What is the C6XTY Synthetic lattice?

What is new and unique about the synthetic lattice is that the 'tensile elements' hold together the 'compression' members in a 'sea of tension.' This concept was first introduced by Buckminster Fuller. The lattice is in tension and utilizes the familiar shape of the soccer ball in compression, which is also known as a Fullerene or Carbon 60 molecule. The unique geometry makes it inherently stable and well suited for carrying loads in compression much like a ball bearing. The tension and compressive components are assembled or woven into a synthetic lattice. This geometry can be used to make structural fabrics into all form factors.

Historically, the application of geometric principles has proven to be a simpler, more elegant and an infinitely more economical way of extending existing materials, than the quest to discover and develop whole new classes of raw materials themselves. There is a long and proven history of applying geometry to achieve optimal structural solutions. From the chariot wheel to woven carbon fiber airplanes, the intersection of geometry and materials sets the stage for some of the most critical advances in technology. Against this evolutionary backdrop, the C6XTY Lattice becomes one milestone in a natural progression.

I need to dive a little deeper into the paternity and some of the defining characteristics of the structure. The lattice is in tension. Compression is isolated into and around the surfaces of the spheres. We can now build in tension- 'no more stone piling' as Fuller was fond of pointing out.

Fuller popularized what is commonly known as the geodesic dome. He showed how one could obtain a high strength-to-weight ratio in a domed structure through the orderly subdivision of the twenty equilateral spherical triangles of the icosahedron. Due to the stable nature of triangular structures in response to stress, and assuming that the elastic limit of the strut material is not exceeded, the structure is able to support both itself and a relatively large load compared to its weight, and to provide a small ratio of structural weight to area covered, and to volume enclosed. Accordingly, geodesic dome structures are highly, if not supremely, economical. Fullers' philosophy and writings remain relevant and inspiring today.

(In the photo: Sam Lanahan, C6XTY's President, with Buckminster Fuller)

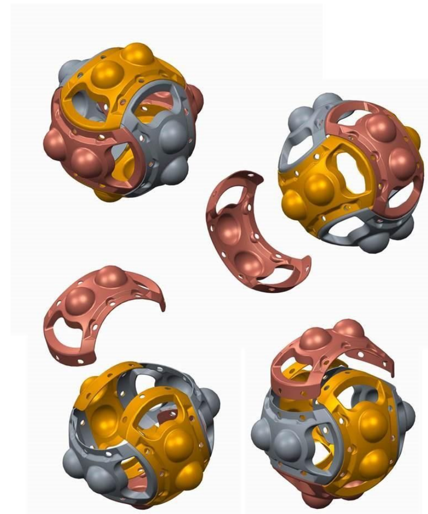
Kenneth Snelson is the rightful progenitor of the ‘continuous tension/discontinuous compression’ network and was a protégé of Fuller’s. Kenneth Snelson’s art structures use straight slender compression elements in a tensile wire array. Snelson’s sculptures are internationally celebrated both as an art and a source of fascination for all.

However, Fuller is the first to introduce us to the contraction “tensegrity” (a combination of “tensile” and “integrity”), as described in his U.S. Pat. No. 3,063,521. Here, he showed that an even greater strength-to-weight ratio can be achieved by disconnecting the compression members from one another and eliminating more of them, the compression members being entirely interconnected by tension members. He referred to the remaining compression members as “discontinuous compression columns” because no compression force is transmitted directly from one column to another as they “float in a sea of tension elements.”

Now it’s possible to observe the natural progression from compression columns to spheres. Compression is isolated in a simple repeating pattern in the form of icosahedrons or truncated regular icosahedrons. These five-fold symmetric polyhedrons also provide critical edges and faces lying in mutually orthogonal parallel planes, so that three-dimensional lattice structures might be formed. The icosahedral elements are not ‘close-packed,’ and as such the lattice is permeable. These units may be further assembled into hybrid materials with superior strength-to-weight ratios and precisely definable flexibility/stiffness gradients, among other characteristics.

Interconnecting elements are used to tie the icosahedral components together in tension along the tri-axial Cartesian coordinate system, forming a structural ‘fabric.’ The term ‘fabric’ is used in its broadest sense to refer to a structure that may be essentially entirely rigid, essentially entirely flexible, or may have any combination of rigidity and flexibility along any combination of axes. In the abstract, the geometry can be expressed without regard to size or location; it is scalable from the very small to the very large.

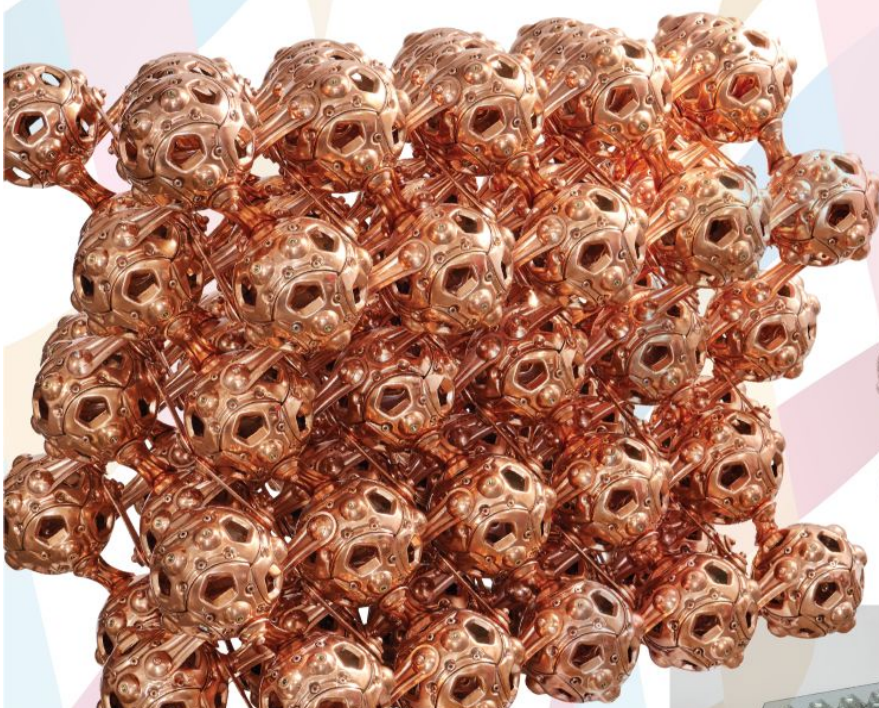
There are many examples of icosahedral and truncated icosahedral structures found in nature. Certain shapes are well suited for microbiological tasks and persist within organisms where identical, spontaneously assembling protein subunits tend to form symmetrical, minimum-energy shapes. A common feature among the icosahedral structures found in microbiology is that they control permeability. Some of these structures, in viruses, for example, may be nearly impermeable, protecting their contents from damaging outside influences and allowing small entities with limited genetic resources to construct viable outer casings. In other cases, icosahedral forms screen molecules, allowing only molecules of a certain size access to vital cellular resources and mechanisms. Other icosahedral structures do not limit access but form a scaffolding to support and guide important cellular functions. Requiring a minimum of effort, this arrangement can arise automatically and satisfies nature's pervasive requirement of achieving maximum volume with minimum material.



In conclusion the C6XTY synthetic lattice uses well-proven engineering principles and geometry found in nature to leverage inherent compression and tension forces of conventional materials to their optimal performance. While the components mimic natural morphologies the use of the term 'synthetic' in this instance means that the C6XTY lattice itself is not found in nature. The geometry is superior for omni-axial loading. The resulting fabric is inherently stable, permeable, and ordered.

The present C6XTY tower as shown page -2, is die cast 150mm radius aluminum with a wall thickness of 1mm. The raw material undergoes five independent operations to become 1/6th of the spherical shape. The final assembly requires the six pieces to be riveted together [as shown in the adjacent image] into the C6XTY form and from there, the tensile and compressive components of the helix are assembled.

The inventor- I had the great good fortune to serve as the assistant to **Buckminster Fuller** and his impact on my life is immeasurable. From my early studies, I was intrigued by Fuller's explorations into compression surrounded in a sea of tension to 'fill all space.' **Flextegrity** was incorporated in 2004 with the intent to develop and market a strong lightweight tensile material that was omni directional and could be made both flexible and stiff- a 'Structural Fabric.'



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