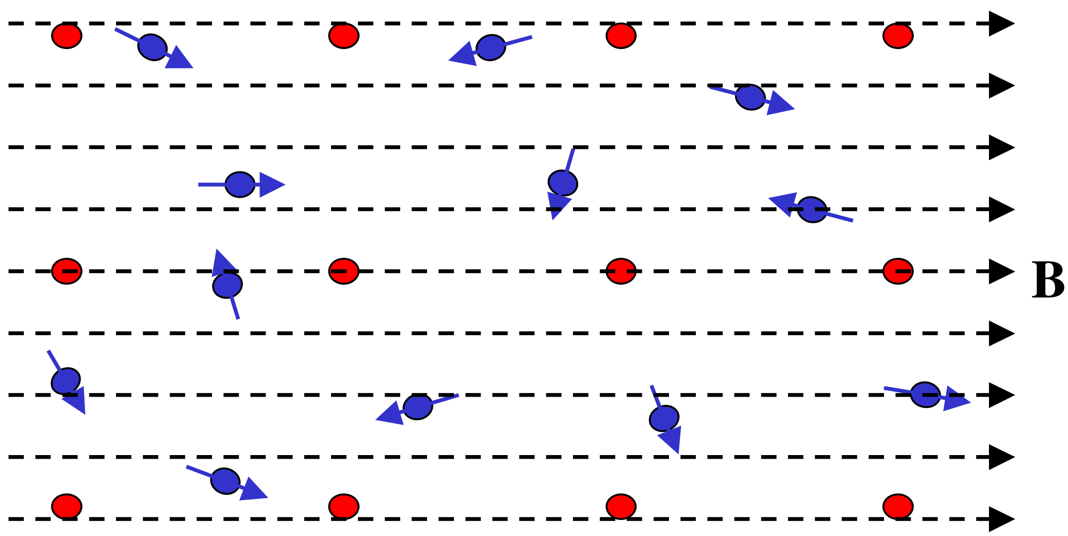
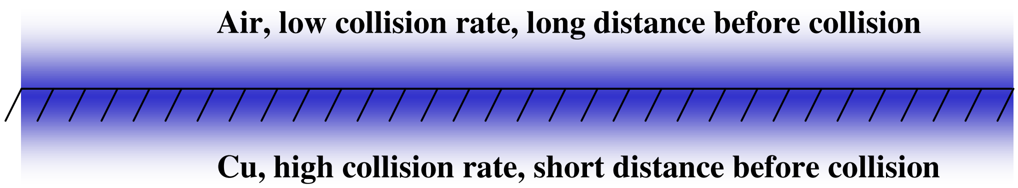
Using Surface Electrons to Obtain Excess Energy

Why does Cu have relative permeability of 1? Why don't the mobile conduction electrons align themselves with an applied magnetic field so as to give Cu some permeability greater than 1, i.e. make Cu appear slightly ferromagnetic? Below is a simplified image of the Cu atoms with enormous free space between them, the atoms shown as positive ions (red) with conduction electrons (blue) within that free space. Also shown are the spin axes of the electrons, that have random orientations. The presence of an applied magnetic field is also shown.

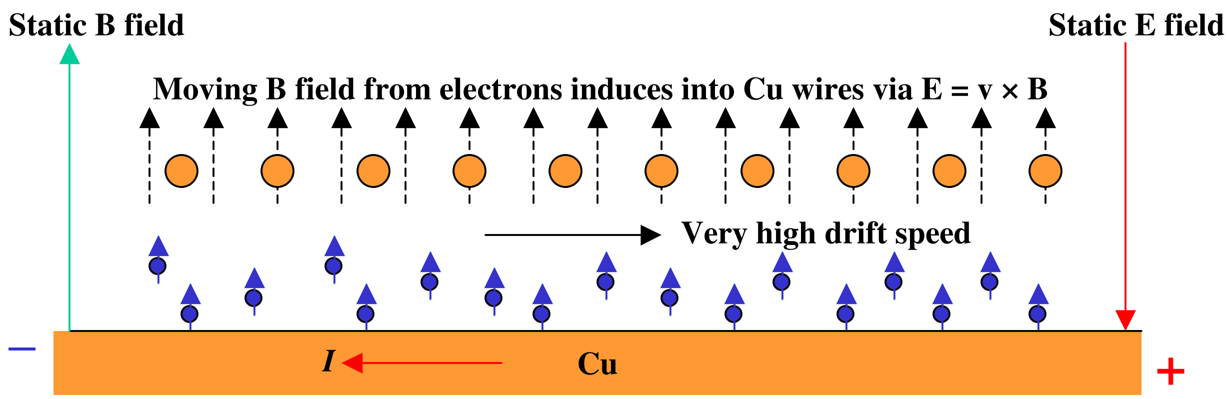


We know that the ions are fixed in the lattice and their magnetic dipole orientations are also fixed and random, so they do not produce ferromagnetism. But the conduction electrons are not fixed, so why don't they align with the field and contribute to a ferromagnetic property? The answer is that they are moving about randomly at Fermi velocity, and they collide with ions. "Collide with" is the wrong expression, they get absorbed then later re-emitted, and the re-emitted electrons leave their atom with random alignment. Free electrons *can* align with a magnetic field, but because they have mass that alignment is not immediate, it takes time and they finally precess around the field axis in a known manner and rate called Electron Spin Resonance (ESR). So the question becomes, is there enough time between an emitted electron and its later collision for such an alignment to take place. Well obviously not, because Cu does not exhibit a ferromagnetic property.

Next we look at a Cu conductor that is at a high negative electric potential relative to a nearby object so that electrons are drawn to the surface to create surface charge. The next image is a much simplified view of that surface. Because the electrons are moving at high Fermi velocity some actually leave the surface so the surface layer extends some distance into the air space outside the conductor. The blue intensity represents the net electron volume distribution (not the net negative charge distribution, that is obviously greater above the surface where no Cu ions exist).



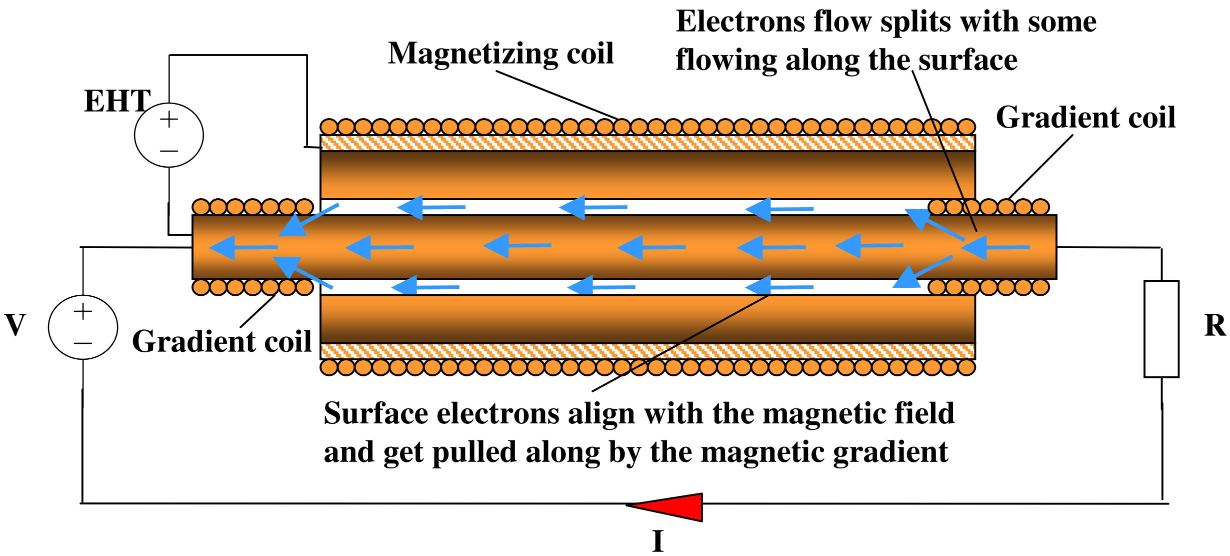
Clearly, because the air molecules are at a much lower density than the Cu atoms, the mean distance travelled by an electron in air before colliding with something is very much longer than that in Cu. There exists the possibility that those electrons have time to align with with an applied magnetic field, thus giving that surface layer a ferromagnetic property with $\mu_R > 1$. Also if given an electric field parallel to the surface (as exists along the surface of a Cu wire that is carrying current) those surface electrons have a significantly greater drift speed than those within the Cu. We can then have the situation envisaged in the next image where a B field normal to the surface along with a high value E field also normal create surface electrons with their spins normal to the surface and those electrons can travel parallel to the surface at significant speed.



The moving electrons within the Cu travel at trivial drift velocity and are not aligned with the B field, hence they only create the well known H or B field that exists external to the Cu, not shown here. But those external electrons aligned with the static applied B field move at non-trivial speed along the surface, resulting in a B field normal to the surface ***that is moving at that non-trivial speed***. This can induce into a Cu conductor that is helically wound around the central Cu and ***that induction will be DC***. Such DC induction into a coil is not recognized in classical physics. That it may be possible to do this is certainly worth an experiment to verify it, and that need not be too difficult.

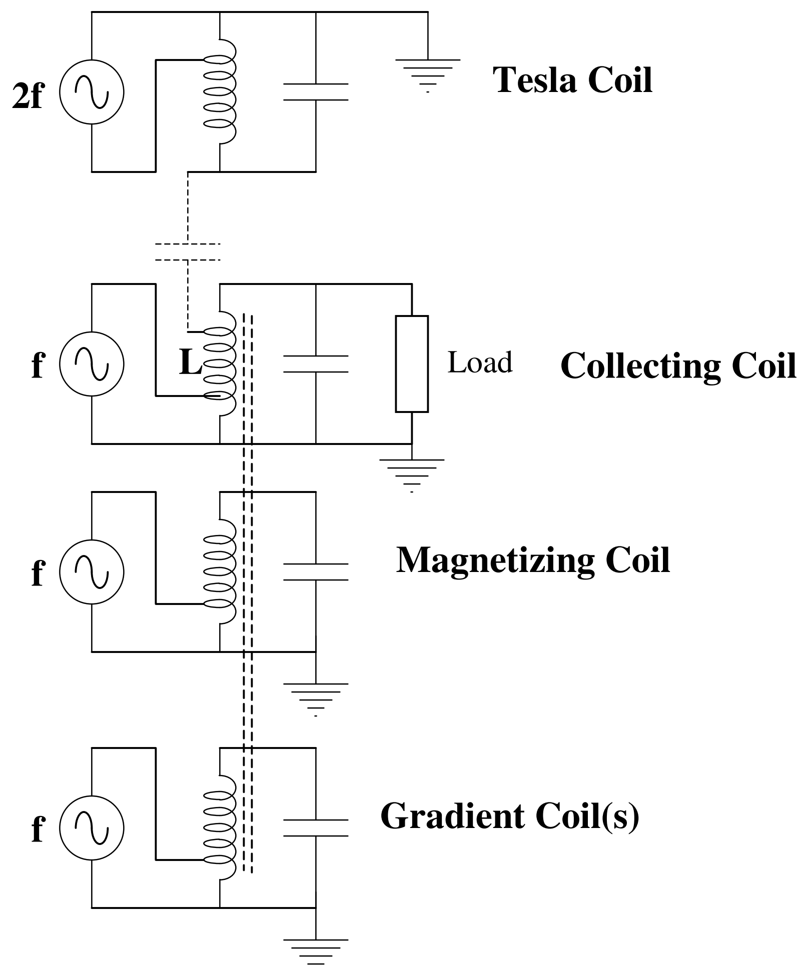
Although we have used static applied B and E fields to illustrate this principle, it may be noted that RF fields can be used if they are suitably phase synchronized. Further it may be noted that such alternating fields create a rectification effect, i.e. that when the surface is positively charged due to a lack of surface electrons the positive surface charge is simply positive ions fixed in the lattice so there is no magnetic polarization and there is no charge movement. Only a negatively charged surface can be ferromagnetic, it is as though the act of creating that surface charge brings that ferromagnetic surface layer into existence. That is like turning permeability on and off. And if that permeable layer is also in the presence of a magnetic field to become magnetized, that is like turning a magnet on and off.

If in the real world we had the ability to turn permanent magnets on and off at no energy cost, it would be so easy to make a perpetual running motor, simply bring two attracting magnets together while extracting mechanical energy, then turn them off to get them back to their starting positions and repeat the process. So is there the possibility that we can use surface charge to do something similar? The next image shows such a possibility.



Current is passed from a voltage source along a Cu rod to a load. A Cu tube concentric to the rod is at a high positive potential relative to the rod thus bringing conduction electrons to the surface of the rod. A DC energized coil ensures that the surface electrons align themselves with its magnetic field, then two further coils at each end of the rod create a magnetic gradient along the rod. Thus there are two parallel paths of electron flow, the surface electrons being much fewer than the inner ones but moving at a much higher velocity. The surface electrons as tiny magnets aligned with the magnetic field get pulled along by the magnetic gradient as well as by the potential gradient along the rod. They re-enter the rod at the far end. The additional pulling force on those surface electrons causes the current I to be greater than it would be otherwise, and when we analyse the power dissipated we find an anomalous quantity not accounted for by the power taken from the voltage source. The anomalous power is accounted for if the surface electrons are considered as tiny current loops, and as each loop moves through the magnetic gradient the flux change induces voltage so as to load its current source. Here we have an example where the spinning electrons can be considered as quantum dynamos supplying energy to our outside world. Unfortunately this is really just a gedanken experiment, in the practical world the energy gained is tiny and unlikely to be easily measurable, and certainly won't supply the losses in the coils (although they could be replaced by permanent magnets consuming zero energy). A carefully controlled experiment might limit the number of internal electrons contributing to the current by not using a conducting rod, but instead using a thin conductive coating on a rod insulator. This allows the outer electrons to make a larger contribution to the anomalous effect. However we don't have to use DC, using RF could offer a more rewarding result because (a) the skin effect eliminates the consideration of many of the internal electrons and (b) resonance can magnify the small anomalous voltage to make it more prevalent. This is considered in the next section.

Here we show an RF power source feeding a load via an LC tuned circuit. The coil that forms the inductance L is the collecting coil, it is where the anomalous energy is collected. A second coil (Tesla coil) is driven at RF to supply the high potential needed to pull electrons to the surface of the collector coil via capacitive coupling between the two coils. Since we wish to obtain anomalous voltage induction for both directions of current in L, the Tesla coil is driven and resonant at twice the frequency. A third coil supplies the magnetic field that aligns the surface electrons on the collector, and a fourth short coil emplaced at one end (or coils at both ends) supplies the gradient field. Coils 3 and 4 are driven from the same source as the collector coil and are also resonant so as to minimise input power.



No attempt has been made here to illustrate the disposition of the various coils, that should be obvious from the previous figure. It is hoped that those experimenters with the Rusian Grenade system might recognize how their coils might fit the descriptions here, and maybe help them to recognize where and how the excess energy can appear.