CLAIMS:

1. An instrument for processing a biological sample, the instrument comprising:

~~a chassis;~~

a tape path~~, connected to the chassis,~~ along which a tape with a matrix of wells can be ~~automatically~~ advanced through the instrument;

a dispensing assembly~~,~~ for aspirating the biological sample and a reagent and ~~connected to the chassis,~~ for dispensing the biological sample and a reagent into the matrix of wells of the tape to form a biological sample and reagent mixture;

a sealing assembly~~, connected to the chassis,~~ for sealing the biological sample and reagent mixture in the tape; and

an amplification and detection assembly~~, connected to the chassis,~~ for detecting a signal from the biological sample and reagent mixture in the matrix of wells in the tape~~.~~, wherein the amplification and detection system includes a thermal unit positioned on the tape path that is configured and arranged to control the temperature of the biological sample and reagent mixture in the matrix of wells of the tape; and

a pressure chamber mounted on the thermal unit on the tape path to pressurize an area over the tape.

2. The instrument of claim 1, ~~wherein the instrument is positioned on a cart assembly~~ further comprising an analytics system to analyze data that is collected from the biological sample and reagent mixture.

3 The instrument of ~~claim 1, and further comprising:~~

~~a plate rack, connected to the chassis, with a nest that is configured to receive a plate containing the biological sample or the reagent;~~

~~a plate stacker, connected to the chassis, with an arm that is configured to grab the plate from the plate rack; and~~

~~a plate shuttle, connected to the chassis, with a nest that is configured to receive the plate from the arm of the plate stacker.~~

any preceding claim, wherein the instrument is capable of both isothermal amplification and polymerize chain reaction.

4. The instrument of ~~claim 3, wherein the dispensing assembly can aspirate the biological sample or the reagent out of the plate on the plate shuttle and dispense the biological sample or the reagent into the tape in the tape path.~~ any preceding claim, wherein the thermal unit includes a heat pump.

5. The instrument of ~~claim 1, and further comprising:~~

~~a deck plate station, connected to the chassis, that is configured to receive a plate containing the biological sample or the reagent.~~

any preceding claim, further comprising tape which includes a first matrix of wells and a second matrix of wells offset from the first matrix of wells.

6. The instrument of ~~claim 5, wherein the dispensing assembly can aspirate the biological sample or the reagent out of the plate on the deck plate station and dispense the biological sample or the reagent into the tape in the tape path.~~ any preceding claim, wherein further comprising a tape which has a first matrix of wells and a second matrix of wells offset from and interlaced with the first matrix of wells.

7. The instrument of ~~claim 1, and wherein the dispensing assembly further comprises:~~

~~a sample dispenser with one or more tips that can aspirate and dispense the biological sample; and~~

~~a reagent dispenser attached to a side of the sample dispenser with one or more tips that can aspirate and dispense the reagent;~~

~~wherein the reagent dispenser can move in a z direction relative to the sample dispenser.~~

any preceding claim, wherein the tape path includes at least a portion which extends through the instrument and defines a path along which the tape with the plurality of wells can be automatically advanced or retracted.

8. The instrument of ~~claim 7, and further comprising:~~

~~a sample dispenser wash, connected to the chassis, to wash the tips of the sample dispenser; and~~

~~a reagent dispenser wash, connected to the chassis, to wash the tips of the reagent dispenser.~~

any preceding claim, wherein the tape path which extends through substantially the entire length of the instrument and defines a path along which the tape with the plurality of wells can be automatically advanced or retracted.

9. The instrument of ~~claim 1, wherein the tape path further comprises:~~

~~a drive mechanism to automatically advance the tape along the tape path, wherein the drive mechanism includes a belt to frictionally advance the tape along the tape path.~~

any preceding claim, further comprising a plate rack coupled to the chassis.

10. The instrument of ~~claim 1, wherein the tape path further comprises:~~

~~a tape infeed positioned adjacent a first end of the tape path to feed the tape into the instrument;~~

~~a tape cutter positioned near the first end of the tape path to cut the tape; and~~

~~a tape hold down positioned above the tape path that can be extended to hold down the tape in the tape path.~~

any preceding claim, further comprising a plate rack coupled to the chassis, with a nest that is configured to receive a plate containing the biological sample or the reagent.

11. The instrument of ~~claim 10, wherein the tape cutter can singulate the tape so that a single array of tape with a matrix of wells can move through the instrument.~~ any

preceding claim, further comprising a plate shuttle, coupled to the chassis, with a nest that is configured to receive the plate from the arm of the plate stacker.

12. The instrument of ~~claim 1, and further comprising:~~

~~a tape rewind positioned adjacent to a second end of the tape path to collect tape from the instrument.~~

any preceding claim, further comprising at least one dispensing assembly wash, coupled to the chassis, to wash portions of the dispensing assembly.

13. The instrument of ~~claim 1, wherein the amplification and detection assembly further comprises:~~

~~a thermal unit mounted to the tape path with a heat pump to heat or cool the biological sample and the reagent in the tape; and~~

~~a heated pressure chamber mounted on the thermal unit on the tape path to pressurize an area over the tape.~~

any preceding claim, further comprising a drive mechanism to automatically advance the tape along the tape path.

14. The instrument of ~~claim 1, and further comprising:~~

~~an analytics system to analyze data that is collected~~ from the ~~biological sample and reagent mixture.~~

any preceding claim, wherein the tape path further comprises a tape infeed positioned adjacent a first end of the tape path to feed the tape into the instrument. and a tape cutter positioned near the first end of the tape path to cut the tape.

15. The instrument of ~~claim 1, wherein the instrument is capable of both isothermal amplification and polymerize chain reaction.~~ any preceding claim, wherein the pressure chamber is heated.

~~16. The instrument of claim 1, and further comprising:~~

~~a thermal management system with a fluid path that is configured to have a fluid flow through it to exchange heat with components positioned adjacent to the fluid path.~~

~~17. The instrument of claim 1, wherein the tape comprises:~~

~~a first matrix of wells; and~~

~~a second matrix of wells that are offset from and interlaced with the first matrix of wells.~~

~~18. An instrument for amplifying and analyzing a biological sample and a reagent, the instrument comprising:~~

~~a path extending through the device for advancing a tape containing a plurality of wells through the instrument;~~

~~a dispensing and sealing station, positioned along the path and downstream of an entrance to the path, with a dispensing assembly positioned adjacent to the dispensing and sealing station to dispense a biological sample and a reagent into the plurality of wells in the tape to form a biological sample and reagent mixture, and a tape sealing assembly positioned adjacent to the dispensing and sealing station to seal the biological sample and reagent mixture in the plurality of wells in the tape;~~

~~a holding station, positioned along the path and downstream of the dispensing and sealing station, with a thermal unit positioned below the holding station to heat or cool the biological sample and reagent mixture in the plurality of wells in the tape; and~~

an amplification and detection station, positioned along the path and ~~downstream of the holding station, with a thermal unit to amplify~~

~~the biological sample and reagent mixture, and a detection unit to detect a signal from the biological sample and reagent mixture.~~

~~19. The instrument of claim 18, and further comprising:~~

~~a plurality of amplification and detection stations.~~

20. The instrument of claim 19, wherein the plurality of amplification and detection stations are positioned in parallel with one another.

21. The instrument of claim 19, wherein the plurality of amplification and detection stations are positioned in series with one another.

22. The instrument of claim 18, wherein a drive mechanism is positioned along the path to advance the tape along the path.

23. The instrument of claim 22, wherein the drive mechanism includes a belt that runs along the path and contacts a bottom side of the tape to move the tape along the path with friction.

24. The instrument of claim 23, wherein a plurality of rollers are positioned above and contact a top side of the tape to hold the tape in contact with the belt as the tape moves along the path.

25. The instrument of claim 18, wherein a thermal unit is positioned below the dispensing and sealing station to heat or cool the biological sample and reagent mixture in the plurality of wells in the tape.

26. The instrument of claim 18, wherein a retractable hold-down is positioned over the holding station that can extend out and hold down the tape in the dispensing and sealing station.

27. The instrument of claim 18, wherein a heated pressure chamber is positioned above the amplification and detection station to pressurize and heat an area above the tape.

28. An instrument for amplifying and detecting a biological sample, the instrument comprising:

a plate rack that is capable of holding one or more plates;

a plate stacker to lift a plate out of the plate rack;

a plate shuttle with a platform on which the plate stacker can place the plate from the plate rack, wherein the plate shuttle can position the platform for aspirating or dispensing;

a plate deck on which a plate can be placed;

a dispensing assembly with a first plurality of tips and a second plurality of tips, wherein the dispensing assembly can dispense a biological sample and a reagent into the plurality of wells on the tape to form a biological sample and reagent mixture;

a path extending through the instrument along which the tape is advanced through the instrument;

a tape sealer that seals the plurality of wells in the tape;

a thermal unit that heats the biological sample and reagent mixture in the plurality of wells in the tape;

a heated pressure chamber that pressurizes an area over the tape; and

a detection device that detects a signal from the biological sample and reagent mixture in the plurality of wells in the tape.

29. The instrument of claim 28, wherein the plate in the plate rack can contain the biological sample, the reagent, or dispense tips.

30. The instrument of claim 28, wherein the plate on the plate deck can contain the biological sample or the reagent.

31. The instrument of claim 28, wherein the first plurality of tips of the dispensing assembly can aspirate from the plate on the plate shuttle, the plate on the plate deck, or the tape.

32. The instrument of claim 28, wherein the first plurality of tips of the dispensing assembly can dispense into the plate on the plate shuttle, the plate on the plate deck, or the tape.

33. The instrument of claim 28, wherein the second plurality of tips of the dispensing assembly can aspirate from the plate on the plate shuttle, the plate on the plate deck, or the tape.

34. The instrument of claim 28, wherein the second plurality of tips of the dispensing assembly can dispense into the plate on the plate shuttle, the plate on the plate deck, or the tape.

35. The instrument of claim 28, wherein the instrument includes a chassis to support each component in the instrument.

36. An instrument for processing a biological sample, the instrument comprising:

a tape with a plurality of wells, wherein the tape has a first matrix of wells and a second matrix of wells offset from and interlaced with the first matrix of wells;

a tape path extending through the instrument along which the tape with the plurality of wells can be automatically advanced; and

a dispensing assembly for dispensing the biological sample and a reagent into the plurality of wells of the tape, wherein the dispensing assembly can dispense the biological sample or the reagent into the first matrix of wells and reposition to dispense the biological sample or the reagent into the second matrix of wells.

37. The instrument of claim 36, and further comprising:

a tape sealing assembly for sealing the biological sample and the reagent in the tape; and

a detection assembly for detecting a signal from the biological sample and the reagent in the plurality of wells of the tape.

38. The instrument of claim 37, wherein the instrument includes a chassis to support each component in the instrument.

39. A method of analyzing a biological sample and reagent mixture in an instrument, the method comprising:

automatically advancing a tape with a matrix of wells to a first position on a tape path in the instrument using a tape infeed and a drive mechanism positioned along the tape path;

automatically advancing the tape to a second position on the tape path in the instrument using the drive mechanism positioned along the tape path;

dispensing a biological sample into the matrix of wells in the tape with a dispensing assembly when the tape is positioned at the second position of the tape path;

dispensing a reagent into the matrix of wells in the tape with a dispensing assembly when the tape is positioned at the second position of the tape path, wherein a biological sample and reagent mixture is formed;

sealing a seal over the matrix of wells in the tape with a tape sealer when the tape is positioned at the second position;

automatically advancing the tape to a third position on the tape path in the instrument using the drive mechanism positioned along the tape path;

automatically advancing the tape to a fourth position on the tape path in the instrument using the drive mechanism positioned along the tape path;

amplifying the biological sample and reagent mixture at the fourth position of the tape path; and

detecting a signal from the biological sample and reagent mixture using a camera positioned above the fourth position of the tape path.

40. The method of claim 39, wherein the tape infeed can be moved to an extended position to load a spool of tape and moved to a retracted position to advance the tape through the tape infeed to the first position on the tape path.

41. The method of claim 39, and further comprising:

singulating the tape with a tape cutter at the first position on the tape path.

42. The method of claim 39, wherein the drive mechanism automatically advances the tape along the tape path using friction between a belt and a plurality of rollers.

43. The method of claim 39, and further comprising:

picking a plate containing a biological sample or a reagent out of a plate rack using a plate stacker;

moving the plate along the plate stacker;

placing the plate on a plate shuttle; and

moving the plate shuttle through the instrument to position the plate so that the dispensing assembly can aspirate from or dispense into the plate.

44. The method of claim 43, and further comprising:

moving the plate shuttle out of the instrument so that a plate can be placed on or removed from the plate shuttle by a user or a robotic arm.

45. The method of claim 43, and further comprising:

aspirating the biological sample or the reagent from the plate on the plate shuttle; and

aspirating the biological sample or the reagent from a plate on a plate deck assembly.

46. The method of claim 39, and further comprising:

lifting the second position and the fourth position from a first level to a second level using a lift mechanism, wherein the second level is the level of the tape on the tape path;

holding a first edge of the tape down using a retractable hold down when the biological sample and the reagent are dispensed into the matrix of wells in the tape with the dispensing assembly; and

cooling the biological sample and reagent mixture in the tape at the third position of the tape path using a thermal unit positioned at the third position of the tape path.

47. The method of claim 39, wherein the biological sample and reagent mixture is amplified using a thermal unit that is positioned at the fourth position of the tape path.

48. A tape path assembly for an instrument for processing a biological sample, the tape path assembly comprising:

a tape path comprising:

a front end;

a back end;

a first position downstream of the front end;

a second position downstream of the first position;

a third position downstream of the second position; and

a fourth position between the third position and the back end;

a tape infeed attached to the front end that automatically advances a tape with a matrix of wells to the first position of the tape path; and

a drive mechanism that advances the tape along the tape path.

49. The tape path assembly of claim 48, wherein the tape infeed includes a first set of rollers, a second set of rollers, and a third set of rollers, wherein each of the sets of rollers has a first roller positioned at a first side of the tape and a second roller positioned at a second side of the tape.

50. The tape path assembly of claim 49, wherein the first set of rollers is driven by an actuator.

51. The tape path assembly of claim 50, wherein the second set of rollers is held against the first set of rollers by a tension mechanism such as a spring.

52. The tape path assembly of claim 51, wherein the second set of rollers is configured to transfer motion from the first set of rollers to the third set of rollers.

53. The tape path assembly of claim 52, wherein the third set of rollers is on an extendable portion of the tape infeed such that the third set of rollers does not contact the second set of rollers when the extendable portion is in an extended position, and the third set of rollers contacts the second set of rollers when the extendable portion is in a retracted position.

54. The tape path assembly of claim 53, wherein the extendable portion is configured to receive a tape spool at the extended position.

55. The tape path assembly of claim 54, wherein the third set of rollers is configured to receive the tape from the tape spool when the extendable portion is in the extended position.

56. The tape path assembly of claim 55, wherein the third set of rollers is closely associated with a set of rollers held against the third set of rollers by a tension mechanism, such as a spring, and which are used to help hold and move a leading edge of the tape toward the first set of rollers.

57. The tape path assembly of claim 56, wherein the extendable portion is enclosed within the instrument when the extendable portion is in the retracted position.

58. The tape path assembly of claim 57, wherein the first set of rollers is closely associated with a set of rollers held against the first set of rollers by a tension mechanism, such as a spring, and which are used to help receive the leading edge of the tape and advance the tape along the tape path.

59. The tape path assembly of claim 48, and further comprising:

a cutter located immediately before the first position of the tape path for cutting the tape to a desired length.

60. The tape path assembly of claim 59, and further comprising a sensor for detecting a position at which to cut the tape.

61. The tape path assembly of claim 60, wherein the cutter comprises an upper blade and a lower blade.

62. The tape path assembly of claim 61, wherein the lower blade is driven upward across the upper blade by an actuator.

63. The tape path assembly of claim 62, wherein the upper blade is fixed.

64. The tape path assembly of claim 63, wherein a spring-loaded tape holder is configured to hold the tape against the upper fixed blade while the tape is cut.

65. The tape path assembly of claim 64, wherein the lower blade and the spring-loaded tape holder are configured to retract after the tape is cut.

66. The tape path assembly of claim 48, wherein the drive mechanism comprises:

a pair of first pulleys at the front end of the tape path;

a pair of second pulleys at the back end of the tape path; and

a pair of drive belts set in parallel at about a width of the tape, wherein each drive belt wraps around one of the first pulleys and one of the second pulleys.

67. The tape path assembly of claim 66, wherein the drive mechanism comprises a plurality of spring loaded rollers configured to hold the tape to the drive belts.

68. The tape path assembly of claim 67, wherein an actuator is configured to drive the drive belts.

69. The tape path assembly of claim 68, and further comprising a retractable hold down located at the third position.

70. The tape path assembly of claim 69, wherein the retractable hold down is configured to hold the tape down while the tape is at the second position.

71. The tape path assembly of claim 70, wherein the retractable hold down is driven by an air cylinder.

72. The tape path assembly of claim 71, wherein the retractable hold down is forced down against the tape in an extended position by a cam track.

73. The tape path assembly of claim 72, wherein the retractable hold down moves into a retracted position to allow the tape to advance.

74. The tape path assembly of claim 48, wherein the tape path comprises a lift mechanism positioned below the tape path.

75. The tape path assembly of claim 74, wherein the lift mechanism is driven by an actuator.

76. The tape path assembly of claim 75, wherein the actuator can raise a platform of the lift mechanism to a height of the tape path.

77. The tape path assembly of claim 48, wherein the tape path comprises a sensor for sensing a feature on the tape.

78. The tape path assembly of claim 48, wherein the tape path comprises a first cover positioned over the first position of the tape path, a second cover positioned over the third position of the tape path, and a third cover positioned over the tape path

between the fourth position and the back end of the tape path, wherein the covers prevent the tape from coming off of the tape path.

79. The tape path assembly of claim 48, and further comprising:

a rewind assembly positioned adjacent to the back end of the tape path to receive tape from the tape path.

80. The tape path assembly of claim 79, wherein the rewind assembly comprises:

a shaft;

an actuator that drives the shaft at the same speed that the tape moves along the tape path; and

a spool that is positioned on the shaft, wherein the tape can be wound around the spool as the shaft is driven with the actuator and the tape exits the back end of the tape path.

81. An instrument for processing a biological sample, the instrument comprising:

a tape path along which a tape with a matrix of wells can be automatically advanced through the instrument;

a dispensing system for dispensing the biological sample and a reagent into the matrix of wells of the tape to form a biological sample and reagent mixture;

a sealing system for sealing the biological sample and reagent mixture in the tape; and

an amplification and detection system for detecting a signal from the biological sample in the matrix of wells in the tape, wherein the amplification and detection system includes a thermal unit positioned on the tape path that is capable of controlling the temperature of the biological sample and reagent mixture in the matrix of wells of the tape.

82. The instrument of claim 81, wherein the thermal unit further comprises:

a first layer with a plurality of cavities that are capable of receiving a plurality of wells of a tape;

a second layer attached to a bottom side of the first layer; and

a heat pump positioned on a bottom side of the second layer.

83. The instrument of claim 82, wherein the plurality of cavities in the first layer are sized to fit the plurality of wells on the tape.

84. The instrument of claim 81, and further comprising:

a seal covering the matrix of wells of the tape; and

a chamber configured to create an enclosed space above the seal covering the matrix of wells of the tape and configured to pressurize and heat the enclosed space.

85. The apparatus of claim 84, wherein the chamber is configured to pressurize the enclosed space such that the matrix of wells of the tape is pressed into the plurality of cavities of the thermal unit.

86. The apparatus of claim 84, wherein the chamber is configured to pressurize the enclosed space such that a force pushes against the seal covering the matrix of wells of the tape.

87. The apparatus of claim 84, wherein the chamber is configured to heat the enclosed space such that condensation does not form on the seal covering the matrix of wells of the tape.

88. An apparatus for heating a plurality of wells of a tape, the apparatus comprising:

a first layer with a plurality of cavities that are capable of receiving a plurality of wells of a tape;

a second layer attached to a bottom side of the first layer; and

a heat pump positioned on a bottom side of the second layer, wherein the heat pump is positioned so that heat can be exchanged between the heat pump and a biological sample and reagent mixture in the plurality of wells on the tape through the second layer and the first layer.

89. The apparatus of claim 88, wherein the plurality of cavities on the first layer incudes 768 cavities.

90. The apparatus of claim 88, wherein the plurality of cavities in the first layer are sized to fit the plurality of wells on the tape.

91. The apparatus of claim 88, wherein the first layer is an aluminum layer.

92. The apparatus of claim 88, wherein the second layer is a copper layer.

93. The apparatus of claim 88, wherein the heat pump comprises one or more thermoelectric modules.

94. The apparatus of claim 88, wherein a pyrolytic graphite sheet is positioned between the first layer and the second layer.

95. The apparatus of claim 88, wherein a pyrolytic graphite sheet is positioned between the second layer and the heat pump.

96. The apparatus of claim 88, and further comprising:

a fluid path positioned below the heat pump and extending from a first end of the apparatus to a second end of the apparatus, wherein the fluid path is configured so that a fluid can flow through the fluid path.

97. The apparatus of claim 96, and further comprising:

an inlet port on the first end of the apparatus, wherein the inlet port is connected to the fluid path; and

an outlet port on the second end of the apparatus, wherein the outlet port is connected to the fluid path.

98. The apparatus of claim 96, and further including:

a top housing portion to house the first layer, the second layer, the heat pump, and the fluid path; and

a bottom housing portion to provide support to the top housing portion.

99. An apparatus comprising:

a tape with a matrix of wells;

a thermal unit positioned below the tape with a matrix of wells;

a chamber positioned on top of the tape with a matrix of wells, the chamber comprising:

a housing; and

a glass cover plate;

wherein the housing and the glass cover plate form an enclosed space above the matrix of wells of the tape.

100. The apparatus of claim 99, and further comprising:

a tape path along which the tape with a matrix of wells can be automatically advanced through the instrument;

wherein the thermal unit is positioned on the tape path.

101. The apparatus of claim 100, and further comprising:

a stationary frame connected to the tape path;

a movable frame connected to the stationary frame with a hinge pin; and

an actuator connected to the stationary frame and the movable frame;

wherein the chamber is connected to the movable frame; and

wherein the actuator is configured to move the chamber from a closed position to an open position by rotating the movable frame around the hinge pin.

102. The apparatus of claim 101, wherein the chamber further comprises a heating element for heating the enclosed space above the matrix of wells of the tape.

103. The apparatus of claim 102, wherein the heating element is a resistive heating element.

104. The apparatus of claim 103, wherein the resistive heating element comprises a copper alloy.

105. The apparatus of claim 102, and further comprising a heater plenum with a plurality of air distribution orifices, the heater plenum connected to the heating element.

106. The apparatus of claim 105, wherein the heater plenum comprises aluminum.

107. The apparatus of claim 105, and further comprising an insulator plate for insulating the heating element and the heater plenum to minimize heat loss from the enclosed space.

108. The apparatus of claim 102, and further comprising an air pump for circulating air through the enclosed space to facilitate uniform temperature distribution in the enclosed space.

109. The apparatus of claim 101, and further comprising a compressed air source for providing compressed air to the enclosed space to pressurize the enclosed space.

110. The apparatus of claim 101, wherein the housing of the chamber comprises a low thermal conductivity thermoplastic polymer.

111. The apparatus of claim 101, wherein the glass cover plate of the chamber comprises a mask.

112. The apparatus of clam 101, wherein the glass cover plate of the chamber is coated in an anti-reflective material.

113. The apparatus of claim 101, wherein the housing and the glass cover plate of the chamber form a single piece of glass.

114. An instrument for processing a biological sample, the instrument comprising:

a tape path along which a tape with a matrix of wells can be automatically advanced through the instrument;

a plate stacker with an arm that can rotate around and move vertically on a z-axis, wherein the arm is configured to pick a plate out of a plate rack and place the plate on a plate shuttle;

a dispensing system for dispensing the biological sample and a reagent into the matrix of wells of the tape to form a biological sample and reagent mixture;

a sealing system for sealing the biological sample and reagent mixture in the tape; and

an amplification and detection system for detecting a signal from the biological sample and reagent mixture in the matrix of wells in the tape.

115. The instrument of claim 114, wherein the arm of the plate stacker is configured to pick a plate out of the plate shuttle and place the plate on the plate rack.

116. The instrument of claim 114, wherein the plate rack has one or more nests in which a plate can be positioned.

117. The instrument of claim 116, wherein each of the nests further comprises:

a frame that forms an outer body portion of the nest;

a plurality of corner supports to support a plate in the nest, wherein each of the plurality of corner supports is positioned in one corner of the nest and attached to the frame;

an opening inwards of the frame and the corner supports; and

a slot on one side of the frame.

118. The instrument of claim 116, wherein the plate rack further includes:

a frame to support the plurality of nests;

a rail attached to an outer surface of the frame, wherein the frame can slide along the rail to move the plate rack into and out of the instrument;

a handle attached to the outer surface of the frame, wherein the handle is shaped so that it can be grasped by a user to slide the plate rack into and out of the instrument; and

an identification mechanism attached to the frame, wherein the identification mechanism is positioned to communicate with the

instrument to indicate when the plate rack is positioned in the instrument.

119. The instrument of claim 114, wherein the arm of the plate stacker further includes a spatula to engage a bottom surface of a plate to pick the plate.

120. The instrument of claim 119, wherein the spatula further includes:

a support member with a flat structure to engage and support the plate; and

a plurality of notches, wherein one notch is located in each corner of the support member.

121. The instrument of claim 119, wherein the plate stacker further comprises:

a screw rail centered on the z-axis, wherein the arm is attached to the screw rail and moves in a vertical direction on the screw rail;

a first actuator to control vertical movement of the arm on the screw rail;

a column positioned around the screw rail, wherein the column and arm can rotate around the z-axis;

a second actuator to control rotational movement of the column and the arm;

a camera attached to the arm to scan a barcode on the plate rack; and

a cable carrier to contain cables that connect the camera to the instrument.

122. The instrument of claim 121, wherein the first actuator is a servo motor that can sense the position of the arm on the screw rail.

123. The instrument of claim 114, wherein the plate shuttle has a nest and a plate can be positioned and held in the nest.

124. The instrument of claim 123, wherein the nest of the plate shuttle can extend outside the instrument to allow a user or an external robot to pick a plate from the plate shuttle or place a plate on the plate shuttle.

125. The instrument of claim 123, wherein the nest further comprises:

a frame that forms an outer body portion of the nest;

a plurality of corner supports to support a plate in the nest, wherein each of the plurality of corner supports is positioned in one corner of the nest and attached to the frame;

an opening inwards of the frame and the corner supports; and

a slot on one side of the frame.

126. The instrument of claim 123, wherein the plate shuttle further comprises:

a support extending in a horizontal direction through the instrument;

a rail attached to the support and extending in the horizontal direction through the instrument;

a driving mechanism attached to the support;

an actuator to drive the driving mechanism;

a bracket attached to the driving mechanism with a clamp and connected to the rail, wherein the driving mechanism moves the bracket and causes the bracket to slide along the rail, and wherein the nest is attached to the bracket so that the nest moves with the bracket through the instrument;

a home sensor attached to the support at a first end of the support, wherein the home sensor is positioned to sense when the nest is positioned near the first end of the support; and

a plate sensor attached to the support between a first end and a middle of the support, wherein the plate sensor is home a plate is positioned on the nest.

127. A plate stacker assembly comprising:

a plate rack that includes a plurality of nests attached to a frame, wherein each of the plurality of nests has a plurality of corner supports that are capable of supporting a plate;

a plate shuttle that includes a nest attached to a support structure, wherein the nest has a plurality of corner supports that are capable of supporting a plate; and

a spatula that is capable of picking a plate off of one of the plurality of nests in the plate stacker and placing it on the nest in the plate shuttle, wherein the spatula has a support member that is capable of supporting a plate and notches is each corner of the support member that correspond to the location of the corner supports on the nests in the plate stacker and the plate shuttle.

128. The instrument of claim 127, wherein each of the plurality of nests in the plate rack further comprises:

a frame that forms an outer body portion of the nest, wherein each of the plurality of corner supports is positioned in one corner of the nest and attached to the frame;

an opening inwards of the frame and the corner supports; and

a slot on one side of the frame.

129. The instrument of claim 127, wherein the nest in the plate shuttle further comprises:

a frame that forms an outer body portion of the nest, wherein each of the plurality of corner supports is positioned in one corner of the nest and attached to the frame;

an opening inwards of the frame and the corner supports; and

a slot on one side of the frame.

130. A method for moving a plate in an instrument, the method comprising:

picking a plate off of a nest of a plate rack using a spatula attached to an arm of a plate stacker;

rotating the arm of the plate stacker around a z-axis;

moving the arm of the plate stacker in a vertical direction along the z-axis; and

placing the plate on a nest of a plate shuttle.

131. The method of claim 130, wherein picking the plate off of the nest of the plate rack further comprises:

contacting a support member of the spatula with a bottom of the plate;

passing the spatula through an opening in the nest; and

lifting the plate off of corner supports of the nest using the support member of the spatula.

132. The method of claim 130, and further comprising:

moving the nest of the plate shuttle in a horizontal direction to position the plate on the nest for aspiration or dispensing in the instrument;

aspirating a fluid out of the plate or dispensing a fluid into the plate;

moving the nest of the plate shuttle in a horizontal direction to position the plate for removal from the nest;

lifting the plate off of the nest of the plate shuttle using the spatula attached to the arm of the plate stacker;

moving the arm of the plate stacker in a vertical direction on the z-axis;

rotating the arm of the plate stacker around the z-axis; and

depositing the plate on the nest of the plate rack.

133. A tape sealing assembly comprising:

a spool holder for holding a seal web;

a peel plate located downstream of the spool holder;

a backer take-up mechanism located downstream of the peel plate for advancing the seal web across the peel plate; and

an applicator positioned above the peel plate for peeling a seal from a backer of the seal web and applying the seal to a surface.

134. The tape sealing assembly of claim 133, wherein the surface is a tape with a matrix of wells.

135. The tape sealing assembly of claim 133, wherein the spool holder comprises a roller configured to hold the spool.

136. The tape sealing assembly of claim 135, wherein the spool holder further comprises a locking mechanism configured to prevent the spool from slipping.

137. The tape sealing assembly of claim 136, wherein the locking mechanism comprises a threaded knob configured to provide pressure to an end piece configured to compress the roller.

138. The tape sealing assembly of claim 137, wherein the spool holder comprises a slip clutch configured to control a tension of the seal web.

139. The tape sealing assembly of claim 133, wherein the backer take-up mechanism is configured to hold the seal web after a seal has been removed from the backer of the seal web.

140. The tape sealing assembly of claim 133, and further comprising a sensor for sensing a position of the seal on the peel plate.

141. The tape sealing assembly of claim 140, wherein a bottom edge of the peel plate comprises a small radius for separating the seal from the backer.

142. The tape sealing assembly of claim 140, wherein the sensor is configured to signal the backer take-up mechanism to stop advancing the seal web when an edge of the seal is positioned near the bottom edge of the peel plate.

143. The tape sealing assembly of claim 142, wherein the applicator is configured to pick up the seal when the seal is advanced beyond the bottom edge of the peel plate and a leading edge of the seal is separated from the backer.

144. The tape sealing assembly of claim 143, and further comprising an actuator configured to drive the applicator.

145. The tape sealing assembly of claim 144, wherein the applicator comprises a rotatable head having a convex surface.

146. The tape sealing assembly of claim 145, wherein the convex surface is made of vulcanized rubber.

147. The tape sealing assembly of claim 145, wherein the rotatable head further comprises a plurality of vacuum chambers for picking up the seal.

148. The table sealing assembly of claim 147, wherein the plurality of vacuum chambers forms a grid in the convex surface.

149. The tape sealing assembly of claim 148, wherein the backer take-up mechanism is configured to advance the seal web as the head rotates to peel the seal from the backer.

150. The tape sealing assembly of claim 149, wherein the plurality of vacuum chambers is configured to activate from a first edge of the convex surface to a second edge of the convex surface as the head rotates.

151. The tape sealing assembly of claim 150, wherein the applicator is configured to apply pressure on the surface to activate a pressure sensitive adhesive on the seal and transfer the seal.

152. The tape sealing assembly of claim 151, wherein the plurality of vacuum chambers is configured to deactivate after the entire seal or a portion of the seal is transferred to the surface.

153. The tape sealing assembly of claim 133, wherein the backer take-up mechanism comprises a friction roller adjacent to a driven roller.

154. The tape sealing assembly of claim 153, and further comprising a mechanism to move the friction roller towards and away from the driven roller.

155. The tape sealing assembly of claim 153, wherein the backer take-up mechanism comprises a plurality of guides for guiding the backer through the backer take-up mechanism.

156. The tape sealing assembly of claim 133, wherein the backer take-up mechanism comprises a shaft configured to secure a leading edge of the backer.

157. The tape sealing assembly of claim 156, wherein a disposable core is attached to the shaft.

158. The tape sealing assembly of claim 156, wherein the shaft is configured to rotate to either wind or rewind the backer.

159. The tape sealing assembly of claim 156, wherein the shaft is connected to an actuator.

160. The tape sealing assembly of claim 133, wherein the tape sealing assembly comprises a y-axis stage for moving the tape sealing assembly to a position adjacent to the surface.

161. The tape sealing assembly of claim 133, wherein the tape sealing assembly comprises an x-axis stage for moving the tape sealing assembly to a position adjacent to the surface.

162. The tape sealing assembly of claim 161, and further comprising a y-axis stage attached to the x axis stage for moving the tape sealing assembly to a position adjacent to the surface.

168. The tape sealing assembly of claim 162, wherein the tape sealing assembly comprises a plurality of actuators for driving the x-axis stage and the y-axis stage.

164. A dispensing assembly comprising:

a gantry with an x-axis track and a y-axis track, the y-axis track of the gantry configured to move along the x-axis track of the gantry;

a dispensing head attached to the y-axis track of the gantry below the y-axis track of the gantry, the dispensing head comprising:

a contact dispensing unit; and

a non-contact dispensing unit with a jet tip for dispensing a liquid;

a dispensing enclosure attached to the y-axis track of the gantry on top of the y-axis track of the gantry, the dispensing enclosure having a pressure reservoir; and

a tube connecting the jet tip of the non-contact dispensing unit to the pressure reservoir of the dispensing enclosure;

wherein the contact dispensing unit is attached to the y-axis track of the gantry with a first z-axis track; and

wherein the non-contact dispensing unit is attached to the contact dispensing unit with a second z-axis track.

165. The dispensing assembly of claim 164, wherein the dispensing head and the dispensing enclosure are configured to move simultaneously along the x-axis track and y-axis track of the gantry to minimize relative motion between the dispensing enclosure and the jet tip.

166. The dispensing assembly of claim 164, wherein the contact dispensing unit comprises a pipette tip.

167. The dispensing assembly of claim 164, wherein the contact dispensing unit comprises a plurality of pipette tips.

168. The dispensing assembly of claim 164, wherein the dispensing enclosure further comprises a metering pump for pressurizing the pressure reservoir to provide a constant pressure for dispensing.

169. The dispensing assembly of claim 164, wherein the non-contact dispensing unit comprises a plurality of jet tips.

170. The dispensing assembly of claim 169, wherein the second z-axis track comprises a plurality of independent z-axis tracks, each of the plurality of jet tips attached to one of the plurality of independent z-axis tracks.

171. A method of operating a dispensing assembly, the method comprising:

moving a dispensing head along an x-axis track and a y-axis track of a gantry into a first aspiration position;

aspirating a first liquid with at least one pipette tip of a contact dispensing unit of the dispensing head;

moving the dispensing head along the x-axis track and the y-axis track of the gantry into a second aspiration position;

aspirating a second liquid with at least one jet tip of a non-contact dispensing unit of the dispensing head;

moving the dispensing head along the x-axis track and the y-axis track of the gantry into a first dispensing position;

dispensing the first liquid into at least one well of a tape with a matrix of wells with the at least one pipette tip of the contact dispensing unit;

moving the dispensing head along the x-axis track and the y-axis track of the gantry into a second dispensing position; and

dispensing the second liquid into at least one well of the tape with a matrix of wells with the at least one jet tip of the non-contact dispensing unit;

wherein the contact dispensing unit of the dispensing head extends and retracts along a first z-axis track, the first z-axis track connected to the y-axis track of the gantry; and

wherein the non-contact dispensing unit of the dispensing head extends and retracts along a second z-axis track connected to the contact dispensing unit.

~~172. The method of claim 171, wherein the y-axis track of the gantry is connected to and moves along the x-axis track of the gantry.~~

~~173. The method of claim 171, wherein dispensing the second liquid includes pressurizing the at least one jet tip and opening at least one valve connected to the at least one jet tip to release pressure in the at least one jet tip to force the second liquid out of the at least one jet tip.~~