CLAIMS

1. An apparatus for production of biomass or a bioproduct, the apparatus comprising:

(i) at least one elongate bioreactor, the at least one elongate bioreactor comprised of at least one outer membrane layer that defines a substantially tubular compartment that is configured to be filled with a liquid and/or gel, wherein the at least one outer membrane layer is comprised of a material that is permeable to gas transfer across the at least one outer membrane layer;

(ii) a chamber comprising:

a) at least one wall; and

b) a gaseous atmosphere defined by and enclosed within the at least one wall,

wherein at least a part of the at least one elongate bioreactor is located inside the chamber; and

(iii) a control system configured to control a composition of the gaseous atmosphere within the chamber;

wherein gas transfer occurs across the at least one outer membrane layer of the at least one elongate bioreactor between the substantially tubular compartment and the gaseous atmosphere comprised within the chamber; and

(iv) an auxiliary system in fluid communication with the at least one elongate bioreactors so as to define a flow circuit, wherein the auxiliary system is configured to circulate the liquid and/or gel through the flow circuit.

2. The apparatus of claim 1, wherein chamber is in the form of a tank, a vessel, a barrel, a tent, a warehouse, an inflated structure, or a room.

3. The apparatus of any one of claims 1 to 2, wherein the gaseous atmosphere within the chamber is elevated to a pressure greater than or less than atmospheric pressure.

4. The apparatus of any one of claims 1 to 3, wherein the control system is configured to alter the gaseous atmospheric composition of the chamber by:

(i) depleting O_2-concentration;

(ii) introducing CO_2 containing gas; and/or

(iii) introducing steam.

5. The apparatus of any one of claims 1 to 4, wherein the chamber further comprises:

(i) a sterilisation system;

(ii) gas circulatory apparatus; and/or

(iii) a source of illumination, optionally wherein the source of illumination emits visible and/or UV light.

6. The apparatus of any one of claims 1 to 5, wherein at least one or a part of one wall of the chamber permits transmission therethrough of visible light into the interior of the chamber.

7. The apparatus of any one of claims 1 to 6, wherein the chamber comprises an assembly for supporting the at least one elongate bioreactor within.

8. The apparatus of claim 7, wherein the assembly comprises at least one cradle configured to support the at least one elongate bioreactor.

9. The apparatus of claim 8, wherein the at least one cradle substantially encloses all or a part of the at least one elongate bioreactor.

10. The apparatus of any one of claims 1 to 9, wherein the at least one elongate bioreactor is comprised of one or more hose sections, wherein each hose section is comprised of a gas permeable polymer membrane.

11. The apparatus of any one of claims 1 to 10, wherein the material that is permeable to gas transfer comprises: silicones, polysiloxanes, polydimethylsiloxanes (PDMS), fluorosilicone, organosilicones, cellulose, cellulose acetate, nitrocellulose, or cellulose esters.

12. The apparatus of claim 11, wherein the material that is permeable to gas transfer has:

(i) an oxygen permeability of at least 350Barrers;

(ii) a carbon dioxide permeability of at least 2000Barrers; and/or

(iii) a water vapour permeability of at least 5000Barrers.

13. The apparatus of any one of claims 1 to 12, wherein the at least one outer membrane layer has a thickness of at least 10 μm and at most 1 mm.

14. The apparatus of any one of claims 10 to 13, wherein the one or more hose sections are joined by one or more connectors that facilitate fluid communication between the one or more hose sections.

15. The apparatus of claim 14, wherein the one or more connectors comprise a valve which is operated to reduce or stop fluid communication between the one or more hose sections.

16. The apparatus of any one of claims 1 to 15, wherein the at least one elongate bioreactor further comprises a liquid cellular growth medium.

17. The apparatus of claim 16, wherein the at least one elongate bioreactor further comprises a microbial or algal organism selected from: a photoautotroph, a chemotroph or a mixotroph.

18. The apparatus of claim 18, wherein the organism is selected from one or more of Cyanobacteria, Protobacteria, Spirochaetes, Gram Positive bacteria, green filamentous bacteria such as Chloroflexia, Planctomycetes, Bacteroides cytophaga, Thermotoga, aquifex, halophiles, Methanosarcina, Methanobacterium, Methanococcus, Thermococcus celer, Thermoproteus, Pyrodictium, Entamoebae, slime moulds such as Mycetozoa, Ciliates, Trichomonads, Microsporidia, Diplomonads, Excavata, Amoebozoa, Choanoflagellates, Rhizaria, Foraminifera, Radiolaria, Diatoms, Stramenopiles, brown algae, red algae, green algae, snow algae, Haptophyta, Cryptophyta, Alveolata, Glaucophytes, phytoplankton, plankton, Percolozoa, Rotifera, or cells or whole organisms from animals, fungi or plants.

19. The apparatus of claim 16, wherein the at least one elongate bioreactor comprises a eukaryotic cell culture.

20. The apparatus of claim 17, wherein the at least one elongate bioreactor comprises a human cell culture.

21. The apparatus of any one of claims 1 to 20, wherein the control system is further configured to control the temperature of the atmosphere within the chamber.

22. The apparatus of claim 7, wherein the assembly further comprises a plurality of armatures arranged in either a horizontal or vertical parallel or anti-parallel array.

23. The apparatus of claim 8, wherein the at least one cradle is comprised of a mesh or a perforated sheet material, such that atmospheric circulation is permitted via the perforations of the sheet material.