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SOME ODDITIES IN PLATE AND SHELL BUCKLING

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Buckling of plates and shells is in contrast to some opinions by far not an old-fashioned subject. There are still a large number of interesting and important unsolved phenomena in natural sciences, i.e., in biology, in physics, and in engineering, which can be explained only if structural instabilities, such as buckling of plates and shells, are carefully taken into account. This holds for quite all length scales, from nano to macro, e.g. in nano particles and microstructured materials [1,2].

Furthermore, there are a number of unexpected solutions in plate and shell buckling, such as buckling under tensile loading [3], some of them appearing strange and in full contrast to engineering experience, like, e.g., the fact that introduction of holes might increase the buckling resistance (see, e.g., [4]). Instability phenomena appearing in our everyday live are often completely unnoticed, as, e.g., crumpling of paper boxes, and some instabilities are quite funny; e.g. those related to wine drinking.

In this plenary talk a number of instability phenomena as mentioned in the above paragraph are presented and solved. For this purpose, phenomena are selected not only from the scientific point of view but also regarding their amusement value.

References

[1] F. G. Rammerstorfer, D. H. Pahr, T. Daxner, W.K. Vonach. Buckling in Thin Walled Micro and Meso Structures of Lightweight Materials and Material Compounds. *Computational Mechanics*, 37:470 – 478, 2006.

[2] M. Todt, F. Toth, M.A. Hartmann, D. Holec, M.J. Cordill, F.D. Fischer, F. G. Rammerstorfer. Computational Simulation of Instability Phenomena in Nanoparticles and Nanofilms. *Computational Technology Reviews*, 10:89 – 119, 2014.

[3] F. G. Rammerstorfer. Buckling of elastic structures under tensile loads. *Acta Mechanica*,229:881 – 900, 2018.

[4] J. Blesa Gracia, F.G. Rammerstorfer. Increase of Buckling Loads of Plates by Introduction of Cutouts. *Acta Mechanica*, in press, 2019.