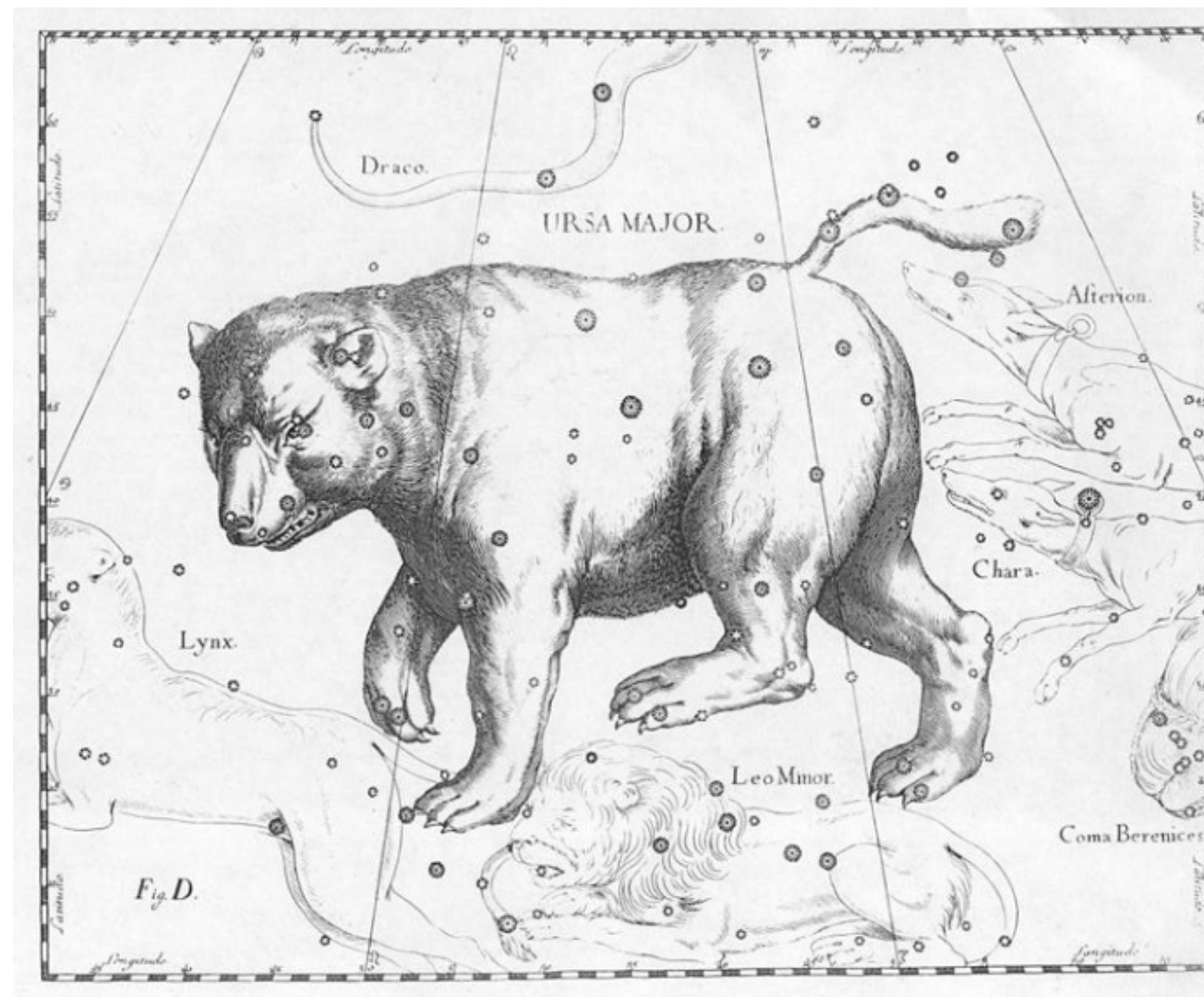# kallisto-sleuth workshop

UC Berkeley
October 24, 2016

Acknowledgments

- **Github contributors / User community / Application developers**
  - https://groups.google.com/forum/#!forum/kallisto-sleuth-users
- Nicolas Bray
- Shannon Hateley
- Daniel Li
- Páll Melsted
- Vasilis Ntranos
- Harold Pimentel
- Suzette Puente
- Lorian Schaeffer
- Pascal Sturmfels
- Alex Tseng

Schedule

- 1:15 — 1:45   Introduction to pseudoalignment

- 1:45 — 2:15   kallisto demonstration
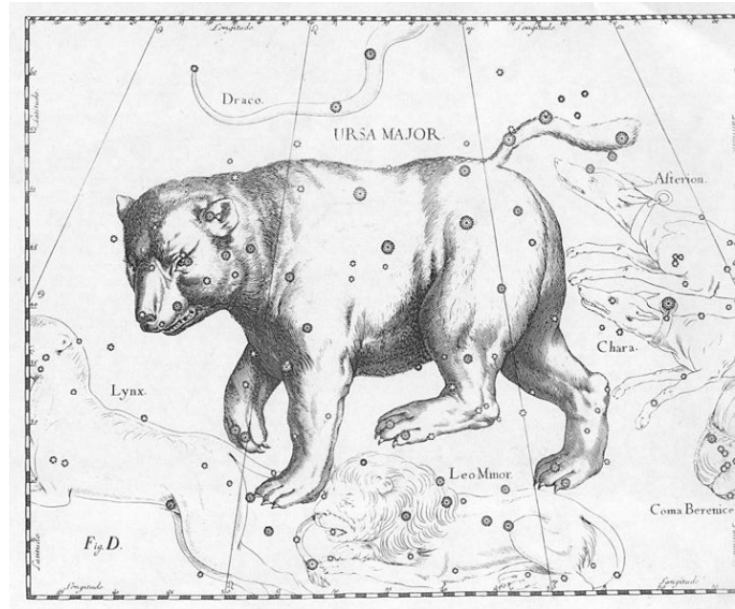
- 2:30 — 3:30   sleuth demonstration

- 3:30 — 4:00   Single-cell RNA-Seq with kallisto

kallisto-sleuth project

kallisto quantification

sleuth analysis

The Lair

http://pachterlab.github.io/lair/

Authors	Title	Journal	Date	Transcriptome	
Ellahi, A., Thurtle, D. M., Rine, J.	The Chromatin and Transcriptional Landscape of Native Saccharomyces cerevisiae Telomeres and Subtelomeric Domains	Genetics	2015-6-1 print	Saccharomyces cerevisiae	Analysis
Eswaran, Jeyanthy, Cyanam, Dinesh, Mudvari, Prakriti, Reddy, Sirigiri Divijendra Natha, Pakala, Suresh B., Nair, Sujit S., Florea, Liliana, Fuqua, Suzanne A. W., Godbole, Sucheta, Kumar, Rakesh	Transcriptomic landscape of breast cancers through mRNA sequencing	Sci. Rep.	2015-10-29 indexed	Homo sapiens	Analysis
Ferreira, Todd, Wilson, Sarah R., Choi, Yoon Gi, Risso, Davide, Dudoit, Sandrine, Speed, Terence P., Ngai, John	Silencing of Odorant Receptor Genes by G Protein βγ Signaling Ensures the Expression of One Odorant Receptor per Olfactory Sensory Neuron	Neuron	2014-2 print	Danio rerio	Analysis
Ng, Shi-Yan, Soh, Boon Seng, Rodriguez-Muela, Natalia, Hendrickson, David G., Price, Feodor, Rinn, John L., Rubin, Lee L.	Genome-wide RNA-Seq of Human Motor Neurons Implicates Selective ER Stress Activation in Spinal Muscular Atrophy	Cell Stem Cell	2015-11 print	Homo sapiens	Analysis
Nikaido, M., Noguchi, H., Nishihara, H., Toyoda, A., Suzuki, Y., Kajitani, R., Suzuki, H., Okuno, M., Aibara, M., Ngatunga, B. P., et al.	Coelacanth genomes reveal signatures for evolutionary transition from water to land	Genome Research	2013-10-1 print	Latimeria chalumnae	Analysis

Example 1

Latimeria chalumnae

Coelacanth
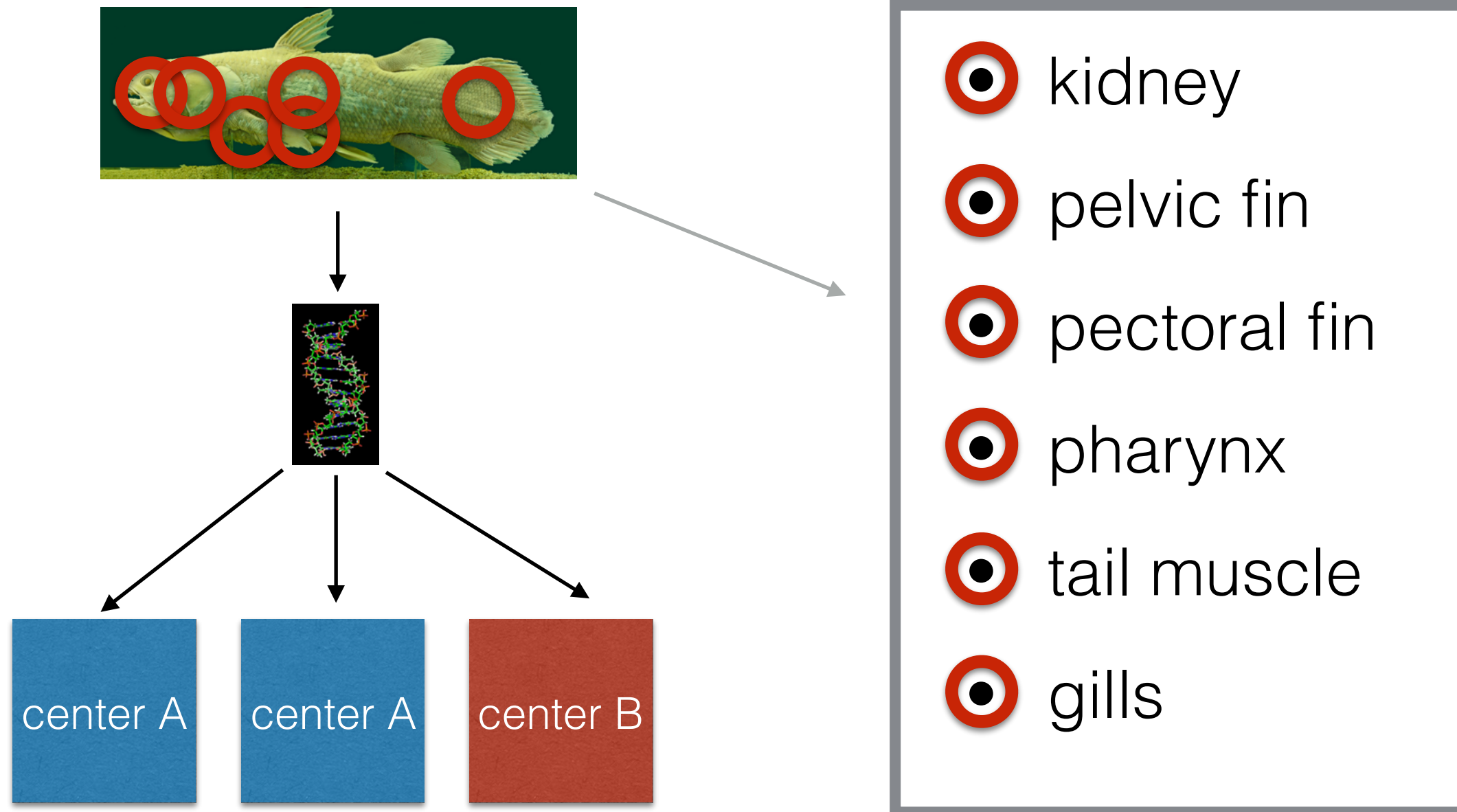

- Thought to be extinct until 1938
- Discovered by Marjorie Courtenay-**Latimer** in a fish market
- Fished off the east coast of South Africa at **Chalumna** river
- Coelacanth = "hollow spine" describing oil filled notochord
- Hinge in skull allows it to consume large prey
- Movement of the four fins resemble locomotion of tetrapods
- Their brain case is 98.5% fat
- Mothers birth to live offspring

Nakaido *et al.*, 2013

Example 2

10X GENOMICS®

PRODUCTS   TECHNOLOGY   COMPANY   CAREERS

Support › Single Cell › Datasets   SE

3k PBMCs from a Healthy Donor
Chromium Demonstration Dataset by Cell Ranger 1.1.0

Peripheral blood mononuclear cells (PBMCs) from a healthy donor (same donor as pbmc6k).

PBMCs are primary cells with relatively small amounts of RNA (~1pg RNA/cell).

- 2,700 cells detected
- Sequenced on Illumina NextSeq 500 with ~69,000 reads per cell
- 98bp read1 (transcript), 8bp I5 sample barcode, 14bp I7 GemCode barcode and 10bp read2 (UMI)
- Analysis run with --cells=3000

Published on May 26, 2016

View Summary
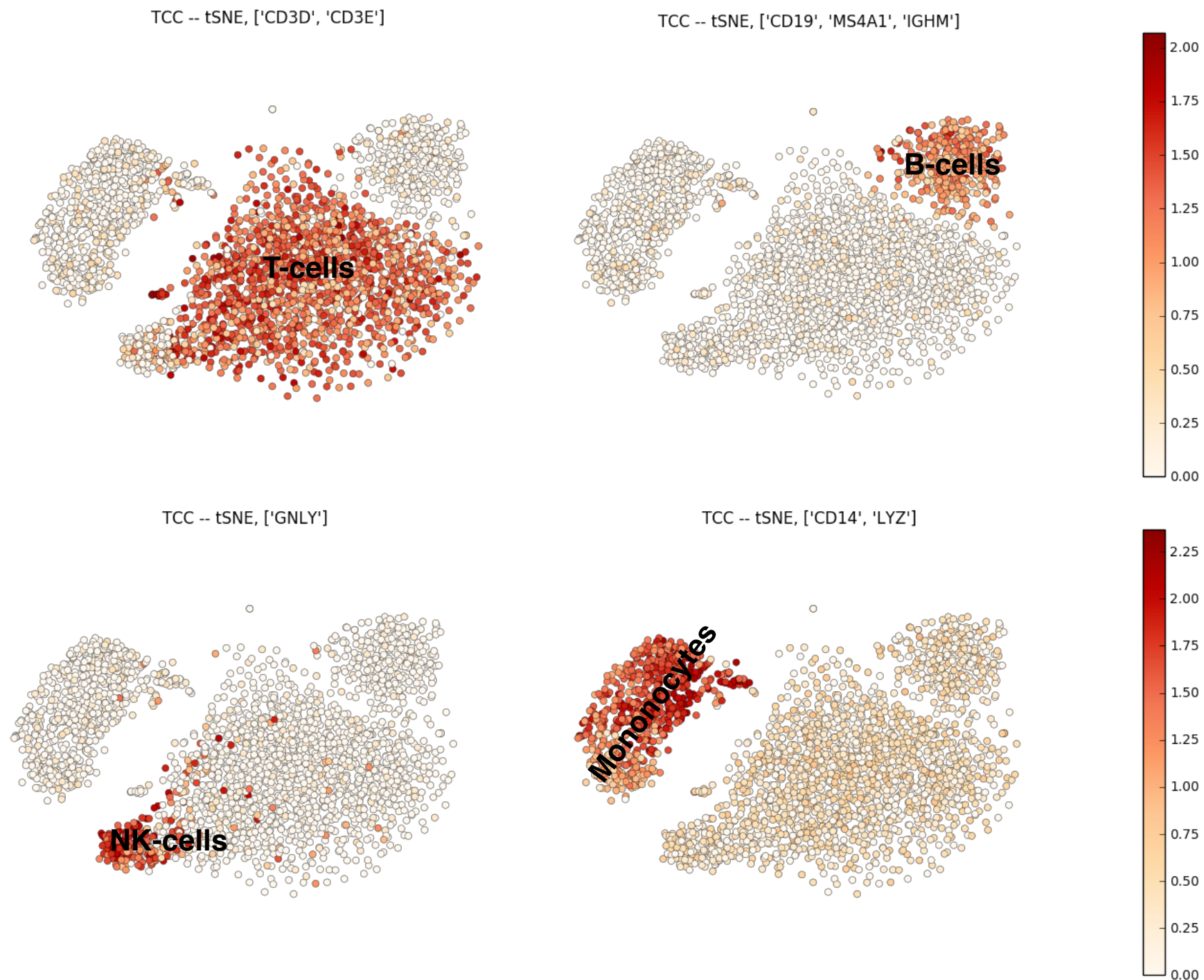
Show batch download instructions

Input Files	Size	md5sum
FASTQs	17.38 GB	7999bb457af4e11c57f96bf97e4ee645

Cell types from single-cell RNA-Seq

TCC -- tSNE, ['CD3D', 'CD3E']

T-cells

TCC -- tSNE, ['CD19', 'MS4A1', 'IGHM']

B-cells

TCC -- tSNE, ['GNLY']

NK-cells

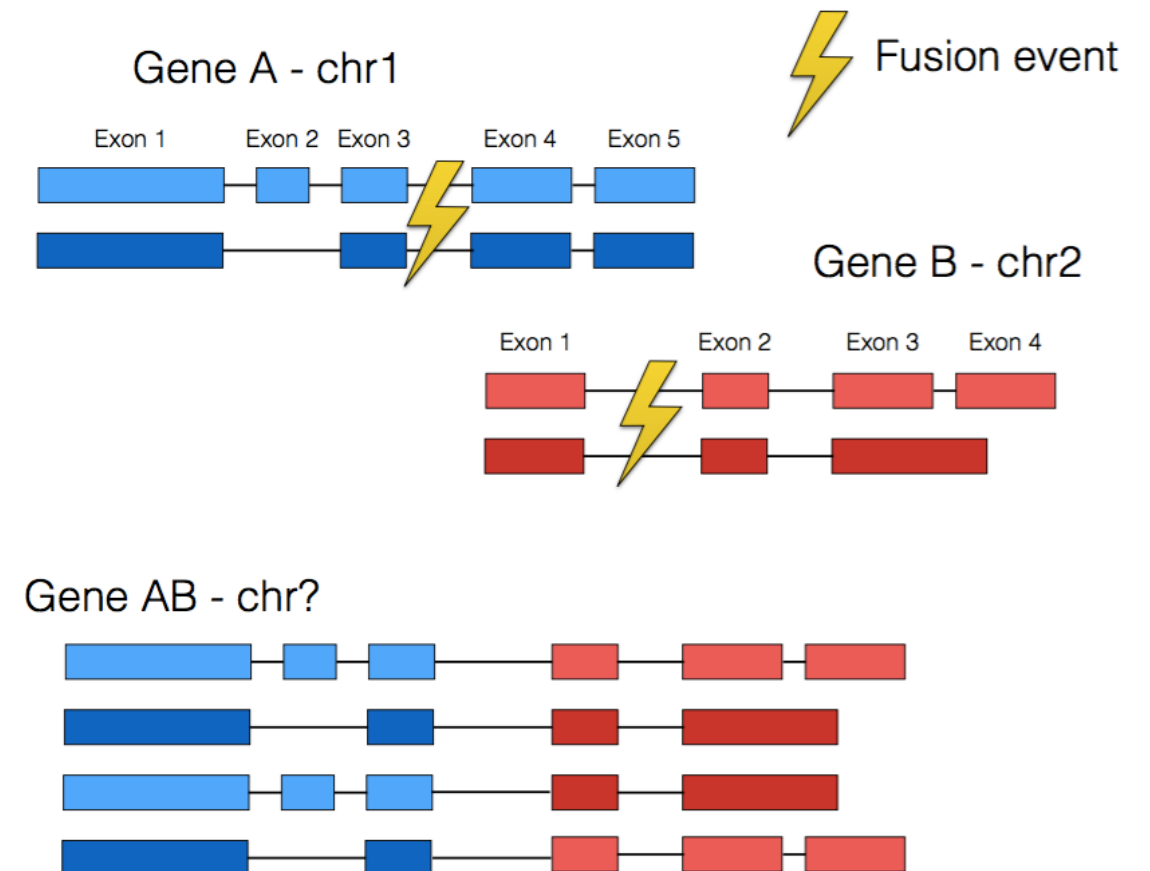TCC -- tSNE, ['CD14', 'LYZ']

Monocytes

Other kallisto-sleuth applications
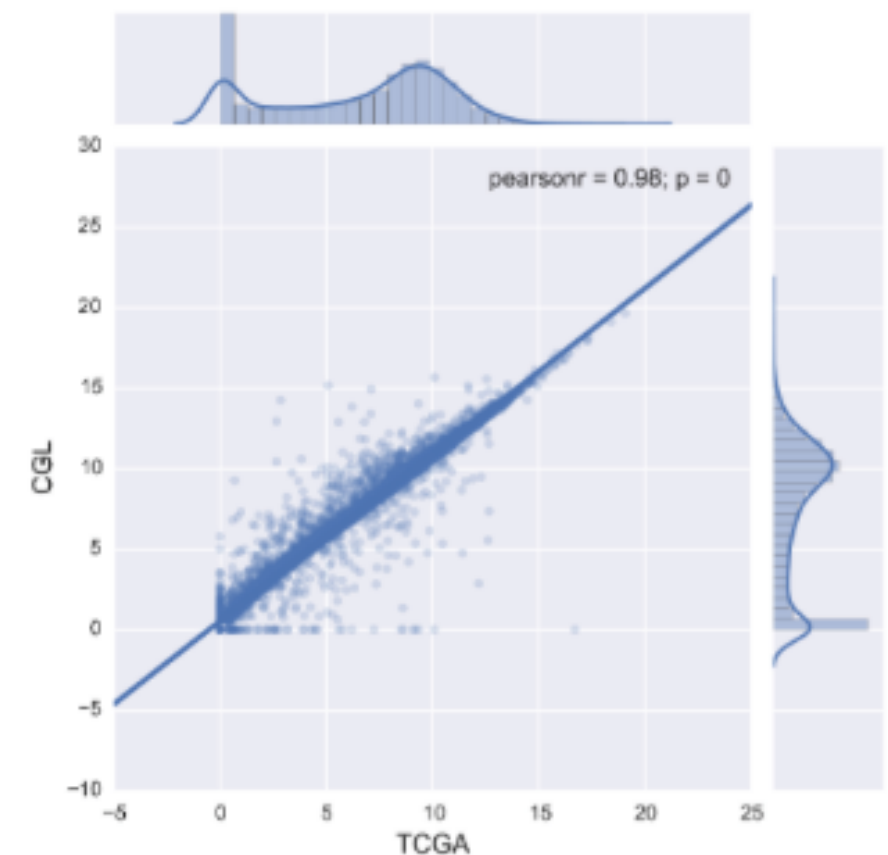
- Metagenomics

- Cancer fusion detection

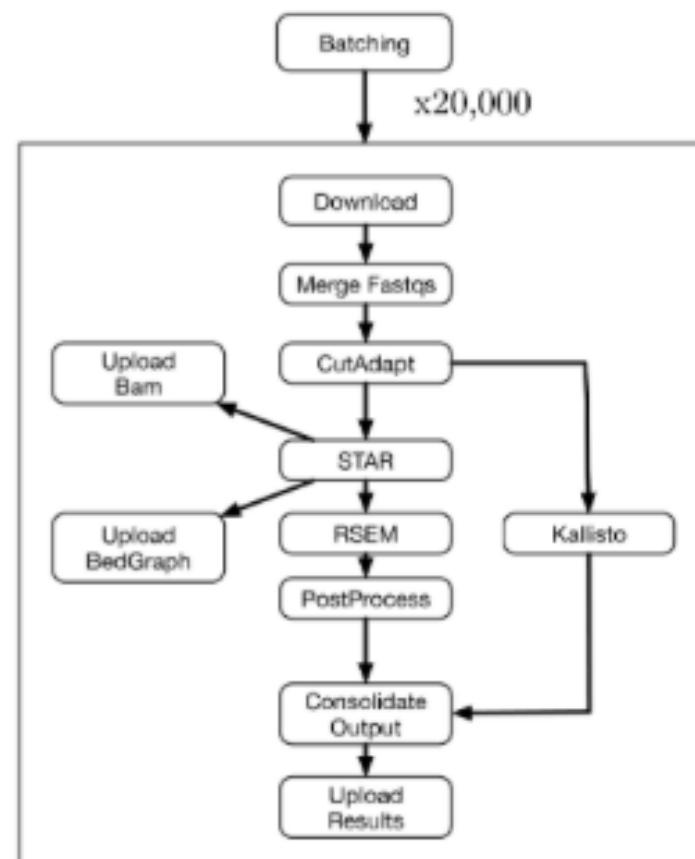

Schaeffer *et al.*, 2016

Hateley, Melsted *et al.*, 2016

Uniform analysis of consortium data

- TCGA pipeline : **$39** / sample.
- Vivian *et al.* bioRxiv 2016 : Toil and kallisto **$0.19** / sample.
- Tatlow and Piccolo, bioRxiv 2016 : cloud-based workflow + kallisto **$0.09** / sample

Vivian *et al.* bioRxiv 2016

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- 1:45 — 2:15 kallisto demonstration

- 2:30 — 3:30 sleuth demonstration

- 3:30 — 4:00 Single-cell RNA-Seq with kallisto