nucleic acid molecule, and the sequence of the nucleic acid molecule corresponding to the analyte, wherein the common barcode sequence identifies the lineage tracing nucleic acid molecule and the analyte as having originated from the biological particle. In some embodiments, the common barcode sequence comprises identical barcode sequence segments. In some embodiments, the common barcode sequence of the lineage tracing barcode molecule and the common barcode sequence of the analyte barcode molecule are identical. In some embodiments, the method further comprises co-partitioning (i) the biological particle and (ii) the plurality of nucleic acid barcode molecules into a partition. In some embodiments, the partition is an aqueous droplet in an emulsion or a well. In some embodiments, the analyte is a genomic deoxyribonucleic acid (gDNA) molecule. In some embodiments, the gDNA molecule is an enzymatically fragmented gDNA molecule. In some embodiments, the gDNA molecule comprises deaminated cytosines or oxidized 5-hydroxymethylcytosine bases. In some embodiments, the analyte is a ribonucleic acid (RNA) molecule. In some embodiments, the RNA molecule is a messenger RNA molecule (mRNA). In some embodiments, the RNA molecule is (i) a clustered regularly interspaced short palindromic (CRISPR) RNA molecule (crRNA) or (ii) a single guide RNA (sgRNA) molecule. In some embodiments, the nucleic acid molecule corresponding to the analyte is coupled to a labelling agent configured to couple to the analyte. In some embodiments, the nucleic acid molecule corresponding to the analyte comprises an analyte barcode sequence that corresponds to the analyte. In some embodiments, the nucleic acid molecule corresponding to the analyte comprises a sequence complementary to the analyte capture sequence. In some embodiments, the labelling agent is an antibody. In some embodiments, the analyte is a metabolite or a protein. In some embodiments, the plurality of nucleic acid barcode molecules is attached to a solid support. In some embodiments, the method further comprises releasing the plurality of nucleic acid barcode molecules from the solid support. In some embodiments, the solid support is a bead. In some embodiments, one or more of (a)-(c) are performed in a partition. In some embodiments, each of (a)-(c) is performed in a partition. In some embodiments, the partition is an aqueous droplet in an emulsion or a well. In some embodiments, the partition is an aqueous droplet in an emulsion or a well.

[0012a] Disclosed herein, in some embodiments, is a method of analyzing chromatin, comprising: (a) providing a mixture comprising (i) a cell or nucleus comprising (1) chromatin comprising a template deoxyribonucleic acid (DNA) and (2) a protein, and (ii) a plurality of nucleic acid barcode molecules; (b) contacting said cell or nucleus with a labelling agent comprising a reporter oligonucleotide such that said labelling agent couples to said protein;

(c) contacting said chromatin with a plurality of transposase complexes, thereby generating a plurality of template DNA fragments; (d) generating a first barcoded nucleic acid molecule comprising (i) a sequence of a template DNA fragment of said plurality of template DNA fragments and (ii) a sequence of a first nucleic acid barcode molecule of said plurality of nucleic acid barcode molecules; and (e) generating a second barcoded nucleic acid molecule comprising (i) a sequence of said reporter oligonucleotide and (ii) a sequence of a second nucleic acid barcode molecule of said plurality of nucleic acid barcode molecules.

[0013] Disclosed herein, in some embodiments, is a method of analyzing chromatin, comprising: (a) providing a mixture comprising (i) a biological particle comprising (1) chromatin comprising a template deoxyribonucleic acid (DNA) and (2) a protein, and (ii) a plurality of nucleic acid barcode molecules; (b) contacting the biological particle with a labelling agent comprising a reporter oligonucleotide, wherein the labelling agent is configured to couple to the protein; (c) generating a plurality of template DNA fragments of the chromatin using a plurality of transposase complexes; (d) generating a first barcoded nucleic acid molecule using (i) a

CLAIMS

WHAT IS CLAIMED IS:

1. A method of analyzing chromatin, comprising:

(a) providing a mixture comprising (i) a cell or nucleus comprising (1) chromatin comprising a template deoxyribonucleic acid (DNA) and (2) a protein, and (ii) a plurality of nucleic acid barcode molecules;

(b) contacting said cell or nucleus with a labelling agent comprising a reporter oligonucleotide such that said labelling agent couples to said protein;

(c) contacting said chromatin with a plurality of transposase complexes, thereby generating a plurality of template DNA fragments;

(d) generating a first barcoded nucleic acid molecule comprising (i) a sequence of a template DNA fragment of said plurality of template DNA fragments and (ii) a sequence of a first nucleic acid barcode molecule of said plurality of nucleic acid barcode molecules; and

(e) generating a second barcoded nucleic acid molecule comprising (i) a sequence of said reporter oligonucleotide and (ii) a sequence of a second nucleic acid barcode molecule of said plurality of nucleic acid barcode molecules.

2. The method of claim 1, wherein a transposase complex of said plurality of transposase complexes comprises (i) a nucleic acid molecule comprising a transposon end sequence, and (ii) a transposase.

3. The method of claim 1, wherein (i) said first nucleic acid barcode molecule comprises a barcode sequence and a first capture sequence configured to couple to said template DNA fragment; and (ii) said second nucleic acid barcode molecule comprises said barcode sequence and a second capture sequence configured to couple to said reporter oligonucleotide.

4. The method of claim 3, wherein (d) comprises coupling said first capture sequence to said template DNA fragment and synthesizing said first barcoded nucleic acid molecule, wherein said first barcoded nucleic acid molecule comprises said barcode sequence.

5. The method of claim 3, wherein (e) comprises coupling said second capture sequence to said reporter oligonucleotide and synthesizing said second barcoded nucleic acid molecule, wherein said second barcoded nucleic acid molecule comprises said barcode sequence.

6. The method of claim 3, wherein said reporter oligonucleotide comprises a sequence complementary to said second capture sequence.

7. The method of claim 1, further comprising partitioning said mixture into a partition.

8. The method of claim 7, wherein (b) or (c) is performed in said partition.

9. The method of claim 7, wherein (b) is performed prior to said partitioning.

10. The method of claim 7, wherein said partition is an aqueous droplet in an emulsion.

11. The method of claim 7, wherein said partition is a well.

12. The method of claim 1, wherein said cell or nucleus is permeable to said plurality of transposase complexes and wherein said plurality of template DNA fragments is generated in said cell or nucleus.

13. The method of claim 1, wherein said reporter oligonucleotide further comprises an analyte barcode sequence that identifies a presence of said protein and wherein said second barcoded nucleic acid molecule comprises said analyte barcode sequence.

14. The method of claim 1, wherein said reporter oligonucleotide comprises a unique molecule identifier (UMI) sequence.

15. The method of claim 1, wherein said labelling agent is an antibody.

16. The method of claim 1, wherein said protein is a cell surface protein.

17. The method of claim 1, wherein said protein is an intracellular protein.

18. The method of claim 1, wherein said plurality of nucleic acid barcode molecules is attached to a solid support.

19. The method of claim 18, wherein said solid support is a bead.

20. The method of claim 19, wherein said plurality of nucleic acid barcode molecules is releasably attached to said bead.

21. The method of claim 20, further comprising releasing said plurality of nucleic acid barcode molecules from said bead.

22. The method of claim 20, wherein each of said plurality of nucleic acid barcode molecules are releasably attached to said bead through a labile bond.

23. The method of claim 22, wherein said labile bond is selected from the group consisting of a thermally cleavable bond, a chemically labile bond, and a photo-sensitive bond.

24. The method of claim 23, wherein the labile bond comprises a linkage selected from the group consisting of an ester linkage, a vicinal diol linkage, a Diels-Alder linkage, a sulfone linkage, a silyl ester linkage, a glycosidic linkage, a peptide linkage, and a phosphodiester linkage.

25. The method of claim 19, wherein said bead is a gel bead.

26. The method of claim 25, wherein said gel bead is degradable upon application of a stimulus.

27. The method of claim 26, wherein said stimulus is a chemical stimulus.

28. The method of claim 27, wherein said mixture comprises said chemical stimulus.

29. The method of claim 1, further comprising sequencing (i) said first barcoded nucleic acid molecule, a complement thereof, or a derivative thereof or (ii) said second barcoded nucleic acid molecule, a complement thereof, or a derivative thereof.

30. The method of claim 1, wherein said protein is a nuclear membrane protein.