CLAIMS

1. A method for providing an array of polynucleotides, comprising:

irradiating a first polynucleotide immobilized on a substrate with a first light while a second polynucleotide immobilized on the substrate is not irradiated with the first light, wherein the first polynucleotide is sequestered by ~~bound to~~ a first photo-cleavable polymer that inhibits or blocks hybridization and/or ligation to the first polynucleotide, and the second polynucleotide is sequestered by ~~bound to~~ a second photo-cleavable polymer that inhibits or blocks hybridization and/or ligation to the second polynucleotide,

thereby cleaving the first photo-cleavable polymer such that it is released from the substrate and the inhibition or blocking of hybridization and/or ligation to the first polynucleotide is reduced or eliminated, whereas hybridization and/or ligation to the second polynucleotide remains inhibited or blocked by the second photo-cleavable polymer,

wherein a first barcode is attached to the first polynucleotide via hybridization and/or ligation,

thereby providing on the substrate an array comprising the first and second polynucleotides, wherein the first polynucleotide is barcoded with the first barcode and the second polynucleotide is not barcoded with the first barcode.

~~2. A method for providing an array of polynucleotides, wherein a first polynucleotide immobilized on a substrate is irradiated with a first light while a second polynucleotide immobilized on the substrate is not irradiated with the first light, wherein the first polynucleotide is bound to a first photo-cleavable polymer that inhibits or blocks hybridization and/or ligation to the first polynucleotide, and the second polynucleotide is bound to a second photo-cleavable polymer that inhibits or blocks hybridization and/or ligation to the second polynucleotide, and the first photo-cleavable polymer is cleaved such that the inhibition or blocking of hybridization and/or ligation to the first polynucleotide is reduced or eliminated, whereas hybridization and/or ligation to the second polynucleotide remains inhibited or blocked by the second photo-cleavable polymer,~~

~~the method comprising attaching a first barcode to the first polynucleotide via hybridization and/or ligation,~~

~~thereby providing on the substrate an array comprising the first and second polynucleotides, wherein the first polynucleotide is barcoded with the first barcode and the second polynucleotide is not barcoded with the first barcode.~~

~~3. The method of claim 1 or 2, wherein the second polynucleotide is irradiated with a second light, and wherein the second photo-cleavable polymer is cleaved such that the inhibition or blocking of hybridization and/or ligation to the second polynucleotide is reduced or eliminated.~~

2~~4~~. The method of claim 1 ~~or 2~~, further comprising irradiating the second polynucleotide with a second light, thereby cleaving the second photo-cleavable polymer such that it is released from the substrate and the inhibition or blocking of hybridization and/or ligation to the second polynucleotide is reduced or eliminated, wherein the second polynucleotide is irradiated with the second light while the first polynucleotide is not irradiated with the second light.

~~5. The method of claim 3 or 4, wherein the second polynucleotide is irradiated with the second light while the first polynucleotide is not irradiated with the second light.~~

~~6. The method of any of claims 3-5, wherein a second barcode is attached to the second polynucleotide via hybridization and/or ligation, wherein an array comprising the first and second polynucleotides is provided on the substrate, and wherein the first polynucleotide is barcoded with the first barcode and the second polynucleotide is barcoded with the second barcode.~~

3~~7~~. The method of ~~any of~~ claim 2~~s 3-5~~, further comprising attaching a second barcode to the second polynucleotide via hybridization and/or ligation, thereby providing on the substrate an array comprising the first polynucleotide barcoded with the first barcode and the second polynucleotide barcoded with the second barcode.

~~8. A method for providing an array of polynucleotides, comprising:~~

~~(a) irradiating a first polynucleotide immobilized on a substrate with a first light while a second polynucleotide immobilized on the substrate is not irradiated with the first light, wherein the first polynucleotide is bound to a first photo-cleavable polymer that inhibits or blocks hybridization and/or ligation to the first polynucleotide, and the second polynucleotide is bound to a second photo-cleavable polymer that inhibits or blocks hybridization and/or ligation to the second polynucleotide,~~

~~thereby cleaving the first photo-cleavable polymer such that the inhibition or blocking of hybridization and/or ligation to the first polynucleotide is reduced or eliminated, whereas hybridization and/or ligation to the second polynucleotide remains inhibited or blocked by the second photo-cleavable polymer, and~~

~~(b) attaching a first barcode to the first polynucleotide via hybridization and/or ligation,~~

~~thereby providing on the substrate an array comprising the first and second polynucleotides, wherein the first polynucleotide is barcoded with the first barcode and the second polynucleotide is not barcoded with the first barcode.~~

~~9. The method of claim 8, further comprising:~~

~~(c) irradiating the second polynucleotide with a second light, thereby cleaving the second photo-cleavable polymer such that the inhibition or blocking of hybridization and/or ligation to the second polynucleotide is reduced or eliminated.~~

~~10. The method of claim 9, wherein the second polynucleotide is irradiated with the second light while the first polynucleotide is not irradiated with the second light.~~

~~11. The method of claim 9 or 10, further comprising:~~

~~(d) attaching a second barcode to the second polynucleotide via hybridization and/or ligation,~~

~~thereby providing on the substrate an array comprising the first polynucleotide barcoded with the first barcode and the second polynucleotide barcoded with the second barcode.~~

~~12. The method of any of claims 1-11, wherein the first polynucleotide and the second polynucleotide are of the same nucleic acid sequence.~~

~~13. The method of any of claims 1-11, wherein the first polynucleotide and the second polynucleotide are of different nucleic acid sequences.~~

~~14. The method of any of claims 1-13, wherein the first polynucleotide and/or the second polynucleotide are single stranded.~~

~~15. The method of any of claims 1-13, wherein the first polynucleotide and/or the second polynucleotide are double stranded.~~

4~~16~~. The method of any of claims 1-3~~15~~, wherein the first polynucleotide and/or the second polynucleotide is a DNA oligo, optionally wherein the first polynucleotide and/or the second polynucleotide are between about 6 and about 30 nucleotides in length, e.g., about 10 and about 20 nucleotides in length.

17. The method of any of claims 3-7 and 9-16, wherein the first light and the second light are the same.

18. The method of any of claims 3-7 and 9-16, wherein the first light and the second light are different, *e.g.*, of different wavelengths, intensities, or durations of irradiation, or any combination thereof.

19. The method of any of claims 1-18, wherein hybridization and/or ligation to the first polynucleotide barcoded with the first barcode is inhibited or blocked, and/or

wherein hybridization and/or ligation to the second polynucleotide barcoded with the second barcode is inhibited or blocked.

20. The method of any of claims 1-19, wherein the first barcode comprises a first photo-cleavable moiety that that inhibits or blocks hybridization and/or ligation, thereby inhibiting or blocking hybridization and/or ligation to the first polynucleotide barcoded with the first barcode, and/or

wherein the second barcode comprises a second photo-cleavable moiety that inhibits or blocks hybridization and/or ligation, thereby inhibiting or blocking hybridization and/or ligation to the second polynucleotide barcoded with the second barcode.

21. The method of claim 20, wherein the first photo-cleavable moiety and the second photo-cleavable moiety are the same.

22. The method of claim 20, wherein the first photo-cleavable moiety and the second photo-cleavable moiety are different.

23. The method of any of claims 20-22, wherein the first photo-cleavable moiety and the second photo-cleavable moiety inhibit or block hybridization.

24. The method of any of claims 20-22, wherein the first photo-cleavable moiety and the second photo-cleavable moiety inhibit or block ligation.

25. The method of any of claims 20-22, wherein the first photo-cleavable moiety and/or the second photo-cleavable moiety comprise a photo-caged nucleobase.

26. The method of any of claims 20-22, wherein the first photo-cleavable moiety and/or the second photo-cleavable moiety comprise a photo-cleavable linker.

27. The method of any of claims 20-22, wherein the first photo-cleavable moiety and/or the second photo-cleavable moiety comprise a photo-cleavable hairpin.

28. The method of any of claims 20-22, wherein the first photo-cleavable moiety and/or the second photo-cleavable moiety comprise a photo-caged 3'-hydroxyl group.

~~29. The method of any of claims 3-7 and 9-28, wherein the first barcode and the second barcode are of the same nucleic acid sequence.~~

~~30. The method of any of claims 3-7 and 9-28, wherein the first barcode and the second barcode are of different nucleic acid sequences.~~

~~31. The method of any of claims 1-30, wherein the first barcode and/or the second barcode are single stranded.~~

~~32. The method of any of claims 1-30, wherein the first barcode and/or the second barcode are double stranded.~~

5~~33~~. The method of any of claims 1-4~~32~~, wherein the first barcode and/or the second barcode are DNA oligonucleotides, and wherein the first barcode and/or the second barcode are between about 5 and about 20 nucleotides in length, optionally wherein the first barcode and/or the second barcode are between about 6 and about 16 nucleotides in length.

~~34. The method of any of claims 1-33, wherein the first barcode and/or the second barcode are between about 5 and about 20 nucleotides in length, e.g., between about 6 and about 16 nucleotides in length.~~

6~~35~~. The method of any of claims 1-5~~34~~, wherein the substrate comprises a plurality of differentially barcoded polynucleotides immobilized thereon.

~~36. The method of any of claims 1-35, wherein the substrate is transparent, translucent, or opaque.~~

~~3~~7. The method of any of claims 1-~~3~~6, wherein the irradiation comprises using a photomask to selectively irradiate the first polynucleotide or the second polynucleotide.

~~3~~8. The method of any of claims 1-~~3~~7, wherein the attachment of the first barcode and/or the second barcode comprises ligating one end of the first/second barcode to one end of the first/second polynucleotide, respectively.

~~39. The method of claim 38, wherein the 5' end nucleotide of the first/second barcode is ligated to the 3' end nucleotide of the first/second polynucleotide, respectively.~~

~~40. The method of claim 38, wherein the 3' end nucleotide of the first/second barcode is ligated to the 5' end nucleotide of the first/second polynucleotide, respectively.~~

9~~41~~. The method of any of claims 1-~~40~~8, wherein the attachment of the first barcode comprises hybridizing one end of the first barcode and one end of the first polynucleotide to a first splint, and/or

wherein the attachment of the second barcode comprises hybridizing one end of the second barcode and one end of the second polynucleotide to a second splint.

1042. The method of claim 941, further comprising ligating the first barcode to the first polynucleotide hybridized to the first splint, and/or ligating the second barcode to the second polynucleotide hybridized to the second splint.

1143. The method of claim 1042, wherein the first/second barcode is directly ligated to the first/second polynucleotide, respectively, without gap filling.

1244. The method of claim 1042, wherein ligating the first/second barcode to the first/second polynucleotide, respectively, is preceded by gap filling.

~~45. The method of any of claims 41-44, wherein the first splint and the second splint are of the same nucleic acid sequence.~~

~~46. The method of any of claims 41-44, wherein the first splint and the second splint are of different nucleic acid sequences.~~

~~47. The method of any of claims 41-46, wherein the first splint and/or the second splint are single stranded.~~

1348. The method of any of claims ~~41-47~~9-12, wherein the first splint and/or the second splint are DNA oligos, optionally wherein the first splint and/or the second splint are at least 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15 nucleotides in length.

~~49. The method of any of claims 1-48, further comprising providing the first polynucleotide and the second polynucleotide immobilized on the substrate.~~

~~50. The method of any of claims 1-49, wherein the first photo-cleavable polymer and the second photo-cleavable polymer are the same.~~

~~51. The method of any of claims 1-49, wherein the first photo-cleavable polymer and the second photo-cleavable polymer are different.~~

1452. The method of any of claims 1-1351, wherein the first photo-cleavable polymer and/or the second photo-cleavable polymer bind to the first and second polynucleotides, respectively, in a non-sequence-specific manner.

1553. The method of any of claims 1-1452, wherein the first photo-cleavable polymer and/or the second photo-cleavable polymer are UV degradable.

1654. The method of any of claims 1-1553, wherein the first photo-cleavable polymer and/or the second photo-cleavable polymer are synthetic, semi-synthetic, or naturally derived.

1755. The method of any of claims 1-1654, wherein the first photo-cleavable polymer and/or the second photo-cleavable polymer comprise a material selected from the group consisting of a PEG (polyethylene glycol), a PDMS (polydimethylsiloxane), a polyethylenimine (PEI), a polyacrylate, a lipid, a nanoparticle, a DNA, an RNA, a synthetic oligodeoxynucleotide (ODN), a xeno nucleic acid (XNA), a peptide nucleic acid (PNA), a locked nucleic acid (LNA), a 1,5-anhydrohexitol nucleic acid (HNA), a cyclohexene nucleic acid (CeNA), a threose nucleic acid (TNA), a glycol nucleic acid (GNA), a fluoro arabino nucleic acid (FANA), and a polypeptide.

1856. The method of claim 1755, wherein the polyacrylate and/or the lipid is cationic, optionally wherein the cationic lipid is Lipofectamine.

1957. The method of any of claims 1-1856, wherein the first photo-cleavable polymer and/or the second photo-cleavable polymer comprise $(dNTP)_6$-PC-$(dNTP)_6$-PC-$(dNTP)_6$-PC-$(dNTP)_6$, wherein PC is a photo-cleavable moiety.

2058. The method of any of claims 1-1957, wherein the first photo-cleavable polymer and/or the second photo-cleavable polymer comprise a DNA-binding protein.

2159. The method of any of claims 1-2058, wherein the first photo-cleavable polymer and/or the second photo-cleavable polymer comprise a polyethylenimine (PEI).

2260. The method of any of claims 1-2159, wherein the first photo-cleavable polymer and/or the second photo-cleavable polymer comprise a UV-degradable group.

2361. The method of claim 2260, wherein the UV-degradable group is in the backbone or at each subunit of the first photo-cleavable polymer and/or the second photo-cleavable polymer.

2462. The method of claim 2260 or 2361, wherein the UV-degradable group is a nitrobenzyl group.

2563. A method for providing an array of polynucleotides, comprising:

(a1) irradiating polynucleotide P1 immobilized on a substrate with light while polynucleotide P2 immobilized on the substrate is photomasked, wherein polynucleotides P1 and P2 are sequestered by ~~bound to~~ a photo-cleavable polymer that inhibits or blocks hybridization and/or ligation to P1 and P2, respectively,

thereby cleaving the photo-cleavable polymer to release it from the substrate and allow hybridization and/or ligation to P1, whereas hybridization and/or ligation to P2 remain inhibited or blocked by the photo-cleavable polymer; and

(b1) attaching barcode 1A to P1 via hybridization and/or ligation to form a barcoded polynucleotide 1A-P1,

thereby providing on the substrate an array comprising polynucleotides 1A-P1 and P2.

2664. The method of claim 2563, further comprising:

(c1) irradiating P2 with light, thereby cleaving the photo-cleavable polymer to release it from the substrate and allow hybridization and/or ligation to P2; and

(d1) attaching barcode 1B to P2 via hybridization and/or ligation to form a barcoded polynucleotide 1B-P2,

thereby providing on the substrate an array comprising barcoded polynucleotides 1A-P1 and 1B-P2.

~~65. The method of claim 63 or 64, wherein polynucleotide 1A-P1 is bound to the photo-cleavable polymer.~~

~~66. The method of claim 64 or 65, wherein polynucleotide 1A-P1 is photomasked in step c1, and hybridization and/or ligation to 1A-P1 remains inhibited or blocked by the photo-cleavable polymer.~~

~~67. The method of any of claims 64-66, wherein barcodes 1A and 1B comprise the same nucleic acid sequence.~~

~~68. The method of any of claims 64-66, wherein barcodes 1A and 1B comprise different nucleic acid sequences.~~

~~69. The method of any of claims 64-68, wherein barcoded polynucleotides 1A-P1 and 1B-P2 are bound to the photo-cleavable polymer, the method further comprising:~~

~~(a2) irradiating one of 1A-P1 and 1B-P2 with light while the other is photomasked,~~

~~thereby cleaving the photo-cleavable polymer to allow hybridization and/or ligation to the irradiated polynucleotide, whereas hybridization and/or ligation to the photomasked polynucleotide remains inhibited or blocked by the photo-cleavable polymer; and~~

~~(b2) attaching barcode 2A to the irradiated polynucleotide via hybridization and/or ligation to form a 2A-barcoded polynucleotide,~~

~~thereby providing on the substrate an array comprising barcoded polynucleotides 2A-1A-P1 and 1B-P2, or an array comprising barcoded polynucleotides 1A-P1 and 2A-1B-P2.~~

~~70. The method of claim 69, further comprising:~~

~~(c2) irradiating the photomasked polynucleotide in step a2 with light while the 2A-barcoded polynucleotide is photomasked, thereby cleaving the photo-cleavable polymer to allow~~

hybridization and/or ligation, whereas hybridization and/or ligation to the 2A-barcoded polynucleotide remains inhibited or blocked by the photo-cleavable polymer; and

(d2) attaching barcode 2B to the irradiated polynucleotide in step c2 via hybridization and/or ligation to form a 2B-barcoded polynucleotide,

thereby providing on the substrate an array comprising barcoded polynucleotides 2A-1A-P1 and 2B-1B-P2, or an array comprising barcoded polynucleotides 2B-1A-P1 and 2A-1B-P2.

71. The method of claim 70, wherein steps a1-d1 form round 1 and steps a2-d2 form round 2, the method further comprising steps a*i*-d*i* in round *i*, wherein barcodes *i*A and *i*B are attached to provide barcoded polynucleotides on the substrate, and wherein *i* is an integer greater than 2.

72. The method of claim 71, wherein barcodes *i*A and *i*B comprise the same nucleic acid sequence.

73. The method of claim 71, wherein barcodes *i*A and *i*B comprise different nucleic acid sequences.

74. A method for providing an array of polynucleotides, comprising:

(a) irradiating polynucleotide P1 and polynucleotide P3 immobilized on a substrate with light while polynucleotide P2 and polynucleotide P4 immobilized on the substrate are photomasked, wherein polynucleotides P1-P4 are bound to a photo-cleavable polymer that inhibits or blocks hybridization and/or ligation to P1-P4, respectively,

thereby cleaving the photo-cleavable polymer to allow hybridization and/or ligation to P1 and P3, whereas hybridization and/or ligation to P2 and P4 remains inhibited or blocked by the photo-cleavable polymer;

(b) attaching barcode 1A to P1 and P3 via hybridization and/or ligation to form barcoded polynucleotides 1A-P1 and 1A-P3;

(c) irradiating P2 and P4 with light, thereby cleaving the photo-cleavable polymer to allow hybridization and/or ligation to P2 and P4; and

(d) attaching barcode 1B to P2 and P4 via hybridization and/or ligation to form barcoded polynucleotides 1B-P2 and 1B-P4,

thereby providing on the substrate an array comprising barcoded polynucleotides 1A-P1, 1B-P2, 1A-P3, and 1B-P4.

75. The method of claim 74, wherein barcoded polynucleotides 1A-P1, 1B-P2, 1A-P3, and 1B-P4 are bound by the photo-cleavable polymer, the method further comprising:

(a') irradiating polynucleotides 1A-P1 and 1A-P3 with light while polynucleotides 1B-P2 and 1B-P4 are photomasked,

thereby cleaving the photo-cleavable polymer to allow hybridization and/or ligation to 1A-P1 and 1A-P3, whereas hybridization and/or ligation to 1B-P2 and 1B-P4 remain inhibited or blocked by the photo-cleavable polymer,

(b') attaching barcode 2A to 1A-P1 and 1A-P3 via hybridization and/or ligation to form barcoded polynucleotides 2A-1A-P1 and 2A-1A-P3;

(c') irradiating 1B-P2 and 1B-P4 with light while 2A-1A-P1 and 2A-1A-P3 are photomasked, thereby cleaving the photo-cleavable polymer to allow hybridization and/or ligation to 1B-P2 and 1B-P4, whereas hybridization and/or ligation to 2A-1A-P1 and 2A-1A-P3 remains inhibited or blocked by the photo-cleavable polymer; and

(d') attaching barcode 2B to 1B-P2 and 1B-P4 via hybridization and/or ligation to form barcoded polynucleotides 2B-1B-P2 and 2B-1B-P4,

thereby providing on the substrate an array comprising barcoded polynucleotides 2A-1A-P1, 2B-1B-P2, 2A-1A-P3, and 2B-1B-P4.

76. The method of claim 74, wherein barcoded polynucleotides 1A-P1, 1B-P2, 1A-P3, and 1B-P4 are bound by the photo-cleavable polymer, the method further comprising:

(a') irradiating polynucleotides 1A-P1 and 1B-P2 with light while polynucleotides 1A-P3 and 1B-P4 are photomasked,

thereby cleaving the photo-cleavable polymer to allow hybridization and/or ligation to 1A-P1 and 1B-P2, whereas hybridization and/or ligation to 1A-P3 and 1B-P4 remains inhibited or blocked by the photo-cleavable polymer,

(b') attaching barcode 2A to 1A-P1 and 1B-P2 via hybridization and/or ligation to form barcoded polynucleotides 2A-1A-P1 and 2A-1B-P2;

(c') irradiating 1A-P3 and 1B-P4 with light while 2A-1A-P1 and 2A-1B-P2 are photomasked, thereby cleaving the photo-cleavable polymer to allow hybridization and/or ligation to 1A-P3 and 1B-P4, whereas hybridization and/or ligation to 2A-1A-P1 and 2A-1B-P2 remain inhibited or blocked by the photo-cleavable polymer; and

(d') attaching barcode 2B to 1A-P3 and 1B-P4 via hybridization and/or ligation to form barcoded polynucleotides 2B-1A-P3 and 2B-1B-P4,

thereby providing on the substrate an array comprising barcoded polynucleotides 2A-1A-P1, 2A-1B-P2, 2B-1A-P3, and 2B-1B-P4.

77. The method of any of claims 74-76, wherein barcodes 1A, 1B, 2A, and/or 2B comprise the same nucleic acid sequence.

78. The method of any of claims 74-76, wherein barcodes 1A, 1B, 2A, and/or 2B comprise different nucleic acid sequences.

79. A method for providing an array of polynucleotides, comprising:

(a) irradiating a plurality of first polynucleotides immobilized on a substrate with a first light while a plurality of second polynucleotides immobilized on the substrate are not irradiated with the first light, wherein the plurality of first polynucleotides and the plurality of second polynucleotides are bound to a photo-cleavable polymer that inhibits or blocks hybridization and/or ligation,

thereby cleaving the photo-cleavable polymer such that the inhibition or blocking of hybridization and/or ligation to the plurality of first polynucleotides is reduced or eliminated, whereas hybridization and/or ligation to the second plurality of polynucleotides remains inhibited or blocked by the photo-cleavable polymer;

(b) attaching first barcodes to the plurality of first polynucleotide via hybridization and/or ligation;

(c) irradiating the plurality of second polynucleotides with a second light while the plurality of first polynucleotides are not irradiated with the first light,

thereby cleaving the photo-cleavable polymer such that the inhibition or blocking of hybridization and/or ligation to the plurality of second polynucleotides is reduced or eliminated;

thereby providing on the substrate an array comprising the first polynucleotides barcoded with the first barcodes and the second polynucleotides barcoded with the second barcodes.

80. The method of claim 79, wherein at least about 90%, at least about 95%, at least about 99%, or 100% of the plurality of first polynucleotides have the same nucleic acid sequences, and/or at least about 90%, at least about 95%, at least about 99%, or 100% of the plurality of second polynucleotides have the same nucleic acid sequences.

81. The method of claim 79 or 80, wherein the plurality of first polynucleotides and the plurality of second polynucleotides have the same nucleic acid sequences.

82. The method of any of claims 79-81, wherein polynucleotides of a universal nucleic acid sequence are immobilized on the substrate prior to the irradiation.

8327. The method of any of claims 1-2679-81, wherein polynucleotides of different nucleic acid sequences are immobilized on the substrate in a pattern prior to the irradiation, wherein the pattern comprises rows and/or columns.

84. The method of claim 83, wherein the pattern comprises rows and/or columns.

85. The method of any of claims 79-84, wherein at least about 90%, at least about 95%, at least about 99%, or 100% of the plurality of first polynucleotides are barcoded with the first barcodes, and/or

wherein at least about 90%, at least about 95%, at least about 99%, or 100% of the plurality of second polynucleotides are barcoded with the second barcodes.

86. A method for providing an array of polynucleotides, comprising:

(i) irradiating a first polynucleotide immobilized on a substrate with light while a second polynucleotide immobilized on the substrate is not irradiated with light, wherein the first and second polynucleotides are bound to a photo-cleavable polymer that inhibits or blocks hybridization,

thereby cleaving the photo-cleavable polymer to allow hybridization to the first polynucleotide, whereas hybridization to the second polynucleotide remains inhibited or blocked by the photo-cleavable polymer;

(ii) attaching a first barcode to the first polynucleotide via hybridization to a first splint followed by ligation, wherein the first splint hybridizes to one end of the first polynucleotide and one end of the first barcode;

(iii) irradiating the second polynucleotide with light, thereby cleaving the photo-cleavable polymer to allow hybridization to the second polynucleotide; and

(iv) attaching a second barcode to the second polynucleotide via hybridization to a second splint followed by ligation, wherein the second splint hybridizes to one end of the second polynucleotide and one end of the second barcode,

thereby providing on the substrate an array comprising the first polynucleotide barcoded with the first barcode and the second polynucleotide barcoded with the second barcode.

87. The method of claim 86, wherein the second splint does not hybridize to the first barcode.

88. An array of polynucleotides produced by the method of any of claims 1-87.

2889. A composition, comprising:

a first polynucleotide immobilized on a substrate;

a first splint hybridized to one end of the first polynucleotide, wherein the first splint comprises a sequence complementary ~~is capable of hybridizing~~ to one end of a first barcode; and

a second polynucleotide immobilized on a substrate wherein the second polynucleotide is ~~bound to~~sequestered by a photo-cleavable polymer that inhibits or blocks hybridization and/or ligation to the second polynucleotide.

~~90. The composition of claim 89, further comprising the first barcode hybridized to the splint.~~

~~91. The composition of claim 89 or 90, further comprising the substrate.~~

~~92. The composition of any of claims 89-91, wherein the first polynucleotide and the second polynucleotide are of the same nucleic acid sequence.~~

~~93. The composition of any of claims 89-91, wherein the first polynucleotide and the second polynucleotide are of different nucleic acid sequences.~~

~~94. A kit comprising the composition of any of claims 89-93, the kit further comprising a second splint capable of hybridizing to one end of the second polynucleotide and one end of a second barcode, upon cleavage of the photo-cleavable polymer.~~

~~95. The kit of claim 94, further comprising the second barcode.~~

~~96. The kit of claim 94 or 95, wherein the first barcode and the second barcode are of the same nucleic acid sequence.~~

~~97. The kit of claim 94 or 95, wherein the first barcode and the second barcode are of different nucleic acid sequences.~~

~~98. The kit of any of claims 94-97, wherein the first splint and the second splint are of the same nucleic acid sequence.~~

~~99. The kit of any of claims 94-97, wherein the first splint and the second splint are of different nucleic acid sequences.~~

~~100. The kit of any of claims 94-99, wherein the first photo-cleavable polymer and/or the second photo-cleavable polymer comprise a material selected from the group consisting of a polyethylenimine (PEI), a polyacrylate, a lipid, a nanoparticle, a DNA, an RNA, a synthetic oligodeoxynucleotide (ODN), a xeno nucleic acid (XNA), a peptide nucleic acid (PNA), a locked nucleic acid (LNA), a 1,5-anhydrohexitol nucleic acid (HNA), a cyclohexene nucleic acid (CeNA), a threose nucleic acid (TNA), a glycol nucleic acid (GNA), a fluoro arabino nucleic acid (FANA), and a polypeptide.~~