

WHAT IS CLAIMED IS: CLAIMS

1. A method, comprising

stretching a double-stranded polynucleotide over a substrate comprising a plurality of two alternating types of equally spaced cleavage regions comprising a plurality of transposases, wherein a first type of cleavage region comprises a first type of adapter and not a second type of adapter and a second type of cleavage region comprises the second type of adapter and not the first type of adapter,

cleaving the polynucleotide with two or more of the plurality of transposases to form a plurality of polynucleotide fragments comprising two ends, wherein the cleaving comprises adding adapters to both strands of each end, and

separating, within the plurality of polynucleotide fragments, a population of longer polynucleotide fragments from a population of shorter polynucleotide fragments.

~~2. The method of claim 1, wherein the polynucleotide is double stranded and the cleaving comprises forming complementary ends at a cleavage point and adding adapters to the complementary ends.~~

~~3.2. The method of claim 21, wherein the adapters added to the complementary ends strands of an end are not connected to each other.~~

~~4.3. The method of claim 21, wherein the adapters added to the complementary ends strands of an end are connected to each other.~~

~~5. The method of claim 2, wherein the cleavage regions comprise two types of cleavage regions, and the plurality of equally spaced cleavage regions alternate between the two types of cleavage regions.~~

~~6. The method of claim 5, wherein a first type of the two types of cleavage region comprises a first type of adapter and a second type of the two types of cleavage region does not comprise the first type of adapter.~~

~~7. The method of claim 6 wherein the second type of cleavage region comprises a second type of adapter and the first type of cleavage region does not comprise the second type of adapter.~~

~~8.4. The method of any one of claims 1 through 7 claim 1, wherein the substrate comprises trenches alternating with interstices, and the cleavage regions comprise surfaces of the trenches and surfaces of the interstices.~~

~~9.5. The method of any one of claims 1 through 7 claim 1, wherein the substrate comprises posts alternating with interstices, and the cleavage regions comprise surfaces of the posts and surfaces of the interstices.~~

10.6. The method of ~~any one of claims 1 through 7~~ claim 1, wherein the substrate comprises wells alternating with interstices, and the cleavage regions comprise surfaces of the wells and surfaces of the interstices.

11.7. The method of claim 43, wherein the adapters comprise a hairpin loop when attached to the strands.

12.8. The method of ~~any one of claims 1 through 11~~ claim 1, wherein the stretching comprises bi-directional molecular combing.

9. The method of claim 1, wherein the first type of adapters are not connected to each other.

10. The method of claim 1, wherein the first type of adapters are connected to each other.

11. The method of claim 10, wherein the first type of adapters comprise a hairpin loop when attached to the strands.

12. The method of claim 1, wherein the second type of adapters are not connected to each other.

13. The method of claim 1, wherein the second type of adapters are connected to each other.

14. The method of claim 13, wherein the second type of adapters comprise a hairpin loop when attached to the strands.

15. A method, comprising
stretching a double-stranded polynucleotide over a substrate comprising a plurality of two alternating types of equally spaced cleavage regions comprising a plurality of transposases, wherein a first type of cleavage region comprises a first type of adapter and not a second type of adapter and a second type of cleavage region comprises the second type of adapter and not the first type of adapter,

cleaving the polynucleotide with two or more of the plurality of transposases to form a plurality of polynucleotide fragments comprising two ends, wherein the cleaving comprises adding adapters to strands of each end, wherein the first type of adapters form hairpin loops when attached to the strands and the second type of adapters form hairpin loops when attached to the strands, and

separating, within the plurality of polynucleotide fragments, a population of longer polynucleotide fragments from a population of shorter polynucleotide fragments.

16. The method of claim 15, wherein the substrate comprises trenches alternating with interstices, and the cleavage regions comprise surfaces of the trenches and surfaces of

the interstices.

17. The method of claim 15, wherein the substrate comprises posts alternating with interstices, and the cleavage regions comprise surfaces of the posts and surfaces of the interstices.

18. The method of claim 15, wherein the substrate comprises wells alternating with interstices, and the cleavage regions comprise surfaces of the wells and surfaces of the interstices.

19. The method of claim 15, wherein the stretching comprises bi-directional molecular combing.

20. A method, comprising
stretching a double-stranded polynucleotide over a substrate comprising a plurality of two alternating types of equally spaced cleavage regions comprising a plurality of transposases, wherein a first type of cleavage region comprises a first type of adapter and not a second type of adapter and a second type of cleavage region comprises the second type of adapter and not the first type of adapter, wherein the adapters within cleavage regions are not connected to each other,

cleaving the polynucleotide with two or more of the plurality of transposases to form a plurality of polynucleotide fragments comprising two ends, wherein the cleaving comprises adding adapters to strands of each end,

separating, within the plurality of polynucleotide fragments, a population of longer polynucleotide fragments from a population of shorter polynucleotide fragments, and
the stretching comprises bi-directional molecular combing.

21. The method of claim 20, wherein the substrate comprises trenches alternating with interstices, and the cleavage regions comprise surfaces of the trenches and surfaces of the interstices.

22. The method of claim 20, wherein the substrate comprises posts alternating with interstices, and the cleavage regions comprise surfaces of the posts and surfaces of the interstices.

23. The method of claim 20, wherein the substrate comprises wells alternating with interstices, and the cleavage regions comprise surfaces of the wells and surfaces of the interstices.

13.—A method, comprising

extending an end of a polynucleotide through a pore of a membrane, wherein the polynucleotide is attached to a bead, the pore is narrower than the bead, and a side of the membrane opposite the bead comprises a nuclease, and

cleaving the polynucleotide with the nuclease.

14. — The method of claim 13, wherein the extending comprises electrophoresing.

15. — The method of claims 13 or 14, wherein the polynucleotide is double stranded.

16. — The method of any one of claims 13 through 15 wherein the nuclease comprises a transposase.

17. — The method of claims 13 or 14, wherein the polynucleotide is single stranded.

18. — The method of any one of claims 13 through 17, wherein the cleaving comprises forming a cleaved end and further comprising adding an adapter to the cleaved end.

19. — The method of claim 18, wherein the polynucleotide is double stranded and the cleaving comprises forming complementary ends and adding adapters to the complementary ends, wherein the adapters are not connected to each other.

20. — The method of claim 18, wherein the polynucleotide is double stranded and the cleaving comprises forming complementary ends and adding adapters to the complementary ends, wherein the adapters are connected to each other.

21. — The method of claim 20, wherein the adapters comprise a hairpin loop.

22. — The method of any one of claims 13 through 21, further comprising releasing the polynucleotide from the bead.

23. — The method of any one of claims 13 through 22, further comprising synthesizing a copy of a strand of the polynucleotide.