WHAT IS CLAIMED IS:

1. A sample carrier comprising:

an elongated thermal-control block having an active surface and an outer surface that face in opposite directions, the thermal-control block including first and second block ends in which a length of the thermal-control block extends therebetween, the active surface having a series of mounting areas that are distributed along the length of the thermal-control block;

chamber cells configured to be disposed over respective mounting areas of the series of mounting areas; and

a removable cover body configured to be coupled to the thermal-control block with the chamber cells therebetween, the thermal-control block and the chamber cells being shaped to form corresponding reaction chambers therebetween, the removable cover body and the thermal-control block being in fixed positions with respect to each other to form a unitary structure that is configured to be positioned within an assay system, wherein the reaction chambers have corresponding inlets that open in a common direction to an exterior of the sample carrier; wherein the reaction chambers have corresponding outlets, wherein the outlets open in a common direction that is opposite the common direction that the inlets open toward, wherein liquid is configured to flow between the inlet and the outlet of each reaction chamber.

2. The sample carrier of claim 1, wherein the inlets are at least partially defined by the chamber cells.

3. The sample carrier of claim 1, wherein the unitary structure is substantially block-shaped, the block ends being shaped for insertion into slots of the assay system.

4. The sample carrier of claim 1, wherein the inlets are coplanar.

5. The sample carrier of claim 1, wherein the inlets are trough-shaped.

6. The sample carrier of claim 1, wherein the reaction chambers include flow sections that have at least one cross-sectional dimension that is at most 150 μm.

7. The sample carrier of claim 1, wherein the thermal-control block includes a channel extending therethrough, the channel being positioned proximate to the mounting areas to transfer thermal energy to and/or from the mounting areas.

8. The sample carrier of claim 7, wherein the thermal-control block includes a plurality of the channels.

9. The sample carrier of claim 7, wherein the channel is configured to convey a working fluid therethrough, the working fluid transferring thermal energy to and/or from the mounting areas.

10. The sample carrier of claim 9, wherein the working fluid in the channel is configured to absorb thermal energy from an operative surface of the thermal-control block and transfer the thermal energy to the mounting areas, wherein the operative surface is located along the outer surface or located along the active surface and has a longitudinal position away from the mounting areas.

11. The sample carrier of claim 7, further comprising a thermal module secured to the thermal-control block, the thermal module having a heater and a fan, the heater and the fan being in thermal communication with the thermal-control block.

12. The sample carrier of claim 7, wherein the thermal-control block includes a heat pipe disposed in the channel, the heat pipe configured to expedite transfer of thermal energy along the length of the thermal-control block.

13. The sample carrier of claim 12, further comprising a thermal module secured to the thermal-control block, the thermal module having a heater and a fan, the heater and the fan being in thermal communication with the thermal-control block and configured to supply thermal energy to the heat pipe and/or absorb thermal energy from the heat pipe.

14. The sample carrier of claim 7, further comprising a body extension, the body extension having a portion of the active surface or the outer surface, the heat pipe extending through the body extension.

15. The sample carrier of claim 7, wherein the channel extends between first and second working ports that open to an exterior of the thermal-control block.

16. The sample carrier of claim 1, further comprising a heater that is secured to the thermal-control block and positioned across the length of the thermal-control block such that the heater is at least opposite the mounting areas.

17. The sample carrier of claim 1, further comprising a planar heater, the planar heater including a film that is coupled to the thermal-control block and a conductive foil that generates heat.

18. The sample carrier of claim 1, further comprising an electrical contact that is exposed to an exterior of the thermal-control block, the electrical contact configured to transfer power to the thermal module.

19. The sample carrier of claim 1, further comprising a conductive coil that is configured to be induced for wireless power transfer.

20. The sample carrier of claim 1, further comprising a thermal module that is coupled to the thermal-control block and includes a heater, a cooling fan, and a processing unit, the processing unit including circuitry that is configured to control operation of the heater and the cooling fan.

21. The sample carrier of claim 1, further comprising a common cell spacer that is configured to be positioned between each of the chamber cells and the active surface of the thermal-control block, the cell spacer causing gaps between the chamber cells and the active surface or substrates that form the reaction chambers.

22. The sample carrier of claim 21, wherein the cell spacer forms a web having a plurality of bridges and substrate openings, the substrate openings aligning with the mounting areas along the active surface when the cell spacer is positioned over the thermal-control block.

23. The sample carrier of claim 21, wherein the cell spacer includes a plurality of thru-holes and the thermal-control block includes a plurality of alignment projections, the thru-holes configured to receive the alignment projections to position the cell spacer relative to the thermal-control block.

24. The sample carrier of claim 1, further comprising a nest assembly that includes a nest frame and the plurality of chamber cells, the nest frame configured to hold the chamber cells, the nest assembly configured to be coupled to the thermal-control block such that the chamber cells are held between the nest frame and the thermal-control block.

25. The sample carrier of claim 24, wherein the nest assembly is shaped to hold each of the chamber cells within a confined space relative to the nest frame, wherein the chamber cells

are permitted to shift within the confined space to allow the chamber cells to align with the mounting areas when the nest assembly is coupled to the thermal-control block.

26. The sample carrier of claim 24, wherein the nest frame has an interior side and an outer side, the interior side configured to face the active surface, the nest frame having projections that project away from the interior side, the projections including support surfaces that face the interior side, the support surfaces configured to engage the chamber cells to prevent the chamber cells from falling away from the nest frame.

27. The sample carrier of claim 24, wherein the chamber cells have interior mounting surfaces that face the thermal-control block when the nest assembly is coupled thereto, the mounting surfaces being substantially coplanar.

28. The sample carrier of claim 1, wherein the removable cover body has an underside that faces the active surface of the thermal-control block, the removable cover body including a plurality of biasing elements along the underside, the biasing elements engaging the chamber cells when the removable cover body is coupled to the thermal-control block.

29. The sample carrier of claim 1, wherein the removable cover body has first and second cover ends in which a length of the cover body extends between the first and second cover ends, at least one of the cover ends having a hinge body, the hinge body configured to rotatably couple to the thermal-control block such that the cover body is permitted to rotate between open and closed positions.

30. A method of assembling a sample carrier, the method comprising:

providing an elongated thermal-control block having an active surface and an outer surface that face in opposite directions, the thermal-control block including first and second block ends in which a length of the thermal-control block extends therebetween, the active surface having a series of mounting areas that are distributed along the length of the thermal-control block;

positioning sample substrates over respective mounting areas of the series of mounting areas;

positioning chamber cells over respective sample substrates; and

coupling a removable cover body to the thermal-control block with the chamber cells therebetween, the thermal-control block and the chamber cells being shaped to form corresponding reaction chambers therebetween, the removable cover body and the thermal-control block being in fixed positions with respect to each other to form a unitary structure that is configured to be positioned within an assay system, wherein the reaction chambers have corresponding inlets that open in a common direction to an exterior of the sample carrier, wherein the reaction chambers have corresponding outlets, wherein the outlets open in a common direction that is opposite the common direction that the inlets open toward, wherein liquid is configured to flow between the inlet and the outlet of each reaction chamber.

31. The method of claim 30, further comprising:

securing a thermal module to the thermal-control block, the thermal module having a heater and a cooling apparatus, the heater and the cooling apparatus being in thermal communication with the thermal-control block.

32. The method of claim 30, wherein the thermal-control block includes channel extending therethrough and a heat pipe disposed in the channel, the heat pipe configured to expedite transfer of thermal energy along the length of the thermal-control block.

33. The method of claim 32, further comprising:

securing a thermal module secured to the thermal-control block, the thermal module having a heater and a cooling apparatus, the heater and the cooling apparatus being in thermal communication with the thermal-control block and configured to supply thermal energy to the heat pipe and/or absorb thermal energy from the heat pipe.

34. The method of claim 30, further comprising:

positioning a common cell spacer onto the active surface of the thermal-control block, the cell spacer causing gaps between the chamber cells and the active surface or between the chamber cells and sample substrates.

35. The method of claim 34, wherein the cell spacer forms a web having a plurality of bridges and substrate openings, the substrate openings aligning with the sample substrates along the active surface when the cell spacer is positioned over the thermal-control block.

36. The method of claim 34, wherein the cell spacer includes a plurality of thru-holes and the thermal-control block includes a plurality of alignment projections, the thru-holes configured to receive the alignment projections to position the cell spacer relative to the thermal-control block.

37. The method of claim 30, wherein positioning the chamber cells includes positioning a nest assembly over the thermal-control block, the nest assembly including a nest frame and the plurality of chamber cells, the nest frame coupling to the thermal-control block and holding the chamber cells therebetween.

38. The method of claim 36, wherein the nest assembly is shaped to hold each of the chamber cells within a corresponding confined space relative to the nest frame, wherein the chamber cells are permitted to shift within the confined space to allow the chamber cells to align with the mounting areas when the nest assembly is coupled to the thermal-control block.

39. The method of claim 37, wherein the nest frame has an interior side and an outer side, the interior side configured to face the active surface, the nest frame having projections that project away from the interior side, the projections including support surfaces that face the interior side, the support surfaces configured to engage the chamber cells to prevent the chamber cells from falling away from the nest frame.

40. The method of claim 30, wherein the sample substrates include a substrate body having a biological or chemical sample immobilized to a surface of the substrate body, the biological or chemical sample being configured for at least one of in-situ hybridization (ISH), fluorescent ISH (FISH), and immuno-histochemistry (IHC).