

Obrecht, H.; Rosenthal, B.; Fuchs, P.; Lange, S.; Marusczyk, C.

Buckling, postbuckling and imperfection-sensitivity: Old questions and some new answers.
(English) [Zbl 1158.74361](#)
Comput. Mech. 37, No. 6, 498-506 (2006).

Summary: From the point-of-view of economy and safety it is desirable to employ structural configurations with a favorable strength-to-weight ratio and a sufficiently small imperfection-sensitivity. The presentation focuses on two examples falling into this category: The axially compressed cylindrical shell filled with – and/or surrounded by – a compliant core, and auxetic structures. Both exhibit unexpected aspects in their load-carrying behavior and have a significant weight-savings potential.

MSC:

[74G60](#) Bifurcation and buckling
[74H55](#) Stability of dynamical problems in solid mechanics
[74K25](#) Shells

Cited in 1 Document

Keywords:

[buckling](#); [postbuckling](#); [imperfection-sensitivity](#); [circular cylindrical shell](#); [axial compression](#); [compliant core](#); [auxetic structures](#)

Full Text: [DOI](#)

References:

- [1] Koiter WT (1945) On the stability of elastic equilibrium (in Dutch), Thesis, Delft University of Technology, H.J. Paris, Amsterdam, 1945. English translation NASA TT-F10833
- [2] Koiter WT (1963) The effect of axisymmetric imperfections on the buckling of cylindrical shells under axial compression. *Proc Kon Ned Akad Wet B66*:265–279 · [Zbl 0117.19103](#)
- [3] Hutchinson JW, Koiter WT (1970) Postbuckling theory. *Appl Mech Rev* 23:1353–1366
- [4] Budiansky B, Hutchinson JW (1972) Buckling of circular cylindrical shells under axial compression. In: *Contributions to the Theory of Aircraft Structures*. Delft University Press, Delft 239–260
- [5] Budiansky B (1974) Theory of buckling and post-buckling behavior of elastic structures. *Adv Appl Mech* 14:1–65
- [6] Thompson JMT (1972) Optimization as a generator of structural instability. *Int J Mech Sci* 14:627–629
- [7] Thompson JMT, Supple WJ (1973) Erosion of optimum designs by compound branching phenomena. *J Mech Phys Solids* 21:135–144
- [8] Arboez J, Singer J (2000) Professor Budiansky's contributions to buckling and postbuckling of elastic structures. *AIAA-Paper* 2000–1322
- [9] Brush DO, Almroth BO (1962) Buckling of core-stabilized cylinders under axisymmetric external loads. *J Aerospace Sci* 1164–1170 · [Zbl 0104.19202](#)
- [10] Almroth BO, Brush DO (1963) Postbuckling behavior of pressure- or core-stabilized cylinders under axial compression. *AIAA J* 1:2338–2341
- [11] Goree WS, Nash WA (1962) Elastic stability of circular cylindrical shells stabilized by a soft elastic core. *Exper Mech* 142–149
- [12] Seide P (1962) The stability under axial compression and lateral pressure of circular cylindrical shells with a soft elastic core. *J Aerospace Sci* 1962:851–862 · [Zbl 0106.17203](#)
- [13] Yao JC (1962) Buckling of axially compressed long cylindrical shell with elastic core. *J Appl Mech* 29:329–334 · [Zbl 0118.41402](#)
- [14] Agarwal BL, Sobel LH (1977) Weight comparisons of optimized stiffened, unstiffened and sandwich cylindrical shells. *J Aircraft* 14:1000–1008
- [15] Budiansky B (1999) On the minimum weight of compression members. *Int J Solids Structures* 36:3677–3708 · [Zbl 0933.74050](#)
- [16] Hutchinson JW, He MY (2000) Buckling of cylindrical sandwich shells with metal foam cores. *Int J Solids Structures* 37:6777–6794 · [Zbl 0994.74026](#)
- [17] Evans AG, Hutchinson JW, Ashby MF (1999) Multifunctionality of cellular metal systems. *Prog Mater Sci* 43:171–221
- [18] Karam GN, Gibson LJ (1995) Elastic buckling of cylindrical shells with elastic cores. I *Analysis Int J Solids Structures* 32:1259–1263 · [Zbl 0872.73016](#)

- [19] Karam GN, Gibson LJ (1995) Elastic buckling of cylindrical shells with elastic cores, II. Experiments. *Int J Solids Structures* 32:1285–1306 · [Zbl 0872.73016](#)
- [20] Anon (1968) Buckling of thin-walled cylinders. *NASA Space Vehicle Design Criteria*, NASA SP-8007, 1965
- [21] Lakes RS (1992) No contractile obligations. *Nature* 358:713–714
- [22] Lakes RS (1993) Advances in negative Poisson's ratio materials. *Adv Mater* 5:293–296
- [23] Evans KE Alderson A (2000) Auxetic materials: Functional materials and structures from lateral thinking. *Adv Mater.* 12:617–628
- [24] Evans KE, Alderson KL (2000) Auxetic materials: The positive side of being negative. *Eng Sci Educ J* Aug:148–154
- [25] Almgren RF (1985) An isotropic three dimensional structure with Poisson's ratio = . *J Elasticity* 15:427–430

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.