"Single-cell recording of lineage and transcriptional regulation in direct reprogramming"

Abstract: Considerable heterogeneity arises during cellular reprogramming. We previously developed a straightforward, high-throughput cell tracking method, 'CellTagging,' that permits the construction of multi-level lineage trees. CellTagging and longitudinal tracking of fibroblast to induced endoderm progenitor reprogramming revealed two distinct trajectories: one leading to successfully reprogrammed cells, and one leading to a 'dead-end' state. Here, I present two new methods: one an experimental method to record transcription factor binding early in reprogramming, revealing trajectory-specific gene regulation; the second is a computational method to dissect gene regulatory network reconfiguration during reprogramming. Together, these tools provide new mechanistic insights into the reprogramming process.

Dr. Samantha Morris, Ph.D., is an Assistant Professor of Genetics and Developmental Biology at Washington University in St. Louis. Her laboratory studies the mechanisms of cell reprogramming, focusing on how pioneer transcription factors drive gene expression, epigenetic, and functional changes in cell identity. To enable these studies, her group develops novel, open-source single-cell experimental and computational approaches to longitudinally record lineage and gene regulation during directed reprogramming. With her team, Dr. Morris aims to engineer clinically relevant cell populations, translating new insights in cell fate specification into better models of disease and development. With clinical collaborators, her laboratory uses their genomic technologies to dissect mechanisms of pediatric gastrointestinal disease, such as Short Gut Syndrome and Hirschsprung's Disease, with a long-term goal of developing novel regenerative therapies. Dr. Morris trained as a Developmental Biologist at the University of Cambridge. In Magdalena Zernicka-Goetz's group, she investigated mechanisms of cell fate decision-making in the earliest stages of development. She then joined the laboratory of George Daley at Harvard Medical School, where she focused on the analysis of gene regulatory networks to dissect and engineer cell identity. In 2015, she established her independent research group. In 2017, Dr. Morris was named a Vallee Foundation Scholar. In 2019, she was awarded the St. Louis Academy of Science Innovation Award and was named an Allen Distinguished Investigator. She sits on the Board of Directors of the Society for Developmental Biology and serves on the editorial boards of Development, Cell Systems, and Developmental Cell.