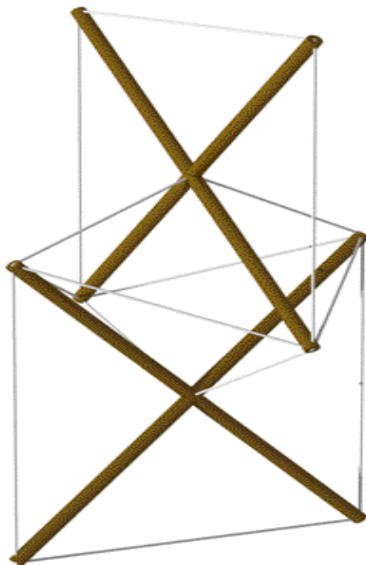




TENSEGRITY: WHAT IS IT?

The term *tensegrity* was coined by Buckminster Fuller after seeing the concept demonstrated by artist Kenneth Snelson in 1948 at Black Mountain College.¹ Fuller was lecturing there when he saw Snelson's "X Piece" on display.



Kenneth Snelson's X-Piece

Fuller is famous for his geodesic dome designs. He took the word *tension* and combined it with the word *integrity* to get the term *tensegrity*.² Simply defined, tensegrity is the balance between compression and suspension. A brick wall is under constant compression. Each brick is piled on top of the brick below. Each brick adds more compression so that the bottom row of bricks has the greatest compression.

Compression is a poor way to build huge structures and has many limitations. The

Great Pyramid of Cheops is completely built under compression and consequently had to be a pyramidal shape to reach as high as it does. Using compression as its only method of construction determined its shape.



Great Pyramid of Cheops built by compression

However, nature is not this way. Nature balances between compression and suspension or tension. The greatest architects in our modern world copy nature's structures as much as possible. Take the suspension bridge for example.

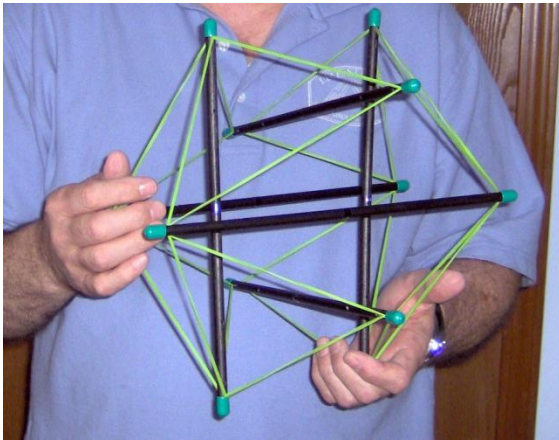


Typical Suspension Bridge

The weight of the bridge is distributed along the wires that suspend its pathway between two sides of a river or a valley. This type of construction is a successful use of compression and suspension.

Tensegrity Models

The ultimate tensegrity models created by artists and architects show a continuous sea of balance between compression and tension. Using cables and dowels as the materials, amazing shapes have been created demonstrating tensegrity principles.

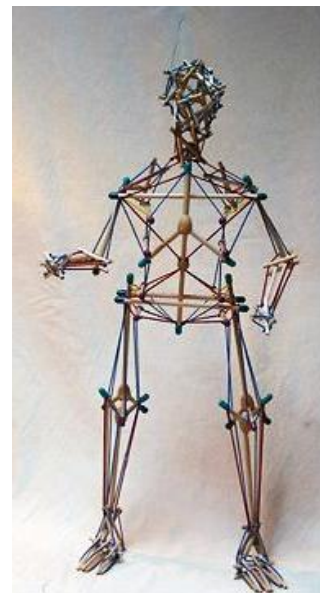


Tensegrity model created by me.

Kenneth Snelson likes to call these tensegrity models “floating compression.” As stated before, these tensegrity principles exist in nature and in the human body. In the model I created above, notice that none of the black dowels ever touch each other. The dowels represent the bones and the rubber bands represent the muscles, tendons, and fascia that connect them together. If we have a proper balance between compression and tension, then we will not injure our spine. There could never be a constant compression on the spine if it is rhythmically broken by an interfering and balancing suspension type of force.

Anatomy Trains: Thomas Myers

Researchers and body-workers such as Thomas Myers³ have developed whole systems of therapy based on the principles of tensegrity applied to the human body. For Myers, postural health exists when the body is held in balanced compression and suspension. If one of the cables (muscles/fascia) gets too tight, it puts stress on the other parts of the body and the whole system suffers. The pain in your foot may be coming from your low back.



Tensegrity Model of Human Anatomy

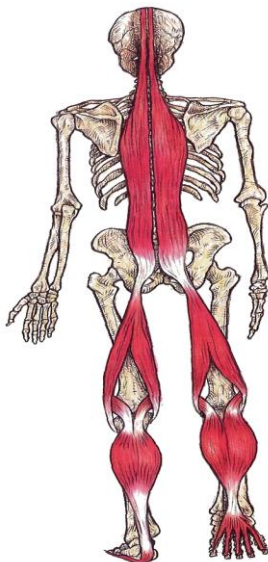
The stability of a tensegrity structure is, however, generally less stiff and more resilient than the continuous compression structure. Load one ‘corner’ of a tensegrity structure and the whole structure will give a little to accommodate. Load it too much and the structure will ultimately break-but not necessarily anywhere near where the load was placed.⁴ In the human body Myers calls this referred pain.

Superficial and Deep Facial Lines

Fascia is the connective tissue that holds our bodies together and gives us our shape. If

the fascia is distorted, so is our body shape and function. Myers discovered that there are lines of fascia that follow exact pathways in the body, much like the Chinese meridian systems of acupuncture. Comparing the relationship between fascia, muscles, and bones with the railroad system, Myers describes their tensegrity relationship.

Bones are the stations; muscles are the trains that stop at every station if close to the bone, or like express trains that pass over many stations, they are more superficial in the body. The fascia is the train tracks and there are two sets, deep and superficial to accommodate the two types of muscle locations mentioned above. Below is shown the superficial back line according to Myers.



Superficial Back Line: Muscles stop at the Bone Stations

The fascia follows these muscles shown from foot to head forming lines of fascia. There is much more to this theory of Myers and anyone interested in this should read his works. They are very pioneering in content.

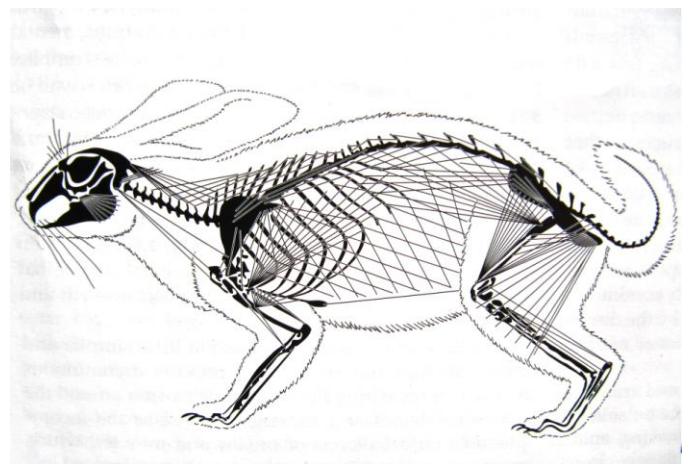
Nature is the Teacher

How do sunflowers change direction to face the sun without any muscles? This phenomenon is known as positive phototropism, and although it is not fully understood yet, is commonly associated with the plant hormone auxin (indoleacetic acid). Auxin is derived from the Greek word *auxein*, which means to increase, and in low concentrations, it causes the elongation of plant cells by entering them and signaling the cleavage of cell wall microfibrils, allowing the cell to expand longitudinally by taking in water.



Field of Sunflowers facing the Sun

However, it is the tensegrity construction of the stem of the sunflower that allows this process to work. You can also see the tensegrity function in animals like a rabbit.



Tensegrity arrangement in a rabbit

By following all the muscles origin and insertion points in a rabbit, you can see the lines of force displaying a natural tensegrity. Nature or evolution has chosen tensegrity as the proper and most efficient means of construction in our physical universe. Thus, we have the greatest amount of support with the least amount of mass.

Some Conclusions

It was Plato who said that, “God geometrizes.” Later on, the members of the Masonic order agreed and put the letter ‘G’ on their rings in concert with other symbols. However, anyone who takes the time can see the geometry of a tree, a plant, a flower, a cloud formation, or the patterns of the planets as they traverse through the heavens can realize a divine hand has declared its own glory. Tensegrity is just one more facet of the divine geometry the surrounds us all. Enjoy and appreciate how unique made you really are.

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¹ <http://en.wikipedia.org/wiki/Tensegrity>

² <http://www.kennethnelson.net/faqs/faq.htm>

³ Thomas Myers, *Anatomy Trains* (London: Churchill Livingstone, 2001), 280 pages.

⁴ *Ibid*, p. 44.

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