Infinite Particle Physics

Chapter 10 – Half-Baked Ideas

If a book is ever to be published, its author must stop creating, and start collating. This would be easy if all the necessary concepts could reach an even brownness simultaneously, like a sheet of cookies in an oven. But ideas obey no timetable, and are not subject to their creator's beck and call. Concepts come in bits and pieces, some with tantalizing prospects, others with just a glint of promise, many just time-consuming detritus! All of these sit in the mind like freshly-cut firewood, capable, someday, of starting a blazing fire, but needing a period of seasoning before they can be used.

So, why do these impede the book? Just reject the unseasoned ideas, and get on with it! This would be a good solution, if one had endless years ahead to let these half-formed ideas mature into the next book. Yet, for an octogenarian, the prospect for my having these endless years is not, shall we say, overly bright! Perhaps, I will have these years, but, just in case, it would seem that a *published* half-baked concept of potential merit is of more use to the world, than a fully-baked one sequestered in a cobwebbed mind!

Finding The Roots Of Magnetism

For over 150 years, since Faraday and Maxwell made quantitative study possible, magnetism has been studied exhaustively and used in endless ways to enhance our lives. However, despite its inestimable value, and despite all the millions of man-hours it has been studied, *no one has discovered what magnetism is!*

Can IPP Come To The Rescue?

What can IPP contribute toward explicating this mystery? Here are a few IPP concepts that may be germaine:

- Through our study, we now perceive that all force-fields are merely dynamic lattice distortion patterns, so we already know that *magnetism is a dynamic lattice distortion pattern!*

- We have known since Oersted's experiments that *groups* of moving charges, all moving in the same direction, at the same speed, i.e. an electric *current*, are necessary to produce a magnetic effect. From IPP's perspective, this hints that magnetism results from the *interactions* of an immense group of contiguous hovering ellipsoidal LD oscillators, all with very nearly the same frequency and ellipticity, because they move as a group.

- We perceive, however, that the wavelengths of these hovering oscillators are so short, relative to the distances between the moving charges, that there is no possibility of synchronized interactions at the basic hovering frequencies.

- *But*, IPP has let us understand that the *ellipticity* of a moving particle's hovering oscillator is due to *bound hemispherical shrinkage*, and this component of shrinkage produces an artifact we term a *de Broglie matter-wave*.

- These matter-waves *could* have long enough wavelengths relative to the charge-spacings in an electric current, such that they could interact to bring all the matter-waves of the moving charges into synchronization. They also *could not!* The possibility hangs on the actual velocity of the moving charges in a wire.

Now, let's see if we can use these concepts to discover the structures of magnetic fields, and their mode of interaction with moving charges. I trust, by now, that you are used to, and will tolerate, my non-mathematical, offbeat way of investigating phenomena!

The Structures Of Magnetic Fields

Since a magnetic field is a very complex phenomenon, we will do well to approach the total concept in stages. As a first step, let's attempt to find the de Broglie wavelength of electrons flowing in a typical metallic conductor used in a magnet coil:

The de Broglie Wavelength of Electrons in Magnet Coils

We know that the current *impulse* travels through the wire at nearly the speed of light (let's choose 0.9c), but we also know that conduction electrons in the bulk of the copper wire travel much more slowly. Let's compute the electron drift velocity for 1A of current in a 1 mm. diameter wire (#18 AWG). Here are some useful facts:

- Copper has 29 protons and electrons, and an atomic weight of 63.55. Copper metal has a density of 8.92 g./cc. Its atoms form a cubic lattice. The following calculation gives the number of copper atoms/centimeter in cardinal directions of the copper cubic lattice:

  $$\text{Cu atoms/cc} = \left(\frac{8.92}{63.55}\right)\left(6.022 \times 10^{23}\right) = 8.45 \times 10^{22}$$

  $$\text{No. of Cu atoms/cm} = \left(8.45 \times 10^{22}\right)^{\frac{1}{3}} = 4.39 \times 10^{7}$$

  What we shall assume, to determine the de Broglie wavelength, is that the electric current passing through the wire is rather like an incompressible fluid passing through a large diameter pipe, which feeds a very restricted nozzle at its end. You will see that the nature of the incompressible fluid defines the impulse propagation time, while the amount of fluid feeding the pipe determines the amount leaving, as well as its velocity. It is easy to see that the emerging velocity of the electrons can be many orders of magnitude higher than the electron velocity through the "pipe". Our interest will be in determining the "pipe" electron velocity, and the de Broglie wavelength of the "pipe" electrons, whose motions produce the magnetic field. Here is a sequence of calculations leading to our goal:

- A current of 1 A. conveys a charge of 1 coulomb/second, which is equivalent to $1 / 1.602 \times 10^{-19} = 6.24 \times 10^{18}$ electrons/second.

- The number of conduction electrons (@ one/atom) available in each cm. of #18 AWG copper wire (1 mm. in diameter):

$$(0.25\pi) \times \left(4.39 \times 10^{6}\right)^{2} \times \left(4.39 \times 10^{7}\right) = 6.64 \times 10^{20} \text{ electrons}$$

- The instantaneous number of translating electrons present in each cm. of wire at 0.9c propagation velocity:

$$\frac{6.24 \times 10^{18}}{0.9 \times 3 \times 10^{10}} = 2.31 \times 10^{11} \text{ electrons}$$

- The translational velocity, v_e, of the "pipe" electrons:

$$v_e = \frac{\left(2.7 \times 10^{10}\right) \times \left(2.31 \times 10^{11}\right)}{6.64 \times 10^{20}} = 9.39 \text{ cm./sec.}$$

- The de Broglie wavelength of the magnet-coil ("pipe") electrons, assuming that *all* of the available conduction electrons participate in the coil current, and v_e is their average drift velocity:

$$\text{de Broglie wavelength} = \frac{h}{m_e v_e} = \frac{6.63 \times 10^{-27}}{\left(9.11 \times 10^{-28}\right) \times 9.39} = 7.75 \times 10^{-1} \text{ cm.}$$

  Thus, the de Broglie (drift) wavelength = 0.78 cm.*

* You may have been wondering, as I did, what is happening to the other 28 electrons orbiting around each copper nucleus, as the current propagates through the wire. My perception is that all these electrons participate in passing the current *impulse* by subtle shifts of their orbits relative to the nucleus, but, being bound, can't contribute to the "pipe" current, and, thus, these bound electrons don't affect, or contribute to, the de Broglie wavelength.

Obviously, the above de Broglie wavelength must be viewed as some *component* of momentum, common to all the "pipe" electrons, which adds to all the other diverse components of momentum that each conduction-band electron possesses, such as orbital motion, thermal noise, changes in coil directions, or drift of the whole system through space.

The Consequence Of This de Broglie Wavelength

Since the de Broglie wavelength is seven times larger than the wire diameter, all the conduction-band electrons in a cross-section of the wire are within the first node of each other's matter waves. Thus, these electrons are constrained to drift at identical speeds, because their proximity causes hemispherical shrinkage components to interchange among all "pipe" electrons, until all have acquired precisely equal integrated drift momentum relative to the wire axis. Thus, their "drift" matter waves will become synchronized, and, hence, create large-scale phenomena.

We should not interpret this to mean that all the matter-wave oscillators will have drift components of identical phase, but merely that each drift component will be locked to the phase which the composite signal of the group has in its vicinity. In other words, viewed from a distant point along the line of the group's velocity, all the individual energy components of the drift matter-wave system will be additive — although, of course, they will be attenuated as the inverse square of the group's distance, and, because the components differ in phase and direction over the length of the wire, they will add vectorily.

Polarization Effects In The Vector-Summed de Broglie Waves

Since the integrated spin vector of each drifting hovering electron invariably points either in the direction of motion, or directly opposite to this motion (as I demonstrated graphically in Fig. 1-6), we can infer that the alternating fields of the "pipe" electrons' hovering oscillators will all be normal to the direction of drift (in an integrated sense). Of course, the wavelengths of these hovering oscillators are much too small ($c / f = 3 \times 10^{10} / 1 \times 10^{23} \approx 3 \times 10^{-13}$ cm.) compared to the average separation of "pipe" electrons ($1 / 4.39 \times 10^{7} \approx 2.3 \times 10^{-8}$ cm.) to effect synchronization of the hovering frequencies of adjacent "pipe" electrons directly. Thus, it is reasonable to conclude that the hovering oscillators will have all directions of polarization, and both spin directions, such that their alternating charge fields completely cancel, yielding no group effect, whatsoever.

Magnetic Fields Are Due To Synchronized Matter-Waves

So, to discover the nature of magnetic fields, we must seek our understanding of them in the synchronized de Broglie matter-wave components of these hovering oscillators. What characteristics will these waves have? Here are some plausible deductions:

- Being equivalent to a *constrained* photon, a matter-wave's LD oscillation will have its ellipsoidal major axis pointing in the direction of the electron's drift motion, and it will step in this direction.

- We must not forget the reason for the existence of the "pipe" electrons' matter-waves — they were created by applying a voltage across both ends of the magnet wire, and this voltage has obviously divided proportionately amongst all the layers of copper atoms comprising the wire, causing the center of the electron orbitals to shift relative to the positive nucleus, thus creating a voltage gradient between lattice layers along the length of the wire. This gradient has accelerated the conduction-band "pipe" electrons of each atom, thereby developing a matter-wave component in each "pipe" electron.

- Now comes the tricky part of this analysis! Let's ask this question: Do the "pipe" electrons, seeing a succession of gradients layer by layer, continue to accelerate as they move through the wire, or do they reach a steady-state velocity in moving through just one layer, which velocity they maintain throughout their progression down the wire? The answer becomes obvious when we reflect on the nature of the matter-waves generated by this gradient:

These Matter-Waves Contain A Charge Field

Here is how to perceive this phenomenon:

- A "pipe" electron's linear drift along the wire requires the addition of a *directed* component of hemispherical shrinkage to its hovering oscillator. This component of hemispherical shrinkage can be created only by the splitting of a *static* component of spherical shrinkage, which, in this case, has been created by the application of a voltage to the magnet wire. This spherical shrinkage is in the form of a plus-minus *charge-displacement field* in each copper atom, which has resulted from the lengthwise displacement of the center of its electron orbitals relative to the location of its +29e charge nucleus. This increment of spherical shrinkage will immediately split, because the conduction zones between copper atoms contain *unbound* electrons which can be accelerated by the charge-displacement field, and therefore can accept one hemispherical component of the splitting spherical shrinkage. The other component then becomes attached to the resulting +e charge copper ion, accelerating it in the opposite direction.

- What is germane to our argument is that, in splitting from spherical shrinkage bound to a charge-displacement field, the two oppositely directed hemispherical shrinkage components *must continue to sum* to this charge-displacement field. Therefore, each split component must contain a charge field of half the mass-energy of the charge field of their spherical shrinkage precursor. And, naturally, this charge field must be manifest in both of the oppositely-directed de Broglie matter-waves which develop within these two splitting hemispherical shrinkage components.

These Two Matter-Waves Have The Same Wavelengths, Etc.

Since the splitting of spherical shrinkage contributes equal momentum to the two separating particles, their oppositely directed drift *will manifest identical de Broglie wavelengths*, even though the Cu ion, being about 110,000 times heavier, will be drifting 110,000 times slower*. The two de Broglie wavelengths will also *have the same phase*. This is easily understood, since they must sum to a spherical shrinkage LD oscillator of twice each de Broglie oscillator's mass-energy. Also, the *charge fields* of the de Broglie waves of the two particles *will also be additive*, such that they wax & wane together at every point in the surrounding space, and have an integrated value equivalent to the inverse-square-diminished value of their central static charge-displacement field. The magnitude of this central field is, of course, equal to the voltage applied to the two ends of the wire divided by the linear number of Cu atoms in the wire.

* This tendency of the copper atoms to move when current passes through a wire is well known to makers of electromagnets, and they make certain that the magnet coil is mechanically constrained. Thus, the momentum opposite to the group of conduction electrons may ultimately be required to move the magnet coil, the magnet's core, and even the laboratory, depending upon how firmly all are bound together. You should see that our analysis is not affected by these variables.

Thus, the static field across each copper atom transmogrifies in the process of drift-generation, to become a field component of the oppositely-directed matter-waves of each atom in the wire. Here, then, is the answer to our beginning question: The "pipe" electrons will drift with a velocity equivalent to the acceleration of one lattice layer!

Notice, however, that, as the conduction electrons drift away from their host ions, they penetrate another layer of the copper lattice, and thereby neutralize the ions in that layer during their transit, although both are drifting in opposite directions. We see, then, that the voltage gradient in the wire is no longer generated by displacement of the orbitals relative to the nucleus, but is, rather, created by a multiplicity of de Broglie matter waves.

Now, adding together the various gestalts we have accumulated in the above discussions, we finally are able to describe —

The IPP Concept Of A Magnetic Field

Placing an electromotive force between the two ends of a conducting wire causes each atom in the wire to become a point of origin of two oppositely-directed de Broglie matter-waves, each wave so constituted as to produce an inverse-square charge field everywhere parallel to the wire axis at the matter-wave's point of origin. These oppositely-moving de Broglie waveforms, which exist in the form of infinitely expanding & drifting lattice-density oscillations, have the same frequency & phase, and sum together to form a composite charge field whose gradient & direction is determined by the vector contributions from all the hovering oscillator drift components of every atom in the magnet coil wire.

Of course, we must perceive these charge-field-containing oscillations as merely a *component* of a much more complex de Broglie waveform containing many more components of hemispherical shrinkage. The mix of hemispherical shrinkage components will undoubtedly differ among all the individual particles comprising the copper wire. These components fall into four basic categories:

1) Those associated with the translational velocity of the laboratory system relative to absolute space.

2) Those associated with the drift velocity of the "pipe" electrons, and the oppositely directed velocity of the copper ions, et al.

3) Those associated with random thermal motions of the atoms & conduction electrons in the copper wire (lattice vibrations).

4) Those associated with random "cosmic noise" (the interactions of everything in the wire matrix with "destabilizing agents").

The last two components of momentum, being random in amplitude and direction among the individual conduction electrons comprising the coil current, can produce no group effects. We can also ignore in our analysis the momentum components due to the laboratory's velocity relative to absolute space, since these normally remain unchanged over the course of an experiment. Thus, we can confine our analysis of magnetic fields to the field-induced momentum components of the oppositely drifting conduction electrons & copper ions in the magnet coil.

The Geometry Of Magnetic Fields

A magnetic field is simply an implicit charge field developed by the summation of field-containing de Broglie matter-wave components from the totality of oppositely drifting conduction electrons & ions in a conductor. The gradient & direction of this implicit charge field will be found to vary continuously, because the sources of the de Broglie waves are uniformly distributed along the breadth and length of the conductor, and take their individual gradient directions from the direction of current flow at each point in the conductor. Thus, the *geometry* of the magnetic field external to a current-carrying conductor depends upon four things:

1) The *location* (coordinates) of all the de Broglie emitting elements (electrons & ions) of the conductor.

2) The *direction of the charge gradient* at each of these de Broglie emitting locations.

3) The *magnitude of this charge gradient* at each location.

4) The *nature of the external medium* in which the magnetic field develops.

There is no need to elaborate on the first three points, since all of you physicists are expert at the integrations needed to calculate the electric field gradient at any point in this external implicit charge-field pattern. What you should notice, however, is that IPP's notion of a magnetic field allows us to purge physics of all the complicated rules of the directions of magnetic lines of force relative to direction of the initiating current flow, and the direction of the magnetic force relative to the direction of movement of a charged particle. All one needs to keep in mind is the way in which the voltage gradient applied to a magnet coil is manifest in the multiplicity of de Broglie waves forming this charge-field pattern. Then, knowing the direction and gradient of this field at each point, we can easily determining the direction of deflection of a charged particle moving through this point — it just becomes a problem in electrodynamics.

We Reach A Point Of Unclarity

The charge-field-containing de Broglie matter-wave concept of magnetic fields is a good start, but we obviously need to understand point 4), above, to fully understand magnetism. We need to know how the nature of the medium surrounding the source of these de Broglie waves affects the implicit charge-field generating process.

The Nature Of The Magnetic-Flux Medium Is Important!

To illustrate, suppose that a portion of the external medium is a conductor. Won't the charge-gradients developed by the de Broglie waves in this conductor cause separation & opposite drift of the conduction electrons and ions in this conductor? And won't these drifting electrons and ions in the external conductor create charge-containing de Broglie waves which rob energy from the magnetic field, tending to lower its de Broglie frequency, which interacts back upon the coil current to increase the flow of "pipe" electrons sufficient to maintain the same EMF per layer of the copper lattice? So IPP shows us why the net result of placing an external conductor in a magnetic field is to increase the coil current — but many complications accompanying this insight remain to be explained.

Other Complications

For example, there is the problem of understanding ferromagnetism, diamagnetism, and permanent magnets from the IPP perspective. These problems obviously relate to the ease or difficulty of establishing temporary, or permanent, circulating currents in various materials immersed in magnetic fields. And the key to understanding the mechanisms of these currents lies in discovering how adjacent atoms in a conductive matrix can adjust their electron orbitals so that they intermesh, and thereby continually pass electrons from one to another as part of a group electron orbital process. *If the conductive atomic matrix has properties which permit continuous loops of these orbitally connected adjacent atoms, then electron current can flow in these loops forever with no energy loss.*

Circulating Orbital Currents May Depend Upon Nuclear Structures

I suspect that IPP will eventually show us why these conductive loops exist only in conductors made from a limited number of elements from the periodic table. And this understanding will derive from IPP's insight that the *configuration* of an atom's electron orbitals is determined by the *shape* of its nucleus, and, thus, from IPP's ability to discern (ultimately) the actual shapes assumed by the nucleons that comprise each isotope of each element, and the way the surface charges of these nucleons vary during the synchronized charge-exchange cycles of adjacent nucleons. Achieving these insights to elements throughout the whole periodic table will be a tremendously challenging task, and I am content to pass this on to younger minds.

How IPP Explains Superfluidity Of Helium 4

Webster's New World Dictionary defines superfluidity as:

"The phenomenon, exhibited by liquid helium at temperatures below 2.18° K, of flowing without friction and having very high thermal conductivity"

This definition falls far short of conveying the baffling nature of this ability of "flowing without friction". For example, when liquid helium above this critical temperature is poured into a beaker, which is then placed in a transparent container in a cryostat, and subsequently cooled below this critical temperature, a wonderful phenomenon occurs: What one notices is that, in defiance of all common experience, the liquid helium appears to have "leaked" through the walls of the beaker, and has reached a common level inside and outside. If one seeks a more plausible explanation, one must assume that the liquid flows up the walls of the container, against gravity, over the beaker lip, down the outside walls, and into the bottom of the surrounding transparent container. In other words, the liquid film on the beaker walls behaves as if were a siphon, wherein the helium film flows from higher to lower level because of superfluid helium's ability to form linear sheet-polymers of tremendous tenacity whose affinity for adjacent polymer sheets is essentially nil. One can picture these sheets as having indeterminate widths and lengths, but having group continuity able to stretch from the inner liquid level over the beaker lip to the outer liquid level. *The property crucial to superfluidity* is the *complete lack of bonding* between these polymer sheets and any materials they come in contact with, including each other. Let us see how IPP explains this non-bonding property:

IPP Concepts That May Provide An Explanation

We begin by assuming these things:

- That the two protons and two neutrons of helium form a planar structure parallel to a cardinal lattice plane.

- That the +2e charge of the helium nucleus is in the form of four +1/2e c-voids, which do not participate in the internal charge-exchanges, and hence reside unchangingly on the outer ends of the four "spokes" of the helium structure.

- That, because of these fixed positive charges, the two "faces" of the helium structure, in both charge-exchange states, consists of equal numbers of plus and minus c-voids. Hence, these faces remain ever neutral, and, thus, have no ability to attract external particles.

- That helium's two electrons "graze" the nucleus at the closest approach of each electron's orbit.

- That these electrons fail to hit the nucleus, because their negative charge alters the charge-exchange timing of helium's two-state charge-exchange cycle, so as to produce an asymmetrical charge pattern which deflects the electron away.

- That the angle of this deflection influences the geometry of the orbitals, such as ultimately to bring each orbital's close approach at the same point in helium's two-state charge-exchange cycle, i.e. the orbitals are quickly synchronized to the charge-exchange cycle.

- Because the two orbiting electrons tend to repel each other, the closest approaches of their orbits will *alternate*, such that one is at the extremity while the other grazes. This tendency to repel also causes the *two orbitals to take diametrically-opposite pathways* toward the helium nucleus.

- Because all four of helium's +1/2e charges are in a common plane, *its two electrons will tend to orbit in this plane.*

- Because these two electrons orbit diametrically opposed, there are two vacant sectors in which two other orbits from adjacent helium atoms can find roaming room. At first thought, it might seem that these adjacent atoms could lie in any of the three cardinal planes, and still offer a suitable orientation for roaming into one of these two vacant sectors. But this thought must be rejected, because only orbits of adjacent helium atoms that lie in the same cardinal plane as the invaded atom will be able to satisfy the planar orbital requirements of both atoms.

- Obviously, as intruding electrons penetrate into the "vacant" sectors, their orbital timing sequences must be 90° out of phase with those of the invaded atom, so that they see maximum attraction from the invaded nucleus, but all these changes are easily accomplished.

- **The resultant of all these interacting attributes** is a tendency of supercooled helium atoms to join together in a cross-linked planar structure, or "sheet polymer", whose surfaces are composed of orbiting electrons centered upon

nuclei which have neutral surfaces. Since the helium atoms, as a group, consist of equal numbers of all three cardinal-plane orientations, they will tend to form extensive sheet polymers *in all three cardinal planes*, each capable of sliding relative to other sheets in the same plane *with absolutely no interaction.*

How These "Polymer Sheets" Move Around Corners

We will recall that the orientation of cardinal planes of the space lattice change each time a particle passes through a grain boundary. This suggests that sheet polymers will be constantly breaking up and reforming in different direction relative to the laboratory apparatus. Perhaps we should visualize a superfluid liquid as a sort of jumble of short pieces of non-stick noodles which constantly appear to twist and turn, as new components join to form new pieces in different directions. What links all these short pieces together, even though they have no tendency to bond to orthogonal sheets, is the tendency of their component atoms to form new sheets, with new partners, after each shift of the direction of their cardinal plane. This constant shifting and re-bonding makes each atom part of the total fabric of atoms, even though, at any instant of time, this fabric has no wide-scale integrity. The fabric can go around corners, because the bits and pieces can link in any direction, due to grain-boundary transits.

See Pions

