The ideas expressed in this article are not developed sufficiently to form a theory at this time. They may be thought of as speculation.

Static forces are forces observed from a reference frame instantaneously moving with the velocity of the forced object. A static force may accelerate the object or may be resisted by an equal force in the opposite direction on the other end of the object. This definition is made possible by (23) of the article *Force and Geometry*. Any moving force can be resolved into forces acting in a reference frame in which an object is stationary. In the real universe, all moving applied forces can be resolved into static forces.

Objects are made of material. To understand static forces, material cannot be represented by perfect mathematical concepts, such as infinitely stiff or uniform. Material must be specified in further detail as being composed of atoms. These atoms are represented in this analysis by a simplified model.

Moving Energy Forces

The article *Moving Energy Forces* demonstrates how energy moves through materials much like water flows through pipes. The movement of energy produces forces (MEF's) just as the movement of photons produces forces when photons are emitted from, reflected by or absorbed by materials. The premise is now stated that MEF's and applied forces are both the result of the movement of photons through material. The movement of photons is also the movement of energy through the material.

Heat Transmission

The transmission of force through a material is closely related to the transmission of heat through a material. Note that radiation heat transfer from the surface of a material has a specific mechanism that science has already identified. Radiation heat transfer involves the emission of photons from the surface atoms. Electrons jump between energy levels in their atomic orbits and photons are emitted or absorbed.

So, why can't this same thing happen within the material? Electrons should be able to jump from level to level anywhere throughout the material. Suppose that all "heat" is photons and that all atoms are constantly emitting and receiving photons in all directions. Conduction heat transfer would be the migration of photons through a material. Although individual photons move at the speed of light, the conduction process would be much slower - dependent upon emission frequency and direction. This issue of direction is important. Note that radiation heat transfer from a material surface sends photons in every possible direction (radiation heat transfer is not a "laser beam" coming off the surface). Conduction heat transfer would also be a disorganized emission of photons within the material, but statistically biased in a direction going from the hot regions of the material to the cold regions.

The Mechanism of Force Transmission

Force transmission through a material comes from the organized, unidirectional emission of photons within the material, as contrasted with heat transfer, which is a disorganized photon emission pattern that transfers energy only due to a statistical bias. Why would photons organize into one specific direction when force is involved? Consider Figure 28, which is a view of the atoms within an unstressed material.

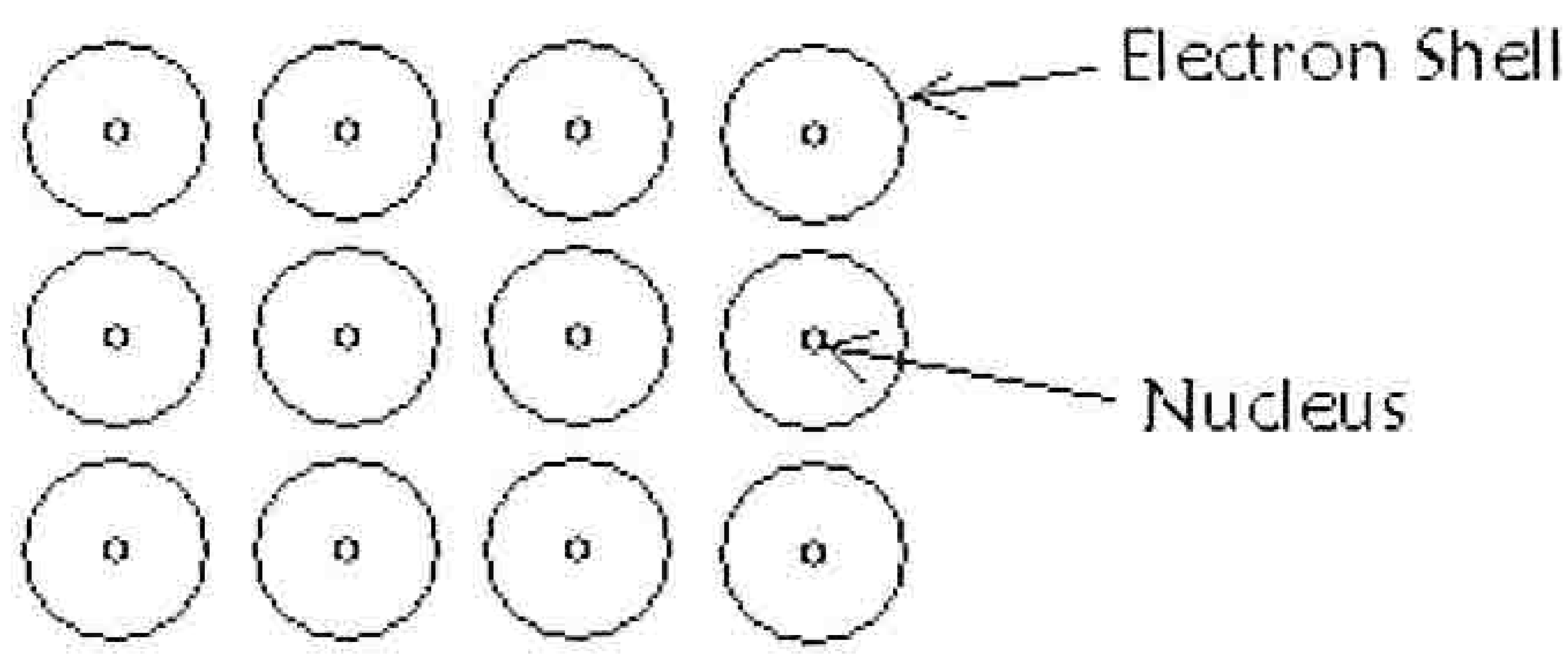

Figure 28. A model of the structure of atoms within an unstressed material.

This picture is not exactly realistic. Electron shells are not so clearly defined and there are errors in the scale of the drawing. However, Figure 28 serves as a reference for Figure 29, which shows a material experiencing a compression force.

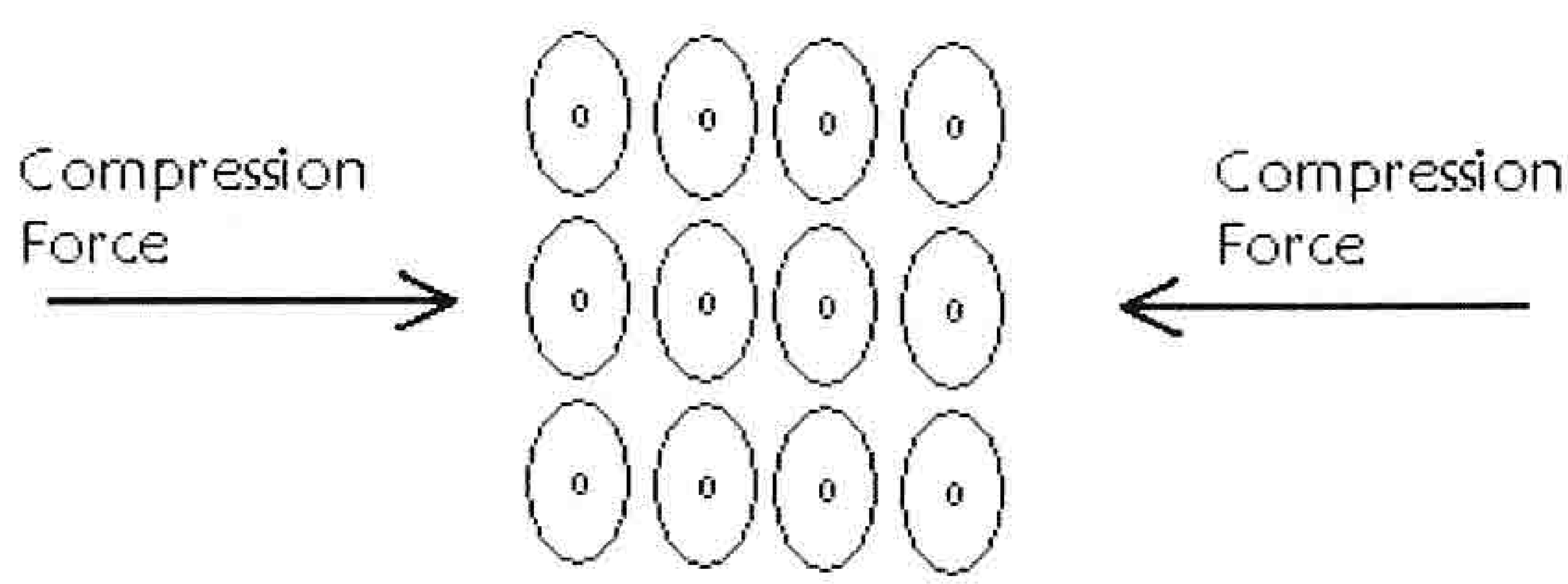

Figure 29. A model of the structure of atoms within a compressed material.

The atoms of Figure 29 are pushed together to show a greatly exaggerated view of the distortion in their relative spacing and electron shell shape . The electron shell distortion shown in Figure 29 would produce a tendency for the electrons to be active. Because the distortion is uniform, the resulting photons would primarily be emitted going left or right.

But these photons don't have far to go. They quickly bump into neighboring atoms and jump their electrons to the next level. This increases the probability that the neighbor atom will emit it's own photon. Considering the vast numbers of atoms making up one atomic layer in an object, the total number of photons going left should statistically be nearly equal to the total number going right (assuming no acceleration). There will be a force balance throughout the layers of the object in the direction of compression.

An important test of this idea would be to see if photons could generate the kinds of forces seen in the real universe. Suppose a shaft in compression was made of AISI 52100 steel at a hardness of Rockwell C Scale 62. This type of steel was specially developed for ball bearings and has one of the highest compressive stress capabilities of any material. It's maximum compressive stress capability in the elastic range can be as high as $4000 N / mm^2$. That would allow it to support the weight of an average automobile on a surface area of $4 mm^2$.

The photon used for this calculation will be near infrared frequency. This frequency is rather low in the available range of frequencies and does not represent an extraordinary condition. It also matches up nicely with the premise that force transfer is related to heat transfer. A wavelength of $1.0 \times 10^{-6} m$ will be chosen. This will result in an individual photon momentum of $6.626 \times 10^{-28} N - \sec$. The electron vibrates at a frequency of $1.24 \times 10^{20} cycles / \sec$ (Compton frequency). It will be assumed that under the high stress cited above that the electron jumps levels (and emits a photon) only once in every 250 vibrations. This would produce one photon going left and one photon going right every 500 vibrations (statistically averaged). Therefore, a photon is emitted in either direction every $4.05 \times 10^{-18} \sec$.

Since force is momentum change per unit time, there is a force of $1.64 \times 10^{-10} N$ generated in the direction of compression for every atom in the cross section of the shaft. The spacing of the atoms in this material will be assumed to be 2 Angstroms ($2 \times 10^{-10} M$). One square millimeter of area would contain 2.5×10^{13} atoms. The total force generated would be $4093 N / mm^2$.

So, photon emission is strong enough to resist applied compressive forces in the real universe, but tensile forces in a material can only be resisted by attractive field forces between atoms. To explain how tensile forces are handled, Figure 28 should be used as the starting point.

At the surface of any material, electromagnetic radiation from the material is constantly being exchanged with the surroundings. The material is in thermal equilibrium with the surroundings when photon flow away from the material equals the photon flow to the material. The natural unstressed state inside a material should be the same situation. A substantial photon flow is constantly occurring in all directions between all the atoms inside the material. The reason that the material is designated as uniform in temperature is because the net macroscopic flow of photons in any direction is zero.

In this view of materials, atomic fields would be constantly pulling the atoms closer together until the electron shells interfere and distort. This distortion causes photon emissions which push the atoms back apart. There is a balance point between the atomic field attraction and photon push-back where the material dimensions are stable.

Under compressive applied forces, the photon emission pattern of the atoms would increase in the direction of compression until the applied force is resisted. Under tensile applied forces, the distortion of the electron orbits is reduced causing a reduction in photon production in the tensile direction. This reduction in photon production allows the existing atomic forces to resist the applied tensile force.

For the case of shear forces, the concept of Mohr's circle is useful. The full explanation of Mohr's circle will not be presented here. In summary, shear forces are really the result of combined tensile and compressive forces, as is shown in Figure 30.

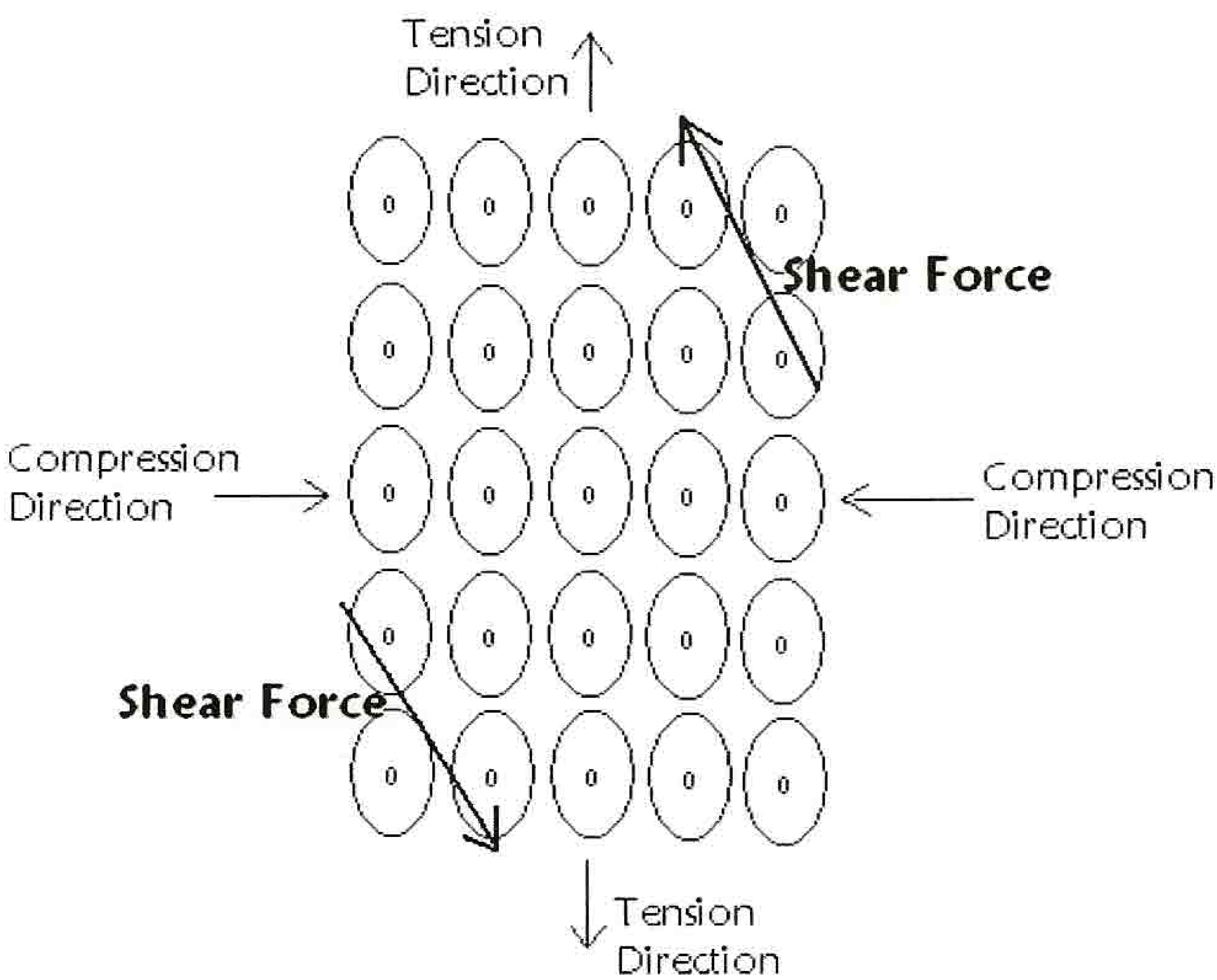

Figure 30. A model of the atomic structure in shear.

Shear is present in almost all states of material stress. Shear even occurs in cases of pure tensile or compressive applied loads. Shear forces create tensile and compressive forces within a material at roughly 45 degree angles to the shear direction, as shown in Figure 30. The reaction of a material in shear is the combination of tensile and compressive reactions and photon production would also reflect this combination loading.