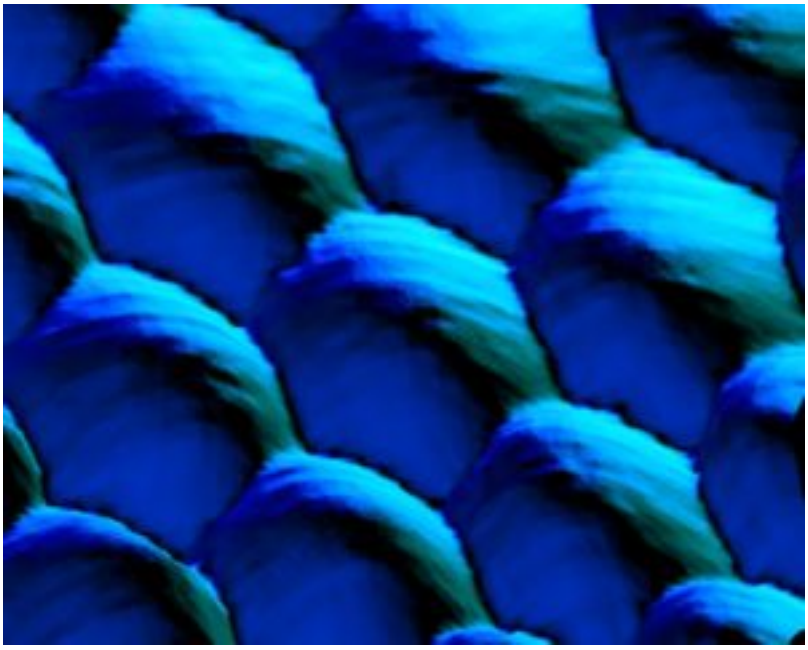
Magnetic Atoms

The Electron Microscope image below is of atoms at the surface of a sheet of platinum, and this shows that the proportion of the surfaces of these atoms that are in contact with atmospheric gases are roughly spherical in form, while the surfaces that are in contact with adjacent atoms are distorted from the spherical so that each atom at this boundary has a hexagonal form.

Prior to the introduction of electron microscopy technology in the early 1980's, atoms in solid matter were depicted in most textbooks as oscillating kinetically in lattice structures similar to that shown in the diagram below, where the proportion of inter-atomic vacuum would be in excess of 500% of the volume of the atom.



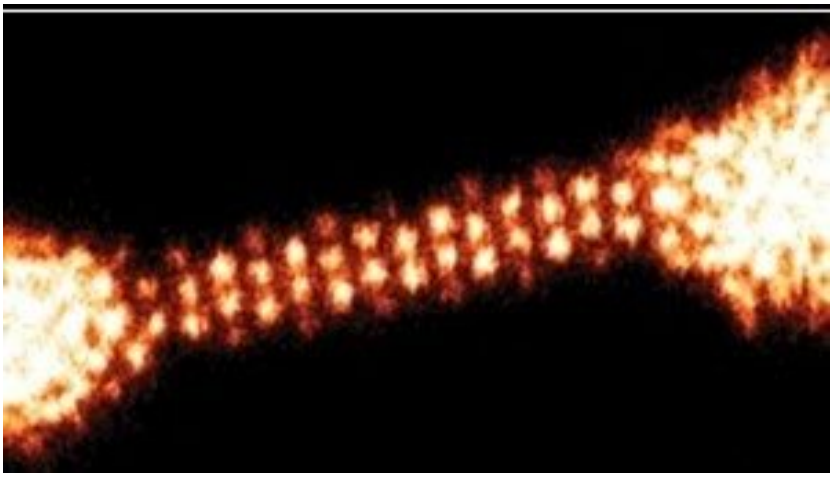
But, due entirely to the introduction of this technology, atoms in solid matter are depicted as having a far closer structural distribution, the diagram below is an example of one described as 'hexagonal close packing'.

And so it is now suggested that, instead of occupying a small proportion of the total volume, atoms now occupy most of the volume of solids and that, instead of in free 'kinetic' motion in a lattice structure, they are now "rotating and vibrating" in place.

The Electron Microscopy image below is of a bridge of gold atoms that has been physically drawn out to form a wire-like structure between two larger gold masses. This nano-wire is clearly a cross sectional arrangement of five atoms and obviously

there are attractive forces acting consistently between these atoms to maintain this structure.

If there were not then according to current ‘kinetic’ theory these atoms would all separate as a result their frequent ‘kinetic’ collisions.



However, if individual atoms in ‘close packed arrays’ are freely “rotating and vibrating” as current theory states, then there can be no consistently and continuously acting forces of attraction between these atoms, and thus no sensible explanation for the generation of an attractive force of sufficient strength between these gold atoms, both to form and to maintain this wire like structure.

The structural change from a “lattice” to a “close packed array” is entirely due to this advance in technology, which has produced numerous images (which take a considerable amount of time to create) of the surfaces of solid matter that show such closely packed arrangements of atoms.

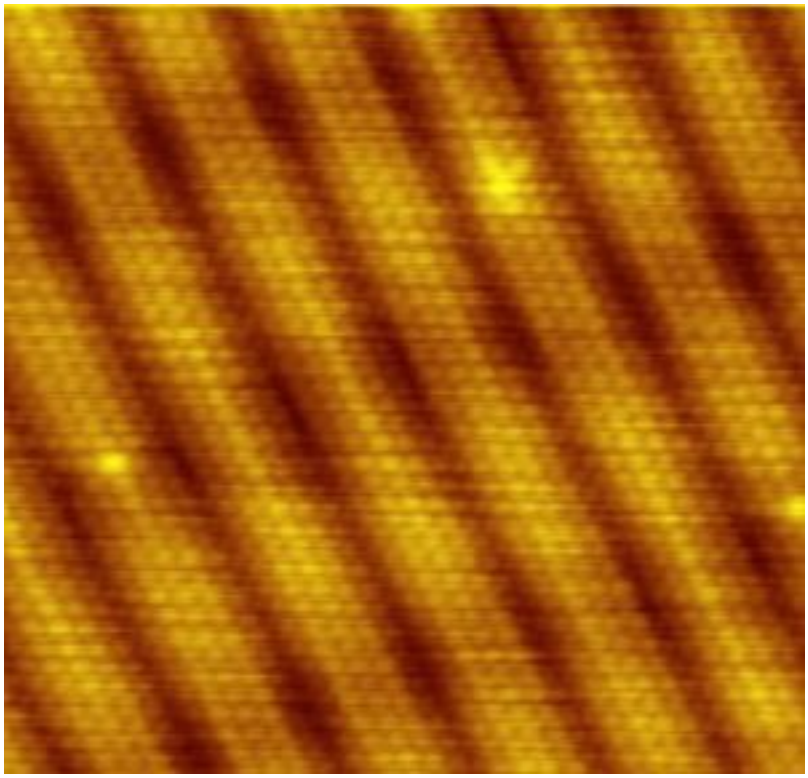
So this is a significant revision of the hypothetical structure of solid matter from individual atoms oscillating in a lattice structure and occupying a vacuum five times their volumes, to spherical atoms that are touching along the face diagonals and are occupying 74% of the available space, as in the *“hexagonal close packed array”* above.

Which means that the hypothetical, inter-atomic vacuum in these metals has now been reduced from 500% to 26%, and, as there is obviously no room for any significant and random kinetic motion of individual atoms, it is now stated that these are instead “kinetically rotating and vibrating” in place.

On the introduction of this technology around 30 years ago, the observed ‘apparent continuousness’ of atoms was excused by saying that these images are “limited in sharpness because the probe is too clumsy”

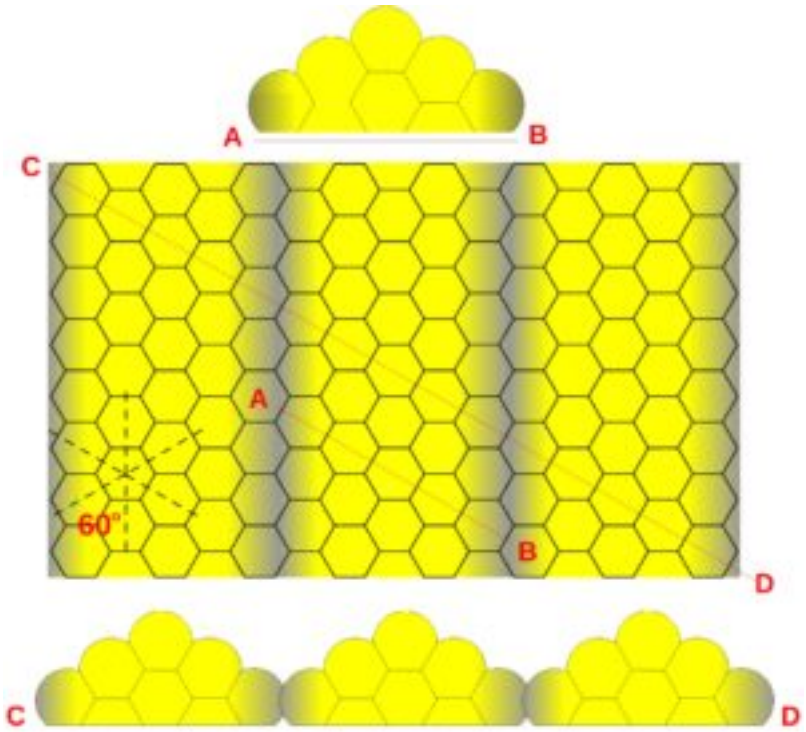
However 25 years later this technology has advanced significantly and there are thousands of images similar to this, clearly indicating that atoms are “pressing upon each other”, as was first suggested by Newton 350 years ago. And in these images the distortion from a natural spherical shape to a hexagonal form at the borders between these atoms can only be the result of the actions of a mutually acting repulsive force.

The image below is of a surface of gold atoms, which is an “*Image of surface reconstruction on a clean Au(100) surface, as visualized using scanning tunneling microscopy. The individual atoms composing the material are visible. Surface reconstruction causes the surface atoms to deviate from the bulk crystal structure, and arrange in columns several atoms wide with regularly-spaced pits between them*.”



The reconstruction below of this gold surface shows that these atoms are aligned in three rows that are at 60 degrees to each other, and cross sections of this surface A-B and C-D are shown.

It is therefore clear in these examples that forces are acting at close range between these gold atoms.



The drawn out, nano-wire structure of gold atoms shown earlier can be replicated with spherical neodymium magnets as in the photos below.

In the two longitudinal arrangements in the photo above of two cross sectional series of five neodymium spheres, the magnetic bonds between the spheres is very strong and it is very difficult to break these bonds either individually, collectively, laterally or longitudinally.

However it is important to note that these arrangements of strong magnets do not extend any significant external magnetic field.

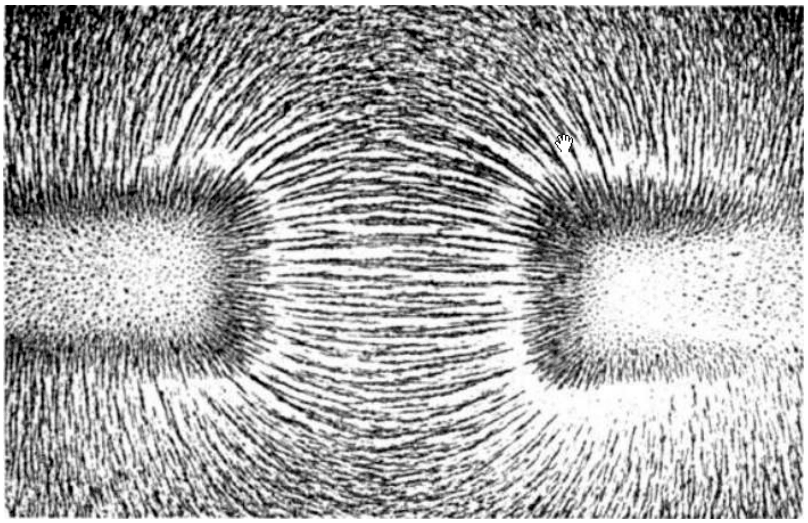
For example if a piece of iron, or another small magnet, is brought close to any of these spherical magnets, either longitudinally or laterally, then there is no magnetic interaction, attractive or repulsive, until a separation of 2-3 mm is reached.

But when the two arrangements in the first picture are brought to this separation they are immediately drawn together strongly and bond to a single entity, as in the following two photos below, and the strength of these bonds are also very difficult to break without a total disruption of these wire like structures.

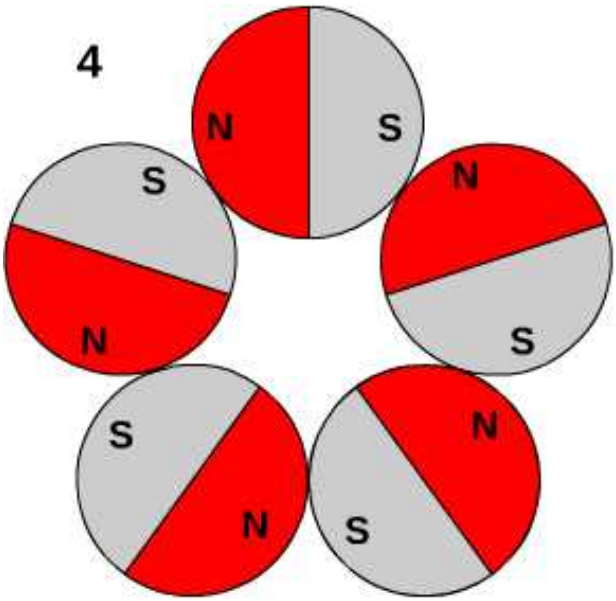
In contrast the arrangement in the next photograph below is that of four rows of these spherical magnets, these rows were separately constructed so that each sphere was in contact north to south with its immediate neighbours.

These four separate rows were, with some difficulty, then placed together, which resulted in their overall N-S alignments combining to form a strong magnet that extends an external field longitudinally to well over 30cm, for example it influences a compass needle at 45cm. However this arrangement, in contrast to those in the above photos is relatively easy to pull apart laterally.

The deviations of single ‘wires’ shown at each end replicate the directional arrangements of the magnetic field in the same way as that of iron filings around standard magnets as in the image below.

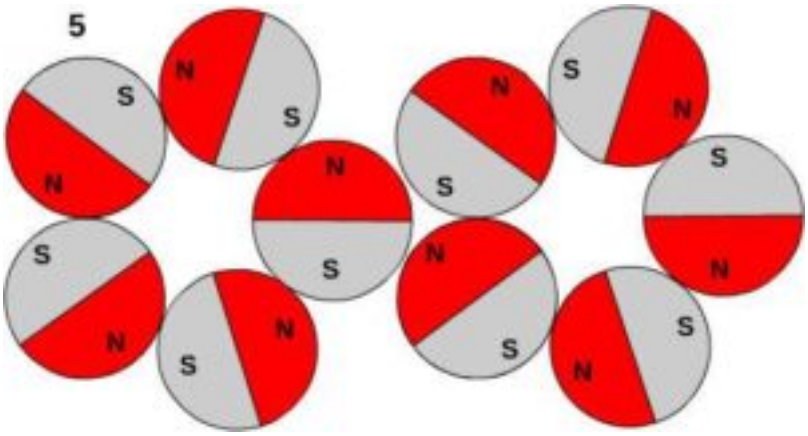


On direct inspection the, cross sectional, magnetic alignments of the spheres composing these assemblies in the three photos above are as in the diagram below.



So it is evident that while this arrangement effectively neutralises, or "cancels out" a longer range action of the field of individual magnets, there are strong close range magnetic forces acting here.

And when two such arrangements are allowed to come into contact the magnetic alignments of these spheres are, again from direct observation, as represented below.



As there are no other identifiable candidates capable of generating the observed strong forces acting between the gold atoms in the 'nano-wire' structure above, it can therefore be suggested that, in such circumstances, at close range the individual

magnetic fields of gold atoms do extend externally, and in the same manner as those of neodymium magnets, to influence and attract adjacent atoms and thus to generate the forces that are observed to act in creating and maintaining these gold wires.

But it is stated unequivocally in the literature that gold is non magnetic.

“Non magnetic materials have atoms aligned in random directions, so their magnetic fields cancel each other out.”

So, while it is obvious that there are strong inter-atomic attractive forces acting here between these gold atoms and, while it is said that atoms “produce a magnetic field”, theory states that these fields do not extend externally to influence adjacent atoms.

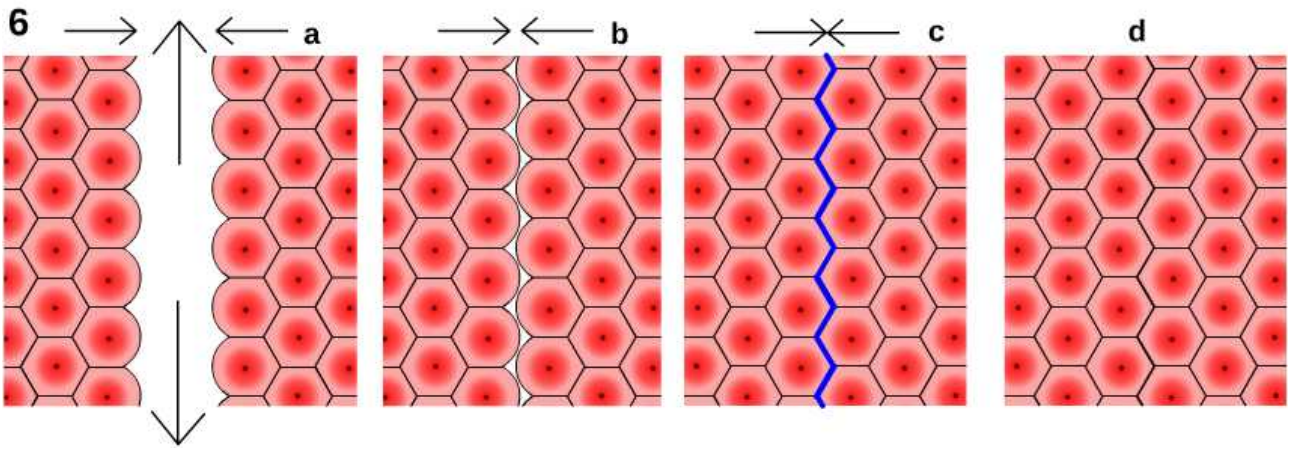
However it is clear that, as demonstrated by the neodymium spheres, if these forces are only acting at close range, and the magnetic fields of atoms accordingly do not combine to generate any significant, externally acting, magnetic field, such as those observed to be extended by metals that are classified as ‘magnetic’, these short range magnetic fields would not be perceptible to instruments at macroscopic level.

It is therefore true in this respect that the magnetic fields of individual atoms “cancel each other out” however it is absolutely clear that their fields are not “randomly aligned”.

These short range, attractive effects are confirmed by experiments demonstrating that two “ultrathin gold nanowires (diameters less than 10 nm) can be cold-welded together within seconds by mechanical contact alone”, and this ‘cold welding’ effect is also observed with larger masses, as when two sheets of various metals are brought into close contact.

“Cold welding was first recognized as a general materials phenomenon in the 1940s. It was then discovered that two clean, flat surfaces of similar metal would strongly adhere if brought into contact under vacuum.” (Wikipedia).

The perfectly plane, facing surfaces of the two metals in Fig. **6a** below are structurally identical to that of the image of a platinum surface shown earlier, and these two pieces of metal are brought together while the intervening gases are extracted in a low pressure environment, which process leads to the complete fusion of the two surfaces so that one, continuous piece of metal is created as in Fig. **6d**.

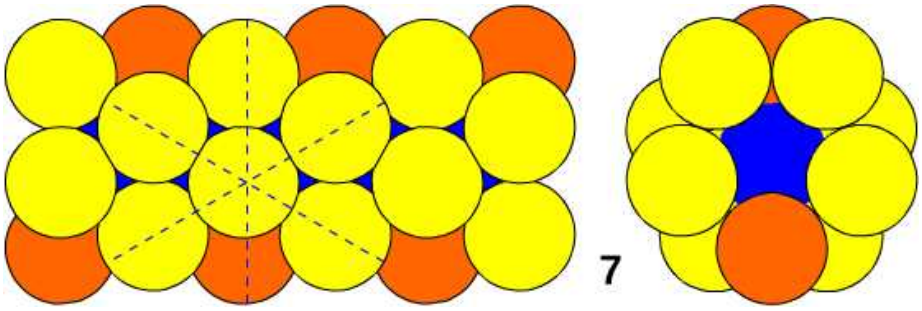


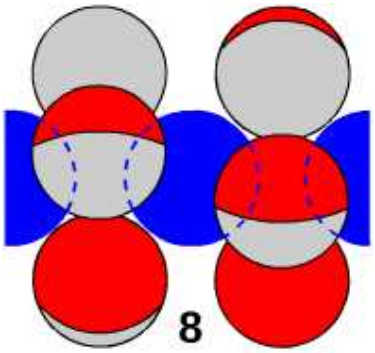
It is therefore evident that there are short-range, and very strong, forces of attraction between the atoms of metals that are classified as being non-magnetic, and that these forces can only be caused by the magnetic fields of atoms extending to and acting mutually with all its adjacent atoms.

As a surface of, for example, silver is composed of well over one quadrillion atoms per square centimetre, the atoms depicted in the images above represent many billions of individual atoms.

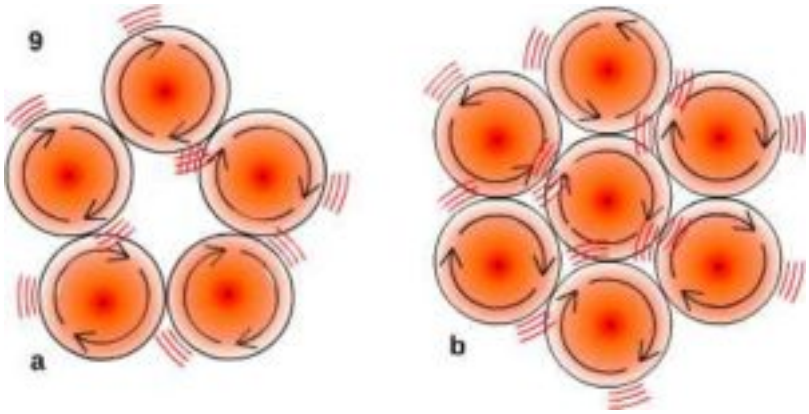
It is therefore obvious that the cumulative effect of such minuscule interactions between the atoms at the surfaces of the two can result in the observed, and extremely strong, bonding effect that is observed at macroscopic level.

With respect to the gold nano-wire shown earlier, diagram **7** below is a representation of this, and the cross sectional structure beside it is that of the outer layer of five atoms, and if this were composed of spherical atoms that are touching at the 'face diagonals', this would obviously leave a central void, in blue, that is patently too small to entertain another spherical central atom, as is demonstrated by the diagram **8** following this, in which the magnetic alignments of the outer atoms N-S are shown.





An alternative ‘close packed’ arrangement is shown in diagram **9b** below composed of seven atoms, which would allow for such a central sphere, while that of five, **9a**, does not.



But the photo below of neodymium magnets indicates that one of five **on the left** is structurally similar to the image of gold nano-wire atoms shown earlier and that of a cross section of seven spheres on the right is of larger dimensions.

In the following diagrams **10A** depicts nominally spherical atoms and their magnetic alignments, and in **10B** the the black arrows represent the actions of attractive magnetic forces.

However it is clear that the central void will be occupied and the blue dashed circle in 10B represents a nominally spherical atom here, which when situated between two sets of five atoms in 10C is accordingly mutually repulsed by and repulses, a total of

twelve surrounding atoms and this central atom is compressed and adopts a dodecahedral form, filling the available space completely as in **10D**.

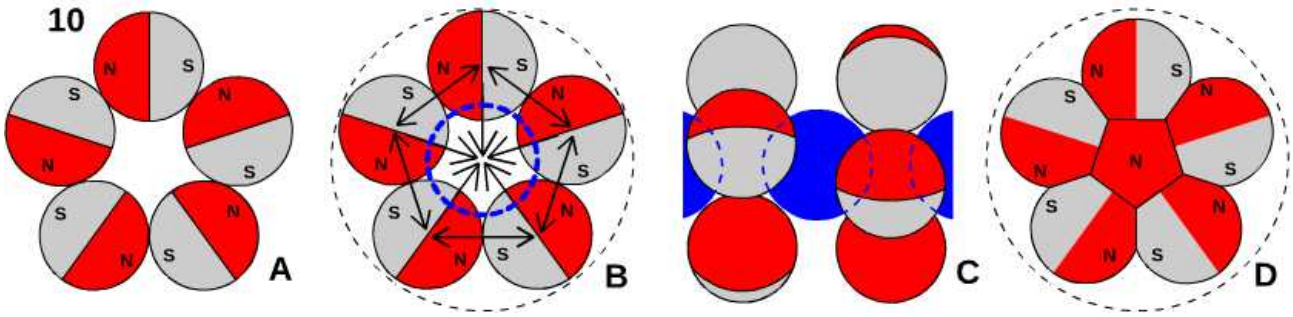
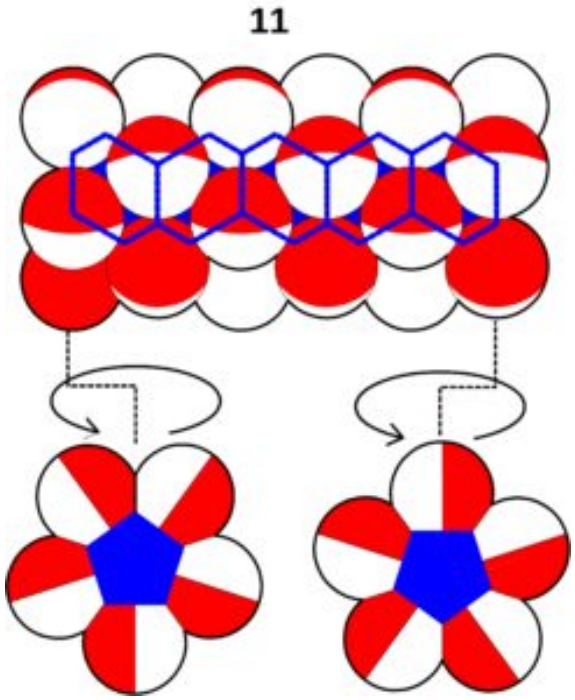
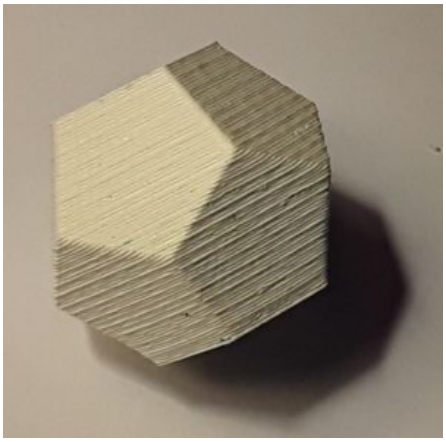


Diagram **11** below is another representation of the structure of the gold nano-wire, with the cross sectional end views added and with the dodecahedral central atoms depicted by the blue dashed lines, the outer forms of which are identical to those in the photo below that of a side view of a dodecahedron, and are similar to the Electron Microscopy image of platinum atoms shown previously.



This is a photograph of a dodecahedron constructed with a 3D printing machine.



But in any case the obvious problem is that if these atoms are rotating and vibrating in place as depicted in 9a&b, then clearly their magnetic fields would also be rotating and no continuous, inter-atomic attractive force could possibly act to maintain these structural arrangements.

And the atoms in the gold nano-wire experiment would simply fall apart and separate, and the observed 'cold welding' could not, by any means, occur.

These observed examples, of 'cold welding', are direct evidence that there are strong attractive forces acting between atoms and that there are opposing and equally strong forces acting repulsively in opposition.

And, as the only possible force of attraction is magnetic, the observed distortion of an atom's outer extents is evidence of an equally strong resistance to the incursion of one atom's field into that of an adjacent atom, which directly translates into the force of pressure that is observed and exerted at macroscopic level.

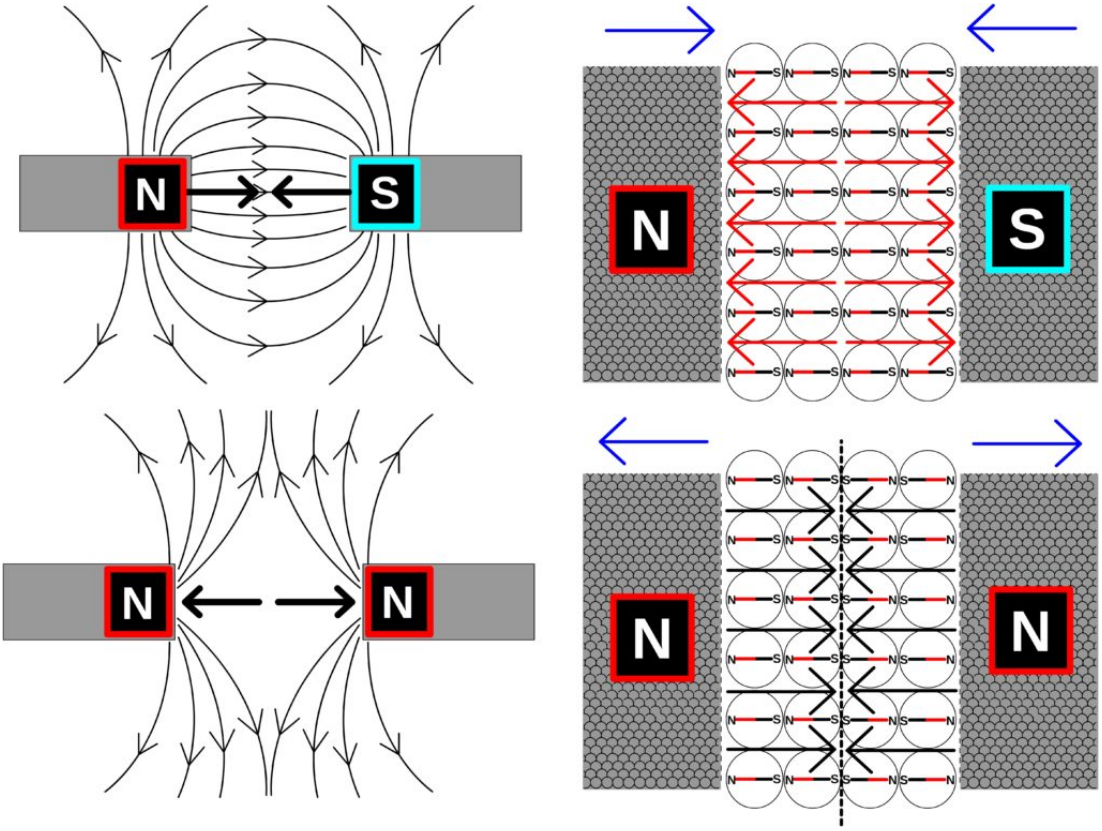
It is therefore evident that magnetism is a fundamental force, and one that is of far greater significance than is generally considered.

In this respect it is still unexplained in terms of current theory as to how the very strong magnetic fields generated between two permanent magnets acts through a discontinuous atmospheric gas which is composed of 99.9% a vacuum.

The images below (which are not to any specific scale) clearly show how the observed strong attractive and repulsive forces generated by the magnets act to divert

atmospheric atoms from their normal alignments to the relatively weak field generated by the Earth itself and so transmit these observed forces.

Clearly if these magnets were separated by a ‘vacuum’ gas structured according to the kinetic atomic theory of gases, then there would be absolutely no possibility of these observed forces acting here.



To translate Newton’s statement quoted earlier from his polite 17th century English into the colloquial – ***‘If anyone considers it is possible for a force to be transmitted between two units of matter through an intervening vacuum separating them, he is stupid’.***