

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

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) much the same as the movement of photons produce forces when they are emitted from, reflected by or are absorbed by materials. The premise is now stated that MEF's are part of the larger category of force transference through materials in general. MEF's and Newtonian force activity are produced in the same way. They are transmitted through materials primarily as the movement of photons within that material. The movement of photons through the material is also the movement of energy through the material. There is some force transfer produced by interatomic fields, but it is probable within this premise that the majority of Newtonian force and energy passage through materials is photon based.

The Mechanism of Force Transmittal

The hypothesis here is that both force transference and energy movement through materials occur as the movement of photons through the material. It is important to note that conduction heat transfer through materials is an important form of energy transfer too. To begin this analysis, note that radiation heat transfer is the emission of electromagnetic radiation from the surface of materials. Radiation heat transfer demonstrates that the emission of photons from atoms is happening constantly with all materials. As electrons jump between energy levels within their orbits, they emit and receive photons into the open space next to the material surface.

So, why can't this same thing happen within the material? Whatever causes the electron to jump from level to level need not be canceled by the presence of neighboring atoms. Suppose that all "heat" is photons and that all atoms are constantly emitting photons in all directions. In this explanation, the uncoordinated photon emission within a material is the process of heat transfer within the material. Radiation heat transfer is not organized in any specific pattern (radiation heat transfer is not a "laser beam" coming off the surface of the material). Radiation heat transfer occurs in all directions in an uncoordinated fashion that appears uniform only when measured macroscopically. Radiation becomes conduction when it occurs inside materials.

So, how could heat transfer turn into force transfer? Consider Figure 1, which shows conceptually a group of atoms (nucleus and electrons) within an unstressed material.

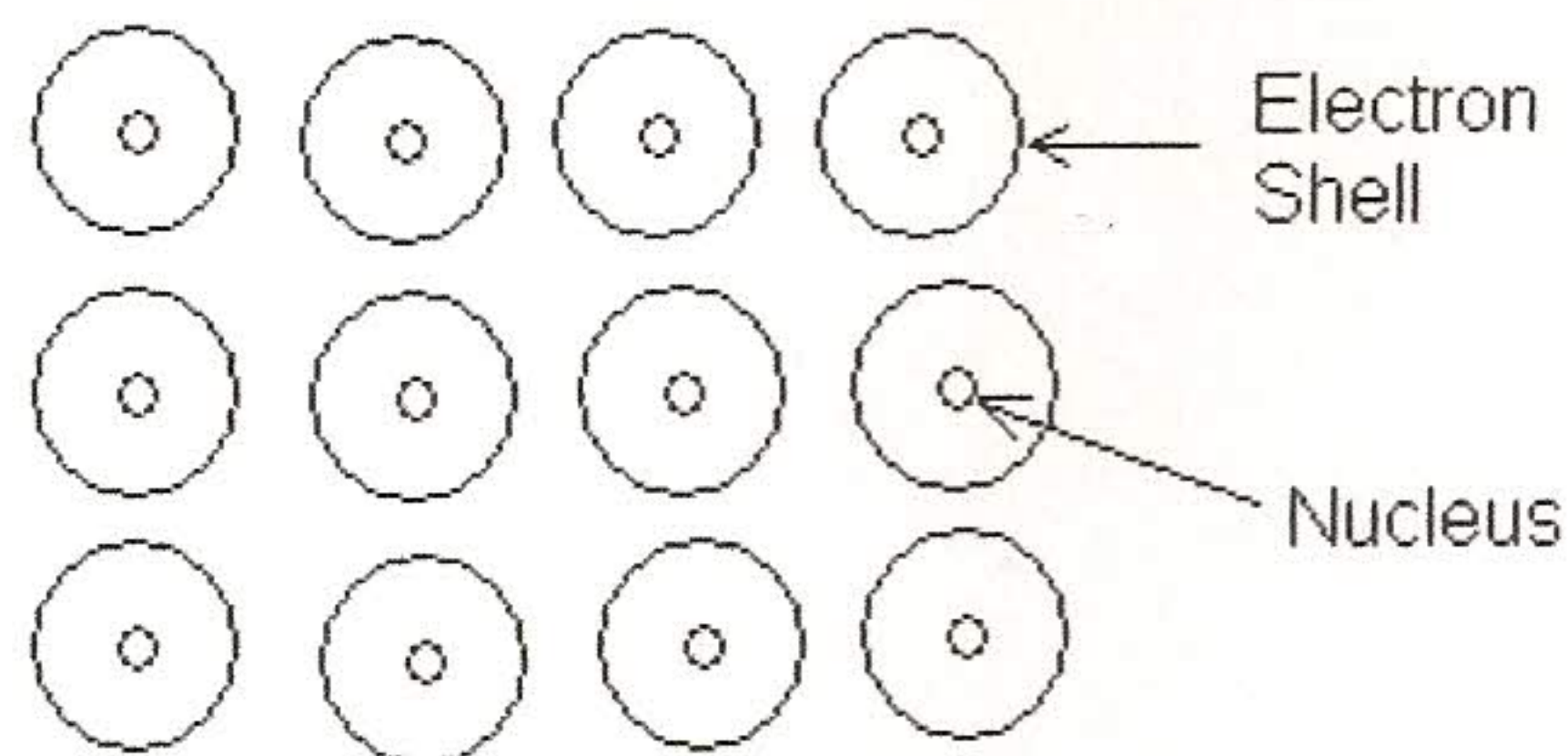


Figure 1. Atoms within an unstressed material.

This picture is not exactly realistic. Electron shells are not so clearly defined and tend to blur together (as far as we know), and there are considerable errors in the scale of the drawing. However, Figure 1 is used as a reference for Figure 2, which shows a material in compression.

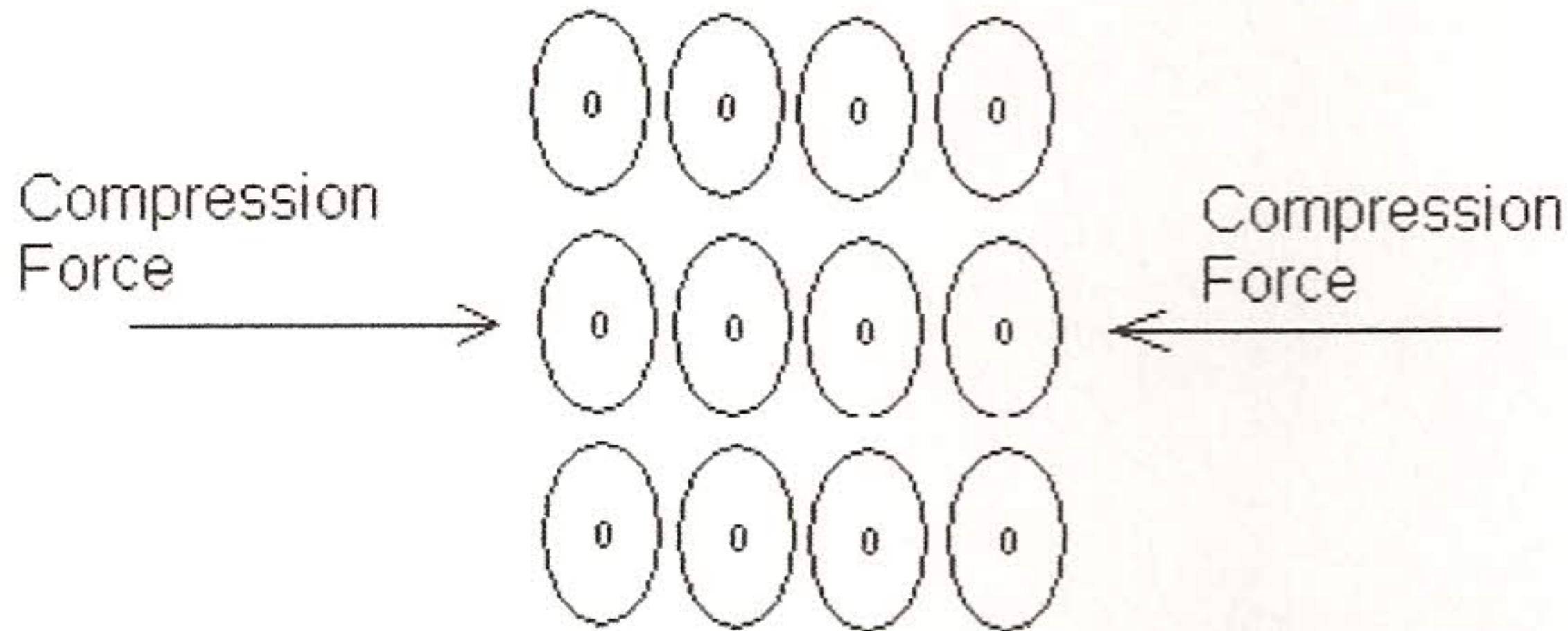


Figure 2. Atoms within a compression stressed material.

The atoms of Figure 2 are pushed closer together, causing a distortion in their electron shells that is uniform in the compression direction. The elastic deflection of real materials under imposed forces is well known (though Figure 2 exaggerates this effect). If electrons are constantly emitting photons in an unstressed material, then the distortion of the shell orbits under the distortion illustrated in Figure 2 would produce an additional tendency for the electrons to be active. In addition, this additional activity is uniform in direction and consistent throughout the material.

As the material is compressed, energy is put into the material. This energy is the compression force times the material deflection. This energy is stored in the deformed electron orbits. This increases the chance that the electrons will produce photons. These photons all go in the same direction due to the uniformity of the distortion. But these photons don't have far to go. They quickly bump into their neighbor and jump it's electrons to a higher level, increasing the possibility that it will soon emit another photon. In Figure 2, this premise predicts that the photons would be emitted primarily going to the left or right. There is an equal statistical probability that the electron will go left or right. Therefore the net production of photons going left is probable to be the same as the net number of photons going to the right (at any cross section within the material). The Newtonian force on one end of the material will be the same as the reaction force on the other end of the material.

If this is true, can the feeble momentum generated by photons produce Newtonian scale forces? Consider a shaft under compression. This shaft is made of AISI 52100 steel at a Rockwell C Scale hardness of Rc = 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 elastically 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 1×10^{-6} m will be chosen. This will result in an individual photon momentum of 6.626×10^{-28} N-sec. The electron vibrates at a frequency of 1.24×10^{20} cycles/sec (Compton frequency). It will be assumed that under the high stress cited above, 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 for every 500 vibrations of the electron (statistically averaged). Therefore, a photon is emitted in either direction every 4.05×10^{-18} seconds.

Since force is momentum change per unit time, there is a force of 1.64×10^{-10} N generated in each 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 (2×10^{-10} m). One square millimeter of area would contain 2.5×10^{13} atoms. The force generated per unit area would be 4093 N/mm^2 .

So, photon emission can account for a material reaction to Newtonian type compressive forces, but tensile forces in a material can only be resisted by attractive field forces between atoms and molecules. This would make the reaction to tensile and compressive forces within a material vastly different in character, but this is not the case in real materials. To explain how tensile forces are handled, Figure 1 should be used as the starting point.

At the surface of any material, electromagnetic radiation from the material is constantly being exchanged with electromagnetic radiation from the surroundings. The material is in thermal equilibrium with the surroundings when the photon flow away from the material equals the photon flow to the material. The natural unstressed state inside a material should have the same arrangement. A substantial photon flow is constantly occurring through the electron orbit matrix of the atoms making up the material. This flow of photons would mean that heat and force are constantly swirling through the material in all directions in the atomic scale. The reason that the material is designated as "unstressed" and uniform in temperature is because the net macroscopic flow of photons in any one direction is zero.

In this view of materials, the atomic field bonds in a material would be constantly pulling the atoms together until the electron shells interfere with each other and distort. This distortion causes a photon emission between neighboring atoms which pushes the atoms back apart. There is a point in the shape of the attractive field curve and photon emission curve where a balance is achieved. This balance point determines the macroscopic stable dimensions of the material.

Under compressive Newtonian forces, the photon emission pattern of the atoms is increased in the direction of the force and this photon response opposes the external Newtonian force. Under tensile Newtonian forces, the distortion of the electron orbits causes a reduction in photon emissions in the force direction (as the electron shells lose some of their distortion). This reduction allows the existing atomic field forces to oppose the Newtonian tensile force.

When considering the reaction of a material to Newtonian force application, it is helpful to examine the material strain. The amount of compression or tension that a material can support before it reaches its maximum elastic capability is small. Steel typically deflects only about 0.3 % of its length before reaching the elastic limit. If the compression/tension response of a material were dependent primarily on atomic field forces, then it is likely that materials would deflect considerably before the elastic limit were reached. This premise is partly supported by the discussion surrounding Figure 20 in the article *Moving Energy Forces*. Atoms are composed mostly of empty space. They could probably sustain substantial change in geometry before

atomic field forces alone could resist Newtonian forces. But, if these field bonds are already in substantial tension due to normal photon emission, then perhaps a small geometry change of the atom could produce a substantial change in photon production. This would explain why material deflection is so small, even for large changes in external force application.

For the case of shearing stress within a material, the explanation is more complex. Even shafts in pure tension experience shearing stresses, the maximum value being at 45 degrees orientation to the axis of tension. A good explanation for how this happens is given by the concept of the Mohr's Circle diagram and related discussion (this explanation will not be repeated here). For the relationship of photon emission to pure shear stress, Figure 3 is a simplified model of a material in pure shear.

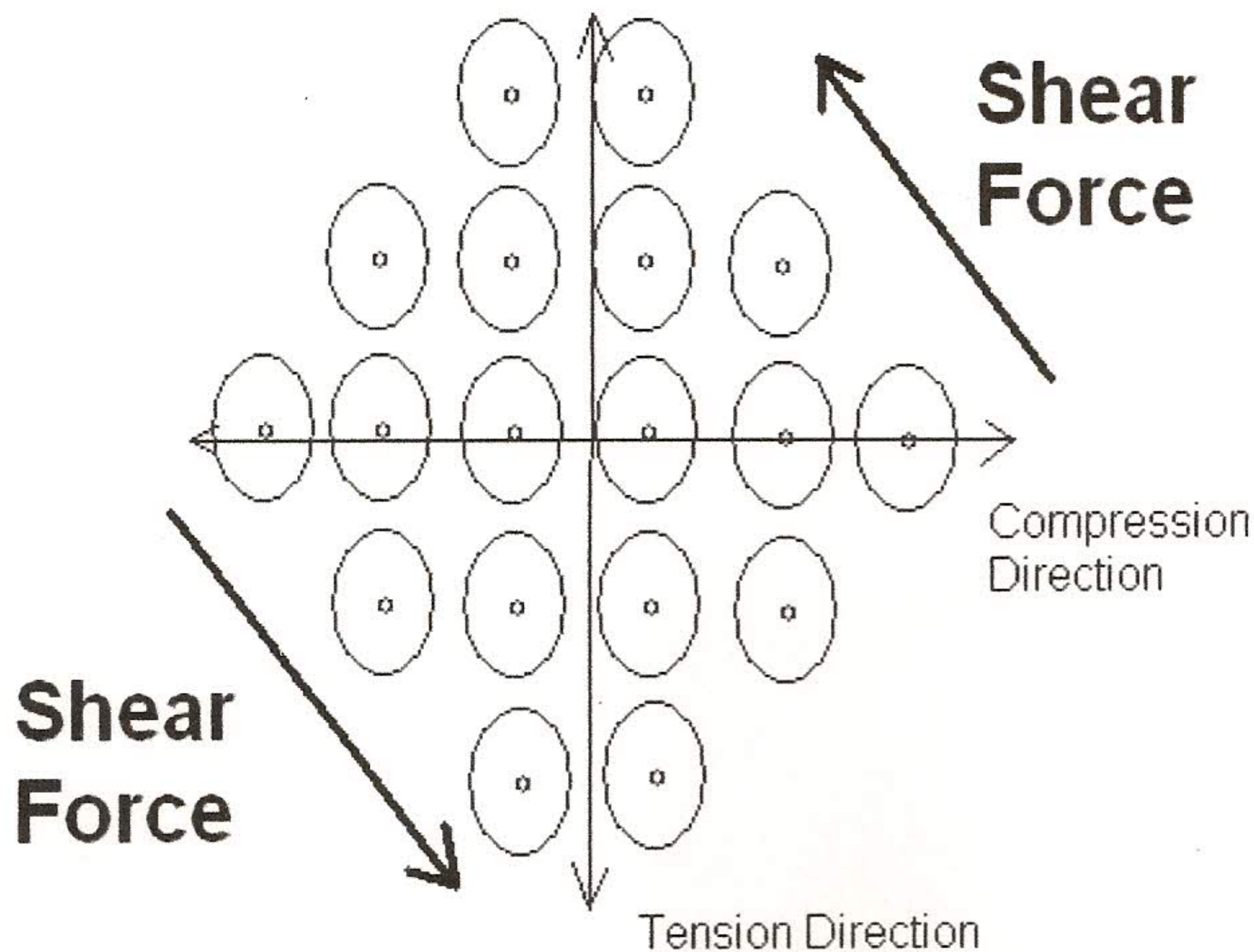


Figure 3. Shear force resolution into tension and compression.

For a material in pure shear stress, at an angle of about 45 degrees to the shear force direction, there is a compression stress of the atoms and consequential increase in photon emission (compared to the unstressed condition). At an angle of about 90 degrees to the compression direction, there is a tensile stress and consequential reduction in photon emission (compared to the unstressed condition). The reaction of a material in shear is therefore a combination of the compressive and tensile photon flow patterns already discussed.

Photon Flow

As stated previously, the natural state of an unstressed material consists of random photon production in all directions. The atomic field forces draw the atoms together, which distorts the electron orbits and produces the tendency for the electrons to jump levels and emit photons. The emitted photons push the atoms back apart. When field force equals photon production force, the material dimensions are stable.

