10x Genomics Platform

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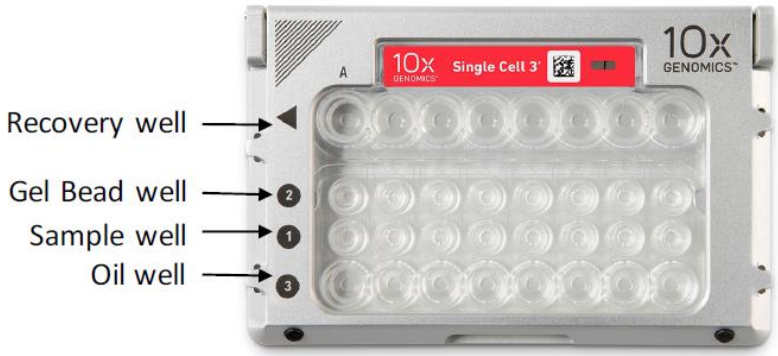
10x Genomics Chromium Controller

Commercial launch early 2016

Microfluidics system for reaction compartmentalization

High throughput, up to 80k cells/run
High capture rate, ~50%

Single-use microfluidics chip



10x Genomics products

Single Cell Genomics

- Copy Number Variation

Single Cell Transcriptomics

- Gene Expression Profiling
- Gene Expression CRISPR Screening (Perturb-Seq)
- Gene & Cell Surface Protein (CITE-seq or Cell Hashing)
- Immune Profiling
- Immune Profiling & Cell Surface Protein
- Immune Profiling & Antigen Specificity

Single Cell Epigenomics

- Chromatin Accessibility (ATAC-seq)

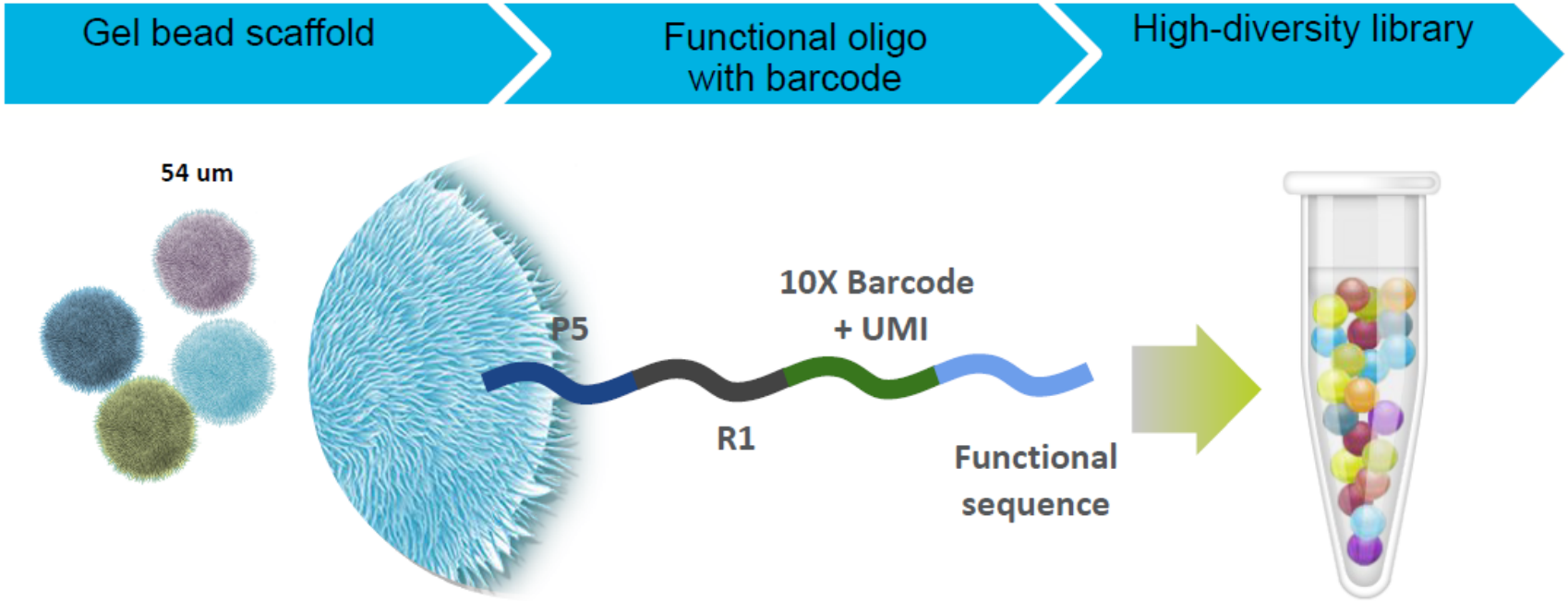
Linked-Reads Genomics

- Whole Genome Sequencing
- Exome Sequencing
- *de novo* Assembly

NEW: Spatial transcriptomics

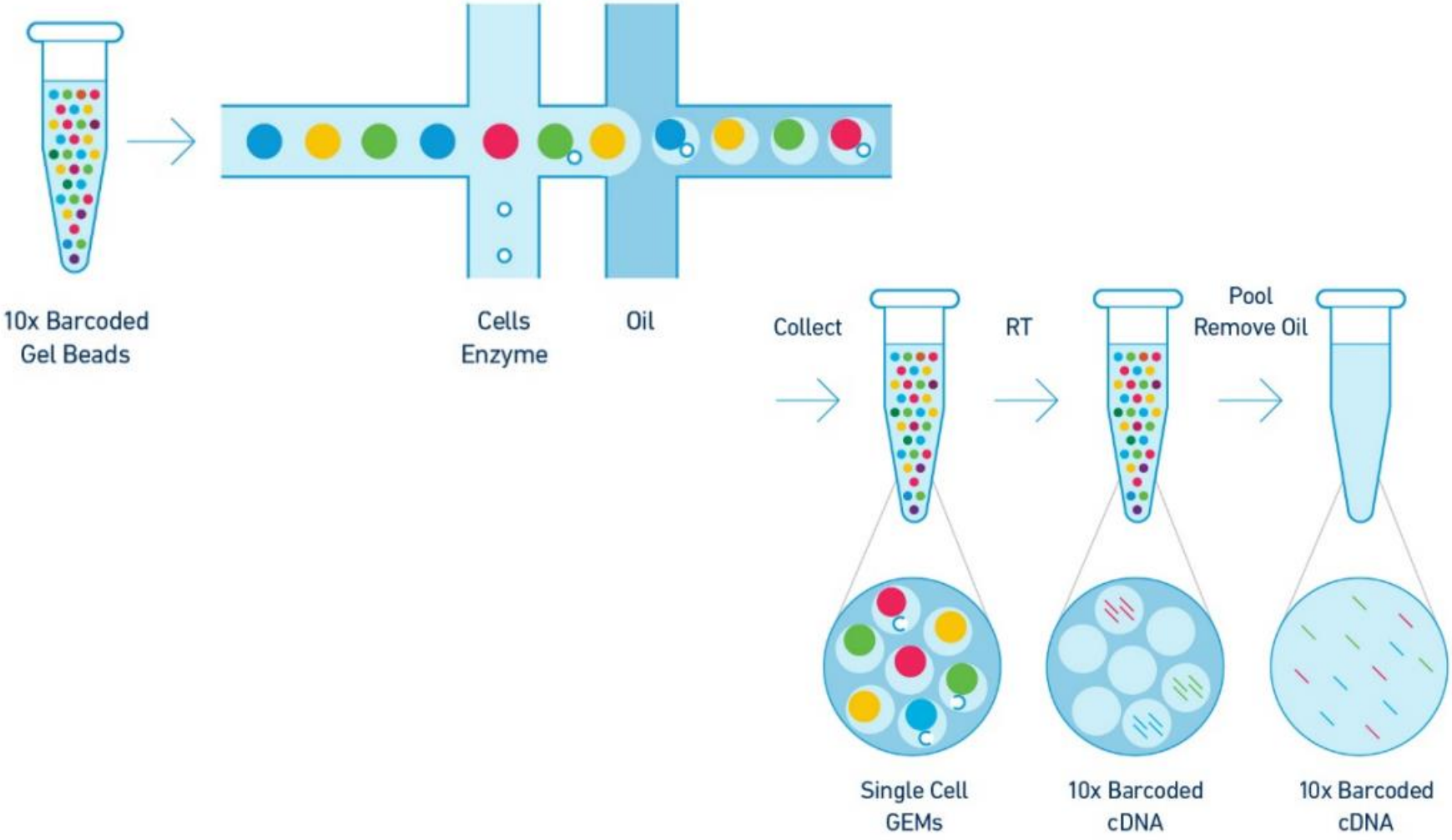
Gel beads up close

4M Discrete Reagents in One Tube

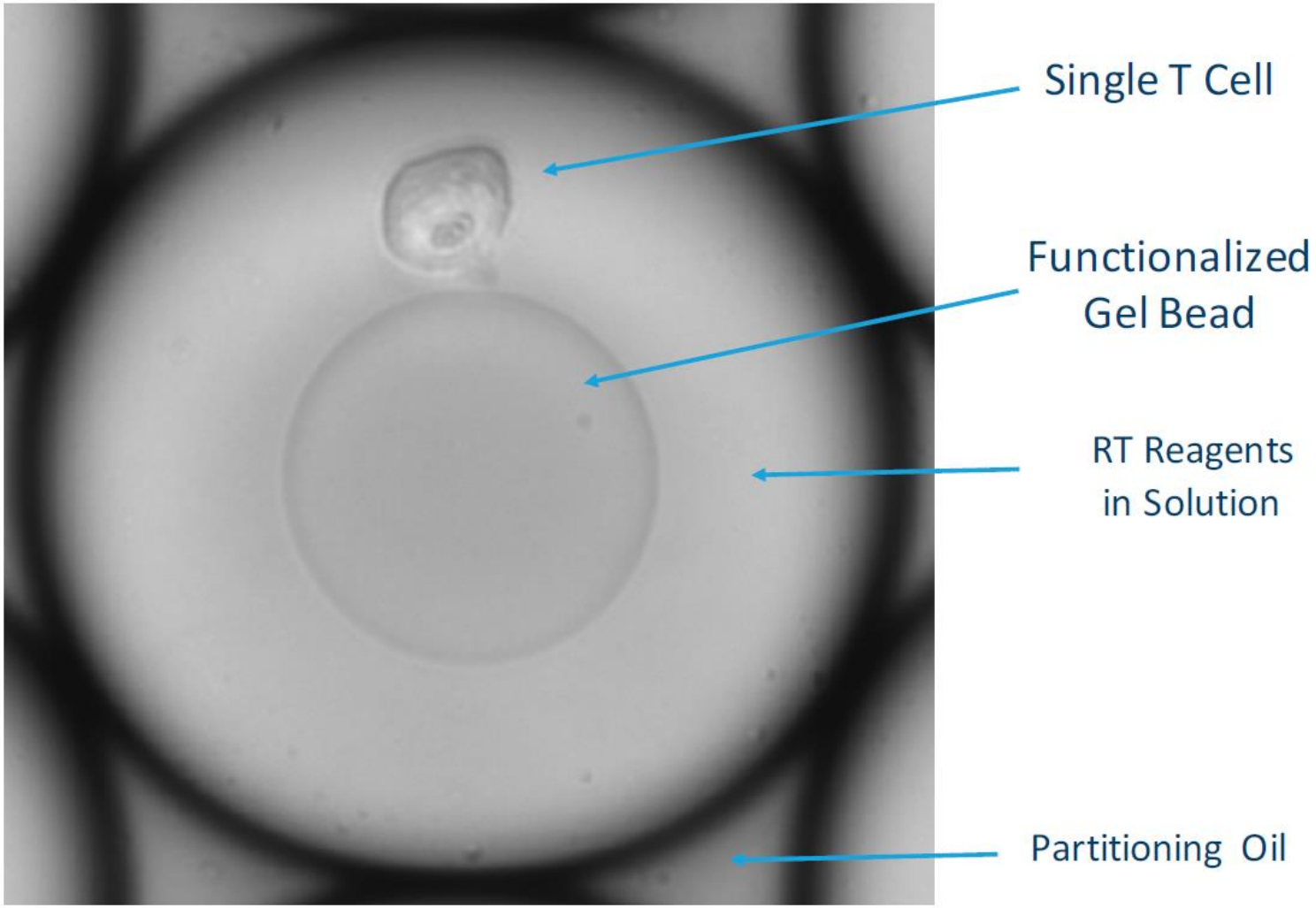


10X Barcode (16bp): unique for each GemBead
+ UMI (10bp): correcting PCR duplicates

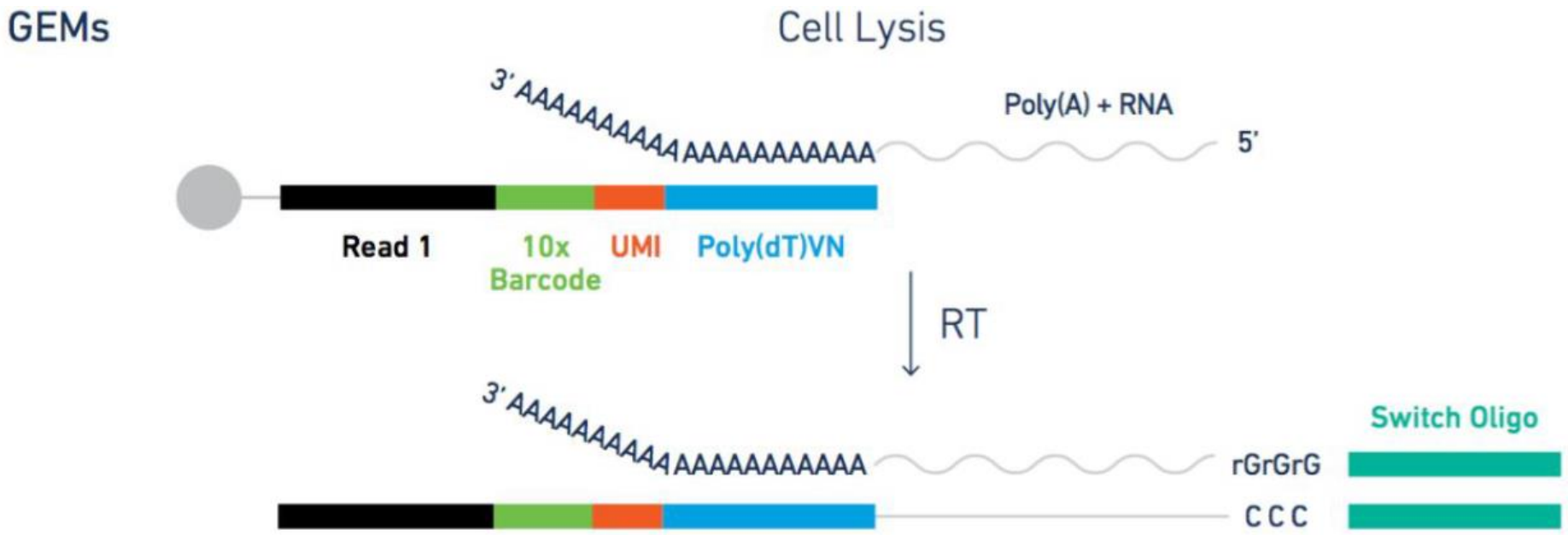
Gel bead in Emulsion (GEM) technology



GEMs up close



Assay scheme for 3’ mRNA sequencing



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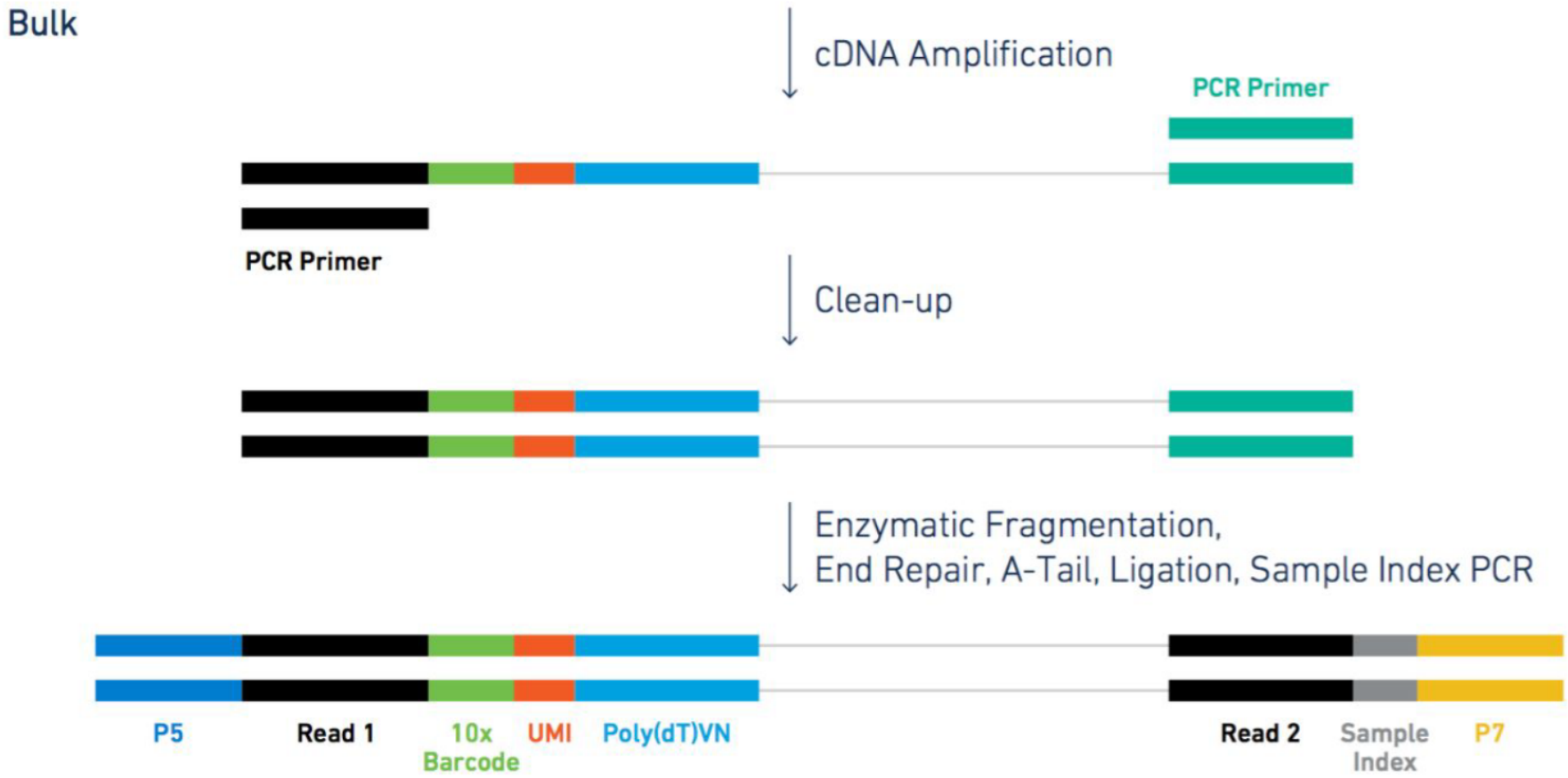
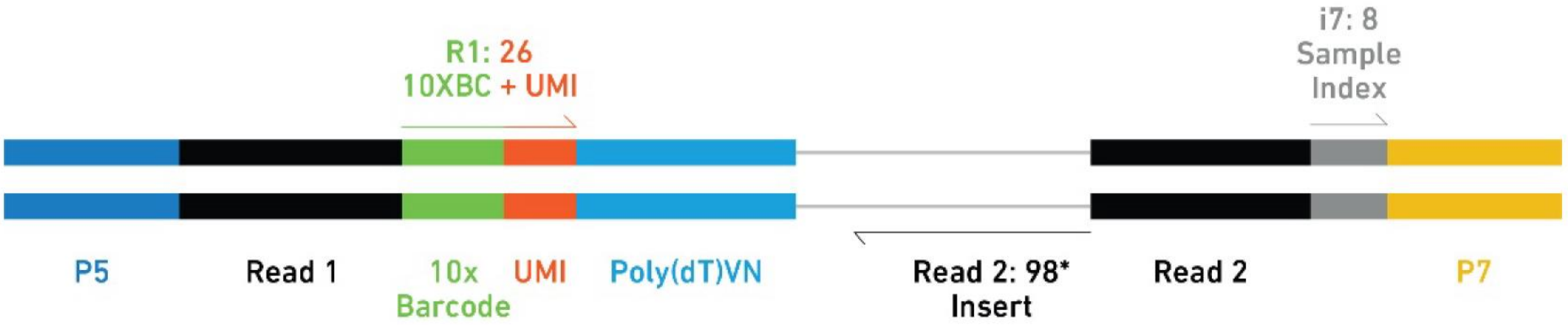
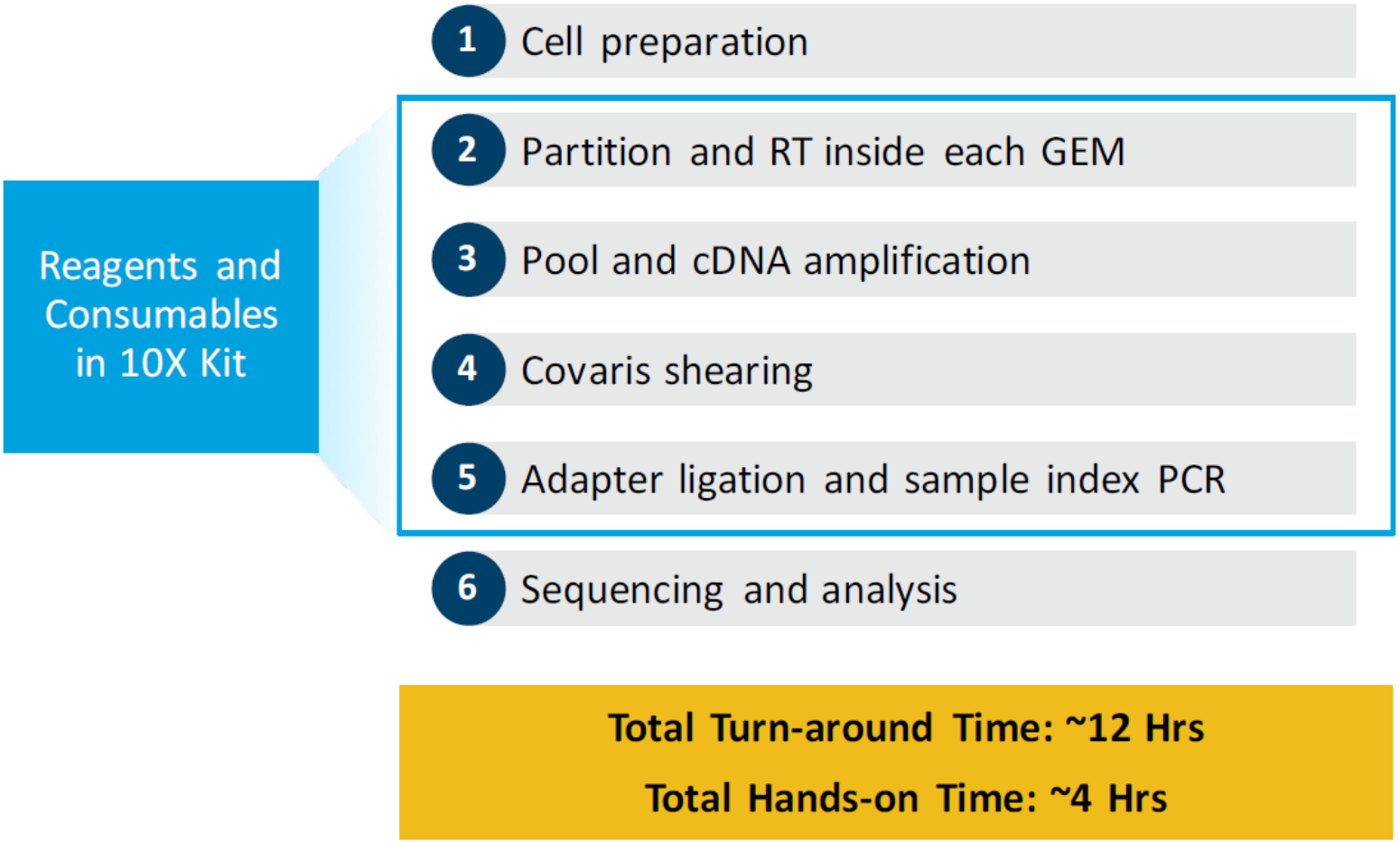


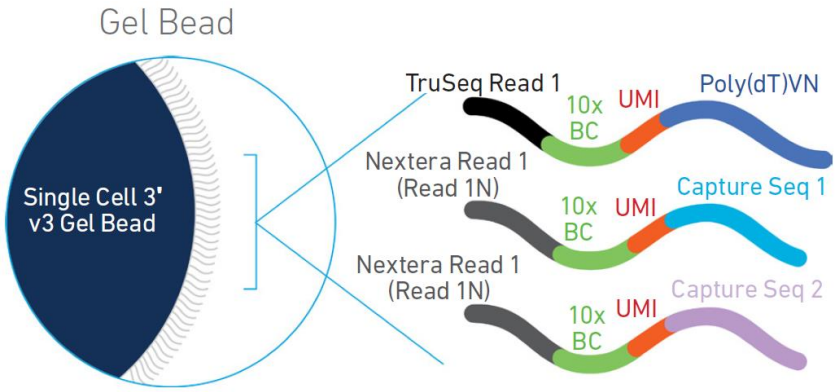
Final library structure

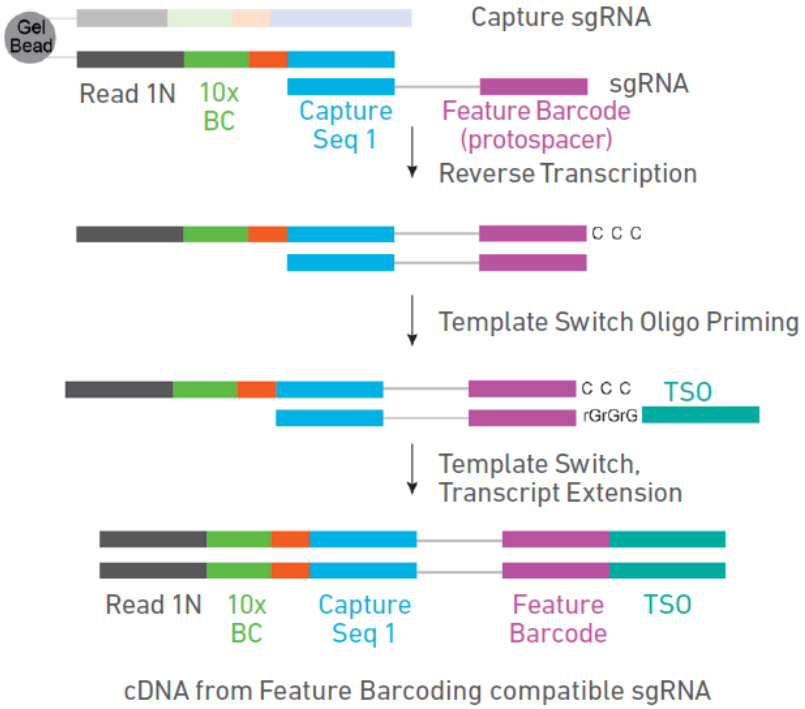


Single cell 3’ end-to-end workflow



Single cell 3’ feature barcoding





Structure of T and B cell receptors

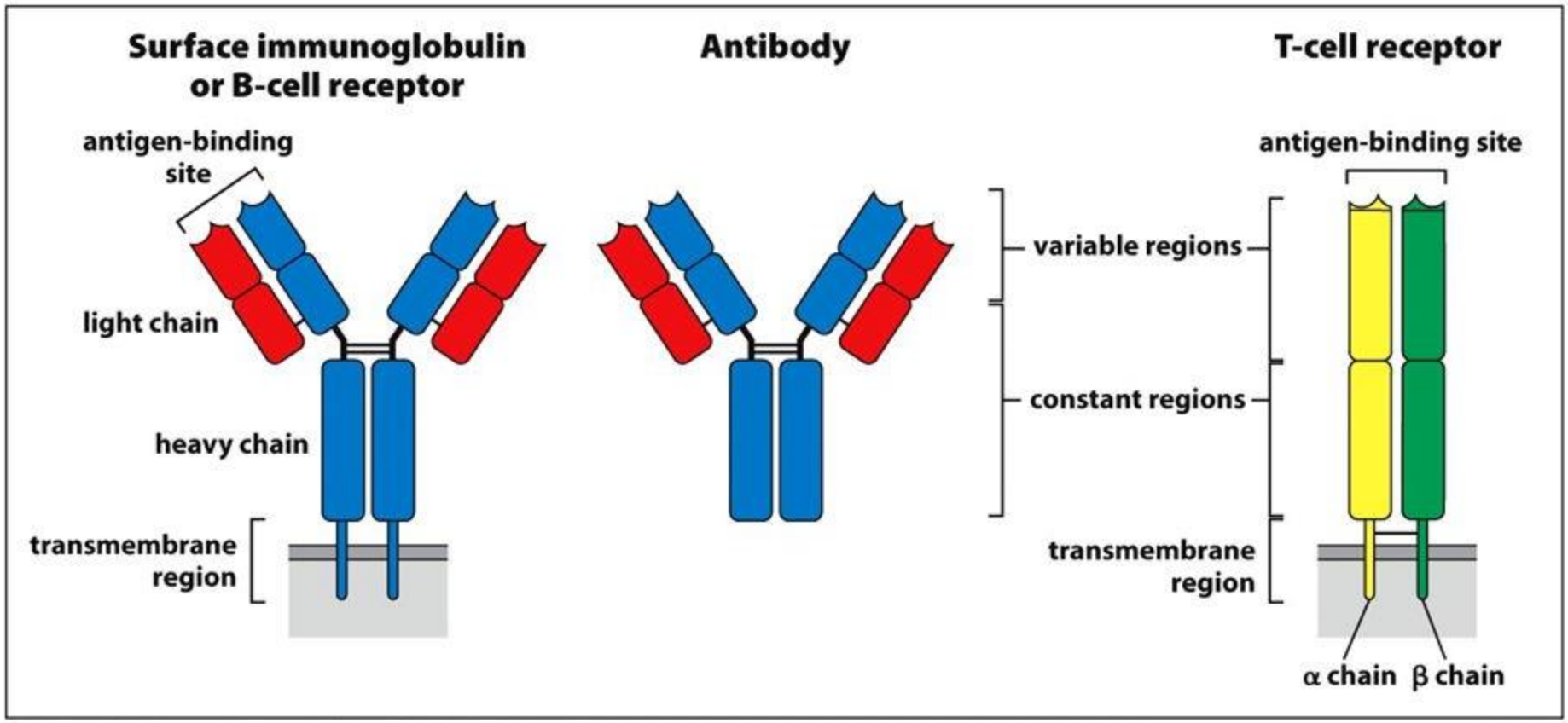
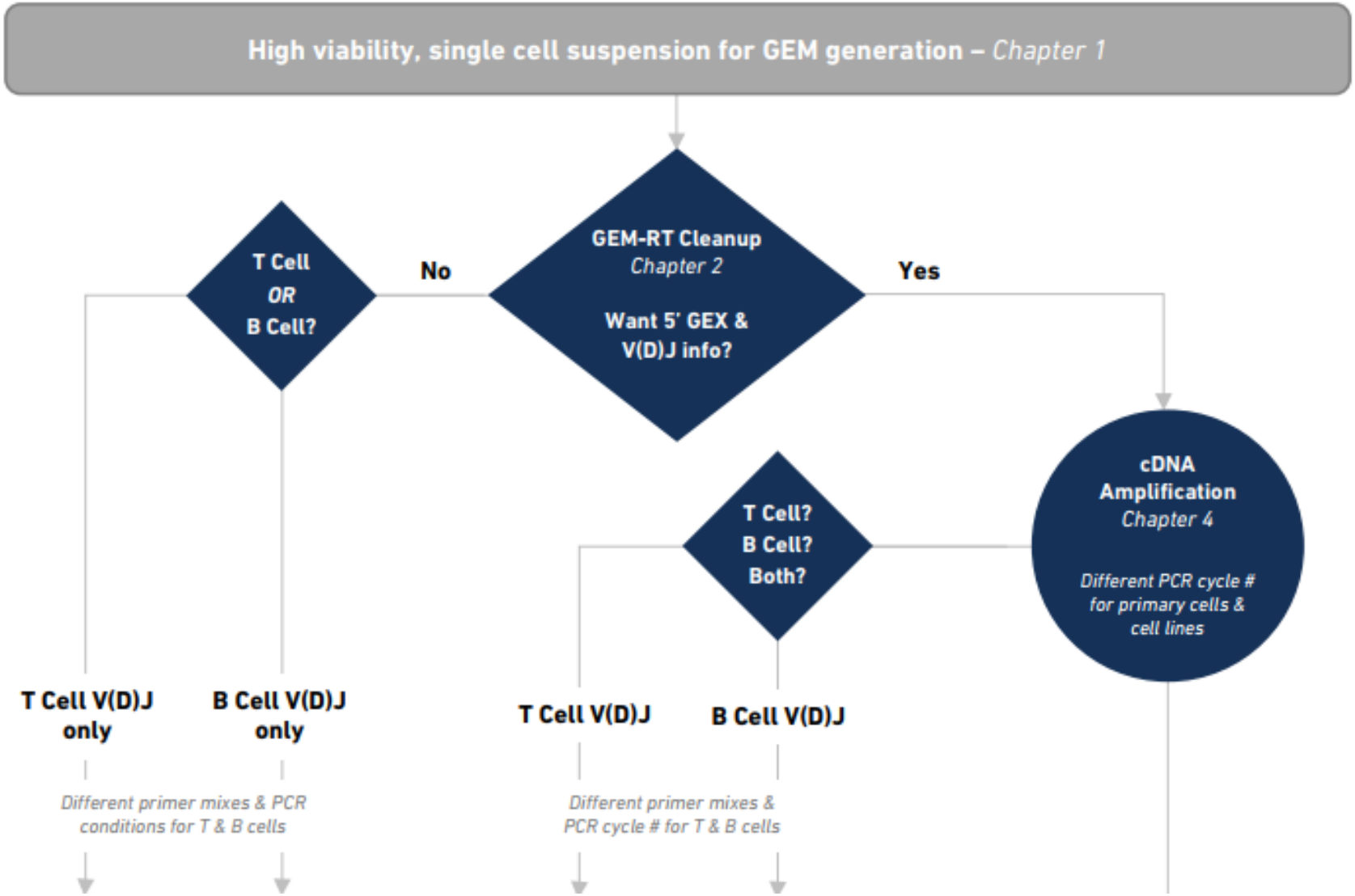


Figure 3.1 The Immune System, 3ed. (© Garland Science 2009)

*More in lecture from Erik and Indu on Thursday

General workflow 5’ + V(D)J single cell sequencing



Gel bead oligos

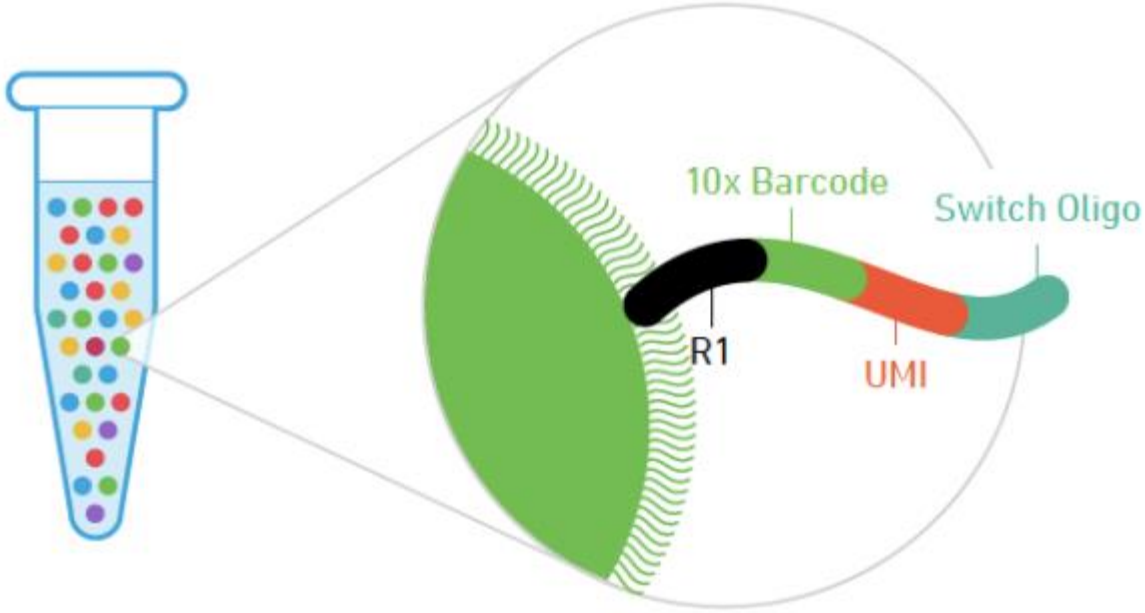
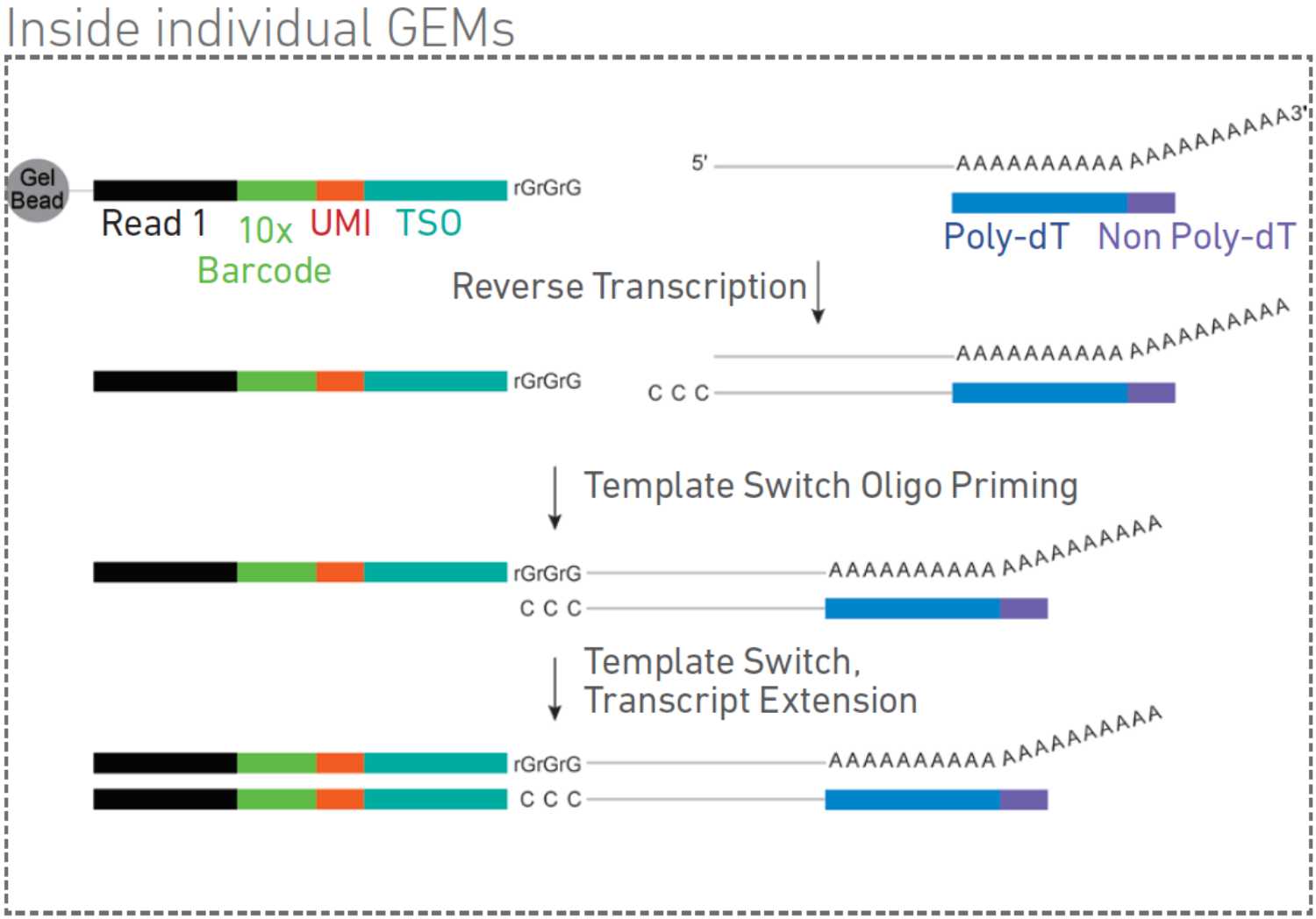


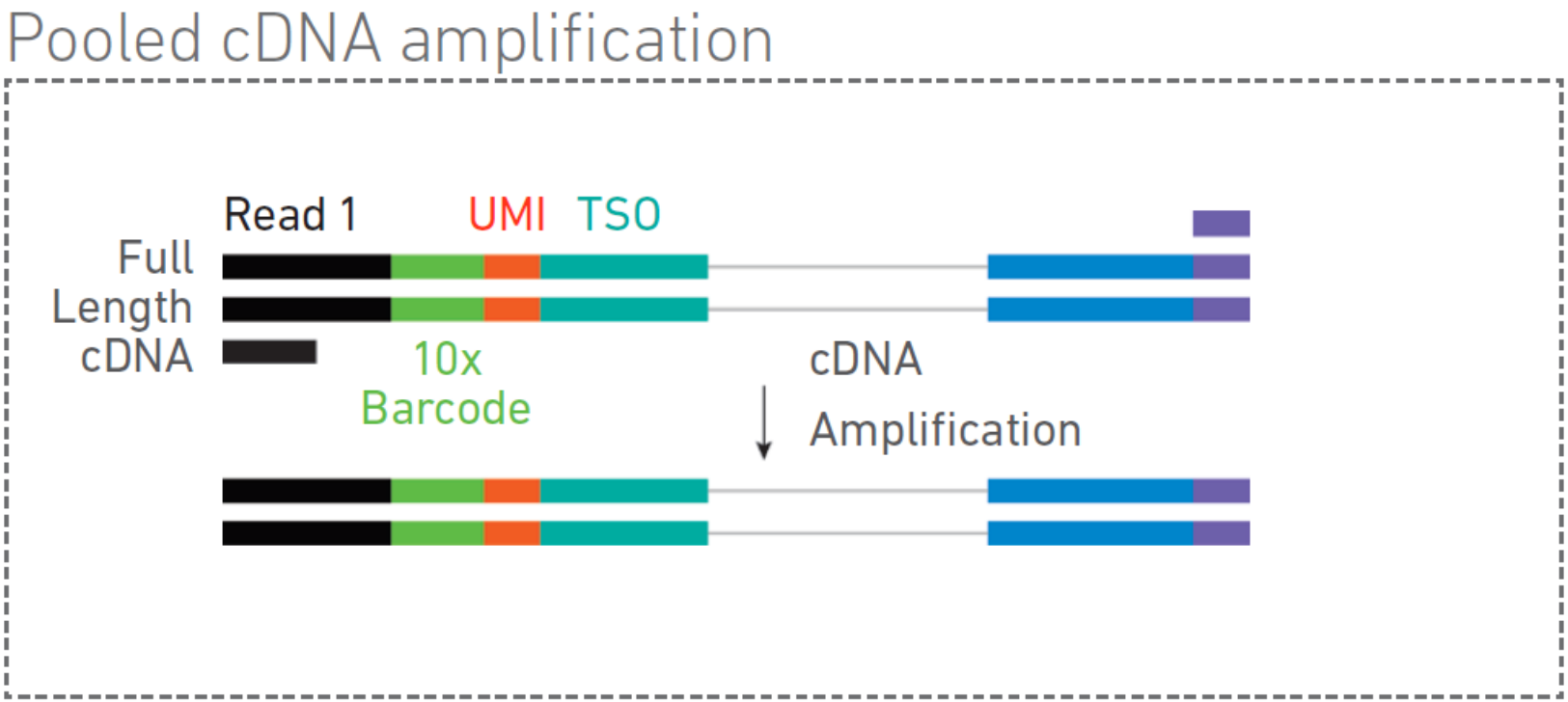
Figure 1. Schematic of a Single Cell 5' Gel Bead oligo primer.

i. Partial Illumina Read 1 Sequence (22 nucleotides (nt))
ii. 16 nt 10x™ Barcode
iii. 10 nt Unique Molecular Identifier (UMI)
iv. 13 nt Switch Oligo

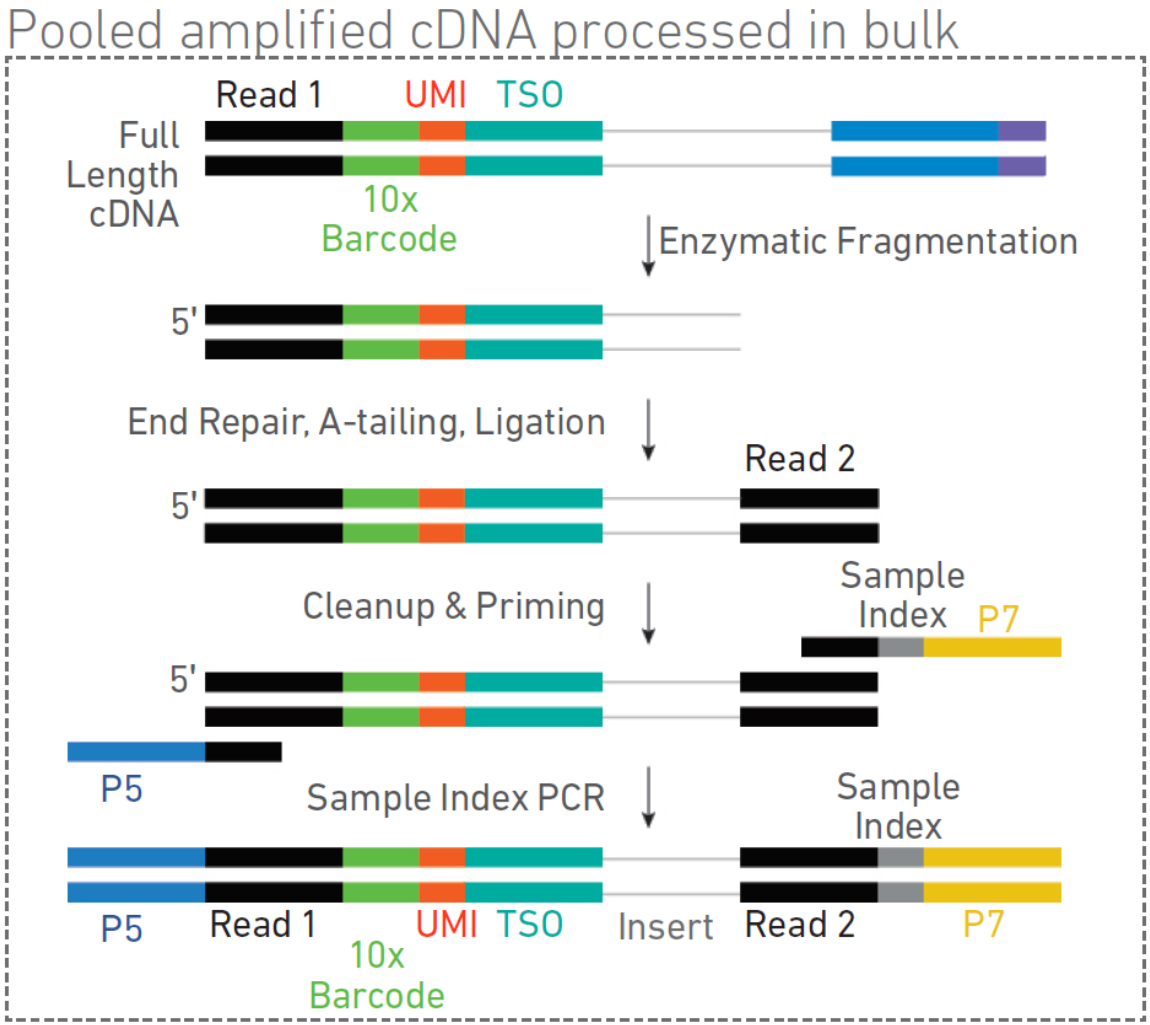
Assay scheme for 5’ scRNA-seq



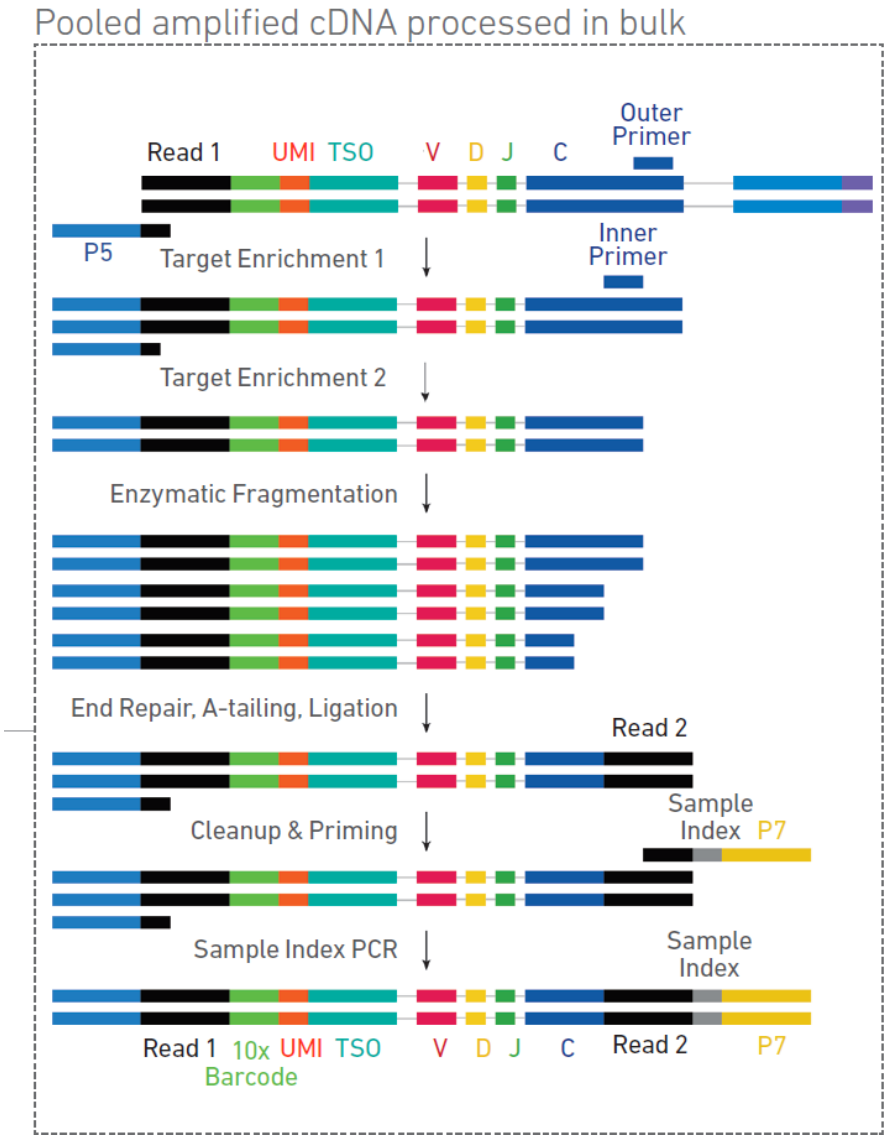
Assay scheme for 5’ scRNA-seq



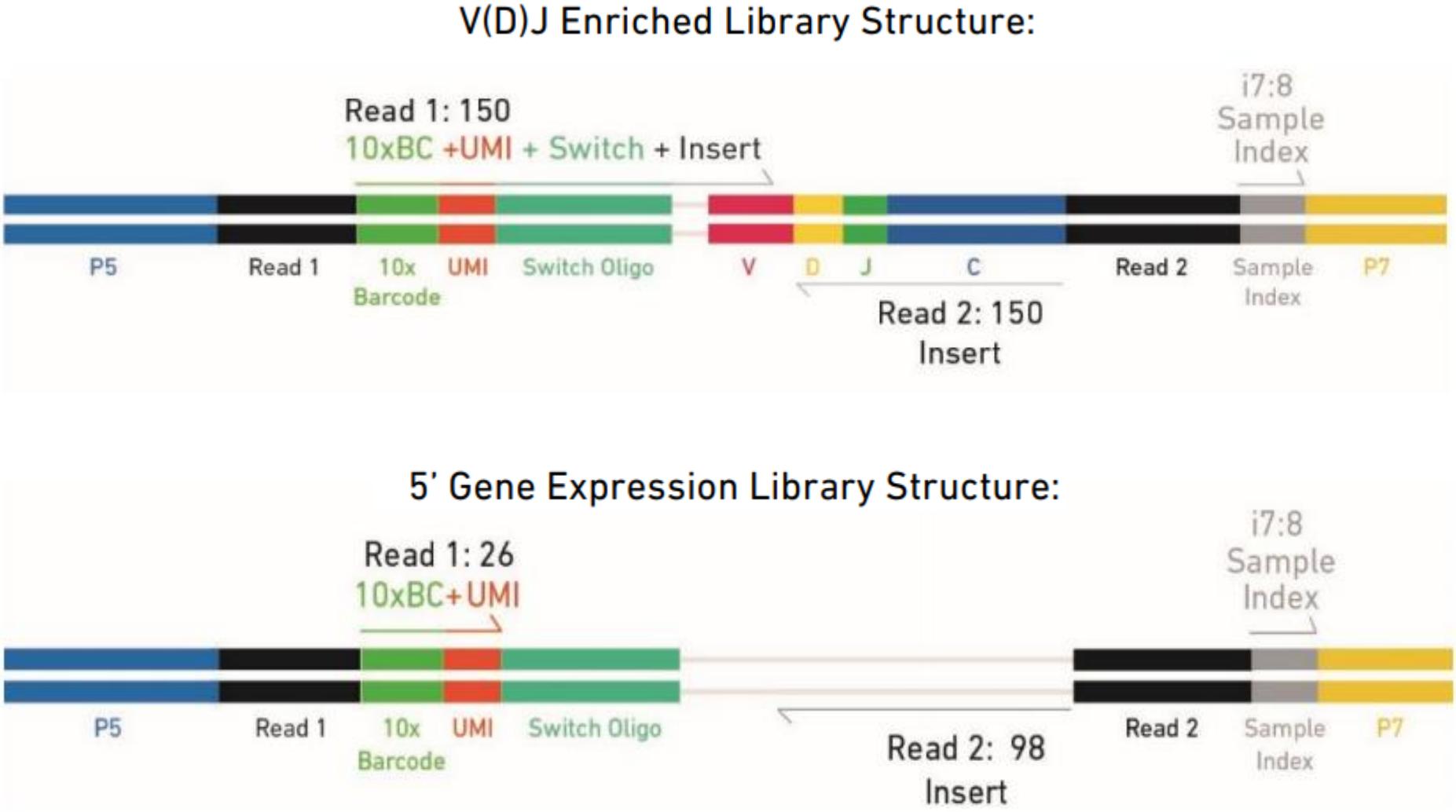
Assay scheme for 5’ scRNA-seq



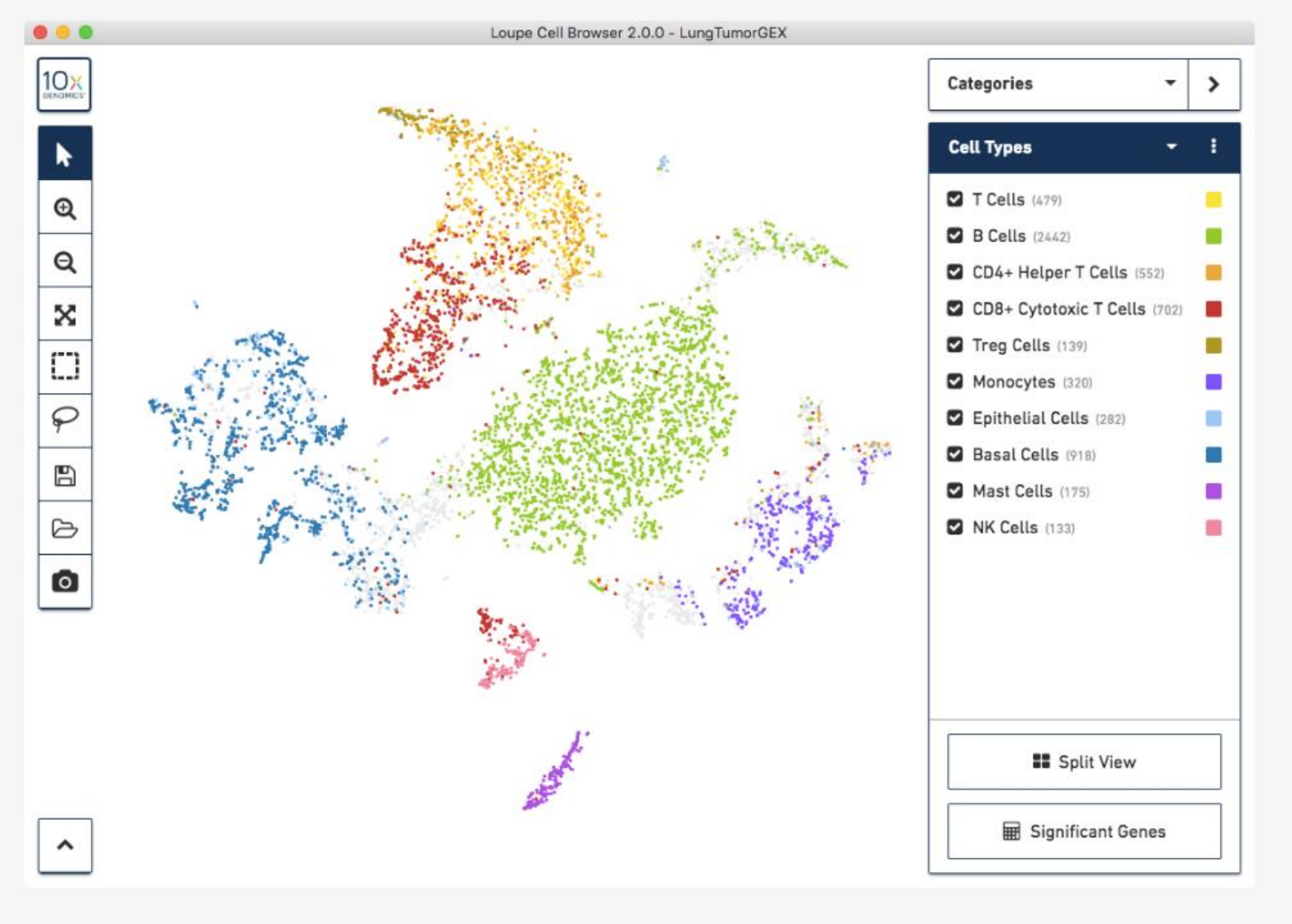
Assay scheme for 5’ VDJ libraries



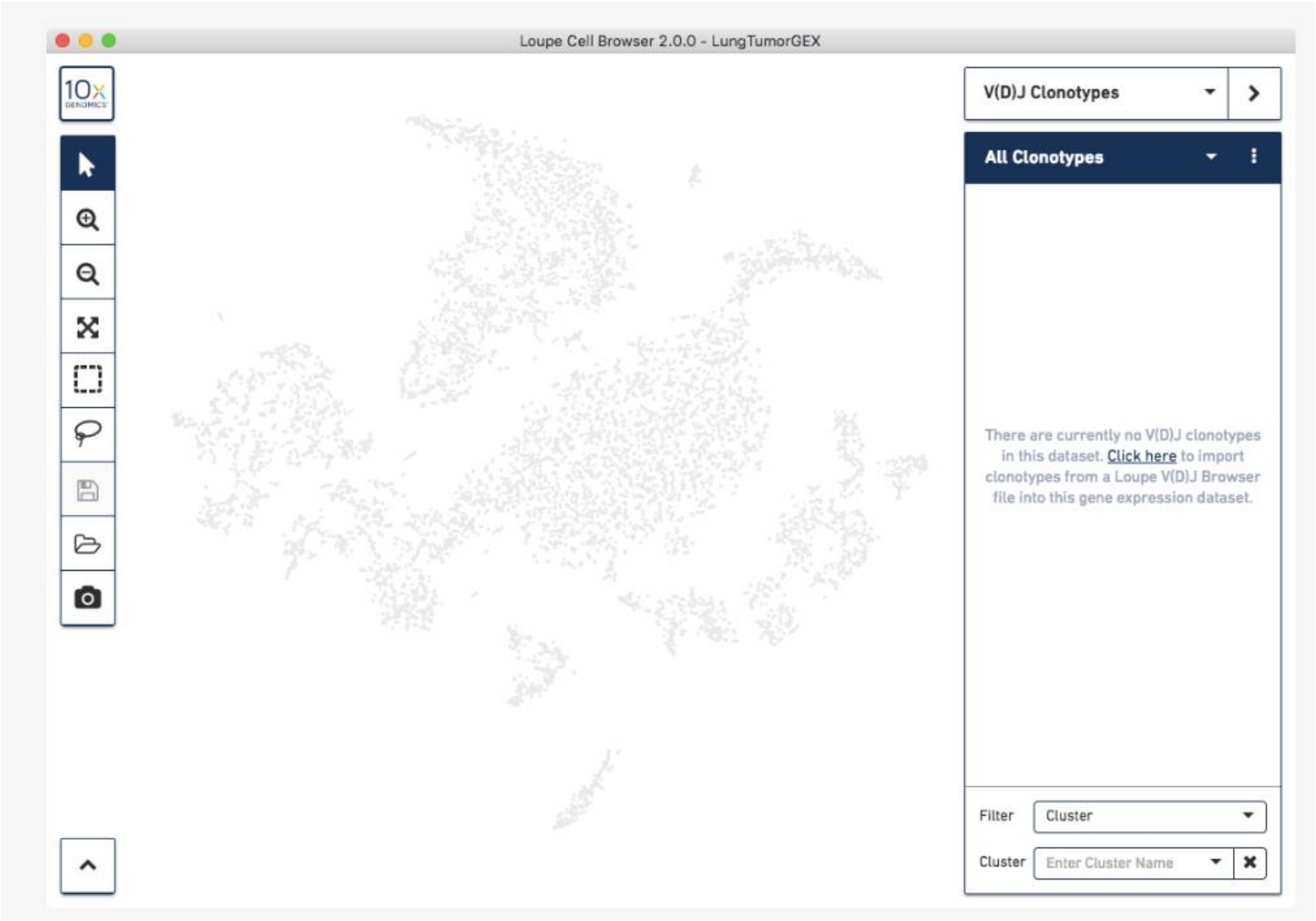
Final library structure



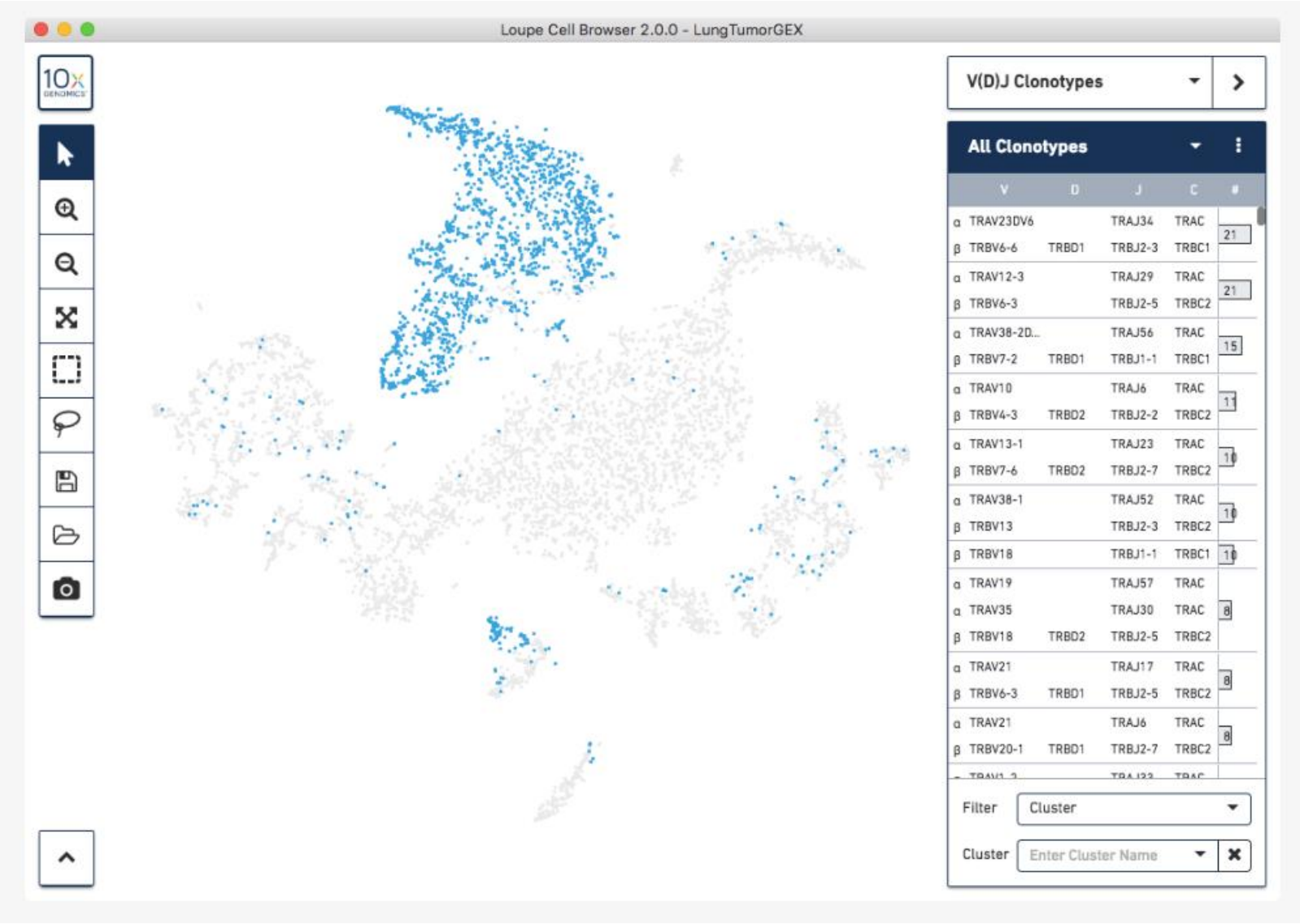
Exploring data using Cell Ranger tools



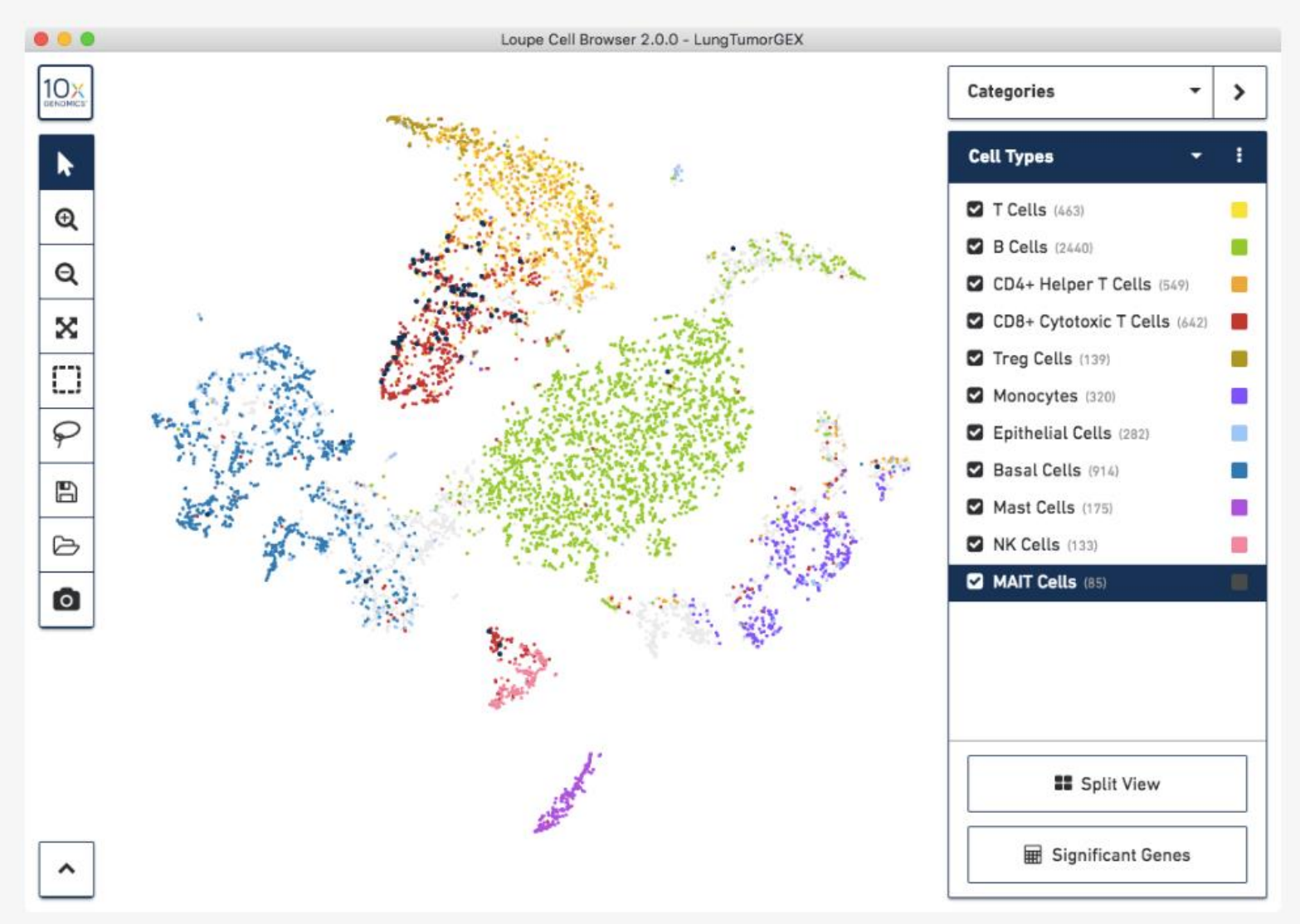
Exploring data continued…



Visualize ALL clonotypes



Combine clonotypes w/gene expression



Cost estimates

Library prep

- With 10,000 cells/reaction: 0.25 EUR/cell
- With 1000 cells/reaction: 2.50 EUR/cell

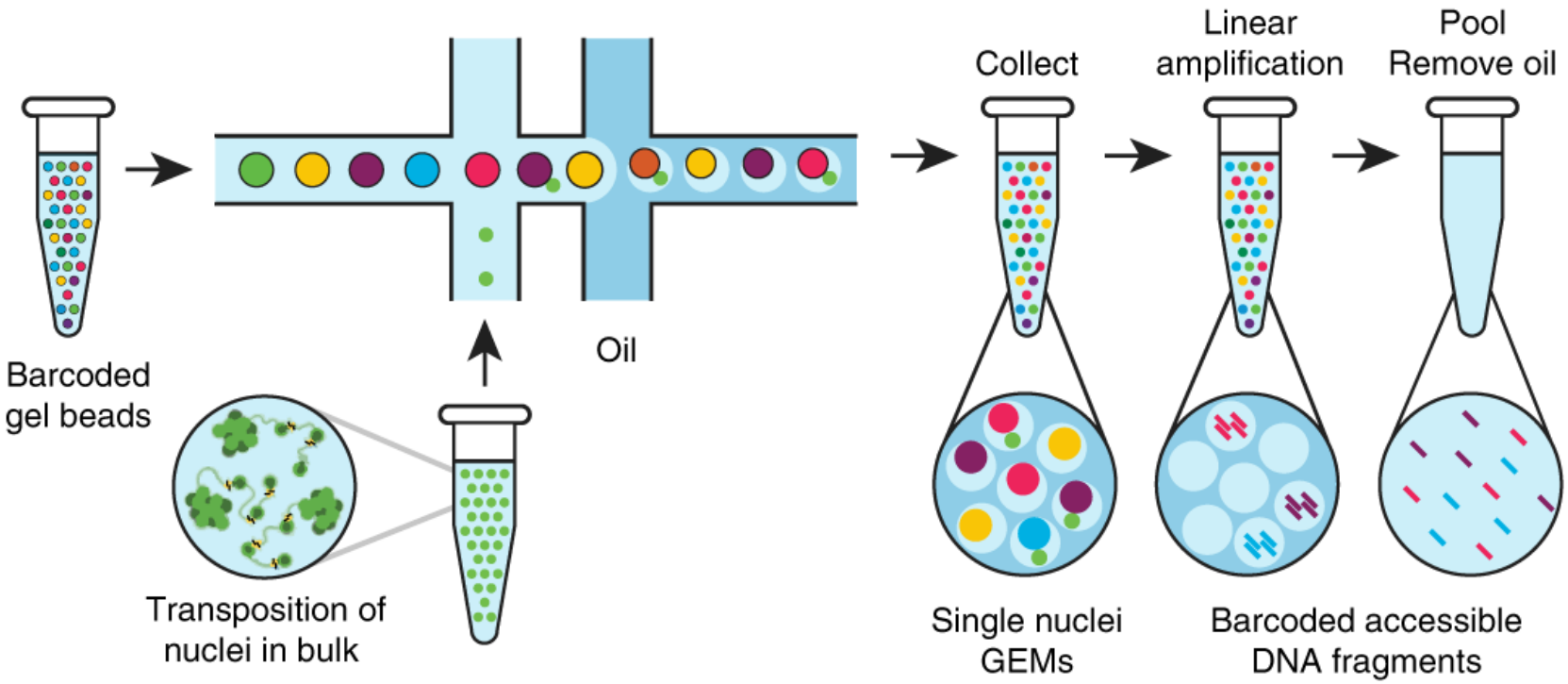
Sequencing 5’ expression @ 25,000 reads/cell:
0.20 EUR/cell

Sequencing BCR @ 2500 reads/cell:
0.02 EUR/cell

Total cost 5’ GEX + BCR sequencing

10,000 cells:	0.47 EUR/cell
1,000 cells:	2.72 EUR/cell

Single-cell ATAC-seq



NEW! Spatial transcriptomics