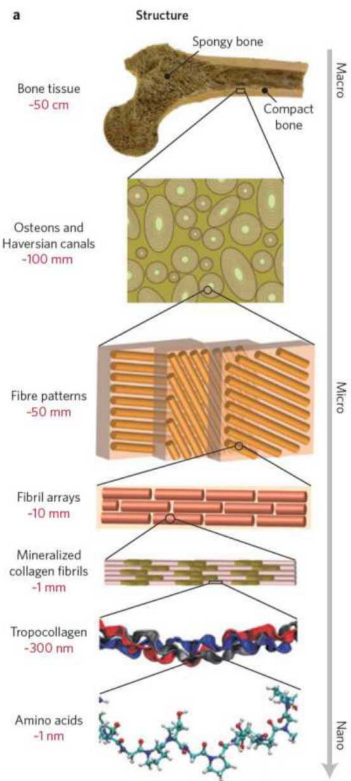
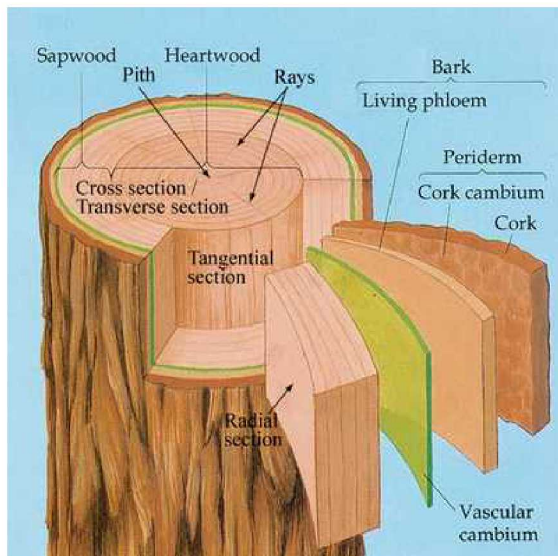


Nature's exceptional hierarchical structures

Bone

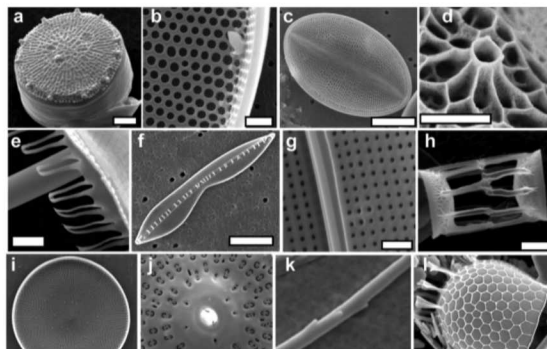


Wood



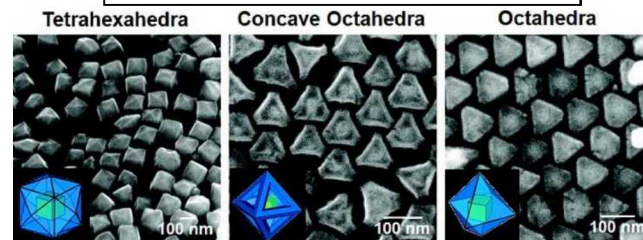
University of Cambridge

Diatoms



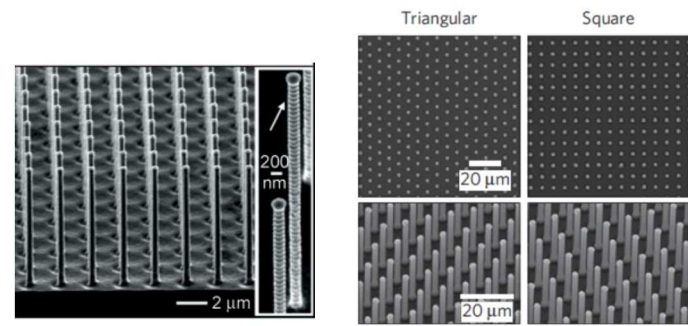
SAND2020-1023PE

Synthetic Nanomaterials: particles, surfaces, porosity



Au/Pd

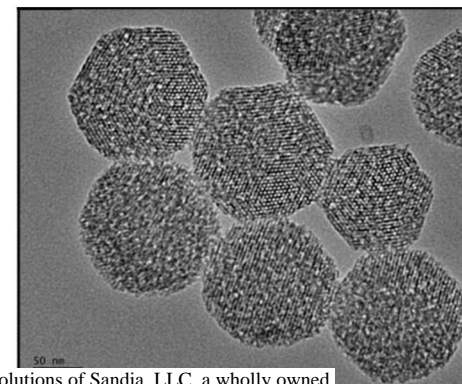
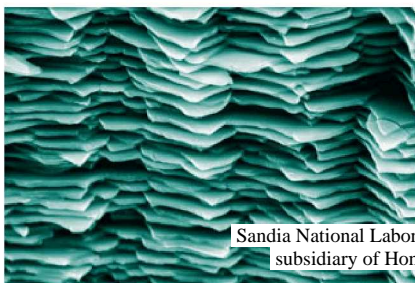
JACS, 2010, 132 (41), pp 14546–14553



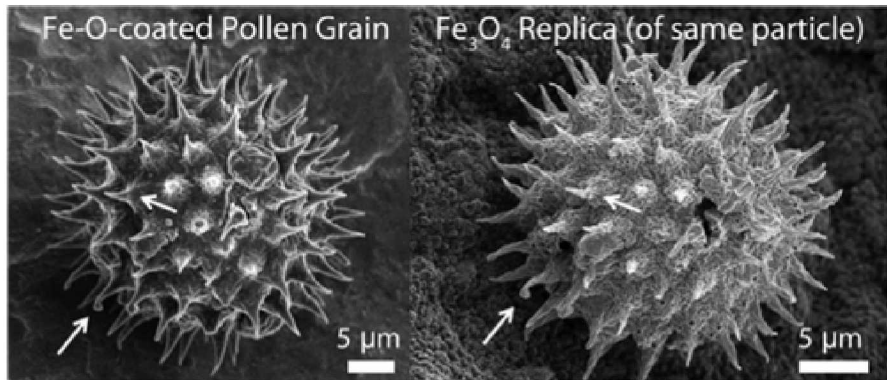
Silicon columns (Aizenberg)

(Lewis, Atwater)

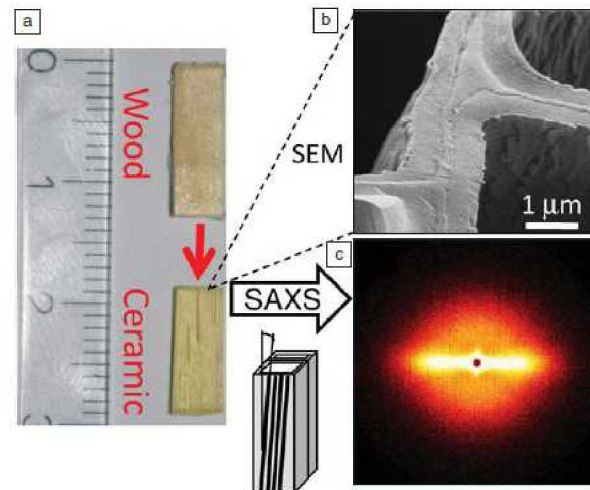
Shell



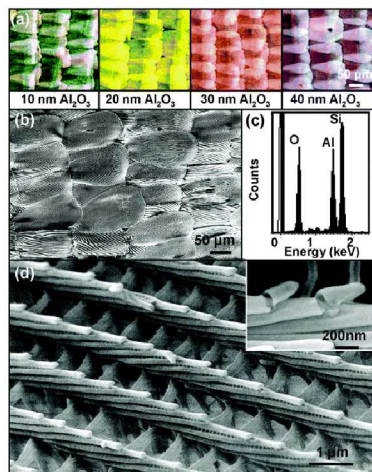
Enabling functional (photonic, electronic, catalytic, etc.) materials: *If you can't make 'em, use 'em.*



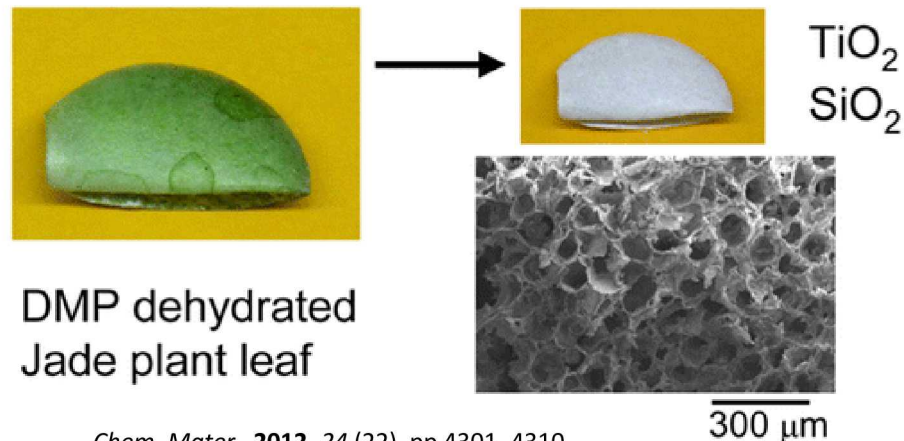
Chem. Mater., **2013**, 25 (22), pp 4529–4536



MRS Bulletin, **2010**, (35)3 pp 219-225



Nano Lett., **2006**, 6 (10), pp 2325–2331



DMP dehydrated Jade plant leaf

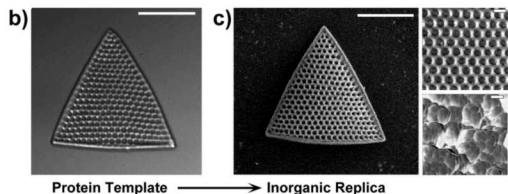
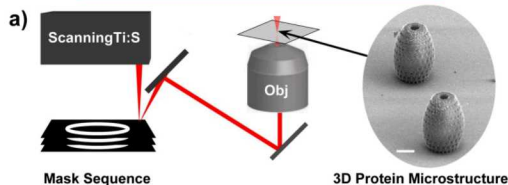
Chem. Mater., **2012**, 24 (22), pp 4301–4310

Static, mechanically stable structures

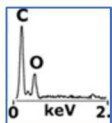
Abilities to synthetically replicate the complex morphology and mechanical properties of biological systems remains a grand challenge in materials science. We are interested in lithographic and biologically directed syntheses of inorganic and composite materials with life-like properties.

Previous Works:

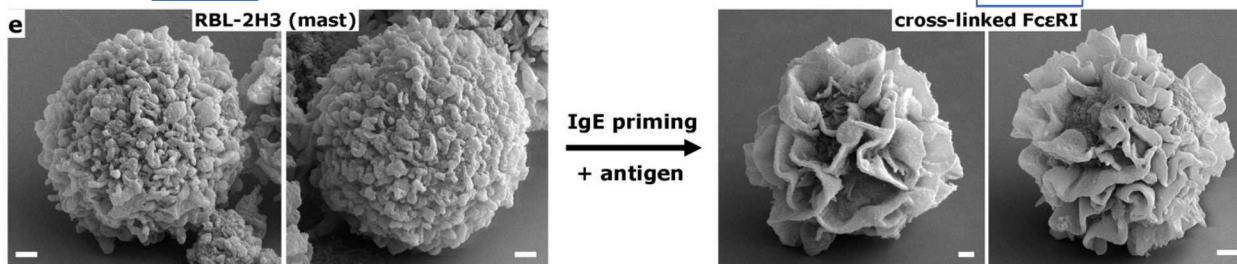
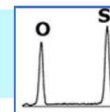
3D printed templates



Khripin, C.Y., Pristiniski, D., Dunphy, D.R., Brinker C. J., Kaehr, B. (2011) ACS Nano, 5, 1401-1409.



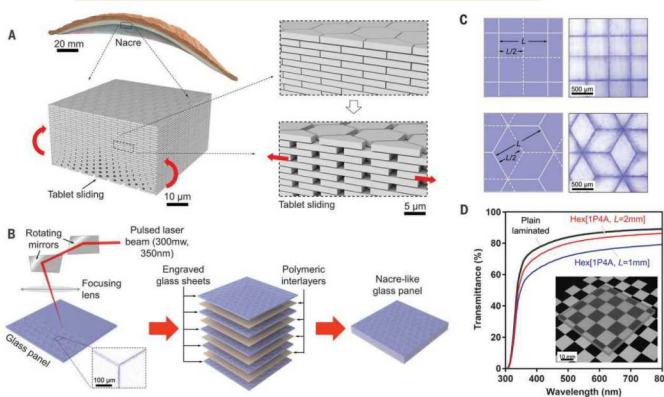
Bio-directed Inorganic Materials:



1. Kaehr, B., Townson, J.L., Kalinich, R.M., Swartzentruber, B., Dunphy, D.R., Brinker, C.J. (2012) PNAS, 109 (43) 17336-17341.
2. Meyer, K.C. Coker, E.N., Bolintineanu, D.S. Kaehr, B., (2014) JACS 136 (38), 13138–13141.
3. Townson, J.L., Lin, YS. Chou, S., Awad, Y.H., Coker, E.N., Brinker, C.J., Kaehr, B., (2014) Nat. Commun. 5:5665
4. Meyer, K.C. Labriola, N.R., Darling, E.M., Kaehr, B., (2019) Adv Biosyst., 1800285.

Current Interests: Technique development for large scale bio-architected materials

Example: Transparent Nacre



Yin, Z., Hannard, F., & Barthelat, F. (2019). Impact-resistant nacre-like transparent materials. Science, 364(6447), 1260-1263.

Tools: Direct-write and R2R printing

- Gravure/flexography
- Direct write (extrusion)/in-mold printing
- Nanoscribe



Magnetic RBCs (ref 2)