Introduction to "Next-Generation" Sequencing and its Applications

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11AM Introduction to NGS (M. Sammons)

11:10AM Practical advice for getting started in NGS (M. Sammons)

11:40AM Center for Functional Genomics NGS Workflow/Recommendations (S. Chittur)

12:10PM Applications: ATAC-seq to define cell lineages (M. Sammons)

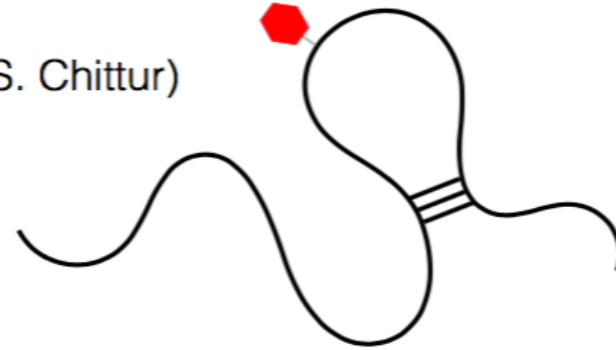**12:25PM** Q&A

12:35PM Short break

12:45PM Brief Primer: Using Galaxy for NGS data analysis (O. Novikova)

1PM Applications: RNA methylome analysis by NGS (J. Herschkowitz)
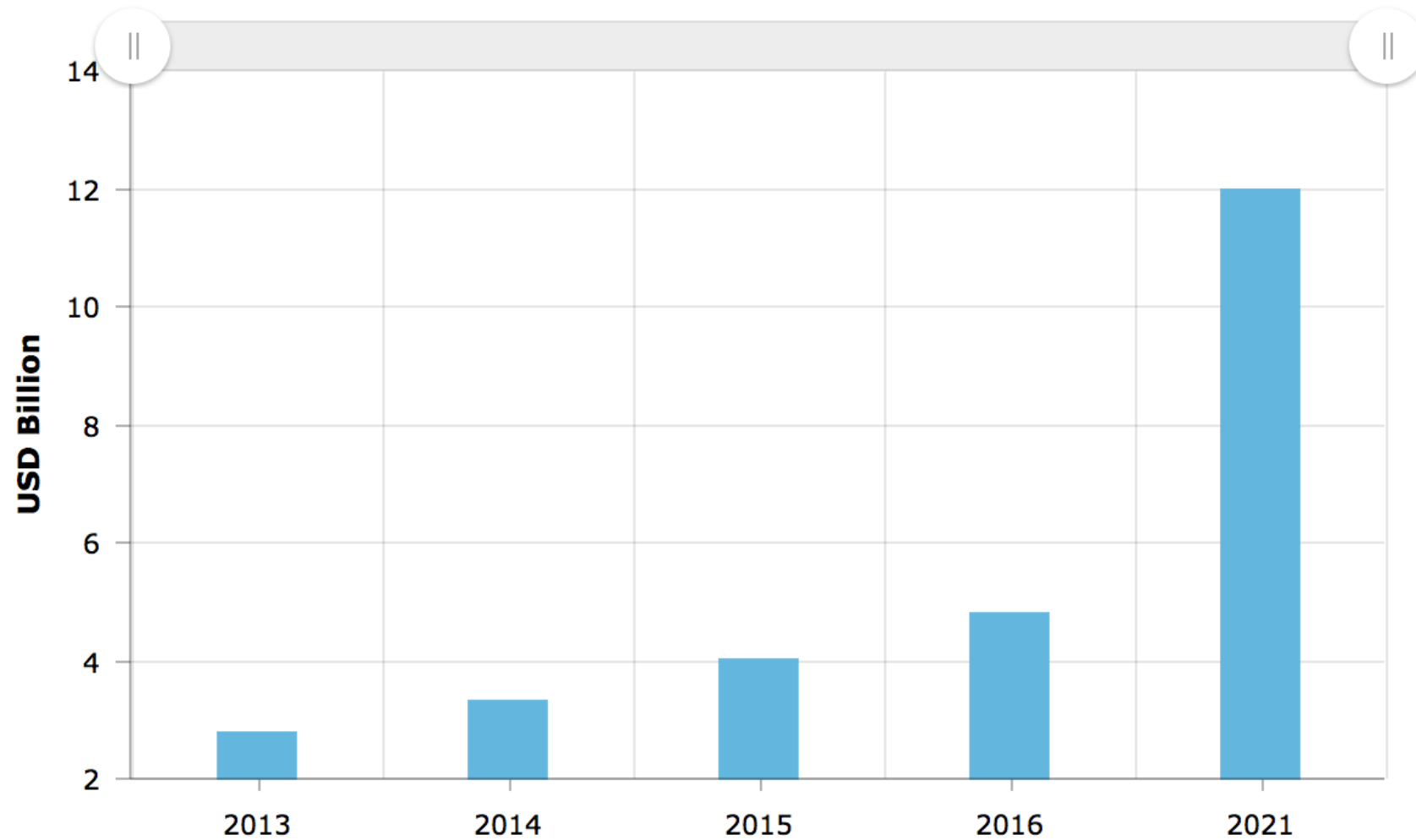
1:15PM Center for Functional Genomics Core Services (S. Chittur)
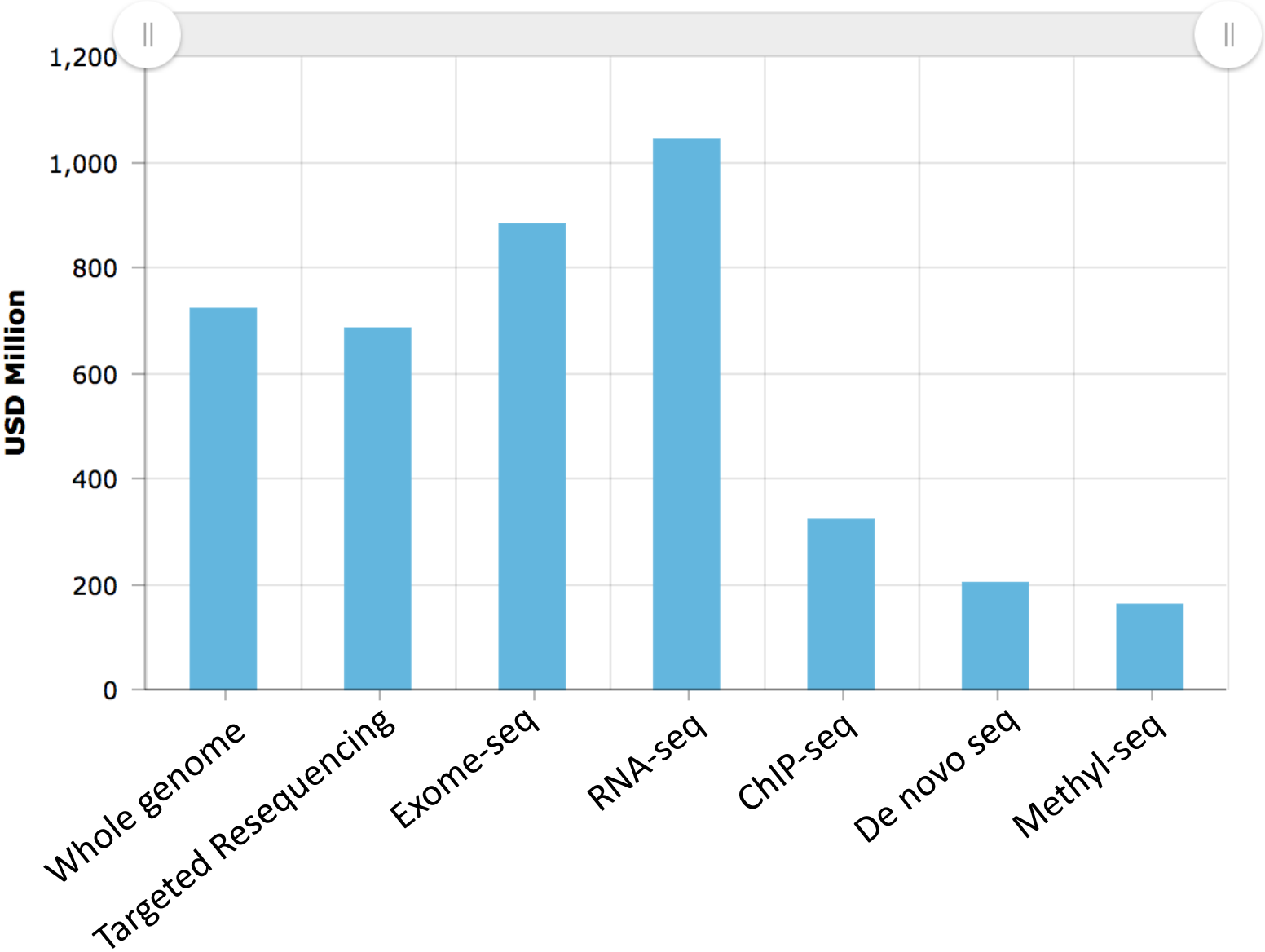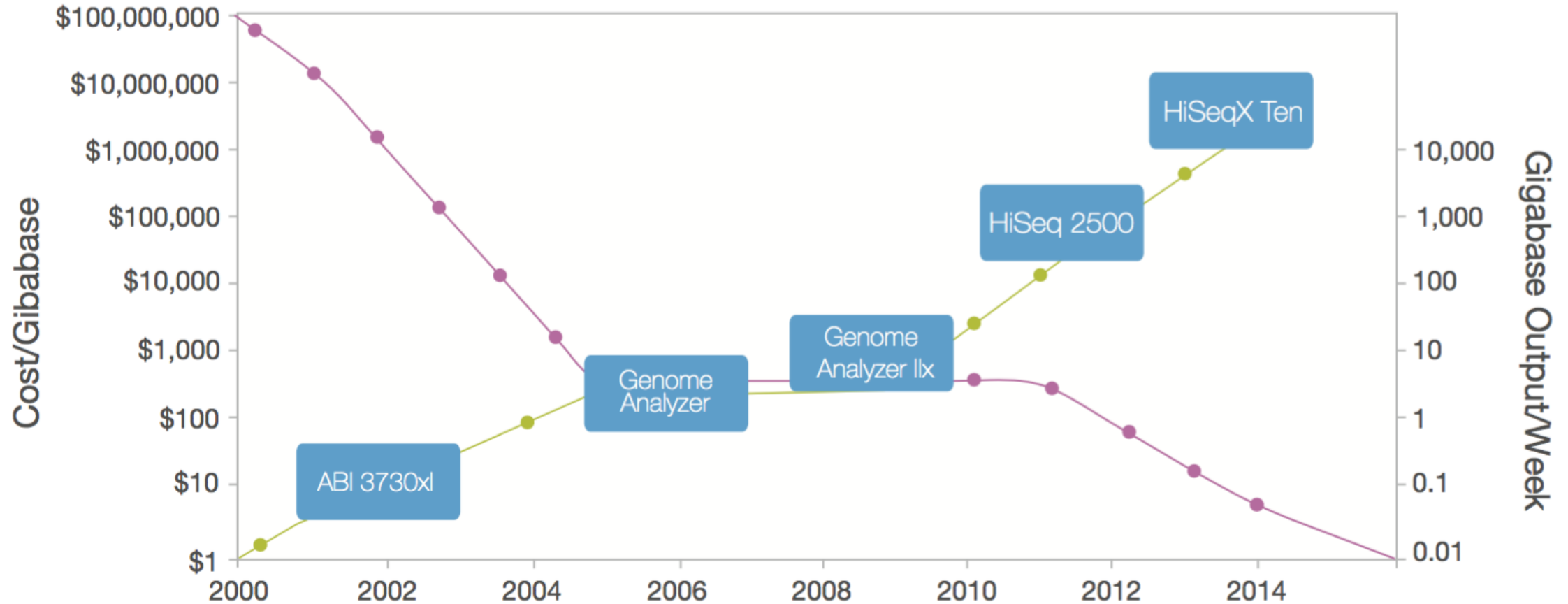
1:45PM Final Q&A

2PM End

Global Next-Generation Sequencing Expenditures

Sequencing Applications by Dollars Spent

Rapid rise in sequencing ability (and drop in cost)

RNA-seq
Differential gene expression analysis → replacing/complimenting microarray
Discovery/quantification of novel genes/RNA species
Differential promoter, UTR, polyA signal analysis
Splicing analysis
Transcriptome assembly
Ribosome footprinting
Analysis of RBP binding to RNA

Whole genome sequencing/resequencing/exome sequencing
Genome assembly (reference or sample/patient-specific)
Identification of mutations/rearrangements in disease
Rapid identification of strain/viruses/metagenomic populations

ChIP-seq/Chromatin analysis
Identification of DNA binding protein genomewide localization
Epigenetics analysis (location of histones/modifications)
Identification of accessible/inaccessible chromatin regions

What is next-generation sequencing?

- Catch-all term for high-throughput DNA sequencing
- Different companies, different technologies, *different uses*

- **Illumina** dominates short read "sequencing by synthesis"
- **Thermo** has short read options with different chemistry
  - 454/Roche and ABI are basically dead…Thermo is hanging in there
- **PacBio** excels at long reads (genome assembly/metagenomics)
- **Oxford Nanopore** does long and short reads with unique set of advantages over others (and disadvantages)

PacBio

- Long reads help assembly of new genomes
- Complete 16S sequencing
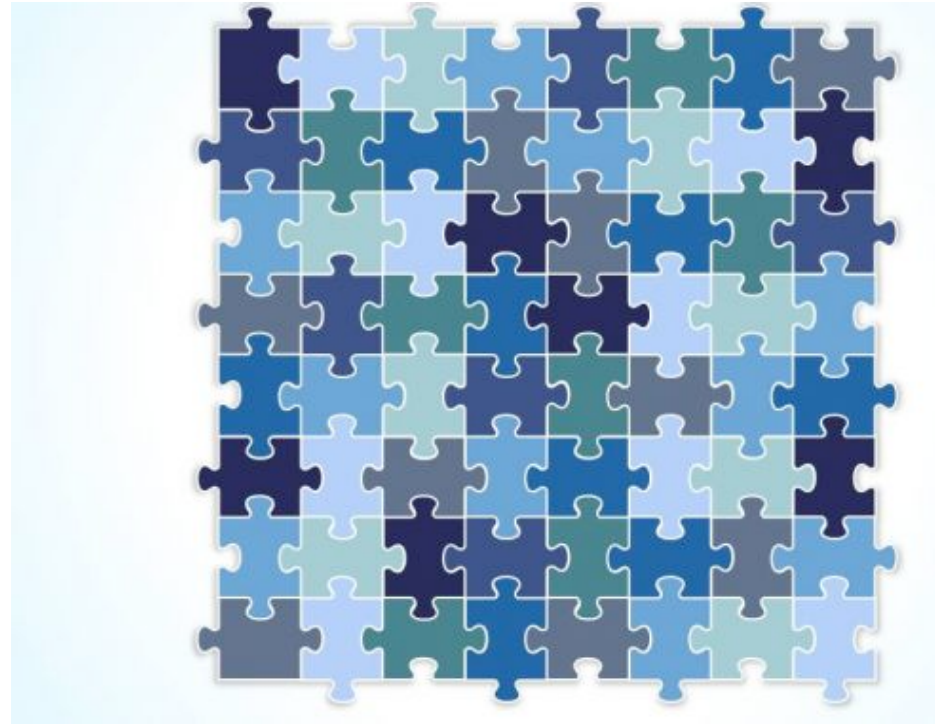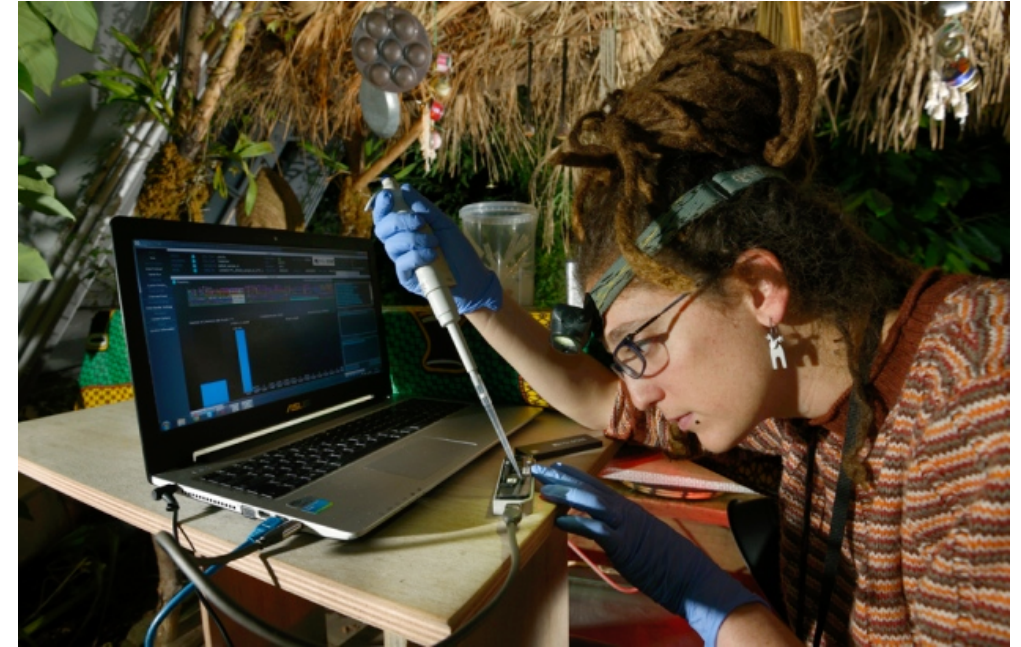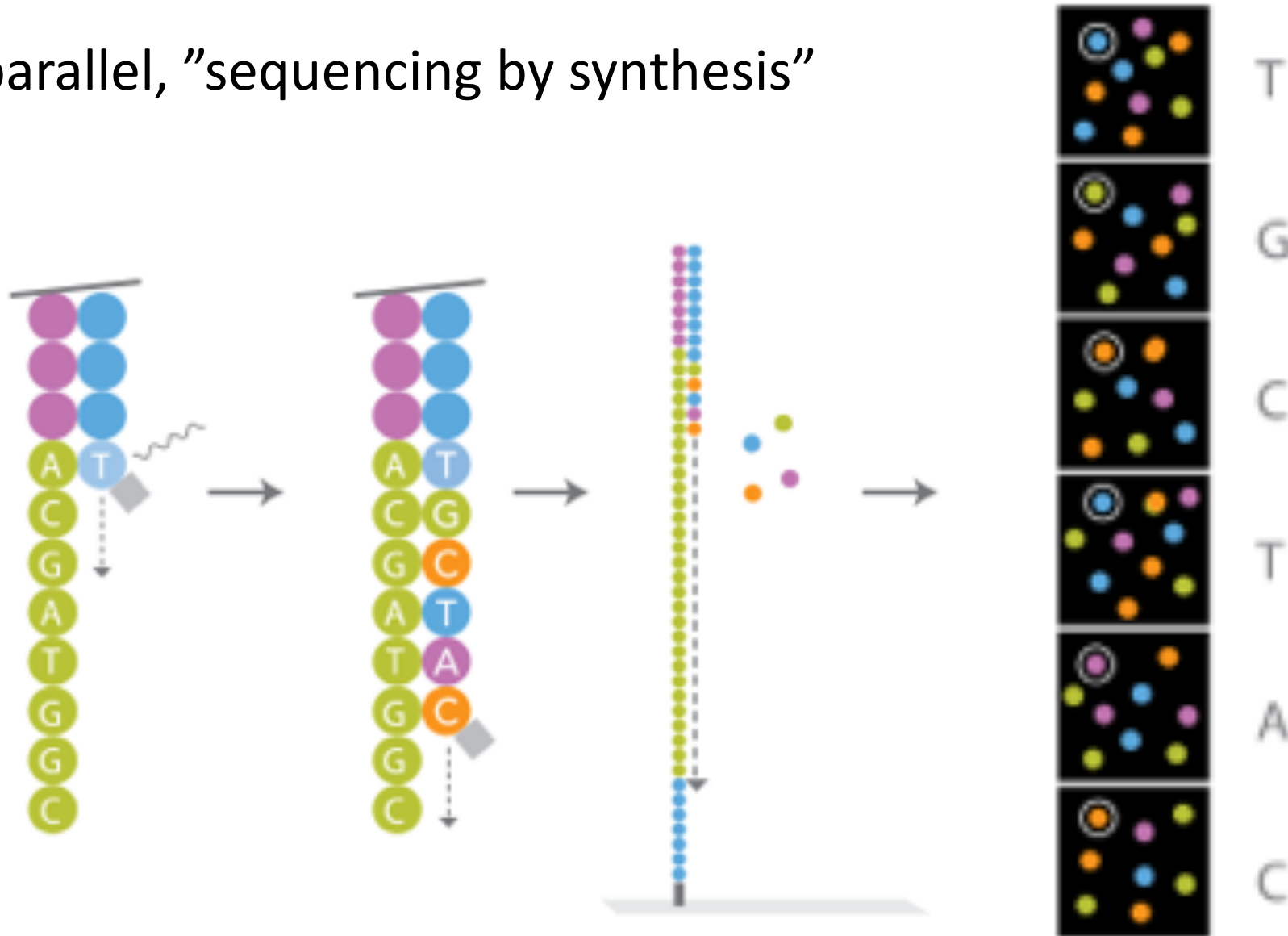

Short reads

Long reads

Oxford Nanopore

- "Unique" nanopore sequencing chemistry
- Mobile, small, short and long reads possible

Illumina

- Highly parallel, "sequencing by synthesis"

For more information

Introduction to Next-Generation Sequencing Technology
www.illumina.com/technology/next-generation-sequencing.html

EMBL-EBI Next-Gen Sequencing Practical Course Online (*Highly recommended!*)
https://www.ebi.ac.uk/training/online/course/ebi-next-generation-sequencing-practical-course

An Introduction to Next-Generation
Sequencing Technology

www.illumina.com/technology/next-generation-sequencing.html

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