CLAIMS

1. A gripper assembly for a robotic arm, the gripper assembly comprising:

a gripper finger having a longitudinal first end and a longitudinal second end opposite the first end;

a gripper pad pivotably coupled to the gripper finger such that the gripper pad is permitted to rotate about a rotational axis relative to the gripper finger, the gripper pad having a pair of lateral sides with one of the lateral sides forming a gripping surface configured to grip an object, and a proximal side located between the pair of lateral sides; and

a gripper pad aligner comprising a pad alignment element coupled to the gripper pad and a finger alignment element coupled to the gripper finger, wherein the pad alignment element is coupled to the finger alignment element and configured to apply an aligning torque to the gripper pad that, when applied, rotates the gripper pad toward a first angular orientation about the rotational axis between the gripper pad and the gripper finger;

wherein the pad alignment element comprises a biasing finger having a fixed end coupled to the finger alignment element and a free end opposite the fixed end, and wherein the biasing force applied by the biasing finger results from a bending of the biasing finger.

2. The gripper assembly of claim 1, wherein the biasing finger is configured to apply a biasing force to the gripper pad that, when applied, rotates the gripper pad toward the first angular orientation.

3. The gripper assembly of claim 1, wherein the finger alignment element comprises a base securable to the gripper finger, and wherein at least a portion of the biasing finger abuts one of the lateral sides of the gripper pad to bias the gripper pad toward the first angular orientation.

4. The gripper assembly of claim 3, wherein the base comprises a top panel positioned along a proximal side of the gripper finger, and one or more first tabs extending from the top panel at a non-zero angle for securing the base to the gripper finger.

5. The gripper assembly of claim 4, wherein the base comprises a side panel extending from the top panel and positioned along a lateral side of the gripper finger, and one or more second tabs extending from the side panel at a non-zero angle for securing the base to the gripper finger.

6. The gripper assembly of claim 3, wherein the pad alignment element comprises a plurality of the biasing fingers each abutting a first lateral side of the pair of lateral sides of the gripper pad to bias the gripper pad toward the first angular orientation.

7. The gripper assembly of claim 1, further comprising a pivot pin extending from the gripper finger to the proximal side of the gripper pad to pivotably couple the gripper pad to the gripper finger.

8. The gripper assembly of claim 1, further comprising a plurality of the gripper pads each pivotably coupled to the gripper finger such that the plurality of the gripper pads are permitted to rotate about a plurality of the rotational axes relative to the gripper finger.

9. The gripper assembly of claim 8, wherein the plurality of rotational axes are spaced longitudinally along the gripper finger.

10. The gripper assembly of claim 1, further comprising a plurality of the gripper pad aligners.

11. The gripper assembly of claim 1, wherein:

the gripper pad aligner comprises a first gripper pad aligner, the pad alignment element comprises a first pad alignment element, and the finger alignment element comprises a first finger alignment element; and

the gripper assembly comprises a second gripper pad aligner comprising aa second pad alignment element coupled to the gripper pad, and a second finger alignment element coupled to the gripper finger, wherein the second pad alignment element is coupled to the second finger alignment element and configured to apply an aligning torque to the gripper pad that, when applied, rotates the gripper pad toward the first angular orientation.

12. The gripper assembly of claim 11, wherein the rotational axis is arranged longitudinally along the gripper finger between the first gripper pad aligner and the second gripper pad aligner.

13. An assay system, comprising:

a container containing a reagent; and

a pair of robotic arms configured to manipulate the position of the container, wherein each of the robotic arms comprises a pair of the gripper assemblies of claim 1 configured to grip the container between the pair of robotic arms.

14. A gripper assembly for a robotic arm, the gripper assembly comprising:

a gripper finger having a longitudinal first end and a longitudinal second end opposite the first end;

a gripper pad pivotably coupled to the gripper finger such that the gripper pad is permitted to rotate about a rotational axis relative to the gripper finger, the gripper pad having a pair of lateral sides with one of the lateral sides forming a gripping surface configured to grip an object, and a proximal side located between the pair of lateral sides; and

a gripper pad aligner comprising a base formed monolithically with the finger, and a pad alignment element coupled to the gripper finger and offset from the rotational axis by a predetermined distance, wherein the pad alignment element is configured to apply an aligning torque to the gripper pad oriented in the direction of a first angular orientation about the rotational axis between the gripper pad and the gripper finger.

15. The gripper assembly of claim 14, wherein the pad alignment element comprises a magnetic member received in an aperture formed in the proximal side of the gripper pad.

16. The gripper assembly of claim 14, wherein the gripper pad aligner comprises a magnetic boss extending from a side of the gripper finger and surrounded by a channel formed in the side of the gripper finger, and wherein the magnetic boss magnetically attracts the pad alignment element and is aligned with the pad alignment element when the gripper finger is in the first angular orientation.

17. The gripper assembly of claim 16, wherein the boss comprises a magnetic material and is integrally formed with the gripper finger.

18. The gripper assembly of claim 16, wherein the boss is attachable to the gripper finger and comprises a magnetic material that is different from a material comprising the gripper finger.

19. The gripper assembly of claim 14, wherein the pad alignment element comprises a magnet coupled to the gripper pad.

20. The gripper assembly of claim 14, wherein the pad alignment element comprises an elongate biasing finger which abuts one of the pair of lateral sides of the gripper pad and extends toward the gripper finger.

21. The gripper assembly of claim 14, wherein the pad alignment element comprises a spring wire and the aligning torque comprises a biasing force applied by the spring wire due to an elongation of the spring wire.

22. The gripper assembly of claim 14, wherein the gripper pad aligner comprises a finger alignment element coupled to the gripper pad and offset from the rotational axis by the predetermined distance.

23. The gripper assembly of claim 22, wherein the pad alignment element comprises a first magnetic member and the finger alignment element comprises a second magnetic member magnetically attracted toward the pad alignment element.

24. The gripper assembly of claim 14, wherein:

the gripper pad comprises a second angular orientation that is spaced from the first angular orientation in a first rotational direction about the rotational axis, and wherein the alignment element applies a rotational torque in a second rotational direction, opposite the first rotational direction, when the gripper pad is in the second angular orientation; and

the gripper pad comprises a third angular orientation that is spaced from the first angular orientation in the second rotational direction about the rotational axis, and

wherein the alignment element applies a rotational torque in the first rotational direction when the gripper pad is in the third angular orientation.

25. The gripper assembly of claim 14, wherein the alignment element is configured to restore the gripper pad to the first angular orientation when the gripper pad is in a second angular orientation spaced from the first angular orientation in a first rotational direction, and when the gripper pad is in a third angular orientation spaced from the first angular orientation in a second rotational direction, opposite the first rotational direction.

26. The gripper assembly of claim 14, further comprising a pivot pin extending from the gripper finger to the proximal side of the gripper pad to pivotably couple the gripper pad to the gripper finger.

27. The gripper assembly of claim 14, further comprising a plurality of the gripper pads each pivotably coupled to the gripper finger such that the plurality of the gripper pads are permitted to rotate about a plurality of the rotational axes relative to the gripper finger.

28. The gripper assembly of claim 14, wherein:

the gripper pad aligner comprises a first gripper pad aligner, the pad alignment element comprises a first pad alignment element, and the base comprises a first base; and

the gripper assembly comprises a second gripper pad aligner comprising a second pad alignment element coupled to the gripper finger, and a second base coupled with the gripper finger.

29. The gripper assembly of claim 28, wherein the rotational axis is arranged longitudinally along the gripper finger between the first gripper pad aligner and the second gripper pad aligner.

30. The gripper assembly of claim 28, wherein:

the first pad alignment element comprises a first magnetic member and the first base comprises a second magnetic member magnetically coupled to and magnetically attracted toward the first magnetic member; and

the second pad alignment element comprises a third magnetic member and the second base comprises a fourth magnetic member magnetically coupled to and magnetically attracted toward the third magnetic member.

31. A gripper assembly for a robotic arm, the gripper assembly comprising:

a gripper finger having a longitudinal first end and a longitudinal second end opposite the first end;

a gripper pad pivotably coupled to the gripper finger such that the gripper pad is permitted to rotate about a rotational axis relative to the gripper finger, the gripper pad having a pair of lateral sides with one of the lateral sides forming a gripping surface configured to grip an object, and a proximal side located between the pair of lateral sides;

a first gripper pad aligner comprising a first finger alignment element that comprises a first base securable to the gripper finger, and a first pad alignment element comprising a first biasing finger extending from the first base toward the gripper pad and abutting one of the lateral sides of the gripper pad; and

a second gripper pad aligner comprising a second finger alignment element that comprises a second base securable to the gripper finger, and a second pad alignment element comprising a second biasing finger extending from the second base toward the gripper pad and abutting one of the lateral sides of the gripper pad.

32. The gripper assembly of claim 31, wherein one of the first the gripper pad aligner and the second gripper pad aligner comprises a plurality of one of the first and second biasing fingers each abutting a first lateral side of the pair of lateral sides of the gripper pad to bias the gripper pad toward a first angular orientation.

33. The gripper assembly of claim 32, wherein:

the gripper pad comprises a second angular orientation that is spaced from the first angular orientation in a first rotational direction about the rotational axis, and wherein one of the plurality of the one of the first and second biasing fingers applies a rotational torque in a second rotational direction, opposite the first rotational direction, when the gripper pad is in the second angular orientation; and

the gripper pad comprises a third angular orientation that is spaced from the first angular orientation in the second rotational direction about the rotational axis, and wherein another biasing finger of the plurality of the one of the first and second biasing

fingers applies a rotational torque in the first rotational direction when the gripper pad is in the third angular orientation.

34. The gripper assembly of claim 32, wherein at least one of the first gripper pad aligner and the second gripper pad aligner is configured to restore the gripper pad to the first angular orientation when the gripper pad is in a second angular orientation spaced from the first angular orientation in a first rotational direction, and when the gripper pad is in a third angular orientation spaced from the first angular orientation in a second rotational direction, opposite the first rotational direction.

35. The gripper assembly of claim 31, wherein at least one of the first and second biasing fingers comprises a pair of the biasing fingers each abutting a first lateral side of the pair of lateral sides of the gripper pad, and wherein the pair of the biasing fingers are at locations spaced from each other along a longitudinal axis of the gripper pad.

36. The gripper assembly of claim 31, wherein the base of at least one of the first gripper pad aligner and the second gripper pad aligner is formed monolithically with the finger.

37. The gripper assembly of claim 31, further comprising a plurality of the gripper pads each pivotably coupled to the gripper finger such that the plurality of the gripper pads are permitted to rotate about a plurality of the rotational axes relative to the gripper finger.

38. The gripper assembly of claim 31, wherein the rotational axis is arranged longitudinally along the gripper finger between the first gripper pad aligner and the second gripper pad aligner.

39. The gripper assembly of claim 31, wherein the rotational axis is arranged longitudinally along the gripper finger between the first gripper pad aligner and the second gripper pad aligner.

40. The gripper assembly of claim 31, wherein:

the first pad alignment element comprises a first magnetic member and the first finger alignment element comprises a second magnetic member magnetically coupled to and magnetically attracted toward the first magnetic member; and

the second pad alignment element comprises a third magnetic member and the second finger alignment element comprises a fourth magnetic member magnetically coupled to and magnetically attracted toward the third magnetic member.

41. A gripper assembly for a robotic arm, the gripper assembly comprising:

a gripper finger having a longitudinal first end and a longitudinal second end opposite the first end;

a gripper pad having a pair of lateral sides with one of the lateral sides forming a gripping surface configured to grip an object, and a proximal side located between the pair of lateral sides; and

a gripper pad aligner comprising a first magnetic member coupled to the gripper finger and a second magnetic member coupled to the gripper pad and magnetically attracted to the first magnetic member, wherein the second magnetic member is configured to apply an aligning torque to the gripper pad oriented in the direction of a first angular orientation about a rotational axis between the gripper pad and the gripper finger.

42. A gripper pad aligner for a gripper assembly of a robotic arm, the gripper pad aligner comprising:

a pad alignment element configured to couple to a gripper pad of the gripper assembly; and

a finger alignment element configured to couple to a gripper finger of the gripper assembly, wherein the pad alignment element is configured to couple to the finger alignment element and configured to apply an aligning torque to the gripper pad when the finger alignment element is coupled to the gripper pad that, when applied, rotates the gripper pad toward a first angular orientation about a rotational axis between the gripper pad and the gripper finger.