THAT WHICH IS CLAIMED:

1. An interlocking porous hydrogel block (IPHB), comprising:

a three-dimensional (3D) macrostructure defined by a continuous polymeric matrix material and a network of microporous channels and/or chambers extending throughout the continuous polymeric matrix material;

the 3D macrostructure comprises a top surface, a bottom surface, and a thickness defined by at least one side edge extending from the top surface to the bottom surface, and wherein the 3D macrostructure structure includes at least one interlocking-male component and at least one interlocking-female component.

2. The IPHB of claim of 1, wherein the at least one interlocking-male component includes a first interlocking-male component extending outwardly from the at least one side edge.

3. The IPHB of claim of 1, wherein the at least one side edge includes a first side edge and a second side edge, and wherein the at least one interlocking-male component includes a first interlocking-male component extending outwardly from the first side edge and a second interlocking-male component extending outwardly from the second side edge.

4. The IPHB according to any one of claims 1-3, wherein the at least one interlocking-female component includes a first interlocking-female component extending inwardly from the at least one side edge towards an interior portion of the 3D macrostructure.

5. The IPHB according to any one of claims 3-4, wherein the at least one side edge includes a third side edge and a fourth side edge, and wherein the at least one interlocking-

female component includes a first interlocking-female component extending inwardly from the third side edge towards an interior portion of the 3D macrostructure and a second interlocking-female component extending inwardly from the fourth side edge towards an interior portion of the 3D macrostructure.

6. The IPHB of claim 5, wherein the first side edge and the third side edge define a first pair of opposing side edges, and the second side edge and the fourth side edge define a second pair of opposing side edges.

7. The IPHB according to any one of claims 1-6, wherein the bottom surface has a rougher texture relative to the top surface, and wherein the bottom surface includes a plurality of minor protrusions, such as individual nubs or ridges.

8. The IPHB according to any one of claims 1-7, wherein (i) the top surface comprises a macroscopic surface area from about 0.25 cm^2 to about 25 cm^2, such as at least about any of the following: 0.25, 0.5, .75, 1, 1.5, 2, 5, 8, 10, and 12 cm^2, and/or about any of the following: 25, 22, 20, 18, 15, and 12 cm^2, (ii) the thickness of the 3D macrostructure is from about 0.5 cm to about 3 cm, such as at least about any of the following: 0.5, 0.75, 1, 1.25, and 1.5 cm, and/or at most about any of the following: 3, 2.5, 2, and 1.5 cm, (iii) the thickness of the 3D macrostructure is from about 0.5 cm to about 3 cm, such as at least about any of the following: 0.5, 0.75, 1, 1.25, and 1.5 cm, and/or at most about any of the following: 3, 2.5, 2, and 1.5 cm, or any combination of (i)-(iii).

9. The IPHB according to any one of claims 1-8, wherein each of the at least one interlocking-female component is configured to receive a corresponding at least one interlocking-male component of a second IPHB.

10. The IPHB according to any one of claims 1-9, wherein the continuous polymeric matrix material is non-degradable.

11. The IPHB according to any one of claims 1-9, wherein the continuous polymeric matrix material is selectably degradable.

12. The IPHB according to any one of claims 1-11, wherein the continuous polymeric matrix material comprises a swellable hydrogel.

13. The IPHB according to claim 11 or 12, wherein the swellable hydrogel comprises one or more natural polymers, such as plant-derived polymers and animal-derived polymers.

14. The IPHB according to any one of claims 1-13, wherein the continuous polymeric matrix material mimics a natural tissue of interest by including one or more physical properties within about 20%, such as within about 15%, 10%, 8%, 5%, 3%, or 1%, of the natural tissue of interest, wherein the one or more physical property of interest includes softness and tension.

15. The IPHB according to any one of claims 1-14, wherein the continuous polymeric matrix material is formed via an additive manufacturing technique, such as 3D printing or digital light synthesis printing.

16. The IPHB according to any one of claims 1-15, wherein the network of microporous channels and/or chambers is structured to mimic the morphology of a natural tissue of interest, such as by varying the geometry and dimensions of the network of microporous channels and/or chambers to mirror the morphology of the natural tissue of interest.

17. The IPHB according to any one of claims 1-16, wherein the average diameter comprises from about 100 to about 800 microns, such as at least about any of the following: 100, 120, 150, 180, 200, 220, and 250 microns, and/or at most about any of the following: 800, 780, 750, 720, 700, 680, 650, 620, 600, 580, 550, 520, 500, 480, 450, 420, 400, 380, 350, 320, 300, 280, and 250 microns.

18. The IPHB according to any one of claims 1-17, wherein the network of microporous channels and/or chambers comprises at least about 40% by volume of the 3D macrostructure, such as from at least about any of the following: 40, 50, 60, and 70% by volume of the 3D macrostructure, and/or at most about any of the following: 90, 85, 80, 75, and 70% by volume of the 3D macrostructure.

19. The IPHB according to any one of claims 1-18, wherein an interface between the network of microporous channels and/or chambers and continuous polymeric matrix material comprises a coating of a compatibilizer selected to promote adhesion of a primary cell of interest.

20. A scaffolding system, comprising: a plurality of IPHBs according to any one of claims 1-19.

21. The scaffolding system of claim 20, wherein the plurality of IPHBs includes a first IPHB including a first interlocking-male component and a second IPHB including a second interlocking-female component, wherein the second interlocking-female component is configured to receive the first interlocking-male component.

22. The scaffolding system of claim 21, wherein the first interlocking-male component is inserted into the second interlocking-female component, and wherein the first IPHB and the second IPHB are each provided in a swollen state improve interlocking of the first IPHB and the second IPHB, the swollen state is provided due to the absorbance of a liquid, such as water or a culture medium.

23. The scaffolding system according to claim 21 or 22, wherein the first IPHB has a first network of microporous channels and/or chambers and the second IPHB has a second network of microporous channels and/or chambers, wherein a first portion of the first network of microporous channels and/or chambers at least partially overlap with a first portion of the second network of microporous channels and/or chambers when the first IPHB and the second IPHB are interlocked and define an aggregate continuous network of microporous channels and/or chambers.

24. The scaffolding system according to any one of claims 20-23, wherein the first IPHB is seeded with a first primary cell and the second IPHB is seeded with a second primary cell, wherein the first primary cell is different than the second primary cell.