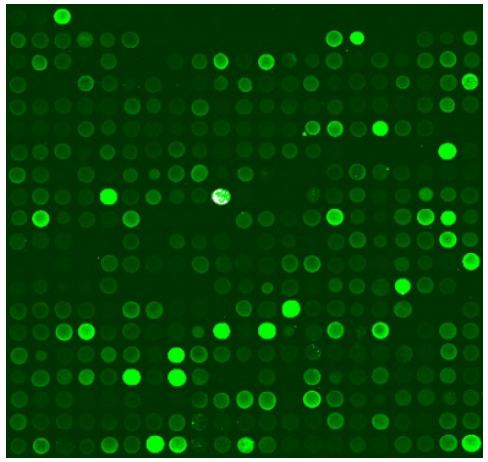
Condition 2
Cy3 wavelength



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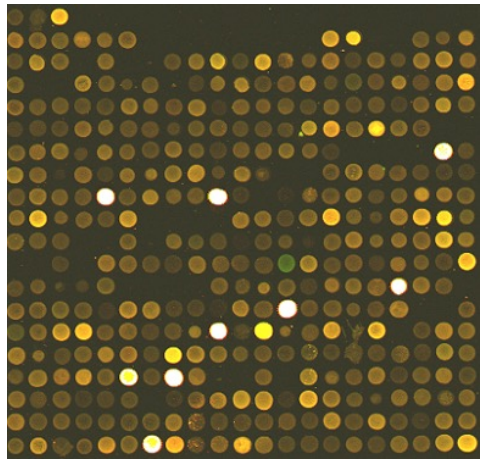
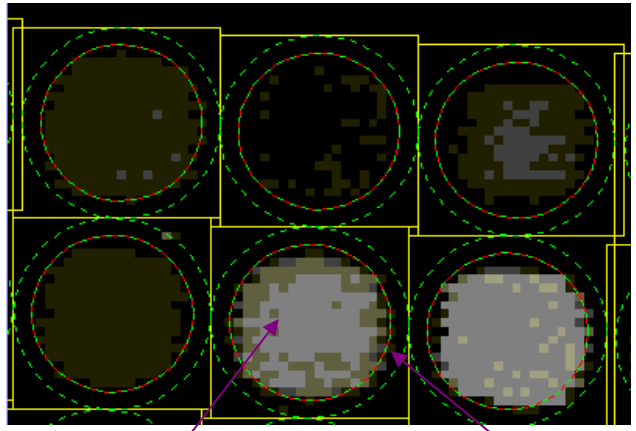
Final image



Globale intensity calculation



Intensity inside spot

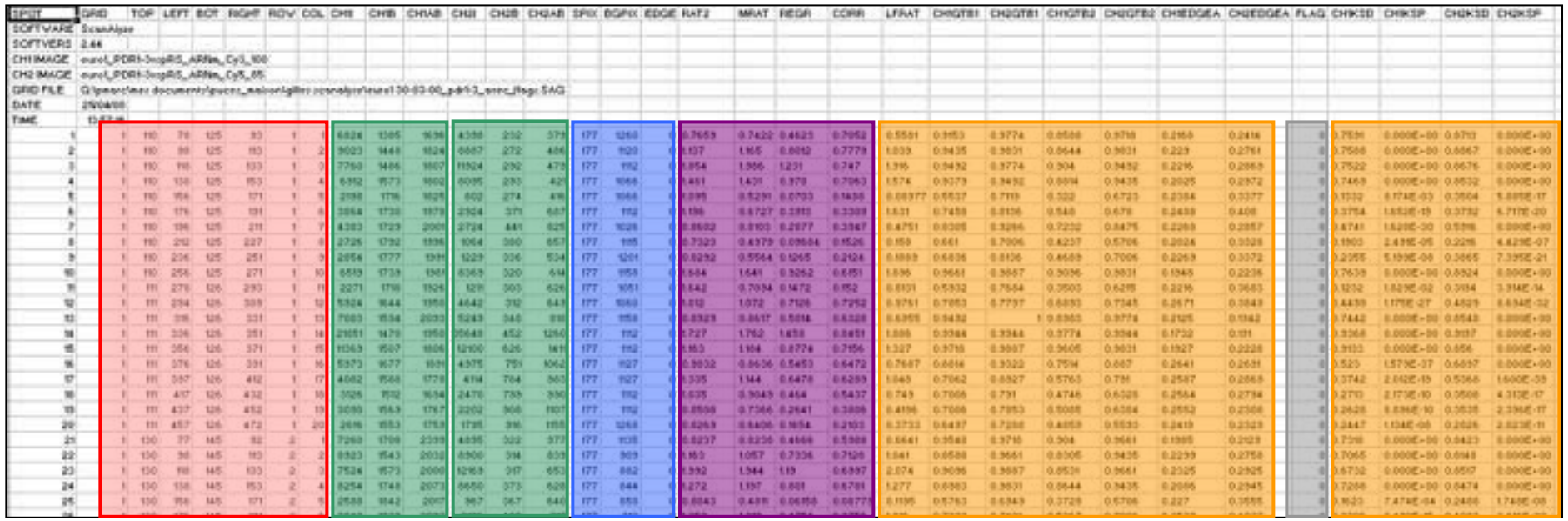
Background measurement

Net intensity
=
Raw intensity - Background

Raw result output

Example of an output file from image analysis software

Position | Intensities (Raw, Bkg) | Size | Homogeneity | Statistics | Annotations

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