## **Under Pressure**

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## Summary

This is a brief description of the behavior of atoms and sub-atomic particles under extreme pressure, based on my theories of sub-atomic structure.

## Atoms

Under the near-vacuum of Earth's surface, low density structures abound. When the pressure rises, for instance under water or underground, higher density structures occur. The sparse structure of graphite is compressed to the denser form of diamonds. Under more extreme conditions, this extends to electron orbits. For instance, Iron has 2 4s electrons, while the 3d subshell only has 6 of the 10 electrons it can hold. Under high pressure at the Earth's core the outer shell collapses into the next layer down, increasing the density sharply.

Under more extreme conditions at the cores of stars, additional compression is possible. Neodymium has 4 of 14 allowed 4f electrons, with 8 electrons in shell 5 (2 5s and 6 5p), and 2 6s electrons as well. Its equivalent in the next row, Uranium, has 4 5f electrons, 8 in shell 6, and 2 in shell 7. Filling the f sub-shell drops the 2 outer shells, more than doubling the density. In addition, Uranium has an empty 5g sub-shell which can hold 18 electrons. Under stellar core conditions, this can be filled with electrons stripped from Hydrogen, leaving free protons to move through the dense matrix.

Under the most extreme conditions, the electrons can be absorbed into the nucleus creating blobs of neutronium. These are denser than the surrounding atoms, so sink to the center of the star. Eventually a neutronium core develops, with a slushy layer of mixed neutronium blobs, free protons, and residual atoms above. The drop in size causes outer layers to collapse inward with a blast of heat hurling the surface outward.

## **Sub-atomic particles**

Most sub-atomic particles in a star have constituents in 2s orbits: Electrons, up quarks, down quarks, and up/down diquarks. As the free electrons get absorbed into the nuclei, few are available to compress. Any that do get changed to 3s orbits (muons) are even easier to absorb (being closer in size to the quarks). Down quarks are easiest to compress, forming strange quarks. However these are small enough that bonding to up/down diquarks isn't feasible. Compressing the diquarks in theory produces up/strange diquarks and then charm/strange. Galactic black holes can go further, producing charm/beauty and beauty/truth. Not all combinations need be viable; a truth monoquark may be too small to bind to a beauty/truth diquark (maximum ratio of diameters is about 12:5). 5s and higher orbits are also possible under the most extreme conditions.

Under further pressure increases, we may reach the point at which the gravitons are no longer trapped by the Lorentz contraction. As v drops,  $L_v$  may become less than  $\lambda$ . Without the gravitons keeping the proto-matter organized, it will become chaotic. The individual proto-matter spheres will crash into each other, interacting weakly. Conservation of Angular Momentum will still guarantee conservation of charge and color, but structures with 6 bits of color may form (since this is the densest form of protomatter). Without the spring of the quark structure pushing outward, a wholesale collapse would occur, spreading the region without gravitational structure. As the density drops, a point would occur where gravitons are again captured (in the outskirts of the collapsing volume). Now, instead of gravity pulling inward, it is in a shell at the surface, exploding outward. Eventually the core will stabilize and gravity will leak back in, establishing a new structure. The resultant negrons have lower density than the surviving baryonic matter, so will expand past it.

At low energies, the graviton always perceives the proto-matter as near position B completely surrounding the gravitons orbit. When the graviton is at position 0 in its orbit, it perceives the center of the proto-matter (B) as adjacent. At position 1, it perceives the proto-matter as some point between A and B. Similarly at position 3, the graviton perceives the proto-matter at some point between B and C. Under critical conditions, the graviton perceives points A and C on the proto-matter as tangent. When the pressure rises just a little past critical, the graviton can escape the gap between points A and C from its perspective. Just below the critical point, the gravitons orbit bulges outward near point 2 into the opening between A and C, which narrows as the graviton speeds up (gaining velocity as it drop in energy from moving outward). Note that the larger circle represents the gravitons orbit, the actual graviton is too small to see in

comparison to a proto-matter sphere: the proto-matter is about  $10^{-35}$ m in diameter while the graviton is about  $10^{-59}$ m.



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