# Creative Geometry of Close Packing Spheres

I first developed the **Dynamic Sphere Geometry** in the late sixties; where spheres transform from one close-packing relationship to another, usually in finite sequences. The geometry intrigued me because most of the sphere arrangements generated had never been seen before and were unique. Since first presenting the **Dynamic Sphere Geometry**, in the early seventies, I have used the geometry to generate about one hundred arrangements – but the geometry should be capable of generating many thousands and, possibly, millions, of new and unique close packing sphere arrangements. For those interested, the whole idea started in 2D by just generating close packing circle arrangements. Circle packing was used by many cultures in the past to generate design and architectural forms: Celtic, Chinese, Islamic, Gothic…

Close-packing spheres are space efficient and have a high structural integrity, but, generally, architects, designers, and those modeling anything from molecules to new types of nano-structure, only have access to a very small range of close-packing sphere arrangements, and to their corresponding lattices. The **Dynamic Sphere Geometry** takes the lid off this limitation and whole families and series of new space-filling structures can be generated – each with a unique property. For those that don't know anything about close packing spheres, imagine the centers of the spheres connected to make structural lattices, or even imagine domed buildings, or spherical structures in space, orbiting the Earth, or as nano-particle materials…

In just a few words I cannot communicate the whole geometry, or where it really gets interesting, when new close-packing, and three-dimensional, sphere clusters transform, move in space, and interconnect. Anyway, here's an introduction by way of an animation and two sets of line drawings, that will hopefully show, just a bit, of how the geometry works. The animation clip shows four transformations (Cells One, Two, Three, and Four), extracted from a series of seven, on a two-dimensional plane.

Press this link for the **animation clip**: Spheres1b

**Fig 1: INTRODUCTION TO DYNAMIC SPHERE GEOMETRY**

Cells of close packing spheres are shown where the close-packing spheres of “Cell One” transform into the close-packing spheres of “Cell Two.” These are the first two packings shown in the animation clip. Various rules are imposed on the **Dynamic Sphere Geometry** that govern how sequences are generated. Spheres repeat infinitely over a two dimensional plane or on multiple planes in three-dimensional space. The spheres of “Cell Two” are in whole number relationhips and two adjacent sides and the diagonal of the rectangle of “Cell Two” are 3, 4, 5 triangles.

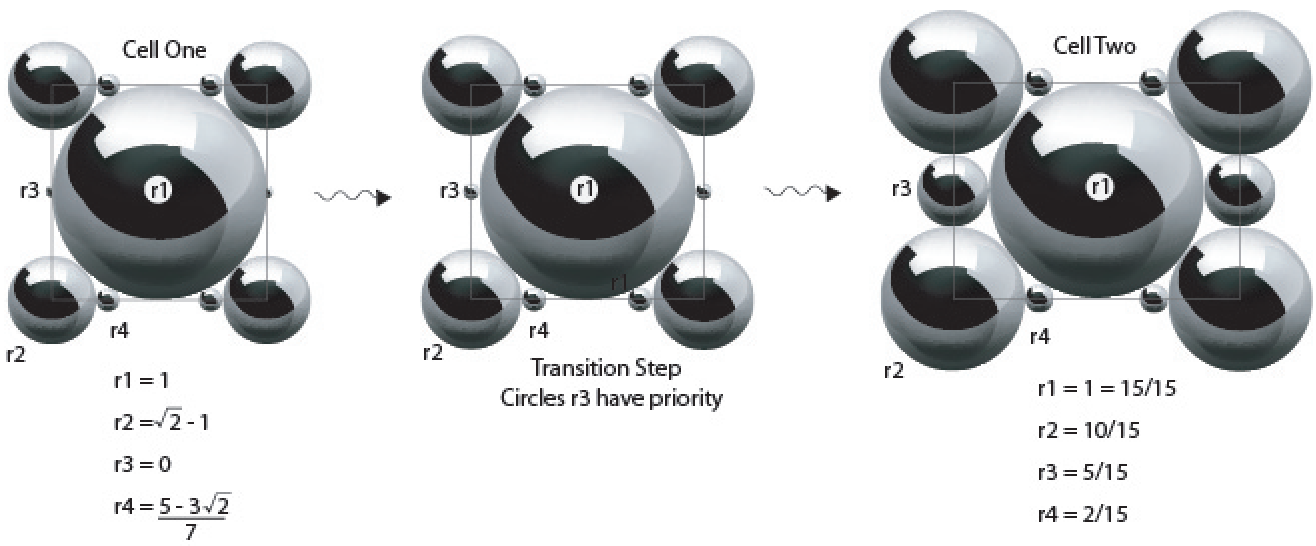
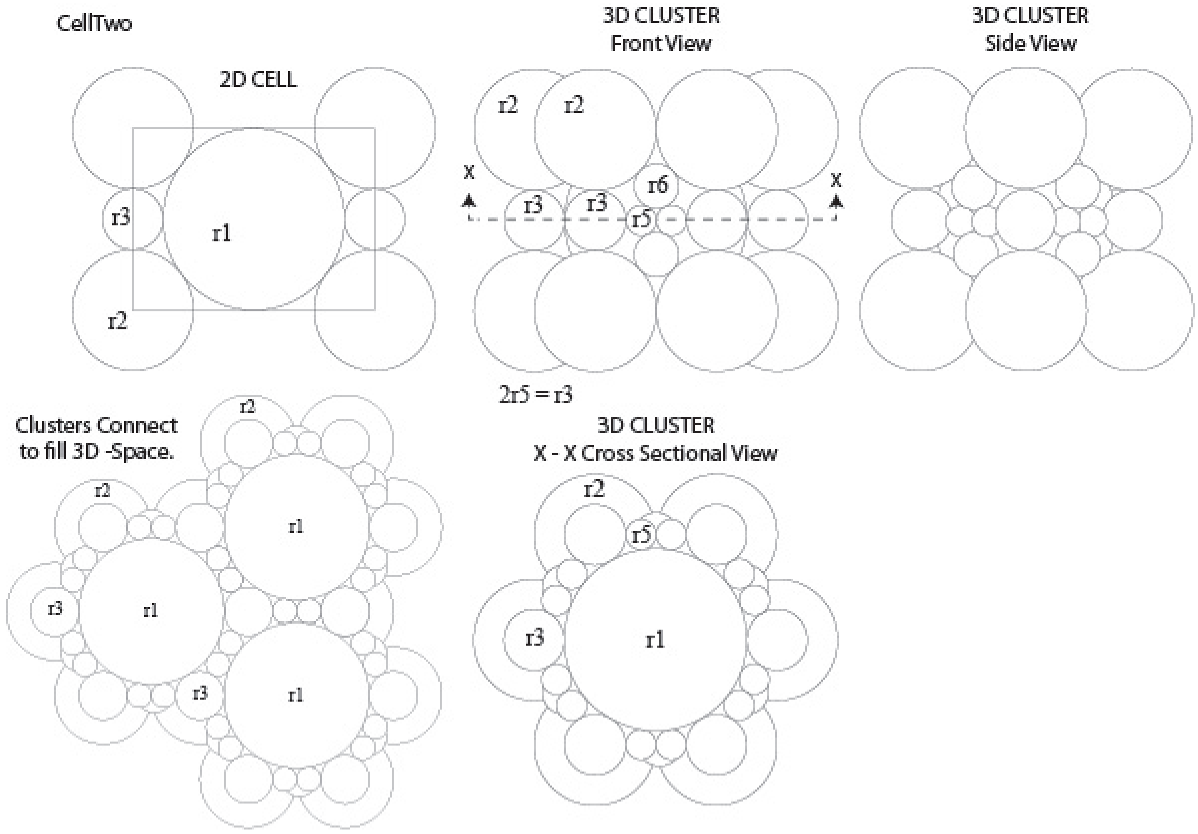



**Fig 2: SHOWS HOW “CELL TWO” TRANSFORMS INTO A 3D CLUSTER THAT REPEATS INFINITELY IN 3D SPACE.** The spheres of “Cell Two,” are in whole number relationships.

CellTwo



2D CELL
r3
r1
r2
3D CLUSTER
Front View
r2
r2
X
X
r6
r3
r3
r5
2r5 = r3
3D CLUSTER
Side View
Clusters Connect
to fill 3D -Space.
r2
r2
r1
r3
r1
r3
r1
3D CLUSTER
X - X Cross Sectional View
r2
r5
r3
r1