CLAIMS:

1. A thermal cycler comprising:

a sample block for receiving a sample;

a Peltier-type thermoelectric element adjacent the sample block, configured for cooling the sample block;

a non-Peltier-type heating device adjacent the sample block, configured for heating the sample block;

a heat sink, separated from the sample block and Peltier-type element; and

a heat pipe connecting the heat sink to the Peltier-type element, which permits thermal energy to transfer from the Peltier-type element to the heat sink.

2. The cycler of claim 1 wherein the sample block is sandwiched between the Peltier-type element and the non-Peltier-type heating device.

3. The cycler of claim 1 further comprising an optics assembly.

4. The cycler of claim 3 wherein the optics assembly comprises a light source and light detector, optionally with one or more lenses.

5. The cycler of claim 1 wherein the sample block is sized and shaped to receive multiple sample tubes arranged in a linear manner, or a strip of sample tubes.

6. The cycler of claim 1 wherein the sample block is sized and shaped to receive a sample holder from the side when in use.

7. The cycler of claim 1 wherein the sample block is removable from the thermal cycler.

8. The cycler of claim 1 wherein the non-Peltier-type heating device is an electrical resistance heater.

9. The cycler of claim 1 wherein the non-Peltier-type heating device includes one or more openings to allow light to pass through the device.

10. The cycler of claim 1 wherein the Peltier-type element is configured so as to be deactivated when the non-Peltier-type heater is activated.

11. The cycler of claim 1 further comprising a computer processor.

12. The cycler of claim 11 wherein the cycler comprises a user interface allowing user interaction with the computer processor.

13. The cycler of claim 11 wherein the computer processor is mounted on a substrate.

14. The cycler of claim 13 wherein the Peltier-type element, the heater, the sample block, and the heat sink and pipe are also secured to the substrate.

15. The cycler of claim 1 wherein the heat pipe has a flat cross section, and includes micro-channel pipes containing a cooling fluid.

16. The cycler of claim 1 wherein the heat pipe is generally S-shaped, with the upper section contacting the heat sink, and the lower section contacting the Peltier element.

17. The cycler of claim 16 wherein the upper section is inclined and the lower section is generally flat.

18. The cycler of claim 16 wherein the lower section is smaller in area than the upper section.

19. The cycler of claim 1 wherein, in use, the cycler undergoes 30 or more standard cycles of 5 seconds each at 50°, 72° and 95°C in under 30 minutes, when operated at a power of 50W or less.

20. The cycler of claim 1 wherein, in use, the cycler undergoes 30 or more standard cycles of 5 seconds each at 50°, 72° and 95°C cycles in under 20 minutes, when operated at a power of 100W or less.

21. The cycler of claim 1 wherein, in use, the cycler undergoes 30 or more standard cycles of 5 seconds each at 50°, 72° and 95°C cycles in under 20 minutes, when operated at a power of 150W or less.

22. The cycler of claim 1 further comprising one or more batteries to provide electrical power.

23. The cycler of claim 1 configured to operate at a selectable power input.

24. The cycler of claim 1 wherein, when the cycler undergoes 30 or more standard cycles of 5 seconds each at 50˚, 72˚ and 95˚C in use at room temperature, the heat sink does not rise above 50˚C.

25. The cycler of claim 1 wherein, when the cycler undergoes 30 or more standard cycles of 5 seconds each at 50˚, 72˚ and 95˚C in use at room temperature, the heat pipe does not rise above 63˚C.

CLAIMS:

1. A thermal cycler comprising:

a sample block for receiving a sample;

a Peltier-type thermoelectric element adjacent the sample block, configured for cooling the sample block for a thermal cycling reaction;

a non-Peltier-type heating device adjacent the sample block, configured for heating the sample block for a thermal cycling reaction;

a heat sink, separated from the sample block and Peltier-type element; and

a heat pipe connecting the heat sink to the Peltier-type element, which permits thermal energy to transfer from the Peltier-type element to the heat sink, wherein the sample block is sandwiched between the Peltier-type element and the non-Peltier-type heating device, wherein the sample block has a first side for receiving a sample, and further comprises a pair of opposed faces, wherein the element and device are located on opposed faces of the sample block, wherein the element is in thermal contact with the first opposed face of the sample block and wherein the non-Peltier-type device is in thermal contact with the second opposed face of the sample block.

2. The cycler of claim 1 further comprising an optics assembly.

3. The cycler of claim 2 wherein the optics assembly comprises a light source and light detector, optionally with one or more lenses.

4. The cycler of any one of the preceding claims wherein the sample block is sized and shaped to receive multiple sample tubes arranged in a linear manner, or a strip of sample tubes.

5. The cycler of any one of the preceding claims wherein the sample block is sized and shaped to receive a sample holder from the side when in use.

6. The cycler of any one of the preceding claims wherein the sample block is removable from the thermal cycler.

7. The cycler of any one of the preceding claims wherein the non-Peltier-type heating device is an electrical resistance heater.

8. The cycler of any one of the preceding claims wherein the non-Peltier-type device includes one or more openings to allow light to pass through the device.

9. The cycler of any one of the preceding claims wherein the Peltier-type element is configured so as to be deactivated when the non-Peltier-type heater is activated.

10. The cycler of any one of the preceding claims further comprising a computer processor.

11. The cycler of claim 10 wherein the cycler comprises a user interface allowing user interaction with the computer processor.

12. The cycler of claim 10 or 11 wherein the computer processor is mounted on a substrate.

13. The cycler of claim 12 wherein the Peltier-type element, the heater, the sample block, and the heat sink and pipe are also secured to the substrate.

14. The cycler of any one of the preceding claims wherein the heat pipe has a flat cross section, and includes micro-channel pipes containing a cooling fluid.

15. The cycler of any one of the preceding claims wherein the heat pipe is generally S-shaped, with the upper section contacting the heat sink, and the lower section contacting the Peltier element.

16. The cycler of claim 15 wherein the upper section is inclined and the lower section is generally flat.

17. The cycler of claim 15 or 16 wherein the lower section is smaller in area than the upper section.

18. The cycler of any one of the preceding claims wherein, in use, the cycler undergoes 30 or more standard cycles of 5 seconds each at 50°, 72° and 95°C in under 30 minutes, when operated at a power of 50W or less.

19. The cycler of any one of claims 1 to 17 wherein, in use, the cycler undergoes 30 or more standard cycles of 5 seconds each at 50°, 72° and 95°C cycles in under 20 minutes, when operated at a power of 100W or less.

20. The cycler of any one of claims 1 to 17 wherein, in use, the cycler undergoes 30 or more standard cycles of 5 seconds each at 50°, 72° and 95°C cycles in under 20 minutes, when operated at a power of 150W or less.

21. The cycler of any one of the preceding claims further comprising one or more batteries to provide electrical power.

22. The cycler of any one of the preceding claims configured to operate at a selectable power input.

23 The cycler of any one of the preceding claims wherein, when the cycler undergoes 30 or more standard cycles of 5 seconds each at 50°, 72° and 95°C in use at room temperature, the heat sink does not rise above 50°C.

24. The cycler of any one of the preceding claims wherein, when the cycler undergoes 30 or more standard cycles of 5 seconds each at 50°, 72° and 95°C in use at room temperature, the heat pipe does not rise above 63°C.