In any of the aforementioned examples, one of skill in the art recognizes that the automated upright carousel can operationally support any desired number of biological production units such as at least two biological production units, up to about six units, up to about eight units, up to about 10 units, up to about 12 units, up to about 14 units, up to about 16 units, up to about 18 units or up to about 20 units or more.

The automated carousel enables ergonomic access to a specific independent cell and/or tissue culture system without disturbance of the biological processes underway in any of the other independent multiple cell and/or tissue culture systems. The carousel is generally height adjustable and easily configurable to a wide variety of user sizes, shapes and weights. The ergonomic carousel is configured to alleviate existing muscular, skeletal or nervous system issues and/or configured to prevent such issues in the first instance for laboratory personnel. In examples, the ergonomic carousel is suitable for vertical adjustment for a sitting configuration to a standing configuration or vice-versa.

In one aspect, the present disclosure refers to an automated carousel comprising: a substantially vertical track assembly comprising an upright drive track and a support track; a plurality of translation assemblies, wherein each of the plurality of translation assemblies is a hub assembly having a first end defining a coupling for an input shaft of a biological production unit in a cantilevered orientation, and a central hub comprising: an inner hub configured to axially rotate the biological production unit; and a resistance arm having a pivotally connected support carriage cooperatively engaged with the support track for translational movement thereon; wherein each translation assembly supports a biological production unit in a cantilevered orientation, said plurality of translation assemblies configured to provide: (i) separate translational movement of each biological production unit along the drive track and the support track, while maintaining the cantilevered orientation of each biological production unit stable with respect to gravity, and separately, (ii) axial rotation of each biological production unit.

In one aspect, the present disclosure refers to an automated carousel system for the distribution and ergonomic positioning of multiple biological production units, each of the biological production units comprising an automated individually operable cell and/or tissue engineering system, the automated carousel system comprising: an automated carousel comprising: a substantially vertical track assembly comprising a drive track and a support track vertically offset and spaced apart from one another; and a plurality of translation assemblies connecting the drive track and the support track at spaced apart positions, wherein each of the plurality of translation assemblies is a hub assembly having a first end defining a coupling for an input shaft of the biological production unit in a cantilevered orientation, and a second end having a vertically downward extending resistance arm, and a central hub comprising: an inner hub comprising a central shaft for engaging with the input shaft of the biological production unit, the central shaft mounted to the vertically downward extending resistance arm of the second end, the inner hub configured to axially rotate the biological production unit; and the vertically downward extending resistance arm having a pivotally connected support carriage cooperatively engaged with the support track for translational movement thereon; each of said plurality of translation assemblies supporting a cantilevered biological production unit, wherein said plurality of translation assemblies are configured to provide (i) separate translational movement of each biological production unit along the connected drive track and support track

while maintaining the cantilevered orientation of each biological production unit stable with respect to gravity, and separately, (ii) axial rotation of each biological production unit; a controller for independent biological control of each cell and/or tissue engineering system within each of said biological production units; a vertical housing assembly supporting the automated carousel, the housing assembly comprising a central source of operational resources; a connector for interconnecting the central source of operational resources to each successive biological production unit; and a computer connection.

In one aspect, the present disclosure refers to a method for improving ergonomics for users of an automated carousel system that comprises a plurality of independent cell and/or tissue engineering systems each supported within a biological production unit, the method comprising: mounting a plurality of biological production units on an automated carousel comprising: a vertical track assembly comprising a drive track and a support track vertically offset and spaced apart from one another; and a plurality of translation assemblies connecting the drive track and the support track at spaced apart positions, each of said plurality of translation assemblies supporting a cantilevered biological production unit, wherein said plurality of translation assemblies are configured to provide (i) translational movement of each biological production unit along the connected drive track and support track in unison or separately while maintaining an orientation of each cantilevered biological production unit stable with respect to gravity, and separately, (ii) axial rotation of each biological production unit; and controlling the translational movement and axial rotation of each biological production unit for ergonomic access to each biological production unit by a user.

A1. An automated vertical track assembly for supporting a plurality of biological units, wherein the vertical track assembly is configured for:

(i) user operated start and stop of translational movement of the biological units in unison along a defined path of the vertical track assembly while maintaining each of the biological units properly oriented with respect to gravity; and

(ii) user operated start and stop of axial rotation of individual biological units;

wherein during both (i) and (iii) each of the biological units is independently operable to support a customized automated cell and tissue culture system therein; and

wherein each of said biological units is interlinked to share a central source of operational resources.

A2. A vertical carousel comprising a plurality of biological units substantially geometrically constrained to translationally move in unison in a predefined orbit while maintaining the proper orientation of each of the plurality of biological units with respect to gravity, and separately axially rotating any independent one or more of the plurality of biological units.

A3. A vertical carousel comprising a plurality of biological units substantially geometrically constrained to translationally move in unison in a predefined orbit while maintaining the proper orientation of each of the plurality of biological units with respect to gravity, and separately the ability to adjust the spacing of each biological unit relative to adjacent biological units so as to

What Is Claimed Is:

1. An automated carousel comprising:

a substantially vertical track assembly comprising an upright drive track and a support track;

a plurality of translation assemblies, wherein each of the plurality of translation assemblies is a hub assembly having a first end defining a coupling for an input shaft of a biological production unit in a cantilevered orientation, and

a central hub comprising:

an inner hub configured to axially rotate the biological production unit; and

a resistance arm having a pivotally connected support carriage cooperatively engaged with the support track for translational movement thereon;

wherein each translation assembly supports a biological production unit in a cantilevered orientation, said plurality of translation assemblies configured to provide: (i) separate translational movement of each biological production unit along the drive track and the support track, while maintaining the cantilevered orientation of each biological production unit stable with respect to gravity, and separately, (ii) axial rotation of each biological production unit.

2. The automated carousel of claim 1, wherein the central hub further includes an outer hub shell supporting a drive carriage for cooperatively engaging with the upright drive track for translational movement thereon.

3. The automated carousel of claims 1 or 2, wherein a separate mechanism in an inner hub comprises a motor driven central shaft for engaging with an input shaft of the biological production unit, wherein actuation of the motor actively rotates the central shaft at a controlled speed causing axial rotation of the associated biological production unit.

4. The automated carousel of claim 2 or 3, wherein said drive carriage comprises a drive block assembly with one face thereof comprising affixed vertically arranged pairs of outwardly projecting bearing members for gripping the drive track and for engaging with

a drive belt or a drive linkage adapted to move along a course of travel defined by the drive track.

5. The automated carousel of any one of claims 1-4, wherein said support carriage comprises a support block assembly with one face thereof comprising affixed vertically arranged pairs of outwardly projecting bearing members for gripping the support track and for engaging with a drive belt or a drive linkage adapted to move along a course of travel defined by the support track.

6. The automated carousel of any one of claims 1-5, further wherein a second end of the hub assembly comprises a port for entry of a connector for centrally provided operational resources to the biological production unit.

7. The automated carousel of claim 6, wherein said port
leads to a hollow shaft extending through the central hub to the biological production unit.

8. The automated carousel of claim 7, wherein the connector comprises cabling enclosing separate operational resources, the cabling originating from a central source and connecting each successive biological production unit on said carousel.

9. The automated carousel of claim 8, wherein the operational resources are electrical supply lines, gas supply lines and controller connections.

10. The automated carousel of any one of claims 1-9, wherein the translational movement along the drive track and the support track is about 180 degrees clockwise or counterclockwise.

11. The automated carousel of claim 10, wherein said biological production unit is a cell and/or tissue engineering system configured to perform one or more of: sterile

reception/storage of tissue biopsy; automated monitoring of digestion process; digestion of biopsy tissue to yield disassociated cells;

cell sorting and selection, safe waste collection; cell seeding on or within a proliferation substrate; ;scaffold proliferation of cells to expand cell populations; cell washing and cell collection; cell seeding on or within a tissue engineering scaffold or matrix; cell differentiation to allow specialization of cellular activity; tissue formation; mechanical and/or biochemical stimulation to promote tissue maturity; harvest of tissue engineered constructs/implants for reconstructive surgery; and storage and transportation of cells and implantable tissue.

12. An automated carousel system for the distribution and ergonomic positioning of multiple biological production units, each of the biological production units comprising an automated individually operable cell and/or tissue engineering system, the automated carousel system comprising:

an automated carousel comprising:

a substantially vertical track assembly comprising a drive track and a support track vertically offset and spaced apart from one another; and

a plurality of translation assemblies connecting the drive track and the support track at spaced apart positions, wherein each of the plurality of translation assemblies is a hub assembly having a first end defining a coupling for an input shaft of the biological production unit in a cantilevered orientation, and a second end having a vertically downward extending resistance arm, and

a central hub comprising:

an inner hub comprising a central shaft for engaging with the input shaft of the biological production unit, the central shaft mounted to the vertically downward extending resistance arm of the second end, the inner hub configured to axially rotate the biological production unit; and

the vertically downward extending resistance arm having a pivotally connected support carriage cooperatively engaged with the support track for translational movement thereon;

each of said plurality of translation assemblies supporting a cantilevered biological production unit, wherein said plurality of translation assemblies are configured to provide (i) separate translational movement of each biological production unit along the connected drive track and support track while maintaining the cantilevered orientation of each biological

production unit stable with respect to gravity, and separately, (ii) axial rotation of each biological production unit;

a controller for independent biological control of each cell and/or tissue engineering system within each of said biological production units;

a vertical housing assembly supporting the automated carousel, the housing assembly comprising a central source of operational resources;

a connector for interconnecting the central source of operational resources to each successive biological production unit; and

a computer connection.

13. The automated carousel system of claim 12, wherein each biological production unit comprises a connected interface for communication by a user, said connected interface connected to a computer via the computer connection.

14. The automated carousel system of claim 12 or 13, comprising up to 24 translation assemblies.

15. A method for improving ergonomics for users of an automated carousel system that comprises a plurality of independent cell and/or tissue engineering systems each supported within a biological production unit, the method comprising:

mounting a plurality of biological production units on an automated carousel comprising:

a vertical track assembly comprising a drive track and a support track vertically offset and spaced apart from one another; and

a plurality of translation assemblies connecting the drive track and the support track at spaced apart positions, each of said plurality of translation assemblies supporting a cantilevered biological production unit, wherein said plurality of translation assemblies are configured to provide (i) translational movement of each biological production unit along the connected drive track and support track in unison or separately while maintaining an orientation of each cantilevered biological production unit stable with respect to gravity, and separately, (ii) axial rotation of each biological production unit; and

controlling the translational movement and axial rotation of each biological production unit for ergonomic access to each biological production unit by a user.

16. The method for improving ergonomics of claim 15, further comprising sending one or more translational movement operating instructions to the automated carousel to translationally move the plurality of cantilevered biological production units in unison, the one or more translational movement instructions comprising information about the location on the carousel of a target biological production unit for positioning and information regarding physical measurement specifications of a specific user standing or seated.

17. The method for improving ergonomics of claim 16, further comprising identifying the target biological production unit for ergonomic positioning for the specific user, and positioning the target biological production unit according to the physical measurements of the specific user standing or seated.

18. The method for improving ergonomics of claim 17, further comprising stopping the translational movement operating instructions when the target biological production unit is ergonomically positioned, and sending one or more results of the ergonomic positioning to a remote management device via a communication interface of the automated carousel.