Introduction to single-cell sequencing and group project

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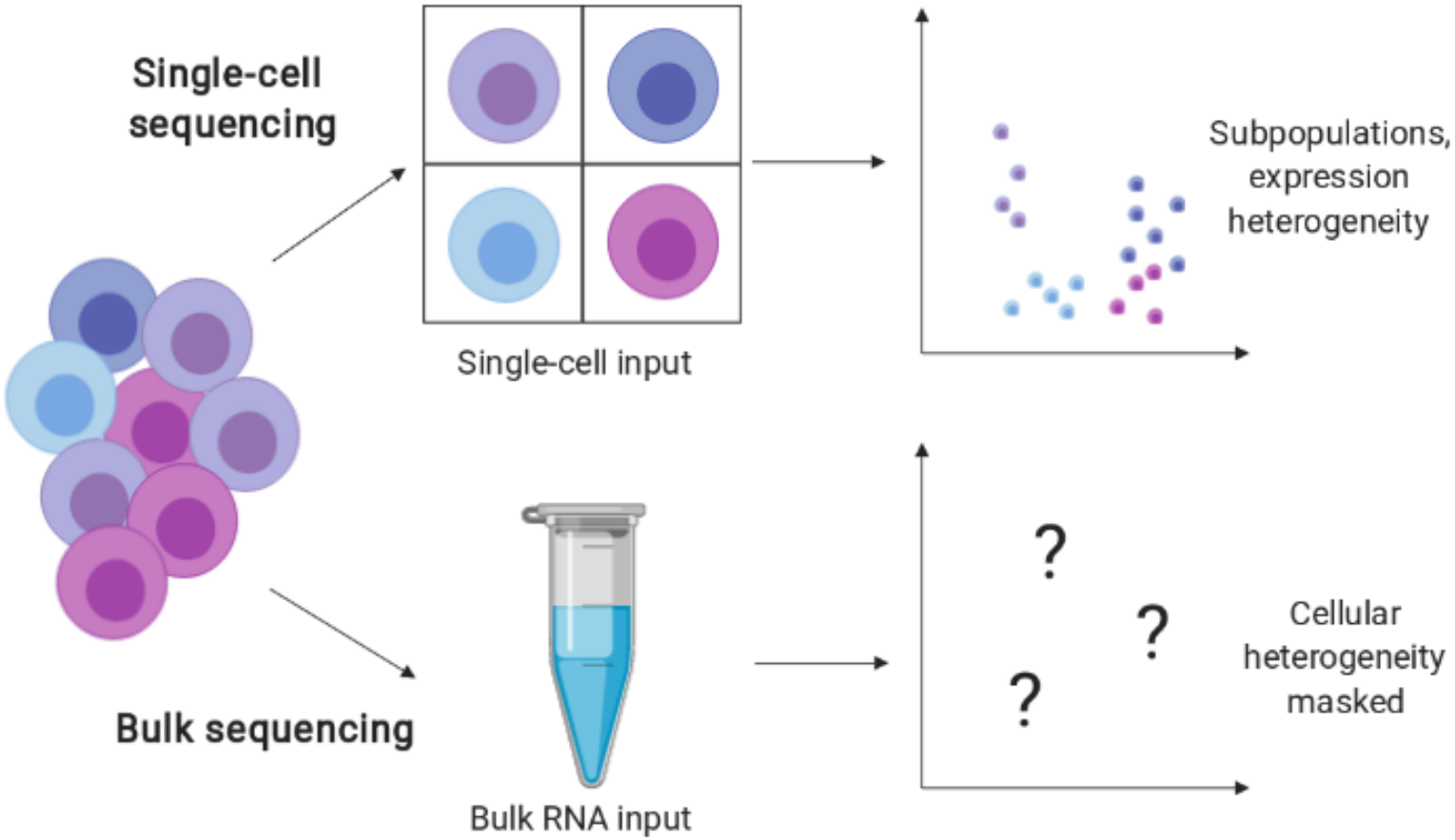
July 23, 2019

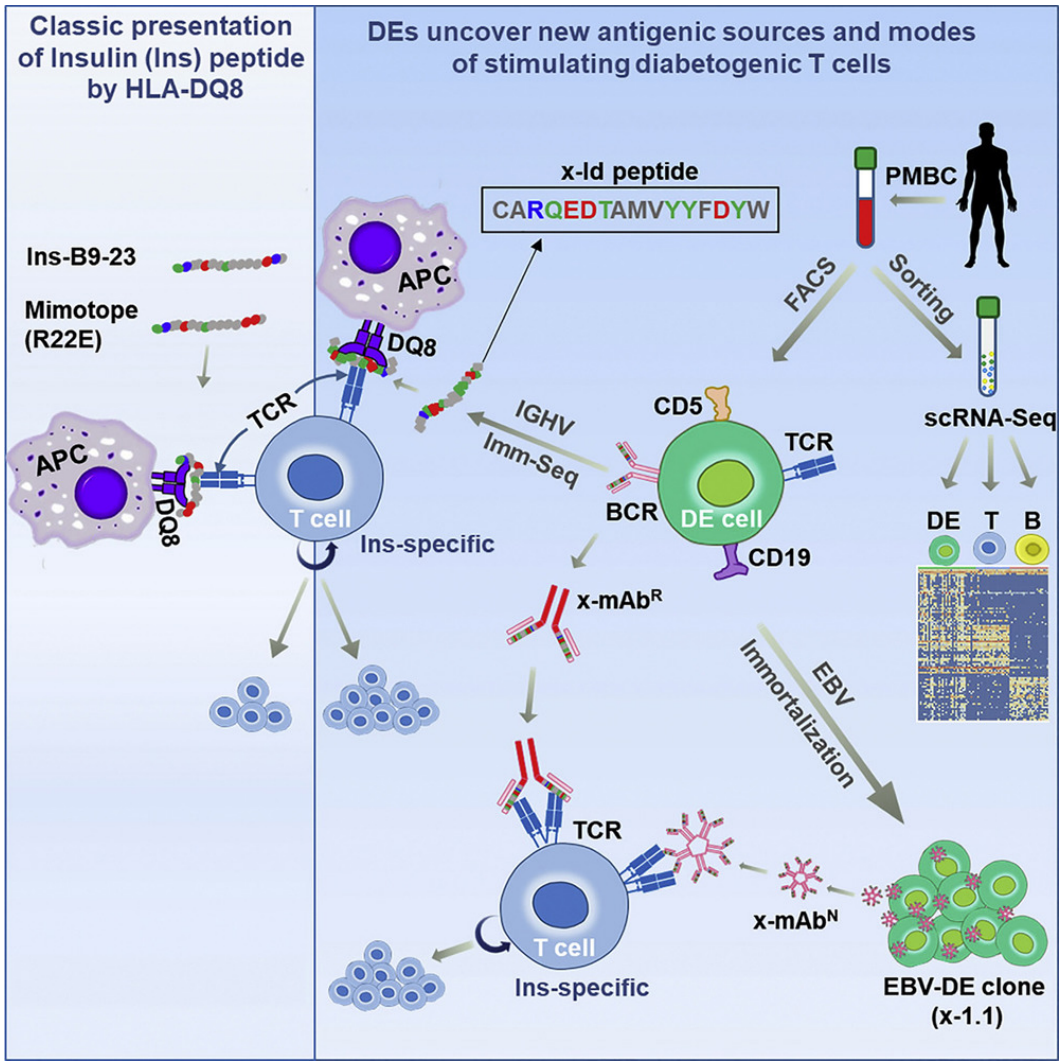
CSAMA 2019, 17th edition

Why do we want to sequence single cells?

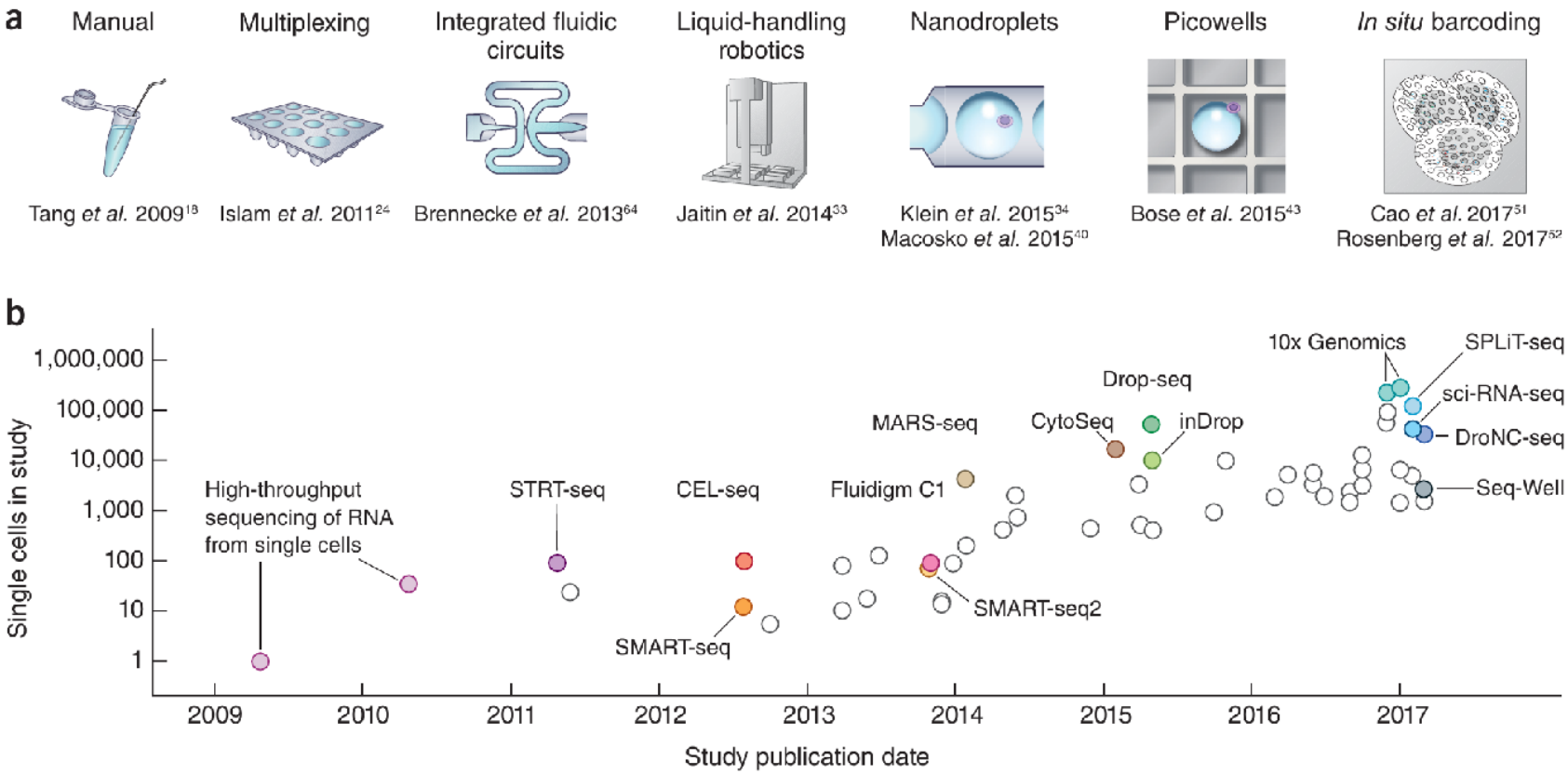


My favourite discovery by single-cell sequencing

A Public BCR Present in a Unique Dual-Receptor-Expressing Lymphocyte from Type 1 Diabetes Patients Encodes a Potent T Cell Autoantigen
Rizwan et al. Cell 2019



Isolation of single cells and sequencing protocols

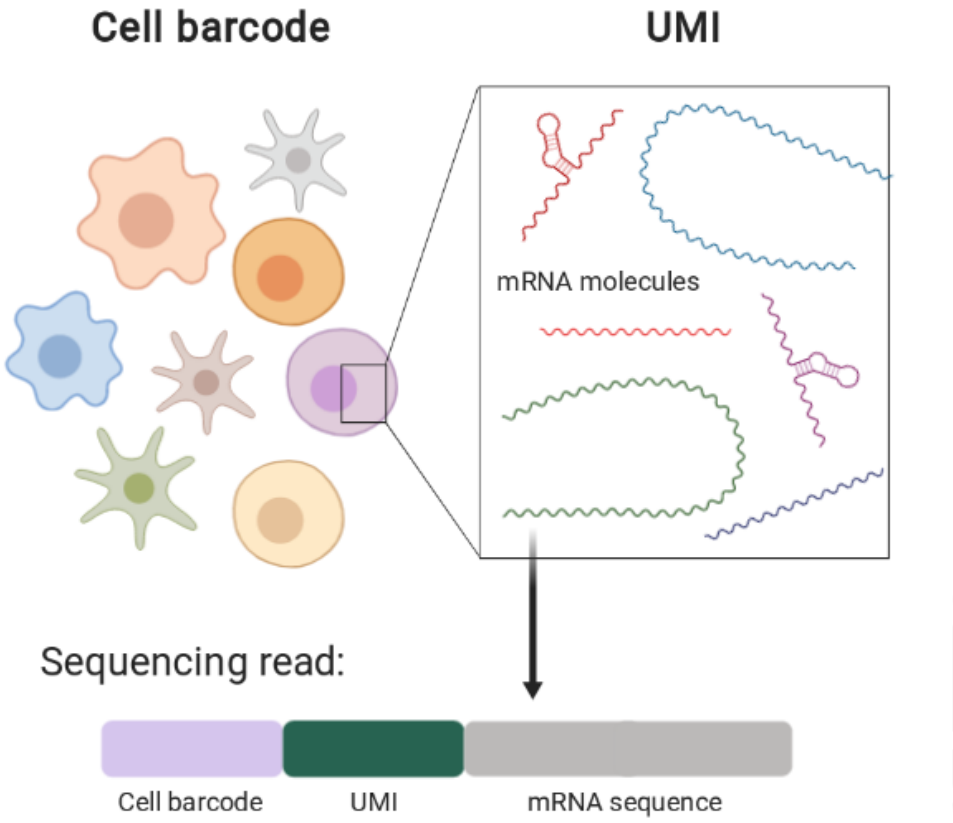


Svensson et al. 2018

Cell barcode and unique molecular identifier (UMI)

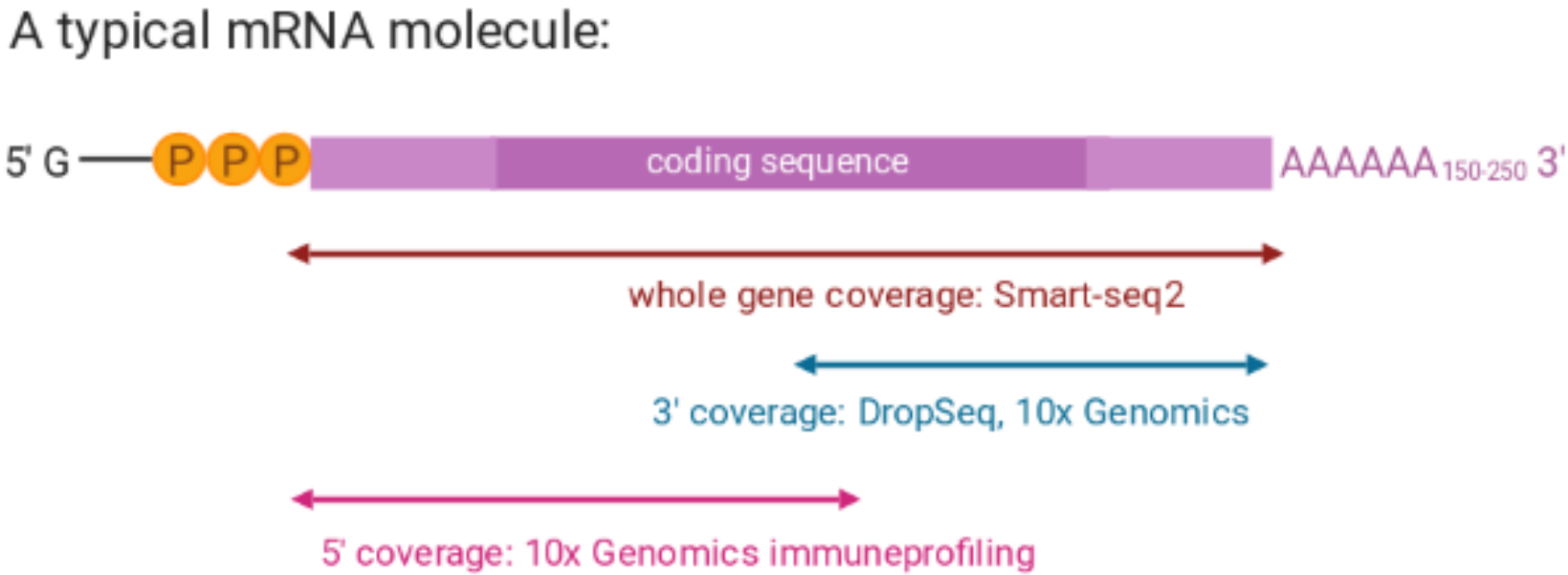
Sequencing data preserves information:

- Which cell did the sequenced transcript belong to? $\rightarrow$ **cell barcode**
- How many times did one transcript get sequenced? $\rightarrow$ **UMI**



Whole gene vs. 3' or 5' sequencing

Depending on the library preparation and sequencing protocols that you are using, you will get different coverage of mRNA molecules.



Overview of single-cell topics during CSAMA

- Wednesday morning: Lectures (Simon Anders, Davide Risso)
- Thursday afternoon: Group work on single-cell sequencing techniques (Katharina Imkeller)
- Friday afternoon: Lab on analysis of single-cell sequencing data (Simon Anders, Davide Risso)

Group project: Understanding the technical aspects of single-cell sequencing

Aims of the workshop

- Understand the molecular biotechnology behind single-cell sequencing.
- How do we get from mRNA molecule to sequencing read?
- Which method to choose for a specific question?
- Why do we model the data differently for different sequencing approaches?

- 4 groups, 4-6 participants per group
- Group work during **Thursday lab, 13h30-16h30**.
- Presentation of results to the whole course on **Friday, 13h30**.
- Please register on the list at front desk (limited space)!

The material for the group project is here...
https://github.com/Bioconductor/CSAMA/tree/2019/lab/group_project_scseq

GROUPS

- SMART-seq2
- Drop-seq and 10x Genomics $3'$
- 10x Genomics $5'$ including VDJ sequencing
- SPLiT-seq