## CLAIMS

1. An apparatus comprising:

a plurality of optical fibers;

a plurality of optical waveguides; and

a plurality of resonator nodes arranged in an array of sensing locations, each resonator node comprising an optical coupling between an optical waveguide and an optical fiber, the plurality of optical fibers having a set of resonant frequencies at a respective sensing location, one or more light sources configured to emit one or more light inputs into the plurality of optical waveguides coupled to the plurality of optical waveguides coupled to the plurality of optical fibers, the one or more light inputs exciting a set of whispering gallery modes at the plurality of resonator nodes to propagate along corresponding circumferences of the plurality of optical fibers,

wherein each resonator node is configured to communicate a set of signals corresponding to at least one shift in the set of resonant frequencies induced by ultrasound echoes in the optical fiber at the respective sensing location.

2. The apparatus of claim 1, wherein the plurality of optical fibers are configured to:

receive a plurality of ultrasound echoes; and

experience the at least one shift in the set of resonant frequencies in response to the plurality of ultrasound echoes,

wherein the plurality of optical waveguides are configured to propagate a set of signals corresponding to the at least one shift in the set of resonant frequencies to an optical detector.

3. The apparatus of claim 1, wherein the plurality of optical waveguides comprise a tapered optical fiber or an integrated photonic waveguide.

4. The apparatus of claim 1, wherein the plurality of optical fibers are in a polymer structure.

5. The apparatus of claim 1, wherein the plurality of optical fibers and the plurality of optical waveguides are in a polymer structure.

6. The apparatus of claim 1, wherein the plurality of optical waveguides are oriented substantially perpendicular to the plurality of optical fibers.

7. A method of ultrasound sensing comprising:

providing a plurality of optical fibers and a plurality of optical waveguides arranged to form a plurality of resonator nodes, each resonator nodes comprising an optical coupling between an optical waveguide and an optical fiber;

exciting a first set of whispering gallery modes, via one or more light inputs emitted from one or more light sources into the plurality of optical waveguides coupled to the plurality of optical fibers, the one or more light inputs propagating along corresponding circumferences of the plurality of optical fibers;

receiving at the plurality of optical waveguides, via the plurality of resonator nodes, a first set of signals corresponding to the first set of whispering gallery modes propagating along the corresponding circumferences of the plurality of optical fibers;

receiving at the plurality of optical waveguides, via the plurality of resonator nodes, a second set of signals corresponding to a second set of whispering gallery modes propagating along the corresponding circumferences of the plurality of optical fibers, the second set of whispering gallery modes propagating in response to the plurality of optical fibers receiving a plurality of ultrasound echoes; and

detecting a set of differences between the first set of signals and the second set of signals.

8. The method of claim 7, further comprising

calculating a magnitude of each ultrasound echo at each resonator node based at least in part on the set of differences between the first set of signals and the second set of signals; and

associating the magnitude of each ultrasound echo to a sensing location of each resonator node.

9. The method of claim 7, the plurality of optical waveguides configured to propagate at least one of the first set of signals and the second set of signals to an optical detector.

10. The method of claim 7, further comprising:

transmitting a plurality of ultrasound signals to a target; and

receiving the plurality of ultrasound echoes from the target corresponding to the plurality of ultrasound signals at the plurality of optical fibers, the plurality of optical fibers configured to perform a synthetic aperture (SA) operation or a compressed sensing (CS) operation.

11. The method of claim 7, wherein the plurality of optical waveguides comprise a plurality of tapered optical fibers or a plurality of integrated photonic waveguides.

12. The method of claim 7, wherein the plurality of optical fibers are in a polymer structure.

13. The method of claim 12, wherein the plurality of optical fibers and the plurality of optical waveguides are in a polymer structure.

14. The method of claim 7, wherein the plurality of optical waveguides are aligned to the plurality of optical fibers to excite the first set of whispering gallery modes or the second set of whispering gallery modes in the plurality of optical fibers.

15. An apparatus comprising:

a plurality of optical fibers, each optical fiber configured to propagate a set of whispering gallery modes along a circumference of a corresponding optical fiber, and

a plurality of optical waveguides optically coupled to the plurality of optical fibers to form a plurality of resonator nodes, one or more light sources emitting one or more light inputs into the plurality of optical waveguides coupled to the plurality of optical fibers, the one or more light inputs exciting the set of whispering galley modes at the plurality of resonator nodes, the plurality of optical fibers communicating to the plurality of optical waveguides a set of signals corresponding to the set of whispering gallery modes,

wherein the plurality of optical waveguides are configured to propagate the set of signals to at least one optical detector.

16. The apparatus of claim 15, wherein the plurality of optical fibers are configured to:

receive a plurality of ultrasound echoes;

propagate a second set of whispering gallery modes in response to the plurality of ultrasound echoes; and

communicate to the plurality of optical waveguides a second set of signals corresponding to the second set of whispering gallery modes,

wherein the plurality of optical waveguides are configured to propagate the second set of signals to the at least one optical detector.

17. The apparatus of claim 16, wherein the set of whispering gallery modes is a first set of whispering gallery modes, and wherein the plurality of optical fibers are configured to communicate, through the plurality of resonator nodes, to the plurality of optical waveguides a set of signals corresponding to a difference between the first set of whispering galley modes and the second set of whispering gallery modes.

18. The apparatus of claim 17, wherein the difference between the first set of whispering gallery modes and the second set of whispering gallery modes is at least one of: at least one shift in a resonant frequency of an optical fiber and an attenuation of a resonance of the plurality of optical fibers.

19. The apparatus of claim 15, wherein the plurality of optical fibers are in a polymer structure.

20. The apparatus of claim 19, wherein the plurality of optical fibers and the plurality of optical waveguides are in a polymer structure.

21. An apparatus comprising:

an optical fiber;

a plurality of optical waveguides; and

a plurality of resonator nodes arranged in an array of sensing locations, each resonator node comprising an optical coupling between an optical waveguide and the optical fiber, the optical fiber having a set of resonant frequencies at a respective sensing location, one or more light sources configured to emit one or more light inputs into the plurality of optical waveguides coupled to the optical fiber, the one or more light inputs exciting a set of whispering gallery modes at the plurality

of resonator nodes to propagate along corresponding circumferences of the optical fiber at respective sensing locations,

wherein each resonator node is configured to communicate a set of signals corresponding to at least one shift in the set of resonant frequencies induced by ultrasound echoes in the optical fiber at the respective sensing location.

22. An apparatus comprising:

a plurality of optical fibers;

an optical waveguide; and

a plurality of resonator nodes arranged in an array of sensing locations, each resonator node comprising an optical coupling between the optical waveguide and an optical fiber, the plurality of optical fibers having a set of resonant frequencies at a respective sensing location, a light source configured to emit a light input into the optical waveguide coupled to the plurality of optical fibers, the light input exciting a set of whispering gallery modes at the plurality of resonator nodes to propagate along corresponding circumferences of the plurality of optical fibers,

wherein each resonator node is configured to communicate a set of signals corresponding to at least one shift in the set of resonant frequencies induced by ultrasound echoes in the optical fiber at the respective sensing location.