Supporting Information

3D-printed architected materials inspired by cubic Bravais Lattices

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Figure S1 – a) Geometry and dimensions of the dogbone sample (ASTM D638-14). b) 3D-printed samples.

Figure S2 – Geometry and dimensions of the cylindrical sample for compression tests (ASTM-D695).
Table S1 - Calibration of 3D solid models: Elastic moduli applied to nodes and struts for each numerical simulation (for each lattice topology).

| Combination | % at Nodes | \( E \) at Nodes (MPa) | % at Struts | \( E \) at Struts (MPa) |
|-------------|------------|-------------------------|-------------|-------------------------|
| 1           | 100%       | 3385                    | 100%        | 3385                    |
| 2           | 100%       | 3385                    | 60%         | 2046.5                  |
| 3           | 100%       | 3385                    | 50%         | 2046.5                  |
| 4           | 100%       | 3385                    | 30%         | 2046.5                  |
| 5           | 100%       | 3385                    | 20%         | 2046.5                  |
| 6           | 100%       | 3385                    | 10%         | 2046.5                  |
| 7           | 60%        | 3385                    | 80%         | 1692.5                  |
| 8           | 50%        | 3385                    | 90%         | 1692.5                  |
| 9           | 50%        | 3385                    | 90%         | 1692.5                  |
| 10          | 50%        | 3385                    | 90%         | 1692.5                  |
| 11          | 50%        | 3385                    | 90%         | 1692.5                  |
| 12          | 50%        | 3385                    | 80%         | 1692.5                  |
| 13          | 50%        | 3385                    | 80%         | 1692.5                  |
| 14          | 50%        | 3385                    | 80%         | 1692.5                  |
| 15          | 50%        | 3385                    | 80%         | 1692.5                  |
| 16          | 50%        | 3385                    | 80%         | 1692.5                  |
| 17          | 50%        | 3385                    | 80%         | 1692.5                  |
| 18          | 50%        | 3385                    | 80%         | 1692.5                  |
| 19          | 50%        | 3385                    | 80%         | 1692.5                  |
| 20          | 50%        | 3385                    | 80%         | 1692.5                  |
| 21          | 50%        | 3385                    | 80%         | 1692.5                  |

Table S2 – Calibration of 3D beam models: Elastic moduli applied to each numerical simulation (for each lattice topology).

| RUN | %     | \( E \) (MPa) |
|-----|-------|---------------|
| 1   | 100%  | 3385          |
| 2   | 90%   | 3047          |
| 3   | 90%   | 2708          |
| 4   | 70%   | 2370          |
| 5   | 60%   | 2031          |
| 6   | 55%   | 1862          |
| 7   | 50%   | 1693          |
**Table S3** – 3D solid models: Elastic moduli that best approximate the experimental behavior.

| Cell | Elastic Modulus assigned to Nodes [MPa] | Elastic Modulus Assigned to Struts [MPa] |
|------|----------------------------------------|----------------------------------------|
| SC   | 2708                                   | 2031                                   |
| BCC  | 3047                                   | 2031                                   |
| FCC  | 2708                                   | 2031                                   |

**Table S4** – 3D beam models: Elastic moduli that best approximate the experimental behavior.

| Cell | Elastic Modulus assigned [MPa] |
|------|-------------------------------|
| SC   | 1693                          |
| BCC  | 1862                          |
| FCC  | 2031                          |

**Table S5** – Experimental results of the SC cells.

|                  | Max Load [N] | Stiffness [N/mm] | Elastic modulus [MPa] | Max Stress [MPa] | Deformation Energy [MJ/m^3] | Max Strain [-] |
|------------------|--------------|------------------|-----------------------|------------------|-----------------------------|----------------|
| Average SC       | 437.0 ± 52.0 | 1136.0 ± 131.2   | 71.05 ± 8.23          | 1.71 ± 0.21      | 0.068 ± 0.018               | 0.090 ± 0.018 |
| SC015-L          | 451.5 ± 102.1| 1290.2 ± 168.1   | 80.62 ± 10.51         | 1.76 ± 0.40      | 0.066 ± 0.032               | 0.076 ± 0.023 |
| SC015-T          | 443.1 ± 60.4 | 1034.7 ± 203.5   | 64.63 ± 12.74         | 1.73 ± 0.24      | 0.076 ± 0.021               | 0.090 ± 0.017 |
| SC02-L           | 430.7 ± 30.3 | 1292.3 ± 96.7    | 80.83 ± 6.02          | 1.68 ± 0.12      | 0.059 ± 0.008               | 0.085 ± 0.010 |
| SC02-T           | 422.5 ± 15.1 | 926.4 ± 56.6     | 57.93 ± 3.56          | 1.65 ± 0.06      | 0.072 ± 0.011               | 0.108 ± 0.020 |

**Table S6** – Experimental results of the BCC cells.

|                  | Max Load [N] | Stiffness [N/mm] | Elastic modulus [MPa] | Max Stress [MPa] | Deformation Energy [MJ/m^3] | Max Strain [-] |
|------------------|--------------|------------------|-----------------------|------------------|-----------------------------|----------------|
| Average BCC      | 685.5 ± 52.9 | 1463.0 ± 83.0    | 91.43 ± 5.19          | 2.68 ± 0.21      | 0.140 ± 0.020               | 0.102 ± 0.014 |
| BCC015-L         | 655.5 ± 82.6 | 1527.9 ± 158.4   | 95.49 ± 9.90          | 2.56 ± 0.32      | 0.123 ± 0.014               | 0.099 ± 0.016 |
| BCC015-T         | 771.4 ± 20.4 | 1529.7 ± 68.9    | 95.61 ± 4.30          | 3.01 ± 0.08      | 0.169 ± 0.013               | 0.111 ± 0.017 |
| BCC02-L          | 606.5 ± 69.0 | 1459.2 ± 62.3    | 91.20 ± 3.89          | 2.37 ± 0.27      | 0.107 ± 0.026               | 0.087 ± 0.014 |
| BCC02-T          | 708.6 ± 39.4 | 1335.0 ± 42.5    | 83.33 ± 2.65          | 2.77 ± 0.15      | 0.160 ± 0.026               | 0.111 ± 0.010 |
Table S7 – Experimental results of the FCC cells.

|                | Max Load [N]  | Stiffness [N/mm] | Elastic modulus [MPa] | Max Stress [MPa] | Deformation Energy [MJ/m³] | Max Strain [-] |
|----------------|---------------|------------------|-----------------------|------------------|----------------------------|----------------|
| Average FCC    | 1019.0 ± 49.5 | 2192.8 ± 314.8   | 139.8 ± 18.4          | 3.98 ± 0.19      | 0.276 ± 0.074              | 0.121 ± 0.025  |
| FCC015-L       | 1007.5 ± 27.8 | 2526.6 ± 650.0   | 158.6 ± 38.6          | 3.94 ± 0.11      | 0.283 ± 0.180              | 0.116 ± 0.031  |
| FCC015-T       | 1089.8 ± 64.6 | 2156.0 ± 120.0   | 141.0 ± 6.4           | 4.26 ± 0.25      | 0.282 ± 0.051              | 0.105 ± 0.017  |
| FCC02-L        | 927.5 ± 48.1  | 2041.2 ± 369.1   | 129.5 ± 22.5          | 3.62 ± 0.19      | 0.267 ± 0.016              | 0.144 ± 0.035  |
| FCC02-T        | 1051.2 ± 57.5 | 2047.5 ± 120.2   | 130.2 ± 6.0           | 4.11 ± 0.22      | 0.270 ± 0.050              | 0.119 ± 0.015  |

Figure S3 – Load-displacement curves of all the unit cells. The acronym indicates the unit cell, the number indicates the layer thickness and the final letter the loading direction (L, longitudinal and T, transversal).
Figure S4 – Ashby plot and scaling laws for different cellular materials (data taken from CES Edu Pack) and comparison with the studied lattices (data taken from FE-simulations).