CLAIMS

1. A system for analysis of a biological sample, comprising:

a ~~and one or more chips together being configured to perform said analysis of said~~ mobile device that receives an integrated chip to analyze the biological sample loaded thereon, ~~said analysis including at least one cycle of operations, each of said cycle of operations comprising:~~ wherein the mobile device and the integrated chip together comprise an extraction module, an amplification module, and a detection module; and

a control mechanism,

wherein during operation of the system, the mobile device and the integrated chip perform at least one cycle of operations comprising:

a) ~~extracting at least one biological material~~ using the extraction module to extract an analyte from the biological sample;

b) ~~generating~~ using the amplification module to generate one or more products from ~~at least one biological material,~~ the analyte; and

c) ~~detecting at least one biological material in the sample,~~ using the detection module to detect the analyte or the one or more products generated from the analyte; and

wherein ~~said system being further configured~~ the integrated chip and the mobile device use the control mechanism to selectively apply nanoscale control during ~~at least one of said cycle of operations.~~ one or more cycles of the extraction, generation, and detection operations.

~~2. The system of Claim 1, further comprising an extraction control module.~~

~~3. The system of claim 2, wherein the extraction control module is configured to extract nucleic acids or proteins.~~

~~4. The system of claim 1, further comprising an amplification control module.~~

~~5. The system of claim 4, wherein the amplification module comprises an isothermal nucleic acid amplification module.~~

~~6. The system of claim 5, wherein the isothermal nucleic acid amplification module comprises at least one of: a Loop Mediated Isothermal Amplification module, a Helicase-Dependent Amplification module, a Strand Displacement Amplification module, a bridge amplification module, or a rolling circle amplification module.~~

~~7. The system of claim 1, wherein the system comprises at least one processor configured to provide nanoscale control.~~

~~8. The system of claim 7, wherein the system comprises at least one chip that comprises:~~

~~an extraction module;~~

~~an amplification module, in fluid communication with said extraction module; and~~

~~a biological sample detection module in fluid communication with said amplification module or said extraction module.~~

~~9. The system of Claim 7, wherein the at least one processor receives feedback signals from at least one of an extraction module, said an amplification module, and said a biological sample detection module.~~

~~10. The system of claim 8, wherein said extraction module further comprises fluid pressure generating means for generating sufficient fluid pressure to shear cells in the biological sample loaded onto the at least one chip.~~

~~11. The system of claim 8, wherein said extraction module further retains or captures magnetic particles on said integrated chip.~~

~~12. The system of claim 8, wherein at least one processor receives feedback control signals from said amplification module to effect nanoscale control of at least one parameter of the amplification module.~~

~~13. The system of claim 1, wherein the system is further configured to determine a pathogenic load in said biological sample.~~

~~14. The system of claim 1, wherein at least one chip comprises a port for loading a biological sample onto the integrated chip; an extraction module in fluid communication with said port; an amplification module in fluid communication with the nucleic acid extraction module; and a separation module, in fluid communication with the amplification module; a fluid pressure generator in fluid communication with said at least one chip.~~

~~15. The system of claim 1, wherein the biological material is selected from the group consisting of nucleic acids and proteins.~~

~~16. The system of claim 2, wherein at least one processor receives feedback control signals from the extraction module to effect nanoscale control of at least one parameter of the extraction module.~~

~~17. The system of claim 8, wherein at least one processor receives feedback control signals from the biological sample detection module to effect nanoscale control of at least one parameter of the biological sample detection module.~~

~~18. The system of claim 1, wherein nanoscale control comprises a rotational or translational position of at least one molecule.~~

~~19. The system of claim 1, wherein at least one processor is configured to provide nanoscale control such that a signal to noise ratio is increased in favor of enriching at least one product that is targeted for analysis in the plurality of products.~~

~~20. The system of claim 1, wherein at least one processor is configured to provide nanoscale control such that a Gaussian spread of the plurality of products produced during the analysis is tightened.~~

~~21. The system of claim 1, wherein at least one processor controls at least one parameter selected from the group consisting of fluid flow, pressure, temperature, tension exerted on a~~

~~molecule, salt concentration, pH, electromagnetic force, mechanical force, and hydrodynamic force.~~

~~22. The system of claim 1, wherein nanoscale control comprises nanomanipulation or control of molecules and fluidic flows at the nanoscale.~~

~~23. The system of claim 1, wherein said extraction includes using at least one of: chemical extraction, ultrasonic disruption, mechanical disruption, thermal disruption, electroporation, exposure to silica beads, and exposure to magnetic beads.~~

~~24. The system of claim 23, wherein said extraction is performed using exposure to magnetic beads.~~

~~25. The system of claim 1, wherein generating one or more products comprises manipulating the biological material by a method selected from the group consisting of amplifying, replicating, duplicating, hybridizing, binding, labelling, and immobilizing.~~

~~26. The system of claim 1, wherein extracting the biological material comprises chemical extraction, ultrasonication, mechanical shearing, thermal disruption, electroporation, silica beads, magnetic beads, or combinations thereof.~~

~~27. The system of claim 1, wherein generating one or more products comprises amplifying at least one nucleic acid target.~~

~~28. The system of claim 1, wherein generating one or more products comprises amplifying the at least one nucleic acid target by isothermal amplification.~~

~~29. The system of claim 1, wherein detecting the one or more products comprises optical detection, fluorescent detection, sequencing, capillary electrophoresis, agarose gel electrophoresis, antibody optical, or fluorescent detection, sequencing of the molecules, capillary electrophoresis, polyacrylamide gel electrophoresis, antibody labeling, or combinations thereof.~~

~~30. The system of claim 1, wherein nanoscale control further comprises precision control of at least one parameter that governs at least one of the steps of the analysis of the biological sample.~~

~~31. The system of claim 1, wherein nanoscale control further comprises precision control of at least one environmental or operational parameter related to the analysis of the biological sample.~~

~~32. The system of claim 1, wherein nanoscale control further comprises control of at least one parameter related to the extraction of biological sample to provide the component of the biological sample.~~

~~33. The system of claim 1, wherein nanoscale control further comprises control of amplification of the component.~~

~~34. The system of claim 1, wherein nanoscale control further comprises control of detection or analysis of the biological material.~~

~~35. The system of claim 1, wherein nanoscale control comprises at least one processor receiving feedback signals corresponding to at least one parameter that is controlled under closed-loop control, to thereby effect nanoscale control of at least one parameter.~~

~~36. The system of claim 1, wherein the nanoscale control comprises nanomanipulation or control of one or more molecules at the nanoscale.~~

~~37. The system of claim 1 wherein nanoscale control further comprises feedback control, closed loop feedback control, or combinations thereof.~~

~~38. The system of claim 1, wherein the biological material is protein, DNA, or RNA.~~

~~39. The system of claim 1, wherein generating one or more products comprises optionally amplifying the biological material.~~

2. The system of claim 1, wherein during operation of the system, the mobile device and integrated chip use the detection module to detect the analyte or the one or more products generated from the analyte by at least one of:

measuring an optical signal corresponding to the analyte or the one or more products generated from the analyte;

sequencing the analyte or the one or more products generated from the analyte; and

performing electrophoresis on the analyte or the one or more products generated from the analyte.

3. The system of claim 1, wherein the analyte is a nucleic acid, and wherein the one or more products are partial or entire copies of the nucleic acid.

4. The system of claim 3, wherein during operation of the system, the mobile device and integrated chip use the amplification module to amplify the nucleic acid to generate a population of the one or more products.

5. The system of claim 1, wherein the analyte is a nucleic acid, and wherein the one or more products are complementary to the nucleic acid.

6. The system of claim 5, wherein the nucleic acid comprises RNA, and wherein during operation of the system, the mobile device and integrated chip use the amplification module to perform a reverse transcription reaction to generate DNA that is complementary to the RNA.

7. The system of claim 1, wherein applying nanoscale control comprises applying a hydrodynamic stress to at least one of the analyte and the one or more products.

8. The system of claim 1, wherein applying nanoscale control comprises adjusting a rotational orientation of at least one of the analyte and the one or more products.

9. The system of claim 1, wherein applying nanoscale control comprises hydrodynamically focusing at least one of the analyte and the one or more products.

10. The system of claim 1, wherein applying nanoscale control comprises applying an electromagnetic tension to at least one of the analyte and the one or more products.

11. The system of claim 1, wherein applying nanoscale control comprises applying a mechanical force to at least one of the analyte and the one or more products.

12. The system of claim 1, wherein applying nanoscale control comprises adjusting a translational position of at least one of the analyte and the one or more products.

13. The system of claim 1, wherein applying nanoscale control comprises adjusting, on a length scale of 100 nm or less, at least one environmental parameter associated with the at least one of the analyte and the one or more products.

14. The system of claim 13, wherein the at least one environmental parameter comprises a temperature of the at least one of the analyte and the one or more products.

15. The system of claim 13, wherein the at least one environmental parameter comprises a concentration of at least one reagent combined with the at least one of the analyte and the one or more products.

16. A method for analysis of a biological sample, comprising:

(1) loading the biological sample onto a chip;

(2) performing an extraction operation to extract an analyte from the biological sample;

(3) performing an amplification operation to generate one or more products from the analyte; and

(4) performing a detection operation to detect the analyte or the one or more products generated from the analyte; and

during at least one cycle of the extraction, amplification, and detection operations, exerting nanoscale control over at least one of the analyte and the one or more products generated from the analyte.

17. The method of claim 16, wherein exerting nanoscale control over at least one of the analyte and the one or more products generated from the analyte comprises applying a hydrodynamic stress to at least one of the analyte and the one or more products.

18. The method of claim 16, wherein exerting nanoscale control over at least one of the analyte and the one or more products generated from the analyte comprises adjusting a rotational orientation of at least one of the analyte and the one or more products.

19. The method of claim 16, wherein exerting nanoscale control over at least one of the analyte and the one or more products generated from the analyte comprises adjusting a translational position of at least one of the analyte and the one or more products.

20. The method of claim 16, wherein exerting nanoscale control over at least one of the analyte and the one or more products generated from the analyte comprises hydrodynamically focusing at least one of the analyte and the one or more products.

21. The method of claim 16, wherein exerting nanoscale control over at least one of the analyte and the one or more products generated from the analyte comprises applying an electromagnetic tension to at least one of the analyte and the one or more products.

22. The method of claim 16, wherein exerting nanoscale control over at least one of the analyte and the one or more products generated from the analyte comprises applying a mechanical force to at least one of the analyte and the one or more products.

23. The method of claim 16, wherein exerting nanoscale control over at least one of the analyte and the one or more products generated from the analyte comprises adjusting, on a length

scale of 100 nm or less, at least one environmental parameter associated with at least one of the analyte and the one or more products.

24. The method of claim 23, wherein the at least one environmental parameter comprises a temperature of the at least one of the analyte and the one or more products.

25. The method of claim 23, wherein the at least one environmental parameter comprises a concentration of at least one reagent combined with the at least one of the analyte and the one or more products.

26. The method of claim 16, wherein performing the amplification operation comprises generating the one or more products by at least one of replicating and amplifying the analyte.

27. The method of claim 16, wherein the analyte is a nucleic acid, and wherein the one or more products are partial or entire copies of the nucleic acid.

28. The method of claim 16, wherein the analyte is a nucleic acid, and wherein the one or more products are complementary to the nucleic acid.

29. The method of claim 28, wherein the nucleic acid comprises RNA, and wherein the amplification operation comprises performing a reverse transcription reaction to generate DNA that is complementary to the RNA.

30. A method for measuring an agent, pathogen, or biomarker in a biological sample, or diagnosing a condition, the method comprising:

performing at least one cycle of operations on the sample, the cycle of operations comprising:

a) extracting an analyte from the sample;

b) generating a product from the sample; and

c) detecting at least one of the analyte and the product;

applying nanoscale control to molecules during the at least one cycle of operations, wherein applying nanoscale control comprises controlling at least one of a rotational orientation of the molecules, a tension applied to the molecules, a force applied to the molecules, and a stress applied to the molecules; and

based on the detected at least one of the biological material and the product, at least one of:

detecting a presence of at least one of a biomarker in the sample, a bacterial, parasitic, or fungal pathogen in the sample, a signature of a DNA in the sample, or a signature of an RNA in the sample;

determining a quantified measure of at least one of a biomarker in the sample, a bacterial, parasitic, or fungal pathogen in the sample, or a viral load in the sample; and

determining a diagnosis based on a presence of at least one of a biomarker in the sample, a bacterial, parasitic, or fungal pathogen in the sample, or a virus in the sample.