Why is MERCURY LIQUID?

by Miles Mathis

First, I beg you to ask this question of the mainstream. Here is what you will find at the top-ranked site on Google:

The s electrons are able to come very close to the nucleus. They swing around very massive nuclei at speeds comparable to that of light. When objects move at such high speeds, relativistic effects occur. The s electrons behave as though they were more massive than electrons moving at slower speeds. The increased mass causes them to spend more time close to the nucleus. This relativistic contraction of the 6s orbital lowers its energy and makes its electrons much less likely to participate in chemistry—they're buried deep in the atomic core.

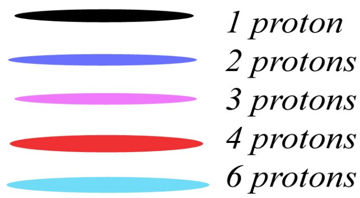
The old Relativity dodge again. But this makes no sense. Are we to believe that Mercury's electrons are going faster than the electrons of other elements? Most other elements avoid Relativistic effects, and so they are solids? Come on! If you are going to cheat with Relativity, at least make up something good.

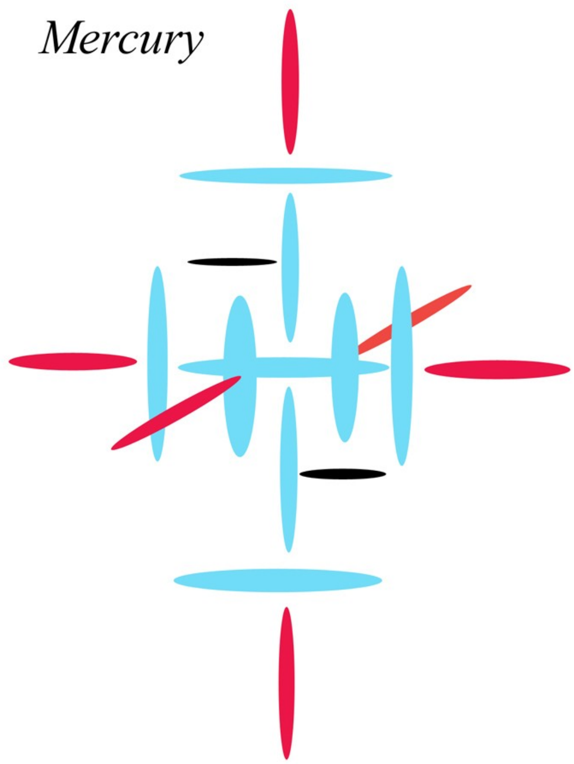
Those who just flew in here on this paper should be reminded that I am not an anti-Relativist. I have corrected Relativity and made it stronger. I believe in relativistic effects for electrons. But not *just* for Mercury's electrons or 6s electrons. This answer doesn't fly, and neither do all the other answers you will find, which are even more pathetic than this one. If these people don't know, can't they just say, "I don't know." That is what I say when I don't know. And, yes, I say it all the time. I say it everyday in emails, when people ask me questions I haven't studied. I say, "I don't know."

I will even admit it here. I don't *know* why Mercury is a liquid. I am not here writing this because I know. I am here because I have a good idea, one I think is better than the Relativity idea. I offer it as a possibility. That is what all my papers are about. That is what science is about.

I have recently created some interesting diagrams of the nucleus, and here I will draw a diagram of Mercury. I suspect it will allow us to discover some better possibilities regarding Mercury's room temperature state.

Mercury is built from Xenon; and is a group 12 element (we are told). Since Xenon is the base, the blue disks in my first diagram are triple alphas and the red disks are double alphas (four protons). Black disks are single protons. I will not diagram the neutrons.





You will have had to read my previous papers on nuclear structure to understand my analysis here, but those who have will already understand why Mercury is special, just by looking over this diagram for a few moments. To start with, we see that Mercury is very balanced, almost like a noble gas. The only difference is that Mercury has a fourth level, and noble gases are always just three levels (in this sense, Radon is not really a noble gas, as we have already seen). And since Mercury has each outer hole quadruple-filled at this level (four protons), we don't have single protons or their single electrons in the outer level for making compounds. That is why Mercury is mostly non-reactive. More on this below.

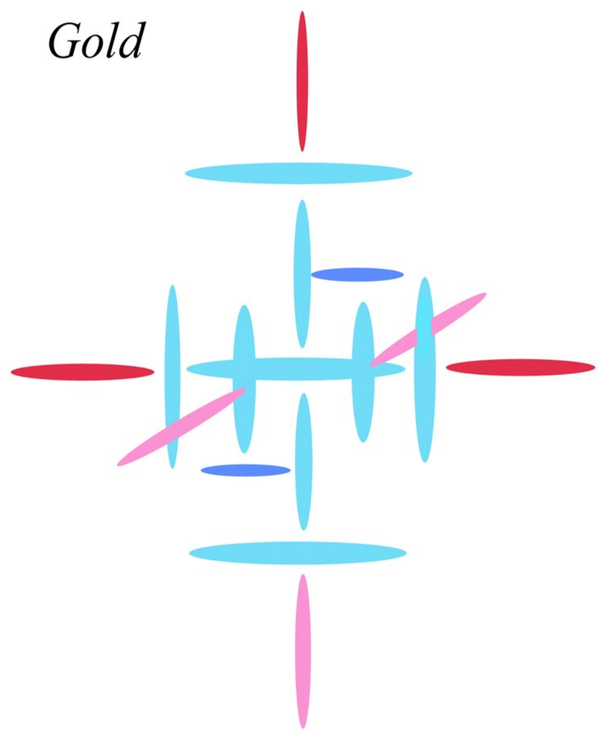
The current explanation mirrors that to some extent:

This configuration strongly resists removal of an electron, mercury behaves similarly to noble gas elements, which form weak bonds and thus easily melting solids. The stability of the 6s shell is due to the presence of a filled 4f shell. An f shell poorly screens the nuclear charge that increases the attractive Coulomb interaction of the 6s shell and the nucleus (see lanthanide contraction).

But as I have shown in previous papers, there is no 4f shell. There is no f sub-shell at all, in any level. So there is no screening, either. The current explanation fails once we have a clear diagram. The nuclear diagram makes it clear that it is not electron shells that explain the properties of elements, it is nuclear shells. Mercury has a quadruple-filled 4th nuclear level, and it fills both the c and t levels (carousel and cap levels). And, as you should have noticed, the n (inner level) is weakly filled. Mercury has skipped the inner level for the most part, in order to achieve outer stability. Mercury has filled that level to the minimum extent possible.

The nucleus fills levels to achieve the greatest balance at each number, paying no attention to filling rules based on levels. This is why filling rules—be they like the Madelung rule or the basic orbital equations—are so often broken. The only rule is balance in the charge field.

To better understand this method, it may help to compare Mercury to Gold:



[One of my readers (Steven Smith) has begun to animate all the elements using my models, and he diagrams all the protons separately. He also diagrams the neutrons and electrons. Here is his animation of gold.]

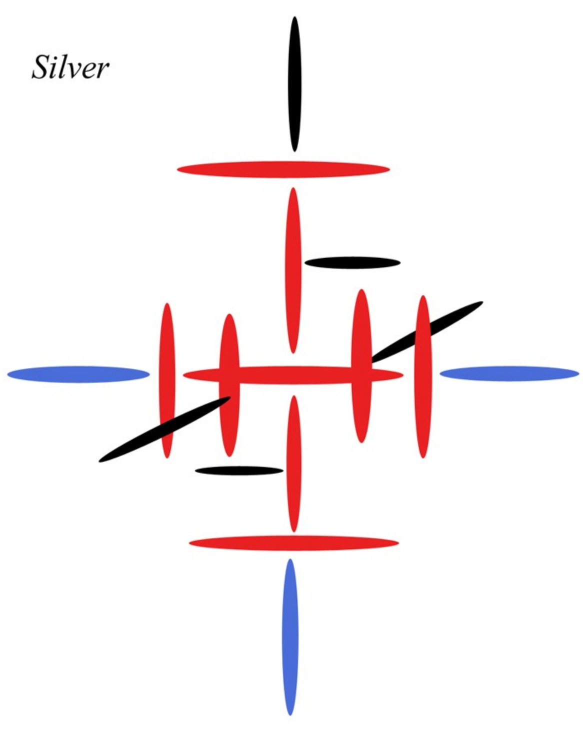
We see that Gold doesn't have the balance of Mercury, but it does have 3 or 4 protons in all directions (top, bottom, and all sides), which makes it fairly unreactive like Mercury. Gold is oxidized at +1 and +3, which is made clear from this diagram. Depending on the situation, it can bond via the odd “valence” proton at the bottom, or it can bond with the three odd protons in the purple slots. But due to the protons in all directions, the nucleus is fairly balanced as a matter of charge, and it needs some encouragement to bond. The heaviness and density of Gold is explained by the double-filled inner holes. This alone accounts for the great difference between Gold and Mercury. Only the four previous elements are denser than Gold, and this is because they have more protons in the inner holes.

Yes, elemental density is a straight function of nuclear density, and it requires no quantum mechanics to understand it. You could say that my diagrams are quantum mechanics—and they are certainly more mechanical than the current math and explanations. But what I mean is that it requires no study of quarks or gluons or any of that bombast to explain elemental density. The elements from Rhenium to Lead are dense for reasons that can be simply diagrammed, as I have just shown. The densest elements are built from Xenon, and the density is due to well-filled holes in the n level.

You will say, "Then why isn't Xenon dense? The structure looks like it is already dense, even before we start filling holes in the 4^{th} level." Well, it is, but we don't measure the density of the nucleus when we measure the density of a gas or liquid. We don't even measure it directly when we measure the density of a solid. The solid structure will be somewhat less dense than the nuclei it is composed of, for obvious reasons. The problem with Xenon is that it has a very balanced charge field, preventing other nuclei from being attracted. This is why the noble gases *are* gases. They not only keep other elements away, they keep other of their own atoms away. But the nuclear densities of the noble gases are quite high. If we could measure the density of the Xenon nucleus directly, we would expect it to be about three times as dense as the Argon nucleus.

I will answer another question here, although it is a bit of a diversion. "Why isn't Rhenium radioactive? The other group 7 elements above Manganese are radioactive." Because Rhenium isn't really group 7. The Periodic Table has been shuffled above Barium, remember, in order to lift out the Lanthanides. If we put the Lanthanides back in, Rhenium becomes group 21. There is no reason for group 21 to be radioactive. The next question should be, "Then why isn't Gold radioactive? If we put the Lanthanides back in, then Hafnium is like a noble gas. If we start over from there, then Gold is 7 numbers up from Hafnium. It should be radioactive." But again, we see that Gold isn't group 7, and it isn't group 11, either; it is group 25. I just showed you the diagram for Gold, and Gold fills both inner holes evenly. Therefore it isn't radioactive. Group 7 radioactivity is caused by one of the inner holes being left open. In fact, my diagramming is the only good answer so far to the question of why there are no radioactive elements in the current period 6, before Polonium. Current theory can't tell you why Technetium is radioactive, or why Rhenium (or Gold) isn't.

To see the difference between group 11 and 25, let us diagram Silver:



As you can see, that looks a lot like Gold as a matter of general shape and construction, so groups 11 and 25 *do* have similar characteristics. But Silver is a better conductor of *electricity* because the Silver nucleus is a better conductor of *charge*. Why? Two reasons: 1) The main line of charge through this configuration is from bottom to top: the nucleus tends to spin around that pole. Since we have two protons bottom and one top with Silver, we have a potential difference across the pole of ½. With Gold we have a potential difference of ¼. A larger potential difference gives us better conductivity. 2) The inner protons also play a part. The difference between Gold and Silver doesn't rely on this inner difference, since the outer difference trumps the inner. But this difference explains why Silver conducts better than Copper. Silver and Copper both have 11 protons in the 4th level and a potential difference of ½. But Silver has more inner protons [level 1 (center disk) and level 3n (the two pillar disks)], and all these protons acts as fans, pulling charge through. So Silver channels charge a bit better than Copper.

To continue this analysis, we may return to Mercury. Mercury is poor conductor, and it is because Mercury has little potential difference (charge potential) across the nucleus. In all three of these elements, we are channeling charge top to bottom. Silver and Gold have more protons top or bottom, so we have a potential difference. Mercury doesn't have that, as you see. Mercury must rely only on the spin of its protons to channel charge through the nucleus, with no help from potential differences. The balance that makes it like a noble gas also makes it a poor conductor.

So why are the noble gases even worse conductors? Beyond the fact that they are gases, they are terrible conductors because the level three protons are all emitting perpendicularly to the field, as you see in the diagram. You can think of the external charge field as meeting the nucleus at these outer faces, and at that boundary, the level three protons or alphas are blocking charge. You can see that they create little walls. That is resistance. A wall is resistance at the atomic level just as at our level. We don't need esoteric explanations, when mechanical ones will do. Any time you see walls like that in a nuclear diagram, you can read it as resistance.

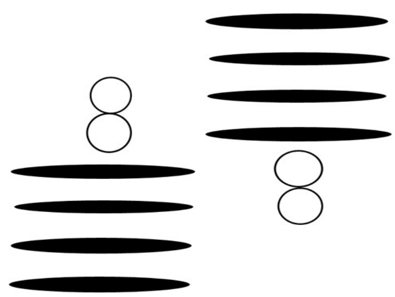
You will say, "But doesn't charge come through the holes in those outer protons on Xenon? Those protons aren't really walls!" True, but the charge suction of the holes isn't that great. Or, it is much greater if you put a proton in the hole to act as a fan, pulling charge into the hole. So the perpendicular protons *do* act as walls. Unless charge arrives near the hole, it is diverted perpendicularly. So *relative to* nuclei that have protons in the holes, these nuclei are non-conductive. The least conductive elements have perpendicular protons in the outer level. The next least conductive elements have an equal number of protons all round, creating balance in the spherical charge and negating potential across the nucleus. The most conductive elements have an unequal number of protons in the outer holes, with preference given to the top and bottom holes.

One more question before I move on. "If Radon is unstable with eight protons in the inner holes (as I showed in a previous paper), why not put the six extras in the outer holes, like Mercury but with five in each instead of four?" Because in either case we get instability. If we put five each in the outer holes with only one each in the inner holes, we get inner/outer imbalance. There is too much angular momentum in the 4th level, and too little charge channeling through the n level, and the nucleus splits from the inside out. But if we put four each in the inner holes, we have to place them in a way that also creates imbalance from side to side. In this case, there is *too much* charge channeling through the inner holes, and the nucleus is over-spun (see previous analysis). So either way, you get radioactivity. All this is to say that at a certain point, no matter what you do you create imbalance in the charge field. This is why all large elements are radioactive. You see that Mercury is already near that limit, since it has a lot of angular momentum up top.

My reader will ask, "Then why are any of the elements above Radon more stable than Radon? Shouldn't they have the same problem Radon has?" No, because they aren't built by the same method. As I showed in my paper on Uranium, the large elements that exist naturally aren't built up like we have built Radon. They are fused from two lower elements.

OK, but I still haven't explained the liquid state of Mercury, which is what I promised in the title. I needed to work up to it, giving you some background. We will use most of what we have learned above in now explaining the liquid state of Mercury. We have already seen that what determines whether an element is gas, liquid, or solid, depends on how the nucleus bonds with itself. If it doesn't bond much at all, like Argon, it is a gas. Argon doesn't bond for two reasons: the 3rd level protons are perpendicular, and the charge field is balanced all round. In addition, the charge field is weak moving through the nucleus, since we don't have any protons fans pulling charge in or out. Beyond that, if we look at non-noble gases like Oxygen, we get bonding between pairs of nuclei and then no bonding beyond that. So the gas is (mainly) diatomic. The diatom repels itself but attracts lots of other things.*

Now, with Mercury, we get balance but we don't get walls. Mercury has the four protons going out to meet the charge field, like spikes. We don't have a wall, so Mercury isn't a gas. But four spikes do create a bit of a problem when Mercury meets Mercury. Remember that those outer holes can hold six protons, so they are only 4/6 filled. Therefore, when we bring two Mercury nuclei together, there is room for two of the new ones, but not all four. In other words, the plugs don't fit together very well. Two of the tines on each side are left out. This creates a semi-bond, but not a full bond. A semi-bond is weak, and depending on how weak it is, it will either create a very soft metal or a liquid.



Study the diagram. In a bond the proton will "fit" into the hole. Two holes are open in each position. When we bring Mercury together with Mercury, we get a diagram like this. As you see, the two protons on the outside have no holes to go into, so they are left dangling. This is a weak bond.

To fine tune this mechanism, we will compare Mercury to Tin. Tin has a similar diagram to Mercury, but with blue disks in the outer holes instead of red disks. Blue disks means the holes are double filled rather than quadruple filled. Some will say, "Shouldn't Tin be a liquid, too, then? Since it is balanced all round?" No, because we have to look at the bond created as well. The outer holes of Tin are half-filled, with two protons in a hole that will hold four. So when Tin meets Tin, we get a good plug-in.

There is a hole for each proton to go into. This creates a good bond. So even though Tin is balanced all round, we get a good enough bond to create a solid.

No other element has the same problem Mercury has, as you will see if you think about it. As we have seen, the period 5 elements won't meet this problem, because they will have 1 or 2 protons in a hole that will take 4. Period 4 elements won't meet this problem, because they will have 1 or 2 protons in a hole that will take 2. To mimic this problem at a lower level, we would need something like 3 protons in a hole that would take 4. But as far as we know, no elements are constructed that way. That would be an element made from Krypton with an atomic number above 54; but the elements above 54 are made from Xenon.

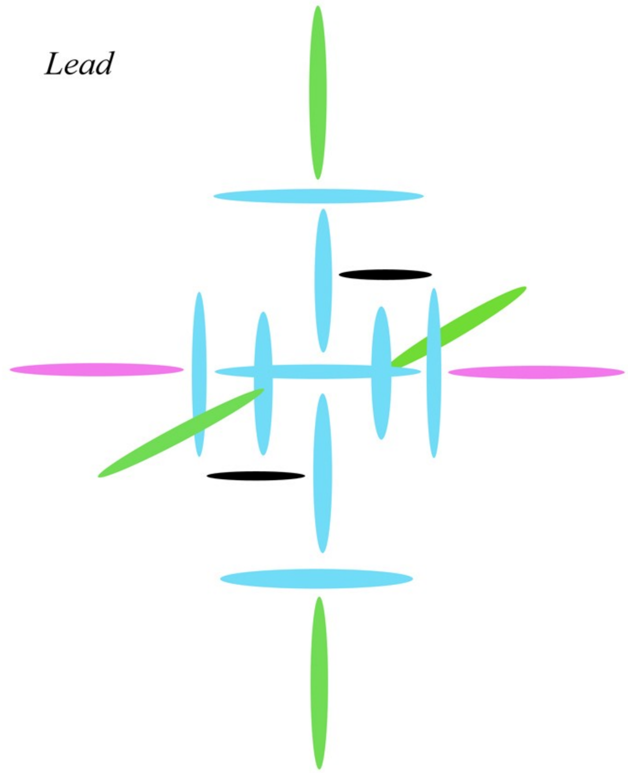
Gold doesn't have this problem either, as we see by studying the diagram above once more. Gold has that problem top and two sides, but it solves that by bonding at the other three places. Gold can bond to Gold at any of the other three places, since the purple disks are filled 3/6. Those three places create perfect plugs for Gold-Gold.

So we have discovered the secret of Mercury. It is the 4/6 plug all round that causes the weak Hg-Hg bond, and the liquid state.

As further proof of this, we may look at Thallium and Lead. Thallium is very soft, but it isn't liquid. It has created a bond stronger than Mercury at one of the six holes. It does this by five-filling two holes, taking one hole down to three. Thallium now has 3/6 in one of the outer holes, which allows for a bond with itself. Lead does the same thing, but twice, so that it has 4 holes five-filled, and two holes three-filled. This makes Lead more stable than Thallium, and so more abundant.

You will say, “That should make Lead very conductive according to your rules, but it isn't. You have a potential difference of 2/5, which should be considerable.” I can best answer that by showing the diagram for Lead. Green is five protons.

Lead



See, no potential difference from pole to pole, therefore low conductivity.

Returning to my diagram for Mercury, please note that my structure explains the known properties of cinnabar and metacinnabar (HgS). See this at Wikipedia, on Mercury Sulfide:

The more stable form is cinnabar, which has a structure akin to that for HgO: each Hg center has two short Hg-S bonds (2.36 Å), and four longer Hg---S contacts (3.10, 3.10, 3.30, 3.30 Å). The black form of HgS has the zincblende structure.

Although they have no way of explaining the 2 and 4 split of cinnabar with their electron orbitals, as you see my diagram explains it immediately. My carousel level has four "plugs", and the axial level has two. The axial level bonds are shorter because they are stronger. The axial level is the main charge channel through all nuclei.

The diagram also explains the cubic structure of metacinnabar, because in that case the Sulfur bonds only at the four carousel plugs. You can read more about this in my new paper on metacinnabar.

*See http://milesmathis.com/oxygen.pdf for more on this.