CLAIMS

What is claimed is:

1. A method comprising:

providing a minimal medium to a bioreactor;

inoculating the minimal medium in the bioreactor with an inoculum including chemoautotrophic and/or photoautotrophic cells and also including heterotrophic cells; and

cultivating, chemoautotrophically, the inoculum to grow a biomass in the bioreactor by providing a gaseous input into the bioreactor until a cell density of the biomass in the medium meets a threshold density of 0.5 grams cell dry weight per liter (CDW/L), whereby the minimal medium is enriched during the cultivation to become an enriched medium.

2. The method of claim 1 wherein the inoculum includes photoautotrophic cells and the cultivating is performed in the absence of light within the bioreactor.

3. The method of claim 1 or 2 wherein the inoculum includes chemoautotrophic cells and the gaseous input comprises CH_4 and O_2.

4. The method of claim 3 wherein the chemoautotrophic cells include cells of *Methylococcus capsulatus*.

5. The method of claim 1-3 or 4 wherein the gaseous input comprises CO.

6. The method of claim 1-3 or 4 wherein the gaseous input comprises CO_2 and H_2S.

7. The method of claim 1-3 or 4 wherein the gaseous input comprises CO_2, H_2 and O_2.

8. The method of claim 1-6 or 7, wherein the inoculum includes cells of *Cupriavidus necator*, cells of *Rhodobacter capsulatus*, or cells of both.

9. The method of claim 1-6 or 7 wherein the inoculum includes cells of a carboxydotroph.

10. The method of claim 1-6 or 7, wherein the inoculum includes cells of *Rhodococcus opacus*.

11. The method of claim 1-9 or 10 further comprising destroying cells in the enriched medium so as to release their contents into the enriched medium.

12. The method of claim 1-10 or 11 wherein the enriched medium includes one or more of a growth factor, a hormone, an antibiotic, an amino acid, a peptide, a protein, a vitamin, a colorant, a carotenoid, a fatty acid, or an oil.

13. The method of claim 1-11 or 12 further comprising separating the insoluble biomass from the enriched medium.

14. The method of claim 13 wherein the enriched medium, after separation, includes at least 1 gram of D-glucose per liter.

15. The method of claim 13 or 14 further comprising cultivating cells of a heterotroph in the enriched medium separated from the biomass, thereby depleting the enriched medium.

16. The method of claim 15 wherein the heterotroph cells are derived from a cell line of a multicellular aquatic organism.

17. The method of claim 1-15 or 16 wherein the minimal medium comprises a gel.

18. The method of claim 1-16 or 17 wherein the minimal medium is added to the bioreactor together with a solid or semi-solid material for the cells.