characterised the Vredefort Dome event, but also give a geographical distribution of these conditions. However, the number of samples analysed for coesite and stishovite is statistically not representative and at this stage it is not possible to demonstrate any clear field relationship between the distribution of high-pressure silica polymorphs and the extent of Lilly's metamorphic zone. On theoretical grounds, I agree that metamorphism must account at least in part for the absence of these minerals, but a much more detailed investigation is needed to clarify this aspect. Other factors may be also responsible for the absence of coesite and stishovite.

The post-shock metamorphism described by Lilly results probably from the high temperature of the rocks immediately before impact. Due to the great magnitude of this event, deep portions of the continental crust must have been shattered, at depths where temperatures attained several hundred degrees. In the Vredefort Dome these deep portions are represented by the lower part of the Witwatersrand Supergroup and by the granitic core, that is those rocks in which the post-shock metamorphism is developed.

After the quick uplift which occurred immediately after impact, rocks brought very close to the surface cooled down rapidly. This part is now eroded. In contrast, rocks which remained at a depth of several hundred metres or more, which presumably constitute the present-day outcrops, remained warm long enough to allow for the recrystallisation of shock metamorphism textures and reversal of coesite and stishovite into quartz. This probably explains the post-shock metamorphism, which in fact has been initiated before the impact.

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Expected shapes of asteroids

FUJIWARA *et al.*[1] have demonstrated experimentally that random breakage of basalt blocks to simulate asteroid formation produces a predominance of what the sedimentary petrologists call blade-shaped fragments; rod-like and sphere-like fragments tended not to be produced. These results agree well with a theoretical analysis[2] of the random breakage situation in which very simple probabilistic methods were used to estimate the formation of the four basic Zingg shapes (disks, spheres, blades and rods). It was proposed that, with an attainable 10% accuracy of dimensional resolution, random breakage of an isotropic rock material would yield 72% blade shapes, 27% tetragonal shapes (rods and disks) and 1% equiaxed shapes (spheres). The sphere value agrees well with the Fujiwara *et al.* results but the theoretical estimation did not allow rods and disks to be separated. It is possible that the experiments[1] produced several disk particles which were judged to be blades. In some earlier experiments Drake[3] examined various rock types; basalts and other aphanitic rocks produced approximately the same number of spheres as predicted by the theory but the number of blades was greater, at the expense of rods and disks; as Fujiwara *et al.* have also found.

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