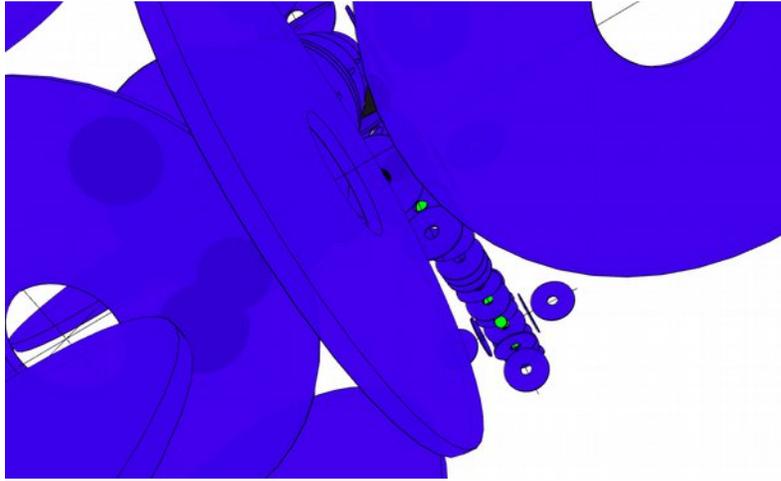


NEGATIVE THERMAL EXPANSION



by Miles Mathis

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I will start this paper with an amusing story concerning how it came to be. Inspiration comes to me in pretty strange ways, as some of you may know. I was rewatching old episodes of *Felicity* to pass the time during the coronahoax, and in episode three Felicity is taking her first chemistry class in college. To lead us into one segment, we see her venomous old professor Dr. Garabay lecturing on negative thermal expansion. He only says two sentences, but for some reason they jumped out at me. I look and listen a little closer than most people, as you know, even when watching mindless TV. He says that there is no known example of negative thermal expansion at the atomic level.

That stopped me cold, and I looked it up. Wikipedia admits the mechanism for this is uncertain, with several theories currently on the table. Further research shows the usual state of science when it comes to questions that impact the charge field or molecular bonding. That is to say, the current theories are not good, to say the least. So then I began brainstorming.

Before I get to it, let me gloss the problem. Negative thermal expansion is clunky science lingo for thermal compression, or shrinkage during heating. The most common example is water, which expands when you freeze it and shrinks when you heat the ice. That includes a state change, from solid to liquid, so it has actually been among the least mysterious examples over the years.

Just so you know, this is seen to be mysterious because normally heating causing expansion. Think of gas in a balloon. You heat it and it expands. That is fairly intuitive for most people, because they know that heating causes faster motion of the molecules in the gas. More motion naturally causes more pressure, for the same reason that hitting a wall hard with your hand causes more pressure than hitting it softly. More pressure equals more expansion. So far so good. But with many substances, we see the opposite, even without a state change. This is mysterious because a) it is counter-intuitive, b) it goes

against the norm, c) it doesn't fit the basic equations of chemistry you are taught in highschool, where a rise in velocity or pressure goes with a rise in temperature. See Boyle's law, Charles' law, Gay-Lussac's law, etc. These are ideal gas laws, but they also apply pretty often to non-gasses, since they state common sense ideas like those I just enumerated.

Here is all Wikipedia has to say under “Origin of Negative Thermal Expansion”.

There are a number of physical processes which may cause contraction with increasing temperature, including transverse vibrational modes, [Rigid Unit Modes](#) and [phase transitions](#). Recently, Liu et al. [1] showed that the NTE phenomenon originates from the existence of high pressure, small volume configurations with higher entropy, with their configurations present in the stable phase matrix through thermal fluctuations.

So already we can tell that the mainstream doesn't know. If they knew, they would just tell you and it would make sense. They could gloss it like I am about to. But I knew coming in that they wouldn't be able to solve this one, because I know from experience that they don't have charge channeling. [Charge channeling is my idea](#), and the mainstream hasn't accepted it yet, so they can't solve problems like this—except by making up stuff like Rigid Unit Modes, transverse vibrational modes, and other absurdities.

So what causes shrinkage with rising temperature? What causes it is that temperature rises are caused by increased charge densities. At the ground level, if you want to raise the temperature of any substance in any state, you have to add charge photons to it. Heat is charge photons. So is electric current, though normally current contains lots of ions. That is why we call it electric, you know: it contains electrons. But all electric current is driven by charge current, and the charge current is the more fundamental. [Electric current is Maxwell's E field, but charge current is his D field](#). The charge current is like the stream, while the ion current is boats on the stream.

Anyway, this charge stream is recycled directly through each and every nucleus and nucleon, in a path defined by its nuclear architecture. Not only do these charge streams define the nuclear architecture, they define molecular architecture as well. Molecular bonds [are not caused by electron sharing](#) or *ad hoc* theories of that nature—which have always been heavily fudged. They are caused by charge pathways between adjacent atoms.

They have had proof of this sitting under their noses for decades, though they have refused to see it. In the present problem that proof comes in the fact that as negative thermal expansion proceeds with rising temperature, the substance in question also becomes *a better conductor*. Its conductivity rises. This is a clue because, given current theory, you would expect the opposite. A rise in temperature should cause higher internal motion, which should cause more randomness in bond structures, whatever they are. Chaos normally rises with temperature. If you heat a piece of cheese, does its structure rise? No, it melts: the structure collapses. But we see the opposite here, with rising temperatures seeming to cause a rise in structure. Solids undergoing negative thermal expansion don't melt, in the sense of losing structure. They *gain* structure, especially electrical structure.

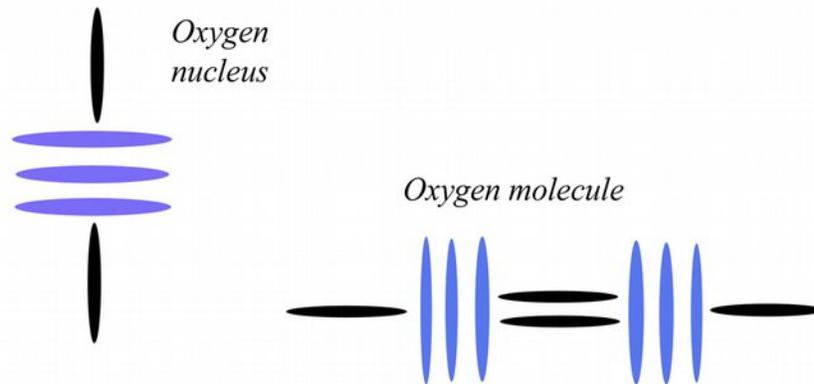
That is because as you add heat, you are adding charge. But not just chaotic charge. No, in these substances, the charge channels easily accept the extra charge, and it passes through each nucleus in a uniform manner. In most cases, it is because these substances have the potential for a lot of pole-to-pole channeling, [which I have called through-charge](#).

The standard charge path through the nucleus is pole-to-equator (see diagram of copper below). That matches the charge path of the Earth, Sun, and Galaxy. All spheres and semi-spheres work on that

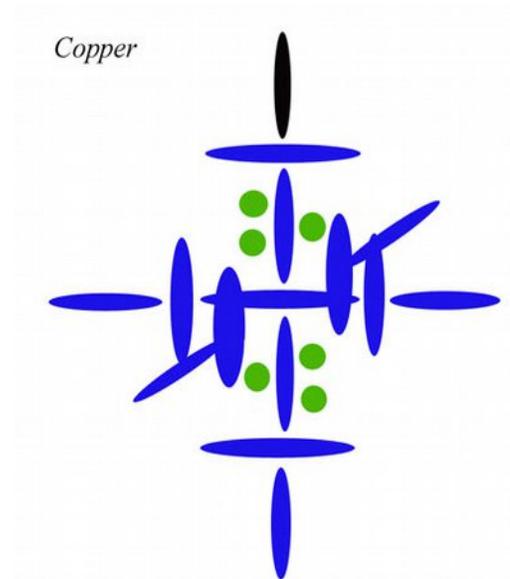
model, which creates a sort of charge engine. But all those entities also have some through-charge, which is charge that passes straight through the body from pole-to-pole. Well, at the nuclear level, [some configurations favor through-charge](#). They do so by having more nucleons on the poles and fewer on the nuclear equator. With fewer nucleons to draw charge out on the equator, more charge passes along the pole. This pole-to-pole channel is the electrical vector. It causes electricity because it allows adjacent nuclei to align, creating long straight paths of charge.

Now, with substances enjoying negative thermal expansion, what is happening is that the new charge coming in as heat strengthens the pole-to-pole channels, and as that happens the nuclei are drawn into straighter lines. This not only helps the conductivity, it also allows for better molecular compression. Substance that is forced into straighter lines can obviously fill space more efficiently. If you want to pack a room with boxes, the worst way to do it is haphazardly, with a lot of misalignment. The best way is with maximum alignment.

This is borne out by any study of the top exhibitors of NTE, such as Cu_2O or ZrW_2O_8 . Notice how they contain oxygen atoms, which we have already seen are used by molecules to facilitate charge channeling. [Larger atoms use smaller linear atoms](#) like oxygen or fluorine to focus charge, so that it is easier to plug in at the poles. They also contain central atoms that have a good conduction potential.



We know about copper, but zirconium also has a good conduction potential, since all its outer protons are on the poles. Being at four up from krypton, it cannot fill the carousel level, so its pole-to-equator streams are weak. Although its pole-to-pole stream is also weak (it only has one proton in each pole, in a hole that can take four), making it a poor conductor alone, if more protons can be plugged in on the pole, that potential for conduction will become a reality. That is what tungsten does for it, of course. If we plug a tungsten in each pole of zirconium, we have a molecule with both charge strength and charge linearization. The oxygens then plug in, adding focus to the streams. Since the two tungstens are so large, at lower temperatures the molecule is still sluggish. It needs strong charge streams to come alive. But if we then raise the temperature, the oxygens draw in charge more positively, and the molecule becomes a viable engine. As that happens, the molecule further linearizes to accommodate the rising charge, and as it does so its structure compresses.



Another subtlety becomes clear when we look at copper oxide. At room temperature, the bond angle is 119, which at first seems strange, given my architecture. The oxygens plug in the free hole in the north pole, so why isn't the molecule linear? Simply because the ambient charge field isn't balanced. Remember, on the Earth, the ambient field is twice as rich in photons as antiphotons, so the south pole is twice as strong. This means there is twice as much spin in one direction as the other, which is good, since this is what drives the field. If the field were balanced, there would be nothing to drive the E field. The nucleus as a whole wouldn't know which way to spin, and we would have the nuclear equivalent of Venus. Poor spin, and therefore poor E field.

But at the atomic level, this means that our oxygens are spinning one way and not the other. At lower temperatures, oxygen recycles more pole-to-equator, since it has three alphas in the core that are able to pull charge out laterally. But as heat rises, the charge streams become more powerful, and they push through the oxygen interior more strongly pole-to-pole. We then have more through-charge.

So let's look more closely at the low-temperature configuration, to see why it gives us that angle. At lower temperatures, the oxygen atom is recycling more charge out laterally, as I said. The polar streams are weak, so the spinning alphas (blue, above) in the core can spit charge out sideways. The nearby copper atom is doing the same thing, since copper also has a viable carousel level. But all this spinning charge is being released out to the side into a field that is not balanced itself. This field has already been skewed by the molecule's recycling. Because the ambient field contains twice as many photons as antiphotons, the molecule will be recycling twice as strongly south-to-north along the pole as it is north-to-south. The south pole vortex will be twice as large (same thing we see on the Earth itself). This skews the entire field around the molecule, creating a field low on one side and a field high on the other. There is less density at the north pole, so the south pole wants to move toward the north pole. Given any lateral imbalance, it will do so, and the spin of the entire molecule provides that lateral imbalance. So you see how field imbalances mechanically explain bond angles. [In previous papers](#), I have even calculated bond angles, straight from the charge field and the nuclear structure. But I won't do that here.

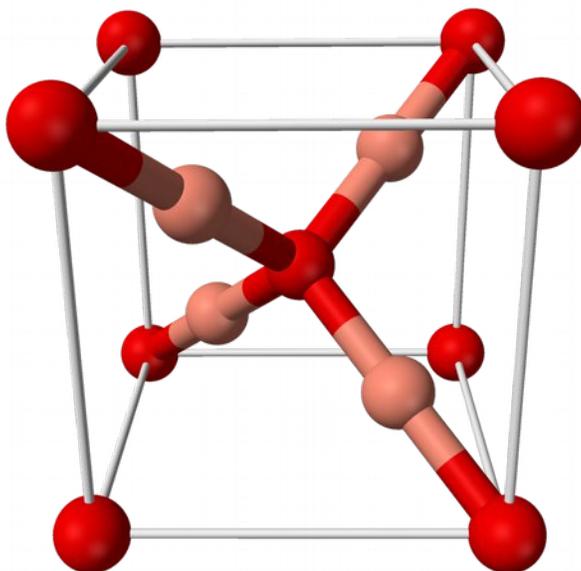
Which brings us back to the original exception: why is there no negative thermal expansion at the

atomic level? Simple. Because there is no room for compression in the nucleus. In almost all cases, the nucleus has already arranged itself into the most efficient structure for that number of nucleons, given the ambient charge field. The nucleus was built under extremely high heat in a star or galactic core, and so the bonds are already very tight. The kind of heat we can apply won't affect it. To compress, the nucleus would have to change structure, and that rarely happens. Actually, it *does* happen, as we have seen in previous papers. In the near presence of a more powerful nucleus, a smaller nucleus can re-arrange nucleons to facilitate more efficient charge channeling. But since the mainstream doesn't realize that is happening, it couldn't possibly know whether any analog of thermal compression was occurring.

So, that is your simple explanation. To explain it more fully, I would have to actually draw the nuclei and molecules in question in this specific problem. And I may do that in the near future. You have seen me do it before, [in many previous papers](#), so I don't feel like I need to prove myself. The mainstream cannot do it, and has never once done it, so I don't know why anyone is listening to them.

By the way, if I am going to continue to draw such things, someone needs to send me an old copy of Photoshop for Mac. When I switched over from PC to Mac, I lost my Photoshop capability. I had learned to draw molecules in Photoshop, but now I just have GIMP, which is honestly a nightmare. I can't get anything done with it.

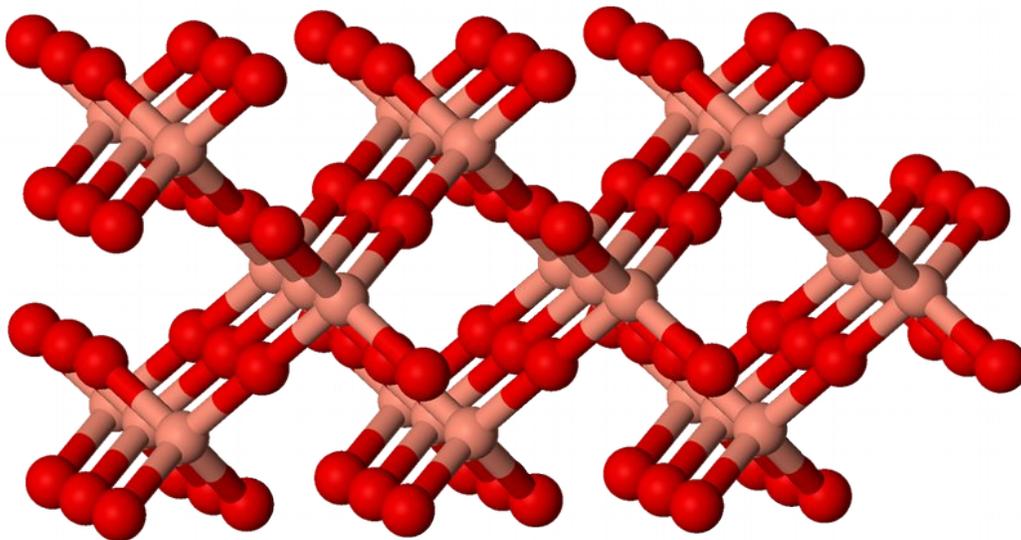
Addendum November 23, 2020: Before I post my own diagram of Cu_2O , let's look at the mainstream diagrams. We will start with the stick and ball model. This one is by Ben Mills, public domain at Wikipedia, but I don't mean to pick on him. It is beautifully rendered, and if the mainstream chemistry theory is bad, it isn't his fault, is it?



Let's count up the bonds. We have five coppers bonded to four oxygens. That doesn't work, does it? The other three coppers are just sitting there, unbonded, since the narrower sticks aren't bonds. They are just unexplained architecture. The central copper is bonded to four oxygens, which also doesn't work. Copper would have to have a valence of +4 to do that. And which of those central bonds is 119 degrees, and why? If we are bonding through electron clouds, how does a cloud bond along a certain

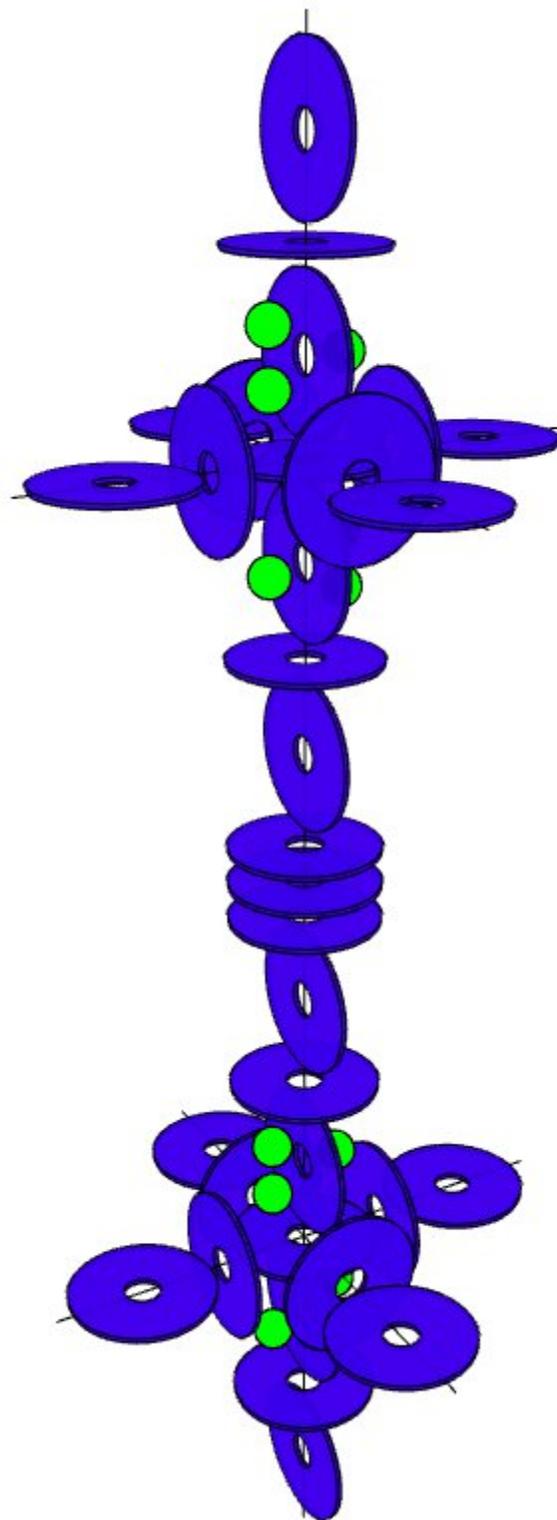
line, at a certain angle?

Given my nuclear diagrams, we know that can't be right, because copper doesn't have four places to bond. And even if it did, we would have to give some explanation of it.



That is the 3D balls diagram at Wikipedia. But they have switched the colors on us, because the central atom now looks like an oxygen. You normally diagram the cation darker and the anion lighter. So they appear to be stirring our brains again, to be sure we don't ask any questions. But the first diagram has to be right in that regard, since we need twice as much copper as oxygen. It has eight coppers and four oxygens, though three of the coppers are unlinked. But if we switch the colors in the second diagram, we can see why they did it: they needed to get more copper in the diagram at a glance, and they achieved that with the switch. But if we switch back to the right color scheme, the second diagram now has a lot more oxygen in it than copper. Let's count em up: we have 27 coppers and 82 oxygens, or 3 to 1 in favor of the oxygens. Wow, that's just a joke. Can you believe they try to pass this by us on the number two most visited website in the US?

Therefore, we know without further study we can toss both diagrams as completely worthless. The only thing that can be right about the first diagram is the oxygens being bonded to two coppers in a line. But if we do that with my diagrams, that trimer would seem to become a closed system. The architecture is symmetrical, same top and bottom. We have coppers on both ends, and both the north and south poles of the larger molecule are closed by double protons. So there seems to be no available plug on either pole for a further bond. The only way that trimer can bond *out* is via the carousel level, or *in* via the open inner holes. But charge is coming out all carousel levels, and you can't bond male to male. The only female plug we have is in the inner holes. See where the green neutrons are diagrammed? That hole could take two on each side, but it only has one on one side. So there is an open slot there:



*diagrams of this sort
by Arlo Emerson*

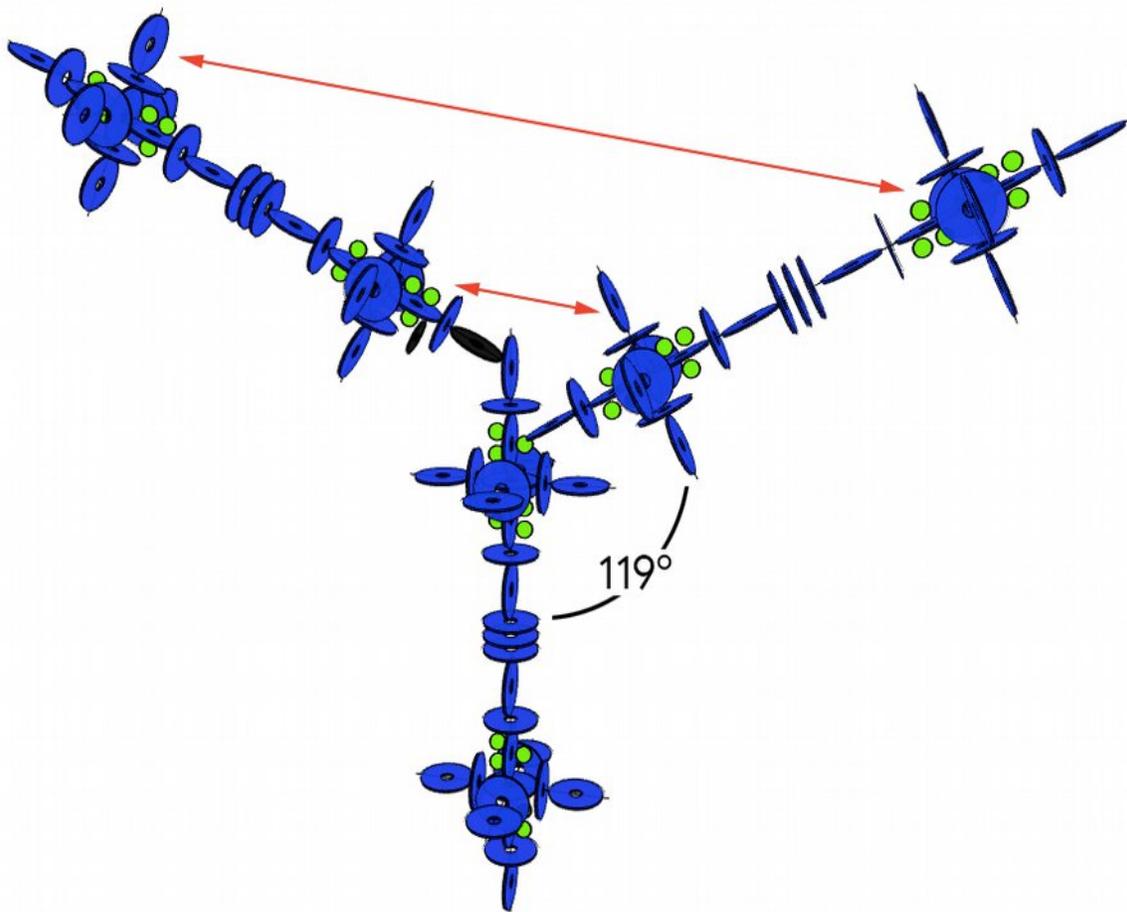
We haven't used that bonding slot much in previous molecules, but [we have used it a couple of times](#), so this is not a first. It is how the large halogens like Iodine bond. And notice that it would immediately explain the 119 degree angle. To plug in there, we have to come in either above or below

the carousel level, so we are 29 degrees north or south of the nuclear equator.

If that is true, it means my brief analysis above was incomplete. It isn't the imbalanced charge field by itself that creates the angle, it is also the necessity of using inner holes to bond adjacent trimers. This relatively strange bonding composition might explain the molecule's characteristics in semiconductors, where charge—and therefore light—seem to move slowly through the substance. That would be explained by the long winding paths charge must take through this molecular structure. It is also explained by the split charge fields, which we are about to unwind.

To make this work, we still need a male plug. The copper-oxide trimer doesn't seem to have that at first glance. However, again, we have the imbalanced charge field to work with. Even with a symmetrical construction, this molecule won't be channeling in both directions the same. In other words, charge and anti-charge won't be equal, since the ambient field isn't equal. Here on Earth, charge is twice as strong as anti-charge, so the south-to-north channeling will still prevail over the north-to-south channel. Therefore, our south-to-north channel will create an exiting charge stream to the north, and we can use that to create our male bond here. The problem with that is if we do bond there, we will have exceeded the channeling capabilities of the alphas, by my own rules. You can't plug more than two protons into an alpha (two black disks into a blue disk), because that exceeds its capability. You can't push more than one proton's worth of charge through one proton, obviously. Therefore, we have to divert part of the total charge somehow.

Well, that is exactly what the plug into the inner hole does. It splits the exiting charge two ways, sending part of it to the copper to the north, but sending part to the adjacent copper to the side. So we see that the mainstream diagrams were right in another way: there is a central copper, of sorts, but it is bonded three ways, not four:



And so you can now see the mechanical and physical reason the bond to the second copper to the north is also angled. Once we plug in the adjacent coppers at the 119 degree angle, that second line of charge interferes with the first line we had along the pole. The carousel levels of the second copper and the oxygens in his line will physically push the third copper to the north away from them (red arrows), creating an angle at the north pole. That is our secondary angle here, and you can see why it isn't the same as the primary angle. The primary angle is caused by the second copper plugging into the first via that inner hole, and having to do so around the carousel level of the first. But the second angle is caused by the second copper pushing the third copper to the north over. If the bonds were the same, you would expect a 3-way split and a 120 degree angle in both places. But a pole bond is not equivalent to an inner bond, for obvious reasons. So we get some skewing of the split. With the mainstream explanation, we had no mechanics to explain any of that.

Now that we see the basic structure of copper-oxide, we can guess what is happening in semiconductor use. Given the right manipulation, this structure could be rigged to create charge loops, in which charge and therefore light would get partially trapped. You can see how this architecture could be partially bonded back to itself, creating mazes light could only navigate with difficulty, having to travel much further than normal. So when we find light seeming to slow down to the speed of sound in semiconductors, it is not because the light is actually slowing below c , it is because its paths are being

lengthened by huge amounts, and much of this extra length is due to these mazes and loops.

