What is claimed is:

1. A surgical device for ~~automated~~ drilling, comprising:

a drill comprising a drill bit configured to bore through bone;

a detector comprising a tissue detection sensor, the drill and detector independently actuable for insertion and removal of the drill bit and the tissue detection sensor in a bore generated by the drill bit, wherein the drill and the detector are releasably coupled to a stage element and are configured for selective attachment to a motorized frame to dispose a selected drill or detector for action.

~~2. The surgical device of claim 1, wherein the drill and the detector are disposed on a stage element and are configured for selective attachment to a motorized frame.~~

~~3.~~2. The surgical device of claim 1 ~~or claim 2~~, wherein the tissue detection sensor is an optical probe.

~~4.~~3. The surgical device of any preceding claim, further comprising a backpressure sensor configured to detect a pressure exerted on the drill bit during drilling.

~~5.~~4. The surgical device of any preceding claim, in which the drill further ~~comprising~~ comprises a drill actuator and a torque sensor configured to detect a torque applied by ~~an~~ the drill actuator ~~of the drill~~.

~~6.~~5. The surgical device of any preceding claim, wherein a diameter of the drill bit is less than about 1 mm.

~~7.~~6. The surgical device of any preceding claim, wherein a length of the drill bit is configured for drilling to a depth of at least about 7 mm.

~~8.~~7. The surgical device of any preceding claim, further comprising a tool chassis configured to removably receive a therapeutic or diagnostic device and permit independent actuation of at least a component of the therapeutic or diagnostic device for insertion and removal in the bore generated by the drill bit.

9.8. The surgical device of claim 87, wherein at least one of the therapeutic or diagnostic device is removably received by the tool chassis and selected from the following: a cannula, an electrocautery element, an electrical probe, a pressure sensor, a biopsy device, and a laser ablation device.

10.9. The surgical device of claim 87, wherein the tool chassis is configured to removably receive the detector and the therapeutic or diagnostic device.

11.10. A surgical system for automated drilling, comprising:

the surgical device of any one of claims 1-910, the surgical device having an arrangement of actuators for actuating the drill and the detector; and

a controller configured to:

actuate the drill to bore through bone;

actuate the drill to retract the drill bit from the bore;

actuate the detector to insert the tissue detection sensor into the bore; and

determine a tissue characteristic at a distal location of the bore based on a sensed signal from the tissue detection sensor.

12.11. The surgical system of claim 110, wherein the determination of the tissue characteristic includes determination of a change in anatomy at or near the distal location of the bore.

13.12. The surgical system of claim 110 or claim 112, wherein the determination of the tissue characteristic includes determination of a presence of a blood vessel at or near the distal location of the bore.

14.13. The surgical system of any one of claims 110-132, wherein the determination of the tissue characteristic includes determination of a thickness of a tissue layer at the distal location, determination of a density of a tissue layer at the distal location, or a combination thereof.

15.14. The surgical system of any one of claims 110-134, wherein the controller is further configured to detect a penetration of the drill bit from a more rigid tissue to a less

rigid tissue based on a pressure as detected by the backpressure sensor, a torque as detected by the torque sensor, or a combination thereof.

~~16.~~15. The surgical system of claim 1~~5~~4, wherein the controller is configured to halt drilling by the drill bit based on the detected penetration.

~~17.~~16. The surgical system of any one of claims 1~~0~~1-1~~6~~5, wherein the controller is configured to actuate the stage element for selective attachment of the drill and the detector to the motorized frame.

~~18.~~17. The surgical system of claim 1~~6~~7, wherein the controller is further configured to actuate translation of the motorized frame to dispose one of the drill and the detector at the bore.

~~19.~~18. The surgical system of ~~claim~~ any one of claims 1~~1~~0-1~~7~~8, wherein the controller is further configured to actuate linear movement, rotational movement, or combination thereof of the detector through the bore.

~~20.~~19. The surgical system of any one of claims 1~~1~~0-1~~8~~9, wherein the controller is further configured to actuate linear movement, rotational movement, or a combination thereof of a component of a therapeutic or diagnostic device through the bore.

~~21.~~20. The surgical system of claim 19~~20~~, wherein the controller is further configured to actuate translation of the motorized frame to dispose the therapeutic or diagnostic device at the bore.

~~22.~~21. A~~n automated~~ drilling method, comprising:

with a drill comprising a drill bit, drilling a bore ~~through bone~~;

removing the drill bit from the bore;

~~with a detector comprising a tissue detection sensor,~~ inserting ~~the tissue detection sensor~~ a detector into the bore; ~~and~~

detecting a ~~tissue~~ characteristic at a distal location of the bore based on a sensed signal from the ~~tissue detection sensor~~detector, the drill and the detector

independently actuable for insertion and removal of the drill bit and the ~~tissue detection sensor~~detector in the bore generated by the drill bit, and

translating a stage element upon which the drill and the detector are disposed for selective attachment of one of the drill bit and the detector to a motorized frame to dispose the one of the drill bit and the detector at the bore.

~~23. The method of claim 22, further comprising translating a stage element upon which the drill and the detector are disposed for selective attachment of one of the drill bit and the tissue detector sensor to a motorized frame to dispose the one of the drill bit and the tissue detector at the bore.~~

~~24. The method of claim 22 or claim 23, wherein detecting the tissue characteristic includes determining at least one of a presence of a blood vessel at or near the distal location, a change in anatomy at or near the distal location, a thickness of a tissue layer at the distal location, and a density of a tissue layer at the distal location.~~

~~25.~~22. The method of claim ~~24~~21, wherein detecting the characteristic ~~the determination~~ is based on interferometry.

~~26.~~23. The method of any one of claims 2~~2~~1-2~~25~~, further comprising detecting at least one of a change in pressure exerted on the drill bit during drilling and a change in torque applied by an actuator of the drill.

~~27. The method of claim 26, further comprising detecting penetration of the drill bit from a more rigid tissue to a less rigid tissue or from a less rigid tissue to a more rigid tissue based on the detected change in pressure, the detected change in torque, or a combination thereof.~~

~~28.~~24. The method of claim ~~26~~ 23 ~~or claim 27~~, further comprising halting drilling based on the detected change in pressure, the detected change in torque, or a combination thereof.

~~29.~~25. The method of any one of claims ~~22~~21-~~28~~24, further comprising actuating the detector to remove the ~~tissue detection sensor~~detector from the bore and actuating a

therapeutic or diagnostic device to insert at least a component of the therapeutic or diagnostic device into the bore.

~~30.~~26. The method of claim 2~~9~~5, wherein the therapeutic device is a cannula ~~and the method further includes delivering a drug via the cannula to a location in or distal to the bore~~.

~~31.~~27. The method of claim 2~~9~~5, wherein the therapeutic device is an electrocautery system ~~and the method further includes cauterizing a tissue at a location in or distal to the bore~~.

~~32.~~28. The method of claim ~~29~~25, wherein the therapeutic device is a laser ablation device ~~and the method further includes ablating a tissue at a location in or distal to the bore~~.

~~33.~~29. The method of claim ~~29~~25, wherein the diagnostic or therapeutic device is an electrical probe ~~and the method further includes at least one of electrical recording and electrical stimulation at a location in or distal to the bore~~.

~~34. The method of claim 33, wherein the electrical stimulation is deep brain stimulation.~~

~~35. The method of claim 33, wherein the electrical recording is of brain activity in an epileptic patient.~~

~~36.~~30. The method of claim ~~29~~25, wherein the diagnostic device is a biopsy device ~~and the method further includes obtaining a tissue sample from a location in or distal to the bore~~.

~~37.~~31. The method of claim ~~29~~25, wherein the diagnostic device is a cannula ~~and the method further includes extracting a tissue or fluid from a location in or distal to the bore~~.

~~38.~~32. The method of claim ~~29~~25, wherein the diagnostic device is an intracranial pressure sensor ~~and the method further includes measuring an intracranial pressure from a location in or distal to the bore~~.

~~39. A method of operating the surgical device of any of claims 1-10, comprising:~~

~~actuating the drill to bore through bone;~~

~~actuating the drill to retract the drill bit from the bore;~~

~~actuating the detector to insert the tissue detection sensor into the bore; and~~

~~determining a tissue type at a distal location of the bore based on a sensed signal from the tissue detection sensor.~~

~~40. The method of claim 39, wherein the bone is a skull.~~

~~41. The method of claim 39, wherein the bone is a vertebra.~~