

## A Universal Property of Geometrical Hardening

**Graham J. Weir**

*Industrial Research, Lower Hutt, New Zealand*

Geometrical hardening relates to the effective hardening of elasto-plastic materials resulting from repeated, identical impacts which flatten the impacting surfaces. This increases Newton's coefficient of restitution, making the material appear as if its yield strength has increased, and hence apparently hardened. A remarkable aspect of geometrical hardening is that while Newton's coefficient of restitution for the first impact is dependent on the the relative speed of impact, and the physical and geometrical properties of the impacting particles, the subsequent increase in Newton's coefficient of restitution from the repeated quasi-static impacts is effectively a universal property, characterised essentially only by the initial coefficient of restitution and the number of subsequent impacts.

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