WHAT IS CLAIM IS:

1. A device for applying tension to a nucleic acid sequence, comprising:

one or more fluid channels for directing fluid flow within the device;

a means of retaining nucleic acid molecules within the one or more fluid channels;

a mechanism for applying tension, that tends to stretch the nucleic acid molecule, to the nucleic acid molecules retained therein during template-driven primer extension, replication or at least one cycle of amplification,

further comprising one or more chambers, configured for nucleic acid amplification, replication or template-driven primer extension, for reacting, storing, or introducing reagents, wherein the reagents include nucleic acid primers, nucleotide triphosphates, and polymerase.

2. The device of claim 1, wherein the mechanism for applying tension to the nucleic acid molecules retained in the device comprises first and second surfaces with means for anchoring nucleic acid molecules thereon, and further wherein said first and second surfaces are configured for moving relative to each other.

3. The device of claim 1, wherein the mechanism for applying tension to the nucleic acid molecules comprises at least one surface with means for anchoring nucleic acid molecules thereon, the device further comprising a mechanism for providing a fluid flow over said nucleic acid molecules.

4. The device of claim 3, wherein at least one surface with means for anchoring nucleic acid molecules thereon further comprises passages for fluid flow distributed between the means for anchoring said nucleic acid molecules.

5. The device of claim 3 wherein the mechanism for providing a fluid flow over said nucleic acid molecules is configured to create a velocity gradient in laminar fluid flow.

6. The device of claim 1, wherein the mechanism for applying tension to the nucleic acid molecules retained in the device comprises fluid flow channels configured to provide a velocity gradient in laminar fluid flow, a stagnation point within a fluid flow, counter propagating fluid flows, or a combination of these.

7. The device of claim 1, wherein the mechanism for applying tension to the nucleic acid molecules retained in the device comprises an array of optical, electrical, or magnetic manipulators configured to manipulate particles bound to the nucleic acid molecules.

8. The device of claim 1, wherein the device is configured to operate isothermally.

9. The device of claim 1 configured for processing nucleic acid molecules, wherein processing includes replicating, sequencing or identifying.

10. The device of claim 1 configured as a microfluidic device for processing nucleic acid molecules, wherein the device is configured to apply tension for denaturing nucleic acid molecules.

11. The device of Claim 1, wherein the means for retaining the nucleic acid molecules includes anchoring means, and the mechanism for applying tension includes an array of movable individually controlled elements or particles.

12. The device of Claim 11, wherein anchoring means are covalent bonding, antibody-antigen bonding, or streptavidin-biotin bonding.

13. The device of Claims 11, wherein the movable individually controlled elements are piezoelectric elements.

14. The device of Claim 1, wherein the mechanism for applying tension comprises surfaces arranged to form an array of individually movable elements, each said movable element individually addressable by a control circuit driven by a programmable processor.

15. The device of Claim 14, wherein the control circuit includes a feedback channel that reports force and/or displacement to the processor.

16. The device of claim 11, wherein the mechanism for applying tension to the nucleic acid molecules retained in the device comprises optical or magnetic tweezers configured to manipulate particles bound to the nucleic acid molecules.

17. The device of Claim 16, wherein the optical tweezers trap particles with forces generated by optical gradients.

18. The device of Claim 16, further comprising arrays of optical tweezers.

19. The device of Claim 16, further configured to trap particles bound to the nucleic acid molecules in a fluid flow.

20. The device of claim 1, wherein the mechanism for applying tension to the nucleic acid molecules comprises at least one surface having a nucleic acid polymerase attached thereto, the device further comprising a mechanism for providing a fluid flow over said nucleic acid molecules.

21. The device of claim 11, further comprising:

at least one surface having a plurality of support structures thereon, said support structures having means for anchoring nucleic acid molecules; and

a mechanism for providing a fluid flow over said nucleic acid molecules,

wherein the support structures are configured so that fluid can flow between the structures at a controlled rate.

22. The device of claim 11, wherein the mechanism for applying tension to the nucleic acid molecules retained in the device comprises fluid channels configured to create a velocity gradient.

23. The device of Claim 22, wherein the fluid channels are configured to provide for hydrodynamic focusing.

24. The device of Claim 22, wherein the fluid channels are configured to provide for counterpropagating flow.

25. The device of Claim 22, wherein the fluid channels are configured to provide for a T-shaped junction.

26. The device of Claim 11, wherein the mechanism for applying tension to the nucleic acid molecules retained in the device comprises mechanism for applying electric fields to drive fluid flow within the device or mechanism for applying electric fields to the nucleic acid molecules retained in the device.

27. The device of Claim 26, wherein electric field is applied to conductive particles having nucleic acid molecules attached thereto.

28. A kit for processing a nucleic acid molecule, comprising:

a device of Claim 11; and

particles having nucleic acid polymerization primers attached thereto.

29. A kit for processing a nucleic acid molecule, comprising:

a device of Claim 11; and

reagents useful for amplifying, sequencing or identifying a nucleic acid molecule.

30. The device of Claim 11, wherein the device is handheld.

31. The device of claim 1, wherein the mechanism for applying tension to the nucleic acid molecules retained in the device comprises first and second surfaces with means for anchoring nucleic acid molecules thereon, and further wherein said first and second surfaces are configured for moving relative to each other.

32. The device of claim 1 configured as a microfluidic device for applying tension to nucleic acid molecules, comprising:

a) a substrate;

b) a flow channel disposed within the substrate;

c) an inlet in fluid communication with the flow channel through which a sample of nucleic acid molecules can be introduced into the flow channel, wherein the means for retaining nucleic acid molecules within the device includes,

one or more chambers for reacting, storing, or introducing reagents, wherein the reagents include nucleic acid primers, nucleotide triphosphates, and polymerase.

33. The microfluidic device according to claim 32, wherein the substrate comprises an elastomeric material.

34. The microfluidic device according to claim 32, wherein the flow channel is configured such that a sample introduced into the flow channel can be cycled around the flow channel.

35. The microfluidic device according to claim 32, wherein the microfluidic device further comprises a pump operatively disposed to transport fluid through the channel.

36. The microfluidic device according to claim 32, further configured to retain nucleic acids within the flow channel.

37. The microfluidic device according to claim 32, comprising at least one polymerase molecule immobilized within the flow channel.

38. The microfluidic device according to claim 34, wherein the flow channel is substantially circular.

39. The microfluidic device according to claim 38, wherein the microfluidic device further comprises a pump operatively disposed to transport fluid through the channel.

40. The device of claim 1 configured as a device for sequencing a DNA molecule, comprising:

one or more chambers for reacting, storing, or introducing reagents, said chambers comprising four samples, each sample comprising:

a single-stranded or a double-stranded DNA target sequence,

a DNA polymerase;

a primer complementary to the target sequence;

at least four different nucleoside triphosphates; and

a respective dideoxy nucleoside triphosphate selected from among ddATP, ddCTP, ddGTP, and ddTTP.

41. The device of Claim 40, wherein the dideoxy nucleoside triphosphates are labeled by a detectable chemical moiety.

42. The device of Claim 40, wherein the dideoxy nucleoside triphosphates are labeled by base-specific fluorescent moieties.

43. The device of claim 1 configured for detecting presence of a pathogen in a biological sample, comprising:

a means for probing the amplified nucleic acid for the presence of a nucleotide sequence specifically associated with the pathogen.

44. The device of Claim 1, wherein the mechanism for applying tension is selected from a mechanism for applying mechanical tension, hydrodynamic tension, or electrodynamic tension, or a combination thereof.

45. A device of claim 1, wherein at least one of the one or more chambers contain reagents for template-driven primer extension.

46. A device of any one of claims 40 and 43, wherein tension is applied during template-driven primer extension.

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a means of retaining nucleic acid molecules within the one or more fluid channels;

a mechanism for applying tension, that tends to stretch the nucleic acid molecule, to the nucleic acid molecules retained therein during template-driven primer extension, replication or at least one cycle of amplification,

further comprising one or more chambers, configured for nucleic acid amplification, replication or template-driven primer extension, for reacting, storing, or introducing reagents, wherein the reagents include nucleic acid primers, nucleotide triphosphates, and polymerase.

2. The device of claim 1, wherein the mechanism for applying tension to the nucleic acid molecules retained in the device comprises first and second surfaces with means for anchoring nucleic acid molecules thereon, and further wherein said first and second surfaces are configured for moving relative to each other.

3. The device of claim 1, wherein the mechanism for applying tension to the nucleic acid molecules comprises at least one surface with means for anchoring nucleic acid molecules thereon, the device further comprising a mechanism for providing a fluid flow over said nucleic acid molecules.

4. The device of claim 3, wherein at least one surface with means for anchoring nucleic acid molecules thereon further comprises passages for fluid flow distributed between the means for anchoring said nucleic acid molecules.

5. The device of claim 3 wherein the mechanism for providing a fluid flow over said nucleic acid molecules is configured to create a velocity gradient in laminar fluid flow.

6. The device of claim 1, wherein the mechanism for applying tension to the nucleic acid molecules retained in the device comprises fluid flow channels configured to provide a velocity gradient in laminar fluid flow, a stagnation point within a fluid flow, counter propagating fluid flows, or a combination of these.

7. The device of claim 1, wherein the mechanism for applying tension to the nucleic acid molecules retained in the device comprises an array of optical, electrical, or magnetic manipulators configured to manipulate particles bound to the nucleic acid molecules.

8. The device of claim 1, wherein the device is configured to operate isothermally.

9. The device of claim 1 configured for processing nucleic acid molecules, wherein processing includes replicating, sequencing or identifying.

10. The device of claim 1 configured as a microfluidic device for processing nucleic acid molecules, wherein the device is configured to apply tension for denaturing nucleic acid molecules.

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13. The device of Claims 11, wherein the movable individually controlled elements are piezoelectric elements.

14. The device of Claim 1, wherein the mechanism for applying tension comprises surfaces arranged to form an array of individually movable elements, each said movable element individually addressable by a control circuit driven by a programmable processor.

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18. The device of Claim 16, further comprising arrays of optical tweezers.

19. The device of Claim 16, further configured to trap particles bound to the nucleic acid molecules in a fluid flow.

20. The device of claim 1, wherein the mechanism for applying tension to the nucleic acid molecules comprises at least one surface having a nucleic acid polymerase attached thereto, the device further comprising a mechanism for providing a fluid flow over said nucleic acid molecules.

21. The device of claim 11, further comprising:

at least one surface having a plurality of support structures thereon, said support structures having means for anchoring nucleic acid molecules; and

a mechanism for providing a fluid flow over said nucleic acid molecules,

wherein the support structures are configured so that fluid can flow between the structures at a controlled rate.

22. The device of claim 11, wherein the mechanism for applying tension to the nucleic acid molecules retained in the device comprises fluid channels configured to create a velocity gradient.

23. The device of Claim 22, wherein the fluid channels are configured to provide for hydrodynamic focusing.

24. The device of Claim 22, wherein the fluid channels are configured to provide for counterpropagating flow.

25. The device of Claim 22, wherein the fluid channels are configured to provide for a T-shaped junction.

26. The device of Claim 11, wherein the mechanism for applying tension to the nucleic acid molecules retained in the device comprises mechanism for applying electric fields to drive fluid flow within the device or mechanism for applying electric fields to the nucleic acid molecules retained in the device.

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30. The device of Claim 11, wherein the device is handheld.

31. The device of claim 1, wherein the mechanism for applying tension to the nucleic acid molecules retained in the device comprises first and second surfaces with means for anchoring nucleic acid molecules thereon, and further wherein said first and second surfaces are configured for moving relative to each other.

32. The device of claim 1 configured as a microfluidic device for applying tension to nucleic acid molecules, comprising:

a) a substrate;

b) a flow channel disposed within the substrate;

c) an inlet in fluid communication with the flow channel through which a sample of nucleic acid molecules can be introduced into the flow channel, wherein the means for retaining nucleic acid molecules within the device includes,

one or more chambers for reacting, storing, or introducing reagents, wherein the reagents include nucleic acid primers, nucleotide triphosphates, and polymerase.

33. The microfluidic device according to claim 32, wherein the substrate comprises an elastomeric material.

34. The microfluidic device according to claim 32, wherein the flow channel is configured such that a sample introduced into the flow channel can be cycled around the flow channel.

35. The microfluidic device according to claim 32, wherein the microfluidic device further comprises a pump operatively disposed to transport fluid through the channel.

36. The microfluidic device according to claim 32, further configured to retain nucleic acids within the flow channel.

37. The microfluidic device according to claim 32, comprising at least one polymerase molecule immobilized within the flow channel.

38. The microfluidic device according to claim 34, wherein the flow channel is substantially circular.

39. The microfluidic device according to claim 38, wherein the microfluidic device further comprises a pump operatively disposed to transport fluid through the channel.

40. The device of claim 1 configured as a device for sequencing a DNA molecule, comprising:

one or more chambers for reacting, storing, or introducing reagents, said chambers comprising four samples, each sample comprising:

a single-stranded or a double-stranded DNA target sequence,

a DNA polymerase;

a primer complementary to the target sequence;

at least four different nucleoside triphosphates; and

a respective dideoxy nucleoside triphosphate selected from among ddATP, ddCTP, ddGTP, and ddTTP.

41. The device of Claim 40, wherein the dideoxy nucleoside triphosphates are labeled by a detectable chemical moiety.

42. The device of Claim 40, wherein the dideoxy nucleoside triphosphates are labeled by base-specific fluorescent moieties.

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a means for probing the amplified nucleic acid for the presence of a nucleotide sequence specifically associated with the pathogen.

44. The device of Claim 1, wherein the mechanism for applying tension is selected from a mechanism for applying mechanical tension, hydrodynamic tension, or electrodynamic tension, or a combination thereof.

45. A device of claim 1, wherein at least one of the one or more chambers contain reagents for template-driven primer extension.

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