



ARC Industrial Transformation
Research Hub for Nanoscience Based
Construction Material Manufacturing

Part1 - Overview of ARC Nanocomm Hub

Part2 - Damage-tolerant material design motif derived from asymmetrical rotation (Nature Communication)

Professor Wenhui Duan

Dr Wei Wang

Director | wenhui.duan@monash.edu



December 16, 2016
48 Industry Partners + 3 Overseas Universities

37 Research Teams

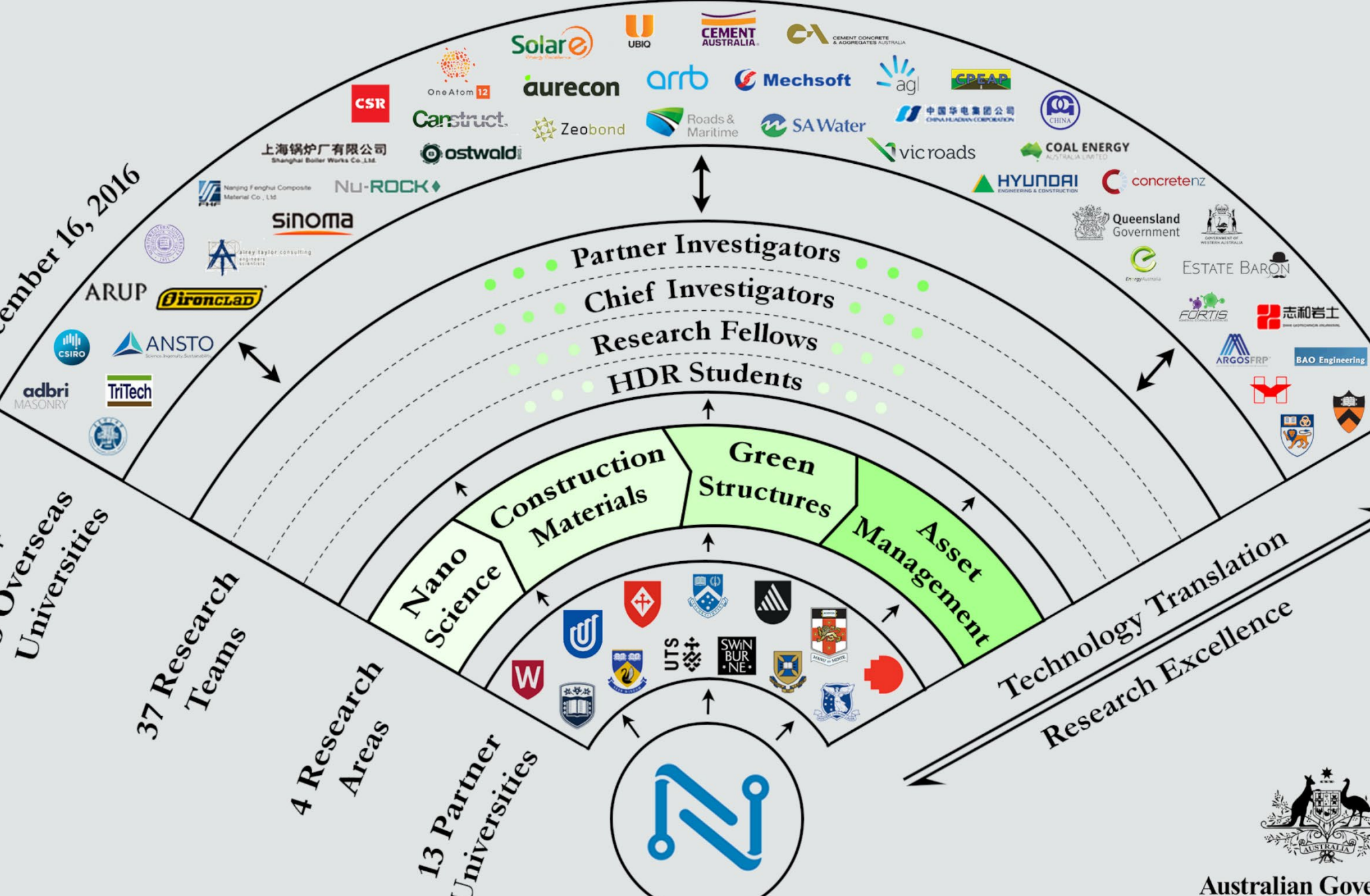
4 Research Areas

13 Partner Universities

ARC Nanocomm Hub

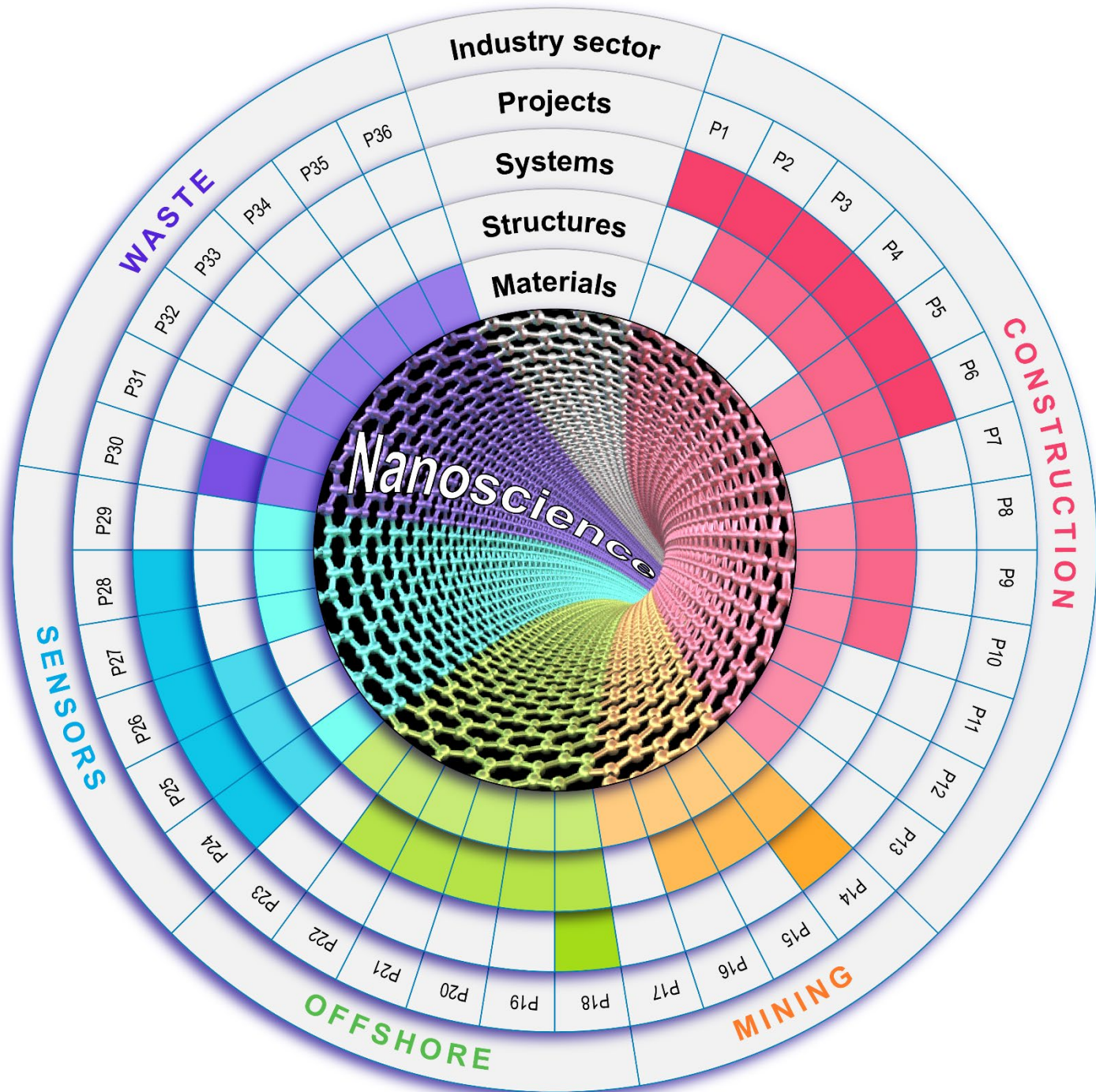
Technology Translation
Research Excellence

Australian Government
Australian Research Council



Interaction between university and industry:

2D Nanocomm model
 Decoupling and
 Diffusion



Performance

ARC mid-term review in 2018 – Satisfaction

PwC report: economic impact analysis of ARC Nanocomm Hub - an increase of \$400-1870 million in gross domestic product in 2020-2050.

Acknowledgement:
Warren South
CCAA
to support our UTS team
led by Prof Vute



Damage-tolerant material design motif derived from asymmetrical rotation

Dr Wei Wang

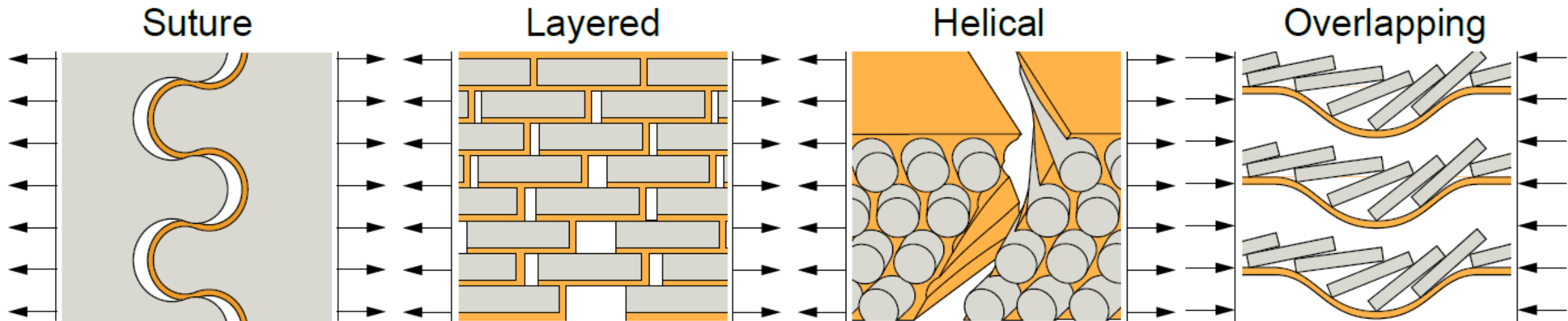
Supervisors:

Prof. Wenhui Duan, Dr Shujian Chen, Dr Kwesi Sagoe-Crentsil



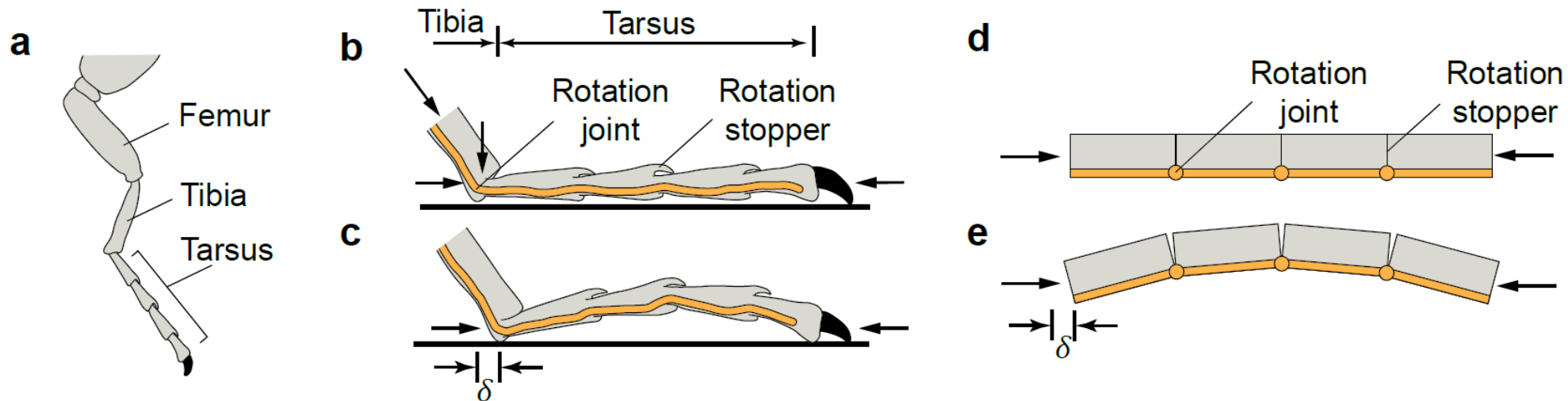
Natural materials and design motifs

- An estimate of more than 7 million living species in the world
- Eight design motifs extracted from natural materials
- Four design motifs designed for energy absorption



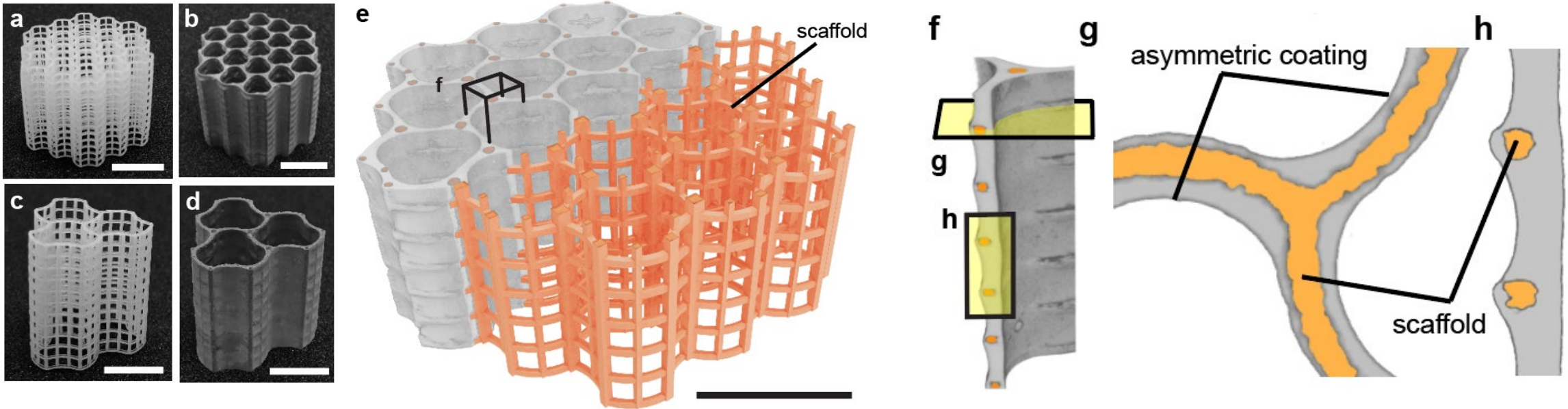
Segmental motif

- Contains both stiff and soft materials
- Stiff segments connected by rotation joints
- Absorb energy by asymmetrical rotation



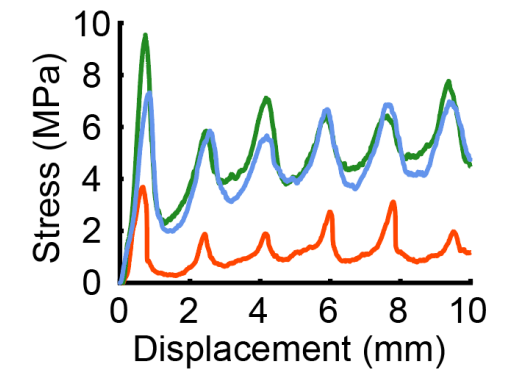
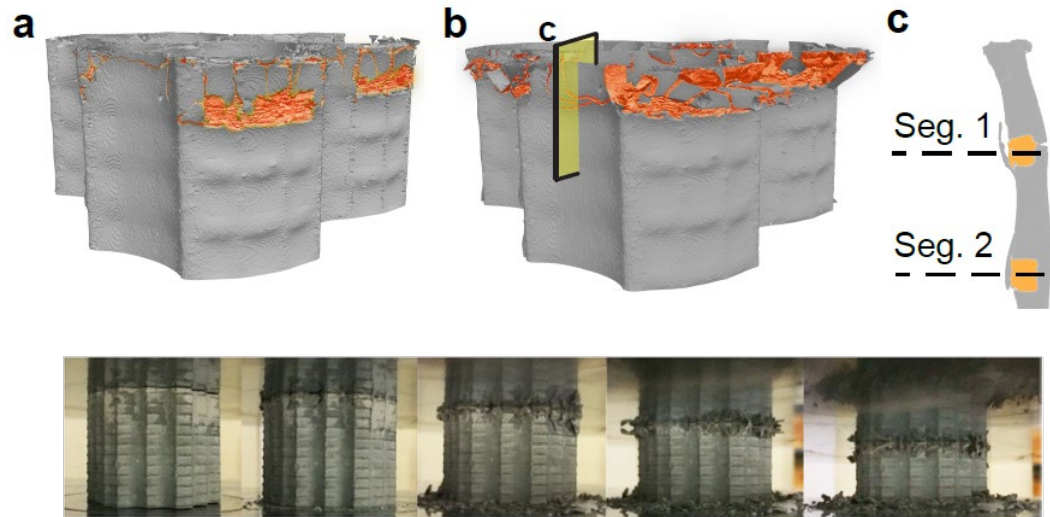
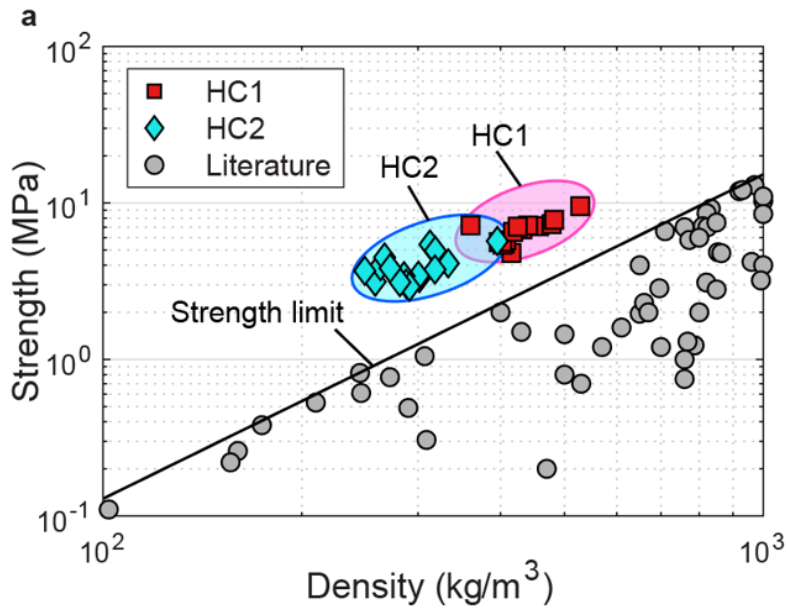
Segmental motif in lightweight cement composites

- Fabricated by 3D printing and rheology properties controlled coating
- Curved honeycomb for asymmetric coating



Performance of lightweight cement composites

- Higher compressive strength than any lightweight cement reported in literature
- Superior damage-tolerance ability
- Unique progressive failure behavior



Thank you!