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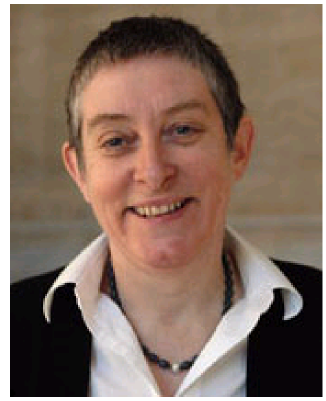
# Lorna J. Gibson



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Curriculum Vitae

**Education**
BASc University of Toronto, 1978
PhD University of Cambridge, 1981

**Research: Cellular Solids Group**
Many materials have a cellular structure, with either a two-dimensional array of prismatic cells, as in a honeycomb, or a three-dimensional array of polyhedral cells, as in a foam. Engineering honeycombs and foams can now be made from nearly any material: polymers, metals, ceramics, glasses and composites, with pore sizes ranging from nanometers to millimeters. Their cellular structure gives rise to a unique combination of properties which are exploited in engineering design: their low weight make them attractive for structural sandwich panels, their ability to undergo large deformations at relatively low stresses make them ideal for absorbing the energy of impacts, their low thermal conductivity make them excellent insulators, and their high specific surface area make them attractive for substrates for catalysts for chemical reactions. Cellular materials are increasingly used in biomedical applications. Open-cell titantium foams are used to replace trabecular bone. Porous scaffolds for regeneration of damaged or diseased tissues often resemble an open-cell foam. Cellular materials are also widespread in nature in plant and animal tissues: examples include wood, cork, plant parenchyma, trabecular bone and lung alveoli.

Our group has contributed to the understanding of the mechanics of cellular solids, as well as to their use in many of the above applications. Recent and current projects include: the mechanics of fluid flow through open-cell foams for helmets and blast protection; the design and characterization of osteochondral scaffolds for the regeneration of cartilage as well as the underlying bone; and the mechanical interaction between biological cells, such as fibroblasts, and tissue engineering scaffolds (e.g. cell migration, contraction).

**Selected Publications**
Gibson LJ and Ashby MF (1997) Cellular Solids: Structure and Properties. Second Edition. Cambridge University Press.
Ashby MF, Evans AG, Fleck, NA, Gibson LJ, Hutchinson, JW, and Wadley HNG

(2000) Metal Foams: A Design Guide, Butterworth Heinemann.

**Foam Mechanics:**

Dawson MA Germaine JT and Gibson LJ (2007) " Permeability of open-cell foams under compressive strain " Int. J. Solids and Structures, 44, 5133-5145.
Dawson MA, McKinley GH and Gibson LJ (2008) The dynamic compressive response of open cell foam impregnated with a Newtonian fluid. J. Applied Mech., 75, 041015.

**Design and characterization of scaffolds for tissue engineering:**

Harley BA and Gibson LJ (2008) In vivo and in vitro applications of collagen-GAG scaffolds. Invited Review. Chem Eng J, 137, 102-21.
Lynn AK, Best SM, Cameron RE, Harley BA, Yannas IV, Gibson LJ, and Bonfield W Design of a Multiphase Osteochondral Scaffold I: Control of Chemical Composition, Journal of Biomedical Materials Research, in press.
Harley BA, Lynn AK, Wissner-Gross Z, Bonfield W, Yannas IV and Gibson LJ Design of a Multiphase Osteochondral Scaffold II: Fabrication of a mineralized collagen-GAG scaffold. Journal of Biomedical Materials Research, in press.
Harley BA, Lynn AK, Wissner-Gross Z, Bonfield W, Yannas IV and Gibson LJ (2008) Design of a Multiphase Osteochondral Scaffold III: Fabrication of layered scaffolds with soft interfaces. Journal of Biomedical Materials Research, in press.
Kanungo, B, Silva E, Van Vliet KJ and Gibson LJ (2008) Characterization of a mineralized collagen GAG scaffold for bone regeneration. Acta Biomaterialia, 4, 490-503.

**Cell-scaffold mechanics:**

Harley BA, Freyman TM, Wong MQ and Gibson LJ (2007) " A new technique for calculating individual dermal fibroblast contractile forces generated within collagen-GAG scaffolds. " Biophysical J., 93, 2911-2922.
Harley BA, Kim HD, Zaman MH, Yannas IV, Lauffenburger DA and Gibson LJ (2008) Micro-architecture of three-dimensional scaffolds influences cell migration behavior via junction interactions. Biophysical Journal, 95, 4013-4024.

**Biomechanics:**

Gibson, L.J., (2005) " Biomechanics of cellular solids, " Invited Review, J. Biomech., 38, 377-399.
Gibson, L. J.(2006) " Woodpecker pecking: how woodpeckers avoid brain injury " J. Zoology, 207, 462-465.

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