CLAIMS

What is claimed is:

1. A satellite (120), comprising:
   an antenna array (405) comprising a plurality of antenna elements (320);

a plurality of panels (315) rotatably coupled with one another via one or more rotary joints (325) along a coupling axis (330), the plurality of panels (315) arranged in a stack (310) and offset from one another along the coupling axis (330), and each panel (315) comprising a respective subset of the plurality of antenna elements (320) arranged on a face (316) of the each panel (315) that is perpendicular to the coupling axis (330); and

one or more actuators (335) configured for deploying the plurality of panels (315), wherein, for deploying the plurality of panels (315), the one or more actuators (335) are configured to rotate each of the plurality of panels (315) about the coupling axis (330) by a respective deployment angle (410).

2. The satellite (120) of claim 1, wherein each panel (315) is located at a respective fixed position along the coupling axis (330) that is offset from others of the plurality of panels (315) along the coupling axis.

3. The satellite (120) of any one of claims 1 or 2, wherein the antenna array (405) is a direct radiating array.

4. The satellite (120) of any one of claims 1, 2, or 3, further comprising:

a body (305), wherein the plurality of panels (315) are rotatably coupled with the body (305) and the coupling axis (330) extends from a face (306) of the body (305).

5. The satellite (120) of claim 4, wherein, for each panel (315), the face (316) of the each panel (315) is parallel with the face (306) of the body (305).

6. The satellite (120) of any one of claims 4 or 5, further comprising:

a plurality of second panels (315) rotatably coupled with the body (305) via one or more second rotary joints (325) along a second coupling axis (330) that extends from the face (306) of the body (305), the plurality of second panels (315) arranged in a second stack (310) and offset from one another along the second coupling axis (330), and each second panel (315) comprising a respective second subset of the plurality of antenna elements (320) arranged on a face (316) of the each second panel (315) that is perpendicular to the second coupling axis; and

one or more second actuators (335) configured for deploying the plurality of second panels (315), wherein, for deploying the plurality of second panels (315), the one or more second actuators (335) are configured to rotate each of the plurality of second panels (315) about the second coupling axis (330) by a respective second deployment angle (410).

7. The satellite (120) of any one of claims 4 through 6, further comprising:

a second subset of the plurality of antenna elements (320) on the face (306) of the body (305) from which the coupling axis (330) extends.

8. The satellite (120) of any one of claims 4 through 7, wherein the body (305) comprises signal processing circuitry (501, 502, 504) operable for communicating signaling via the plurality of antenna elements (320).

9. The satellite (120) of claim 8, wherein the signal processing circuitry (501, 502, 504) comprises analog-to-digital conversion circuitry (520) for communicating signaling from the respective subset of the plurality of antenna elements (320) of the each panel (315), digital-to-analog conversion circuitry (545) for communicating signaling to the respective subset of the plurality of antenna elements (320) of the each panel (315), or a combination thereof.

10. The satellite (120) of any one of claims 8 or 9, wherein the signal processing circuitry (501, 502, 504) comprises beamforming circuitry (525, 540) operable to support forming one or more beams (125) using the plurality of antenna elements (320).

11. The satellite (120) of any one of claims 8 through 10, further comprising:

a plurality of signal paths (560) between the signal processing circuitry (504) and respective second signal processing circuitry (503) in each of the plurality of panels (315), each of the plurality of signal paths (560) extending at least in part through the one or more rotary joints (325).

12. The satellite (120) of claim 11, wherein the plurality of signal paths (560) comprise:

one or more first signal paths for carrying communications signaling, one or more second signal paths for carrying control signaling associated with controlling operations of the respective second signal processing circuitry (503), or a combination thereof.

13. The satellite (120) of any one of claims 4 through 12, further comprising:

one or more batteries located in the body (305) of the satellite (120); and one or more conductors (560) operable to couple the one or more batteries with one or more solar panels (350) located on the plurality of panels (315), each of the one or more conductors extending at least in part through the one or more rotary joints (325).

14. The satellite (120) of claim 13, further comprising: one or more second solar panels (350) arranged on a second face (307) of the body (305) opposite the face (306) of the body (305) from which the coupling axis (330) extends, the one or more second solar panels (350) operable to couple with the one or more batteries.

15. The satellite (120) of any one of claims 4 through 14, wherein in an undeployed condition, the plurality of panels (315) are arranged within a cross-sectional profile of the body (305) perpendicular to the coupling axis (330).

16. The satellite (120) of claim 15, wherein the cross-sectional profile has a first width (308), perpendicular to the coupling axis (330), at a first end from which the coupling axis (330) extends that is narrower than a second width (309) at a second end opposite the first end.

17. The satellite (120) of any one of claims 1 or 2 through 16, wherein each panel (315) further comprises:

a respective set of one or more solar panels (350) arranged on a second face (317) of the each panel (315) opposite the face (316) of the each panel (315).

18. The satellite (120) of claim 17, wherein each panel (315) further comprises:

a respective set of one or more batteries operable to couple with the respective set of one or more solar panels (350).

19. The satellite (120) of any one of claims 1 or 2 through 18, wherein each panel (315) further comprises: respective signal processing circuitry (501, 502, 503) operable for communicating signaling via the respective subset of the plurality of antenna elements (320).

20. The satellite (120) of claim 19, wherein, for each panel (315) of the plurality of panels (315), the respective signal processing circuitry (503) comprises analog-to-digital conversion circuitry (520) for communicating signaling from the respective subset of the plurality of antenna elements (320) of the each panel (315), digital-to-analog conversion circuitry (545) for communicating signaling to the respective subset of the plurality of antenna elements (320) of the each panel (315), or a combination thereof.

21. The satellite (120) of any one of claims 19 or 20, wherein, for each panel (315) of the plurality of panels (315), the respective signal processing circuitry (501, 502, 503)

comprises beamforming circuitry (525, 540) operable to support forming one or more beams (125) using the respective subset of the plurality of antenna elements (320) of the each panel (315).

22. The satellite (120) of any one of claims 1 or 2 through 21, wherein each antenna element (320) of the plurality of antenna elements (320) comprises a transmission element, a reception element, or a combination thereof.

23. The satellite (120) of any one of claims 1 or 2 through 22, wherein a first panel (315) of the plurality of panels (315) has a different shape than a second panel (315) of the plurality of panels (315).

24. The satellite (120) of any one of claims 1 or 2 through 23, wherein the one or more actuators (335) comprise:

one or more motors operable for deploying the plurality of panels (315).

25. The satellite (120) of any one of claims 1 or 2 through 24, wherein the one or more actuators (335) comprise:

one or more springs operable for deploying the plurality of panels (315).

26. The satellite (120) of any one of claims 1 or 2 through 25, wherein the plurality of antenna elements (320) are associated with a first bandwidth, the satellite (120) further comprising: a second antenna (355) associated with a second bandwidth and located outside a first cross-sectional profile of the plurality of panels (315) in an undeployed condition and outside a second cross-sectional profile of the plurality of panels (315) in a deployed condition.

27. A method, comprising:

deploying an antenna array (405) of a satellite (120) based at least in part on rotating each panel (315) of a plurality of panels (315) of the antenna array (405) by a respective deployment angle (410) about a coupling axis (330), the plurality of panels (315) rotatably coupled with one another via one or more rotary joints along the coupling axis (330), the plurality of panels (315) arranged in a stack (310) and offset from one another along the coupling axis (330), and each panel (315) comprising a respective subset of antenna elements (320) of a plurality of antenna elements (320) of the antenna array (405) located on a face (316) of the each panel (315) that is perpendicular to the coupling axis (330);

and communicating signaling (132, 133, 172, 173, 175) via the plurality of antenna elements (320) based at least in part on deploying the antenna array (405).

28. The method of claim 27, wherein:

deploying the antenna array (405) comprises rotating each panel (315) by the respective deployment angle (410) relative to a body (305) of the satellite (120), wherein the coupling axis (330) extends from a face (306) of the body (305); and

communicating the signaling (132, 133, 172, 173, 175) via the plurality of antenna elements (320) comprises communications using signal processing circuitry (540) of the body (305) of the satellite (120).

29. The method of claim 28, further comprising:

providing power to the satellite (120) via one or more solar panels (350) of the satellite (120), the one or more solar panels (350) located on one or more panels (315) of the plurality of panels (315) on a face (317) opposite the respective subset of antenna elements (320), or on a face (307) of the body (305) of the satellite (120) opposite the plurality of panels (315), or a combination thereof.

30. The method of any one of claims 28 or 29, wherein communicating the signaling (132, 133, 172, 173, 175) via the plurality of antenna elements (320) comprises:

performing a conversion between digital signaling and analog signaling at circuitry (520) located in one or more panels (315) of the plurality of panels (315).

31. The method of any one of claims 28 through 30, wherein communicating the signaling via the plurality of antenna elements (320) comprises:

performing beamforming signal processing at circuitry (525, 540) located in one or more panels (315) of the plurality of panels (315), or circuitry (525, 540) located in the body (305) of the satellite (120), or a combination thereof.

32. The method of any one of claims 28 through 31, wherein the antenna array (405) is a direct radiating array.

33. A system, comprising:

a mounting structure (215) comprising a plurality of mounting ports (210) positioned radially about an axis (220) of the mounting structure and axially along the axis (220) of the mounting structure (215); and

a plurality of satellites (120) each connected with a respective mounting port (210) of the plurality of mounting ports (210), each satellite (120) comprising:

an antenna array (405) comprising a plurality of antenna elements (320);

a plurality of panels (315) rotatably coupled with one another via one or more rotary joints (325) along a coupling axis (330), the plurality of panels (315) arranged in a stack (310) and offset from one another along the coupling axis (330), and each panel (315) comprising a respective subset of the plurality of antenna elements (320) arranged on a face (316) of the each panel (315) that is perpendicular to the coupling axis (330);

and one or more actuators (335) configured for deploying the plurality of panels (315), wherein, for deploying the plurality of panels (315), the one or more actuators (335) are configured to rotate each of the plurality of panels (315) about the coupling axis (330) by a respective deployment angle (410).

34. The system of claim 33, wherein the antenna array (405) is a direct radiating array.

35. A system, comprising:

a base (305);

an antenna array (405) comprising a plurality of antenna elements (320);

a plurality of panels (315) rotatably coupled with the base (320) along a coupling axis (330) that extends from the base (305), the plurality of panels (315) arranged in a stack (310) and offset from one another along the coupling axis (330), and each panel (315) comprising a respective subset of the plurality of antenna elements (320) arranged on a face (316) of the each panel (315) that is perpendicular to the coupling axis (330); and

one or more actuators (335) configured for deploying the plurality of panels (315), wherein, for deploying the plurality of panels (315), the one or more actuators (335) are configured to rotate each of the plurality of panels (315) about the coupling axis (330) by a respective deployment angle (410).

36. The system of claim 35, wherein the antenna array (405) is a direct radiating array.

37. An apparatus, comprising:

means for deploying an antenna array (405) of a satellite (120) based at least in part on rotating each panel (315) of a plurality of panels (315) of the antenna array (405) by a respective deployment angle (410) about a coupling axis (330), the plurality of panels (315) rotatably coupled with one another via one or more rotary joints along the coupling axis (330), the plurality of panels (315) arranged in a stack (310) and offset from one another along the coupling axis (330), and each panel (315) comprising a respective subset of antenna elements (320) of a plurality of antenna elements (320) of the antenna array (405) located on a face (316) of the each panel (315) that is perpendicular to the coupling axis (330); and

means for communicating signaling (132, 133, 172, 173, 175) via the plurality of antenna elements (320) based at least in part on deploying the antenna array (405).

38. The apparatus of claim 37, wherein:

the means for deploying the antenna array (405) comprises means for rotating each panel (315) by the respective deployment angle (410) relative to a body (305) of the satellite (120), wherein the coupling axis (330) extends from a face (306) of the body (305); and

the means for communicating the signaling (132, 133, 172, 173, 175) via the plurality of antenna elements (320) comprises means for communications using signal processing circuitry (540) of the body (305) of the satellite (120).

39. The apparatus of claim 38, further comprising:

means for providing power to the satellite (120) via one or more solar panels (350) of the satellite (120), the one or more solar panels (350) located on one or more panels (315) of the plurality of panels (315) on a face (317) opposite the respective subset of antenna elements (320), or on a face (307) of the body (305) of the satellite (120) opposite from the plurality of panels (315), or a combination thereof.

40. The apparatus of any one of claims 37 or 38, wherein the means for communicating the signaling (132, 133, 172, 173, 175) via the plurality of antenna elements (320) comprises:

means for performing a conversion between digital signaling and analog signaling at circuitry (520, 545) located in one or more panels (315) of the plurality of panels (315).

41. The apparatus of any one of claims 38 through 40, wherein the means for communicating the signaling (132, 133, 172, 173, 175) via the plurality of antenna elements (320) comprises:

means for performing beamforming signal processing at circuitry (525, 540) located in one or more panels (315) of the plurality of panels (315), or circuitry (525, 540) located in the body (305) of the satellite (120), or a combination thereof.

42. The apparatus of any one of claims 37 through 41, wherein the antenna array (405) is a direct radiating array.

43. The satellite (120) of any one of claims 1 or 2 through 26, wherein the faces (316) of the plurality of panels (315) are offset from one another along the coupling axis (330).

44. The method of any one of claims 27 through 32, wherein the faces (316) of the plurality of panels (315) are offset from one another along the coupling axis (330).

45. The system of any one of claims 33 or 34, wherein the faces (316) of the plurality of panels (315) are offset from one another along the coupling axis (330).

46. The system of any one of claims 35 or 36, wherein the faces (316) of the plurality of panels (315) are offset from one another along the coupling axis (330).

47. The apparatus of any one of claims 37 through 42, wherein the faces (316) of the plurality of panels (315) are offset from one another along the coupling axis (330).