

CLAIMS:

1. A controlled growth system, comprising:
 - a controller configured to manage process parameters of a controlled growth environment;
 - a sensor configured to monitor a biologic in the controlled growth environment during a growth process; and
 - a computing system in communication with the sensor and the controller, the computing system programmed to perform operations comprising:
 - initiating the growth process by providing the controller with an initial set of process parameters for the controlled growth environment;
 - receiving sensor data from the sensor during the growth process, wherein the sensor data comprises at least an image of the biologic;
 - generating, based on the image, a predicted final quality metric for the biologic, wherein the predicted final quality metric represents a final state of the biologic at an end of the growth process based on a current state of the biologic;
 - determining that the predicted final quality metric for the biologic is not within a threshold range of a canonical final quality metric;
 - based on the determining, generating an updated set of process parameters to achieve the canonical final quality metric; and
 - providing the updated set of process parameters to the controller.
2. The controlled growth system of claim 1, wherein the sensor data further comprises one or more of a temperature reading, a humidity reading, a light intensity reading, and a carbon dioxide level reading.
3. The controlled growth system of claim 1, wherein generating, based on the image, the predicted final quality metric for the biologic comprises:
 - applying a topographic analysis approach to the biologic to generate the predicted final quality metric.
4. The controlled growth system of claim 1, wherein generating, based on the image, the predicted final quality metric for the biologic comprises:

applying one or more computer vision techniques to the biologic to generate the predicted final quality metric.

5. The controlled growth system of claim 1, wherein generating, based on the image, the predicted final quality metric for the biologic comprises:

inputting the image into a convolutional neural network; and
receiving, as output, the predicted final quality metric for the biologic.

6. The controlled growth system of claim 5, wherein generating the updated set of process parameters to achieve the canonical final quality metric comprises:

outputting, from the convolutional neural network, the updated set of process parameters to achieve the canonical final quality metric based on the current state of the biologic.

7. The controlled growth system of claim 5, further comprising:

training the convolutional neural network to learn how various process parameters affect a final quality metric of the biologic at various stages of growth based on a training data set comprising training images of training biologics and training process parameters of the controlled growth environment corresponding to training image.

8. A method for controlling a growth of a biologic in a controlled growth environment, comprising:

initiating, by a computing system, a growth process for the biologic in the controlled growth environment by providing a controller of the controlled growth environment with an initial set of process parameters;

receiving, by the computing system, sensor data from a sensor of the controlled growth environment during the growth process, wherein the sensor data comprises at least an image of the biologic;

generating, by the computing system, based on the image, a predicted final quality metric for the biologic, wherein the predicted final quality metric represents a final state of the biologic at an end of the growth process based on a current state of the biologic;

determining, by the computing system, that the predicted final quality metric for the biologic is not within a threshold range of a canonical final quality metric;

based on the determining, generating, by the computing system, an updated set of process parameters to achieve the canonical final quality metric; and

providing, by the computing system, the updated set of process parameters to the controller.

9. The method of claim 8, wherein the sensor data further comprises one or more of a temperature reading, a humidity reading, a light intensity reading, and a carbon dioxide level reading.

10. The method of claim 8, wherein generating, based on the image, the predicted final quality metric for the biologic comprises:

applying a topographic analysis approach to the biologic to generate the predicted final quality metric.

11. The method of claim 8, wherein generating, based on the image, the predicted final quality metric for the biologic comprises:

applying one or more computer vision techniques to the biologic to generate the predicted final quality metric.

12. The method of claim 8, wherein generating, based on the image, the predicted final quality metric for the biologic comprises:

inputting the image into a convolutional neural network; and

receiving, as output, the predicted final quality metric for the biologic.

13. The method of claim 12, wherein generating the updated set of process parameters to achieve the canonical final quality metric comprises:

outputting, from the convolutional neural network, the update set of process parameters to achieve the canonical final quality metric based on the current state of the biologic.

14. The method of claim 12, further comprising:

training the convolutional neural network to learn how various process parameters affect a final quality metric of the biologic at various stages of growth based on a training

data set comprising training images of training biologics and training process parameters of the controlled growth environment corresponding to training image.

15. A controlled growth system for mycelium, comprising:
 - a sensor configured to monitor a mycelium sheet in a controlled growth environment during a growth process; and
 - a computing system in communication with the sensor and the controlled growth environment, the computing system programmed to perform operations comprising:
 - initiating the growth process by providing the controlled growth environment with an initial set of process parameters for the controlled growth environment;
 - receiving sensor data from the sensor during the growth process, wherein the sensor data comprises at least an image of the mycelium sheet;
 - generating, based on the image, a predicted final quality metric for the mycelium sheet, wherein the predicted final quality metric represents a final state of the mycelium sheet at an end of the growth process based on a current state of the mycelium sheet;
 - determining that the predicted final quality metric for the mycelium sheet is not within a threshold range of a canonical final quality metric;
 - based on the determining, generating an updated set of process parameters to achieve the canonical final quality metric; and
 - adjusting the controlled growth environment based on the updated set of process parameters.
16. The controlled growth system of claim 15, wherein the sensor data further comprises one or more of a temperature reading, a humidity reading, a light intensity reading, and a carbon dioxide level reading.
17. The controlled growth system of claim 15, wherein generating, based on the image, the predicted final quality metric for the mycelium sheet comprises:
 - applying a topographic analysis approach to the mycelium sheet to generate the predicted final quality metric.
18. The controlled growth system of claim 15, wherein generating, based on the image, the predicted final quality metric for the mycelium sheet comprises:

applying one or more computer vision techniques to the mycelium sheet to generate the predicted final quality metric.

19. The controlled growth system of claim 15, wherein generating, based on the image, the predicted final quality metric for the mycelium sheet comprises:

inputting the image into a convolutional neural network; and

receiving, as output, the predicted final quality metric for the mycelium sheet.

20. The controlled growth system of claim 19, further comprising:

training the convolutional neural network to learn how various process parameters affect a final quality metric of the mycelium sheet at various stages of growth based on a training data set comprising training images of training mycelium sheets and training process parameters of the controlled growth environment corresponding to training image.