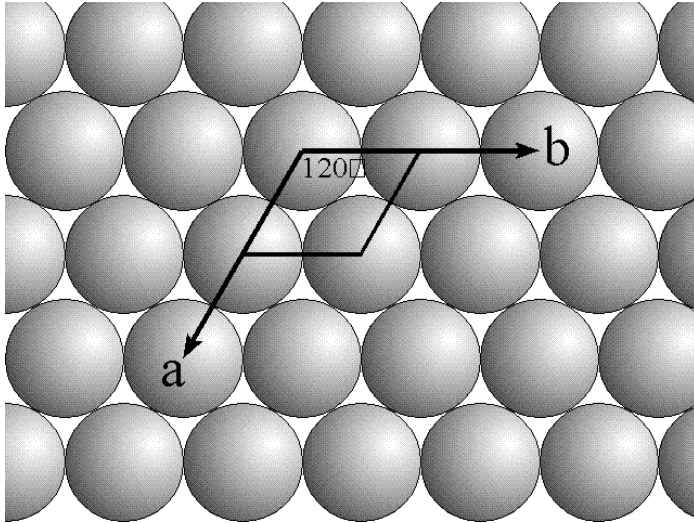
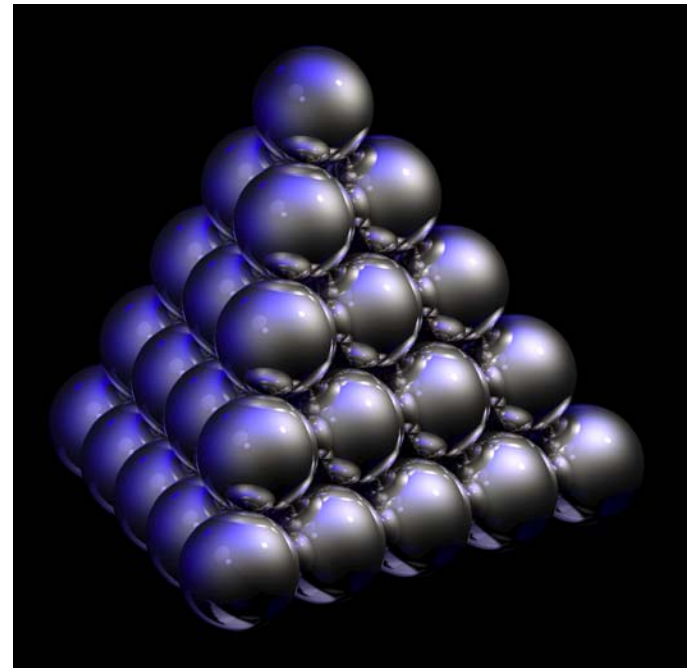




2D hexagonal

$$\phi_{\text{hex}} = \frac{\pi}{2\sqrt{3}} = 0.9069$$



3D face centered cubic

$$\phi_{\text{fcc}} = \frac{\sqrt{2}\pi}{6} = 0.7405$$

Packing Densities for Spheres

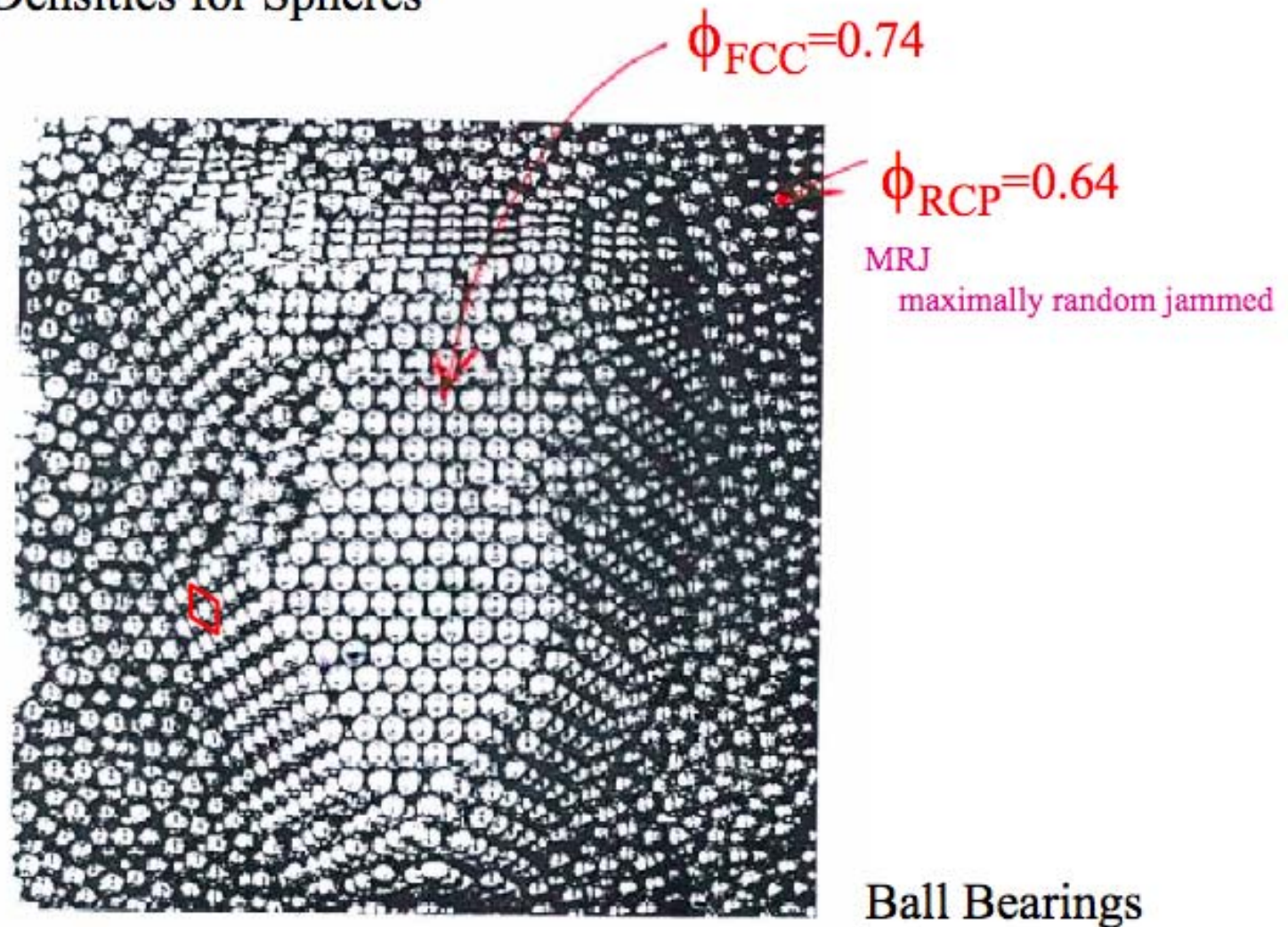


FIGURE 14. Face-centred cubic 'crystal' surrounded by 'liquid' caused by shearing ball-bearing mass. 111 face is shown at the top surface.

From colloquium by Paul Chaikin - paper by Bernal in '50s

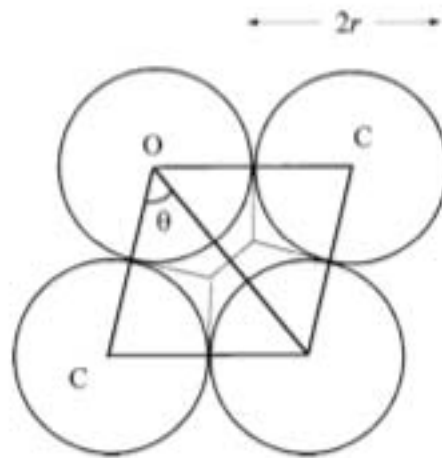
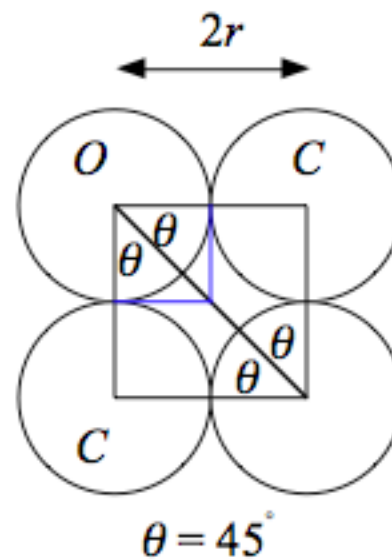
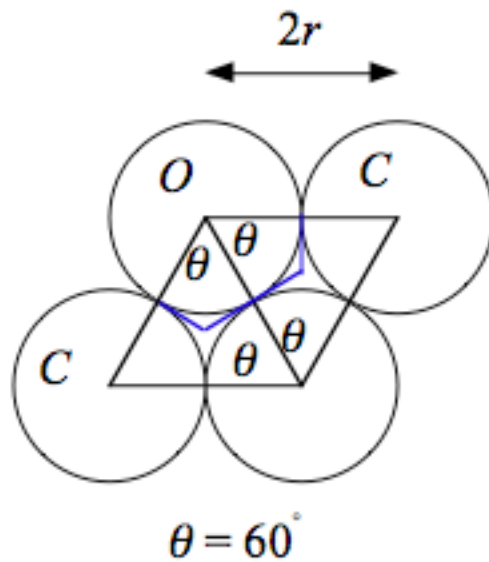
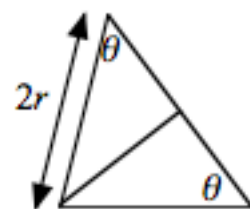
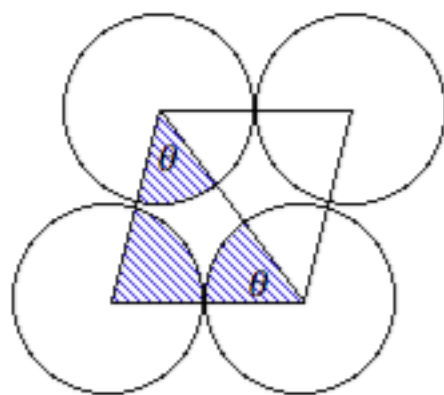


FIG. 1. Assembly of four equal disks of diameter $2r$ packing on a plane. Lines making up the simplicial net — and the Voronoi polygons (—) are shown.

Williams, PRE 57, 7344 (1998)





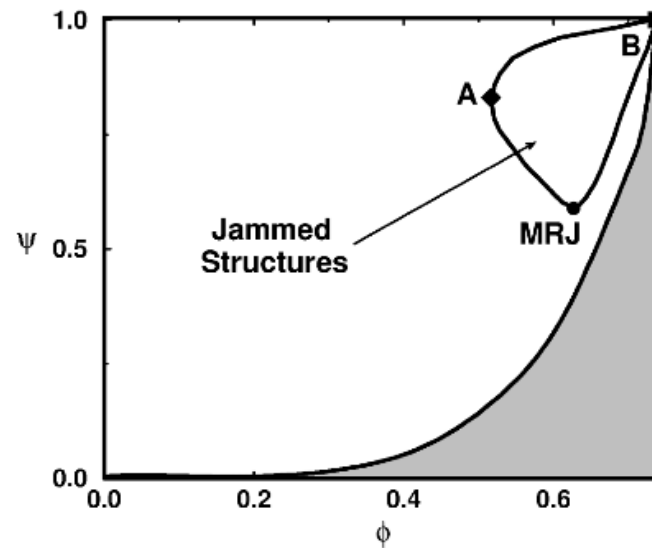


FIG. 1. A schematic plot of the order parameter ψ versus volume fraction ϕ for a system of identical spheres with prescribed interactions. All structures at a given value of ϕ must lie between the upper and lower bounds (white region); gray region is inaccessible. The boundary containing the subset of jammed structures is shown. The jammed structures are shown to be one connected set, although, in general, they may exist as multiply disconnected. Point A represents the jammed structure with the lowest density and point B represents the densest ordered jammed structure (e.g., close-packed fcc or hexagonal lattice for $d = 3$, depending on the choice for ψ). The jammed structure which minimizes the order parameter ψ is the maximally random jammed state.

Torquato, Truskett and Debenedetti, PRL 84, 2064 (2000)

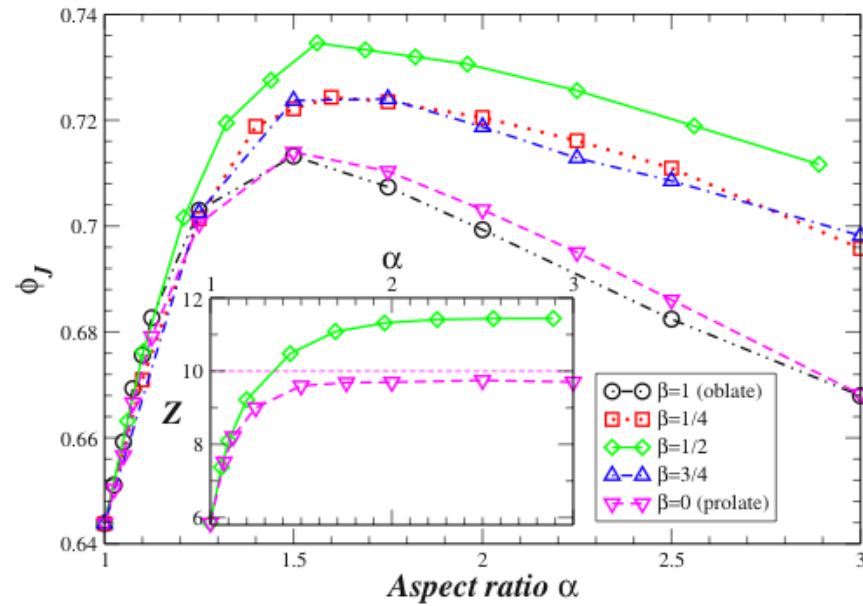


FIG. 1. (Color online) Jamming density and average contact number (inset) for packings of $N=10\,000$ ellipsoids with ratios between the semi-axes of $1:\alpha^\beta:\alpha$ (see Fig. 2 in Ref. [4]). The isoconstrained contact numbers of 10 and 12 are shown as a reference.

Donev, Connelly, Stillinger and Torquato, PRE 75, 051304 (2007)

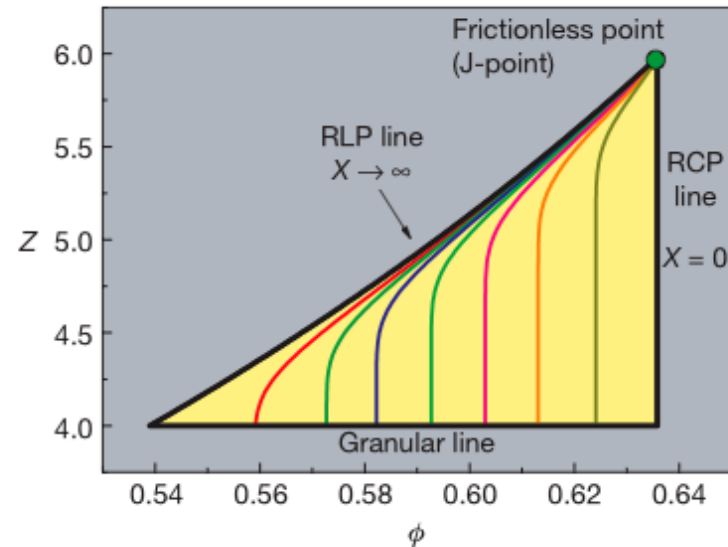


Figure 1 | Phase diagram of jamming: theory. Theoretical prediction of the statistical theory. All disordered packings lie within the yellow triangle demarcated by the RCP line, RLP line and granular line. Lines of uniform finite compactivity are in colour. Packings are forbidden in the grey area.

Song, Wang and Makse, Nature 453, 629 (2008)