

- 53.** The microarray apparatus of claim 52, wherein:
said reaction chamber comprises:
- a substrate having the array of probes deposited thereon; and
 - a cover coupled to the substrate to form the interior cavity of the reaction chamber therebetween; and
- said heat pump comprises a heating element provided at a first location of the cover and a cooling element provided at a second location of the cover.
- 54.** The microarray apparatus of claim 53, wherein:
said cover is oriented in a vertical direction with the heating element positioned below the cooling element such that target fluid heated by the heating element rises from the heating element to the cooling element, where the target fluid is cooled by the cooling element and is drawn down to the heating element by gravity.
- 55.** A microarray apparatus, comprising:
- a substrate;
 - an array of probes deposited on a surface of the substrate; and
 - a cover having a channel with a width smaller than a width of the array of probes, said cover being coupled to the substrate such that said channel and said substrate define a channel cavity such that a target fluid flowing through the channel cavity contacts each probe in the array of probes.
- 56.** The microarray apparatus of claim 55, further comprising:
- a flow inducer for inducing a target fluid to flow through the channel cavity across the array of probes.
- 57.** The microarray apparatus of claim 56, wherein:
said channel has a first end and a second end; and
said flow inducer comprises a pressure generator for generating a pressure difference between the first and second ends of the channel such that the target liquid is driven back and forth through the channel cavity.
- 58.** The microarray apparatus of claim 55, wherein each probe is completely contained within the channel cavity.
- 59.** The microarray apparatus of claim 55, wherein each probe is partially contained within the channel cavity.
- 60.** The microarray apparatus of claim 59, wherein a portion of each probe is contained within the channel cavity, wherein the portion of each probe that is contained within the channel cavity has coefficient of variation less than about 25% from probe to probe.
- 61.** The microarray apparatus of claim 60, wherein the coefficient of variation is less than about 10%.
- 62.** The microarray apparatus of claim 60, wherein the coefficient of variation is less than about 5%.
- 63.** The microarray apparatus of claim 60, wherein the coefficient of variation is less than about 1%.
- 64.** A microarray apparatus, comprising:
- a reaction chamber having an interior cavity;
 - an array of probes deposited on an inner surface of the interior cavity of the reaction chamber for reaction with a target molecule in a target liquid; and
 - a shape modulator for varying the shape of the interior cavity.
- 65.** The microarray apparatus of claim 64, wherein:
said shape modulator comprises one or more movable protrusions, each of said protrusions being extendible into the interior cavity of the reaction chamber.
- 66.** The microarray apparatus of claim 44, wherein:
at least a portion of the reaction chamber is flexible; and
said shape modulator comprises one or more movable protrusions, each of said protrusions being extendible to deform the flexible portion of the reaction chamber.
- 67.** A microarray apparatus comprising a chamber filled with a combination of a volume exclusion liquid and a target liquid.
- 68.** The microarray apparatus of claim 67, wherein the volume exclusion liquid is a magnetic liquid.
- 69.** A microarray apparatus comprising:
- a substrate having a plurality of arrays of probes deposited on a surface the substrate; and
 - a cover coupled with the substrate such that the cover and the substrate form a chamber over each array of probes, said cover having an inlet for introducing a target liquid into the chamber.
- 70.** The microarray apparatus of claim 69, further comprising a clamp for coupling the cover with the substrate.
- 71.** The microarray apparatus of claim 69, wherein the cover has an outlet for removing the target liquid.
- 72.** A method for promoting interaction between a target molecule in a target liquid and an array of probes deposited on a surface of a substrate, said method comprising:
- loading the target liquid on top of the array of probes;
 - positioning a cover on top of the target liquid; and
 - creating a relative motion between the substrate and the cover for generating movement of the target molecule.
- 73.** The method of claim 72, wherein said creating the relative motion between the substrate and cover comprises immobilizing the substrate and moving the cover.
- 74.** The method of claim 72, wherein said creating the relative motion between the substrate and cover comprises immobilizing the cover and moving the substrate.
- 75.** The method of claim 72, wherein said creating the relative motion between the substrate and cover comprises moving the substrate and the cover.
- 76.** The method of claim 72, further comprising:
- retaining the substrate in a substrate holder; and
 - retaining the cover in a cover holder.
- 77.** The method of claim 76, wherein:
either said cover holder permits limited movement of the cover within the cover holder or said substrate holder permits limited movement of the substrate within the substrate holder; and
said creating the relative motion between the substrate and cover comprises agitating the cover holder and the substrate holder to cause relative movement between the cover and the substrate.
- 78.** The method of claim 72, further comprising confining the target liquid within a confinement area around the array of probes.