the general science journal

ELECTRICAL CHARGE

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Let us look freshly at the electrical field, as if we are encountering it for the first time—as if we are aliens just arriving upon earth, uploading books from the Library of Congress and studying them for signs of intelligence. One of the first books[1] we open tells us this,

> The conceptual difficulties [of action at a distance] can be overcome with the idea of the field, developed by the British scientist Michael Faraday…. It must be emphasized, however, that a field is *not* a kind of matter. It is, rather, a concept*—and a very useful one.

Let us also look at the footnote referred to here:

> *Whether the electric field is "real" and really exists, is a philosophical, even metaphysical, question. In physics it is a very useful idea, in fact a great invention of the human mind."

As honest aliens, we must see that this footnote is absolutely false. The question of how the electrical field works is not a metaphysical one, it is a mechanical one. What Mr. Faraday has done is create a heuristic device that also works as a mental misdirection. Look at what the book says,

> "The electric field at the location of the second charge is considered to interact directly with this charge to produce the force."

So the field was created in order to allow them to say that. Mr. Faraday, desiring to clear up action at a distance, drew a line with a pencil from one charge to the other, called that a field line, gave it no physical reality and no mechanical definition, and claimed that the pencil line interacted directly with the second charge. That is supposed to be a great invention of the human mind. As aliens, we must wonder what would be considered a dishonest creation of a human mind.

The book buries this bit of dishonesty with its own, calling mechanics "metaphysics." This is to warn off anyone from asking the questions we are asking here. Humans do not like to be called names, and these physicists are warning readers that if they ask any questions about the reality of the field, they will be called mean and scary names. Physicists do not like to be called philosophers or metaphysicians, and just the threat of it is enough to move them on. This despite the fact that the question involved is clearly and unambiguously one of mechanics. If transmitting a force from one object to another is not mechanics, nothing is.

Next we notice that the basic unit of electrical charge is either the Coulomb or, less often, the statcoulomb. The Coulomb is defined as an Ampere-second, and an Ampere is defined as "that current flowing in each of two long parallel conductors 1m apart, which results in a force of exactly 2 x 10^{-7} N/m of length of conductor." We also are told that two point charges will feel a force of 9 x 10^9 N at a separation of 1m. A statcoulomb is "that charge on each of two objects that gives rise to a force of 1 dyne at the separation of 1cm."

$1 \text{ statC} = 0.1 \text{ Am/c} \approx 3.33564\times 10^{-10} \text{ C}$

As aliens, our first question would be to ask what physical parameters the Ampere has, in terms of length and time. The books do not seem to want to tell us that. We are only told that the Ampere is used as a defining unit in order to obtain an "operational definition." This means that it is much easier to measure current than to measure charge, so the earthlings have decided to base their units on current. But if we are persistent, we can discover electrical charge in terms of length and time. We have to go to the pages on the statcoulomb, and look at its historical derivation.

There we find Coulomb's law and the calculation of the constant in it.

$F = kq_1q_2/r^2$
$k = 1/4\pi\, \varepsilon_0$
$\varepsilon_0 = 1/c^2\mu_0$
$\mu_0 = 4\pi\times 10^{-7}$ N/A^2.

Wow, these earthlings really don't want to tell us what they are doing. Here we have three different constants stacked on each other, each with a more obscure name than the last (electrostatic constant, permittivity of free space, permeability of vacuum) and the final constant circles back and is defined in terms of the Newton and the Ampere. We are being led on some sort of wild goose chase.

But we can still squeeze it out of them. Using Coulomb's law and working back from the last constant, we discover that q actually has no dimensions. All the necessary dimensions are given to the constants, and q is just a floater. If a Coulomb is an Ampere-second, then an Ampere must be a Coulomb per second. Go into the last constant equation, concerning the permeability, and substitute "nothing/second" for an Ampere. If you do that, you get the perfect dimensions for the force in Coulomb's equation. This means that electrical charge is mechanically undefined in the SI system. It cannot even be a wave, since a wave must be defined in cycles per second. We don't have any cycles here or seconds. An Ampere is a nothing per second, but a Coulomb is just a nothing.

The cgs system ditches the constant and gives the statcoulomb the dimensions $M^{1/2}\, L^{3/2}\, T^{-1}$. This gives the total charge of two particles the cgs dimension gm^3/s^2. This begins to tell us something, since, being aliens, we have a very long memory. We remember that Maxwell gave mass the dimensions L^3 T^{-2} (see my paper on the "ug.html" Universal Gravitational Constant) which would make the total charge M^2. This would give the total charge of two particles the cgs dimension g^2 or m^6/s^4. And this means that charge is mechanically and mathematically equivalent to mass. Coulomb's equation is then not just similar to Newton's equation, it is *exactly* the same. We could actually write the charges as masses and nothing would change.

If we express one charge in terms of mass and one charge in terms of length and time, then Coulomb's equation gives us the force in gm/s^2.

$q_1q_2/r^2 = F$
$(g)(m^3/s^2)/m^2 = gm/s^2$

But we could also express both charges is terms of mass

$(g)(g)/m^2 = F$
$F = g^2/m^2$

Or in terms of length and time

$F = m^4/s^4 = v^4$

Notice that this last equation tells us that a force is a velocity squared squared. That is perfectly logical, although it is not something we ever find in these physics textbooks.

Now, we must ask why the Standard Model spends so much time larking about with permittivity constants and so forth. This is all misdirection. Many people will see those constants and think that free space or the vacuum actually have permeability or permittivity. But the truth is these constants are just folderol. Space and the vacuum only take on characteristics when you fail to give characteristics to your primary qualities. Charge, like mass or length, is a primary quality. It is a quality you assign directly to matter to explain the interactions you see or measure. If you create a quality and then fail to assign it any dimensions, then its dimensions will revert to the vacuum; but not otherwise.

But it is just stupid to create a quality like charge and then refuse to let it have dimensions. Why would any scientist create a fundamental quality, refuse to define it mechanically, and then allow its parameters to be soaked up by the vacuum? A vacuum is supposed to have no parameters and no qualities, by definition. If we are going to give the vacuum qualities, we might as well flip our terminology and start calling the vacuum matter and matter the vacuum. Matter is supposed to be something and the vacuum is supposed to be nothing. But it is now the fashion for both the Standard Model and new theories to assign characteristics to the vacuum instead of to matter. This is nothing short of perverse.

As you can see, it is the old statcoulomb that has a degree of transparency. The Coulomb is defined in the most roundabout way, and then a bunch of meaningless constants are piled on top of it, to obscure it. Why? Why are physics textbooks such a mess? And why are they so much worse now than they were a hundred years ago? Why has the statcoulomb been replaced by the Coulomb? Why have the explanations become more obscure rather than less? Why would physics choose to replace the statcoulomb with the Coulomb, and hide the definition of charge beneath such embarrassing piles of absolute garbage?

Let me show you some more misdirection. Wouldn't it have been more logical to explain the electrical field in the same general terms as the gravitational field? In both cases we have a basic force between two particles. In both cases we create a field to help explain it. Why then vary the logic when expressing these two fields in scientific language? Why choose to express the gravitational field in terms of mass and acceleration, and the electrical field in terms of charge?

Given two large bodies, we see an apparent attraction and we assign the cause to mass. Given two very small bodies, we see a repulsion and we assign the cause to charge. Why not assign it to mass? Or, to put it another way, with large objects we immediately assign the cause of the attraction to the matter involved. The matter either acts directly or creates the field, therefore we call the causation "mass." Why not do the same thing with small particles? Why avoid mass and matter so persistently? Why create this nebulous thing called charge and never allow it, decade after decade, to be explained mechanically?

With gravity, we assign the term directly to the force. Gravity creates the force or is the force. Mathematically, gravity is an acceleration caused by the force.
$g = F/m = N/kg$

But the electrical field is expressed without mentioning either mass or acceleration. Instead we have a characteristic called charge, which is either equivalent in dimension to mass (in the case of the statcoulomb) or which has no dimensions (in the case of the Coulomb). Let us skip the Coulomb as a mechanical non-entity and focus again on the statcoulomb. Remember that the statcoulomb is defined as a force at a distance. Well, gravity is also a force at a distance. Or, a statcoulomb is that thing that causes a force at a distance. The charge is not the force or the distance. It is the cause of the force, and the distance just gives us the magnitude.

Again, the same can be said for gravity. With gravity, mass is not the force or the distance, it is the cause of the force, and the distance just gives us the magnitude of the acceleration.

$m = F/g = N/a = N/m/s^2 = Ns^2/m = (Ns/m)(s)$

You may ask, why did I go on to express mass like that? Well, watch this. The Ampere is also defined as 2 x 10^{-7} N/m. A Coulomb is an Ampere-second. Therefore a Coulomb is

1C = 2 x 10^{-7} Ns/m

So mass may be thought of a Coulomb-second.

The problem with all this is that using current definitions, a Coulomb has no dimensions or the dimensions of mass/second. But a statcoulomb has the dimensions of mass.

statC = L^3/T^2
C = L^3/T^3

Can both be right? It is clear that we need to forget about current and finally define the charge mechanically. We must know what physical interactions are causing the forces, in order to clean up this mess.

To do this, the first thing we may notice is that when speaking of the gravitational field, a force does not have to include the distance at which it is felt. A Newton at a distance of 1 meter is the same as a Newton at a distance of 10m. A Newton is a Newton. Admitting this, why do we have as part of the definition of a Coulomb that it is a force at a certain distance? The reason, of course, is that the electrical force is caused by a large number of subparticles and (according to my theory) the gravitational force is not. If we assume that a static repulsion is caused by the bombardment by a huge number of tiny particles, then the total force is a summation of the individual forces of those particles. To obtain this summation, we must know a particle density. This is why we need to know a distance and a speed. The distance gives us an x-separation between the two objects in repulsion, and since we assume the density is constant or near constant, the y and z density must be the same as the x-density. This gives us the size of the “field” that is creating the force. The speed gives us the density of the field at a given dt. In this way, the electrical field acts as a third particle moving from one object to the other, imparting the force by direct contact. But this third particle is much less dense than the two main objects. It acts like a discrete gaseous object, moving from one place to another at a given speed. This speed is of course c.

If we define the field this way, instead of as lines, we can obtain a mechanical explanation of the E/M field. Mechanically and operationally, what we are interested in is the force imparted. Mass and charge are just characteristics invented to explain the force we measure. The force is the experimental fact; mass and charge are just abstractions, or ideas.

What we need to do to clean up the historical mess is a way to explain charge as mass. We need to jettison the whole ideas of charge, since it is not mechanical. It is needlessly fuzzy.

Quantum physicists will say that charge is not the equivalent of mass, since mass is caused by the ponderability of matter, or by its inertia, or by other equivalent ideas. Charge is thought to be caused by spin. I actually agree with this distinction, but I don't think it matters here, mechanically or operationally, and this is why. If the electrical force is caused by a gas of ejected sub-particles, as I proposed, then the term "charge" applies to the summed mass or momentum of those sub-particles. It does not apply to the spin. We don't need to know the mechanics of the spin in order to sum the momenta of the sub-particles. It doesn't matter what *caused* the momentum. In measuring and explaining the force, we only need to be concerned with the sum of the momentum.

Of course, once we have found a way to mathematically sum the momemtum of the gas, we may ask how the gas is created. Then we are taken back to the spin of the elementary particles in the repulsing objects. It would appear that the spin causes the ejection or radiation. This would mean that charge is *caused* by spin; but charge is not spin. Charge is the mass or momentum of the ejected gas or radiation.

The only truly important distinction here is that mass is a quality that is normally applied to the main two repulsing particles (protons or electrons, say), whereas charge must apply to the mass of the field—the summed mass of the sub-particles. By this way of looking at it, protons and electrons do not "have charge." Protons and electrons radiate sub-particles, and the summed mass or momentum of these sub-particles is the "charge." Definitionally and logically and mechanically, **charge is the summed mass of the sub-particles.** In short, charge is mass.

And this is why charge acts mathematically just like mass. It *is* mass. To calculate the charge, you need to know the mass and the distance. You are given the speed, c. This allows you to calculate the momentum. Notice that the distance is actually used to calculate the mass, since distance is telling you how large your gaseous object is. The distance is not telling you that you have a force working through a distance, as with the definition of the Joule. No, the distance is in the denominator in this case. You are dividing the force by the distance, and this is because you are seeking the mass of your gaseous object.

The speed, c, is also used to calculate the mass of your gaseous object. Once again, this is because it is possible to calculate a mass if you are given a size (the distance) and a speed. The speed tells you the density at each dt. It is like a wave density. You have a certain number of sub-particles impacting your main particle at each interval. If you are given a length and a speed, then you have a time. This gives you a density.

You will say, yes, if you already know the force, then you can work back to find a mass for your gaseous object. You can find the mass of the electrical field that way. But if we don't know the force, then we can't know the mass, since we have no way of knowing the mass of each sub-particle. We must have something to sum, in order to find a density. If we don't know what each sub-particles weighs, we have nothing to sum. The speed and distance don't help us.

That is true as far as it goes, but the fact is that we can measure the force. That is why modern physicists have chosen to define everything in terms of the current. We can measure the force and the time and the distance. We know the speed also. Therefore it is quite easy to calculate the mass of the electrical field.

You will say, OK, but we still cannot know the mass of each sub-particle, since we don't know how many there are.
Once again true, but not really to the point. My point with this paper is not to assign a definite mass to the force-carrying sub-particle of the electrical field. It is to show that by giving mass to the electrical field we can totally dispense with charge, both the name and the idea. Charge is not a separate characteristic of matter. Charge is in fact the summed mass of these sub-particles.

This allows us to clean up the great mess of the electrical field. Rather than define a fundamental characteristic like charge by later interactions, we can resolve that characteristic into even more fundamental characteristics. It is topsy-turvy to define charge in terms of current, since charge is supposed to be the cause and current the effect. You do not define causes in terms of effects. My housecleaning defines charge in terms of mass, which not only puts a floor under something that was hanging—it also allows us to throw the hanging thing out as garbage. It allows for a great simplification of theory.

Not only that, but it allows us to throw out a lot of meaningless constants at the same time. By assigning mass to matter in the field, we avoid having to assign characteristics to the vacuum or to free space. Free space does not have permeability of permittivity or anything else. Free space is free space. It is space, and it is free. It it were permeable or permittive, it would be neither. Only when you refuse to assign parameters to charge does free space begin to take on characteristics. Only when you refuse to make sense about matter, does your space also refuse to make sense.

Now we are in a position to resolve the Coulomb and the statcoulomb. Above I found that using only the dimensions of length and time

$\text{statC} = L^3/T^2 = M$
$C = L^3/T^3 = M/T$

Since I have shown how the mass of the radiation is calculated from the length and the speed, we can see where the difference comes from in these two equations. The statcoulomb comes directly out of Coulomb's equation. In that equation we are finding a single force. It has been called an instantaneous force, but since I don't believe in instantaneous forces, I will call it a force over one defined interval. Since it is force over one interval, we are dealing with a velocity, not an acceleration. You cannot have an acceleration over one interval. That is why the first equation has one less time dimension in the denominator.

But remember that we took the Coulomb equation from an experiment that measured current in a length of wire. Since we have an extended length, we must also have an extended time. Although we may have a constant velocity and therefore an acceleration of zero, we still must represent that series of intervals in our math. That is why the Coulomb equation has the extra time variable in the denominator.

Before I move on, let me clear up one other mess. The permittivity of free space is

$\varepsilon_0 = 1/c^2\mu_0 = 8.8541878176 \times 10^{-12}$ C^2/Jm

Permittivity ε_0 is the ratio **D/E** in vacuum.

μ_0 is the **permeability of vacuum**, and has the value $4\pi\times10^{-7}$ N/A^2.

N/A^2 turns out to be m^2/N, so that

$\varepsilon_0 = 8.85 \times 10^{-12}$kg/m^3

Or, if we express mass in terms of length and time, then

$\varepsilon_0 = 8.85 \times 10^{-12}\ /t^2$

The displacement field **D** is measured in units of C/m^2, while the electric field **E** is measured in Volts/m. As Wikipedia says, "**D** and **E** represent the same phenomenon, namely, the interaction between charged objects. **D** is related to the charge densities associated with this interaction, while **E** is related to the forces and potential differences."

$V = J/C = Nm//Ns/m = m^2/s$

If length and time are mathematically equivalent, as Minkowski taught, then we may reduce even further:

$V = J/C = Nm//Ns/m = m^2/s = m$

So a potential difference is just a distance, like any other difference.

$\varepsilon_0 = D/E = N/m^2///m^2//s/m = kg/sm^2 = m/s^3 = 1/s^2$

So you can see that, no matter how we juggle these equation and dimensions, we find that the constants are misleading. They tell us meaningless or contradictory things. But if we change two words in the sentences above from Wiki, we can get a clearer picture of the two fields D and E. Let us change the word "charge" to "mass."

"**D** and **E** represent the same phenomenon, namely, the interaction between massive objects. **D** is related to the mass densities associated with this interaction, while **E** is related to the forces and potential differences."

Now, if we were talking about a gravitational field or any other field, and you said that you divided a mass density (or just a density) by a force or potential difference, you wouldn't thereby create a permittivity or permeability in your vacuum or your free space. The simple act of creating or theorizing densities and forces does not create a resistance in the vacuum. The gravitational field has densities and forces and potential differences, and yet the gravitational field requires no resistance. Why? Simply because Newton was kind enough to assign dimensions to his characteristic "mass." He did not create a characteristic and then refuse to give it a dimension. Mechanically, his definition of mass is almost as empty as the definition of charge, but not quite. Newton tried to hide the fact that his mass was reducible to length and time by giving his constant a very strange dimension, but in the end these dimensions of G reduced to 1. This kept his constant just a fancy number, with no dimensions.

$G = L^3/MT^2$

$M = L^3/T^2$

$G = 1$

Since his constant has dimensions that are reducible to one, his field has no resistance or any other qualities. All the qualities are assignable directly to matter in the field.

The same is ultimately true of the electrical field, but physicists will not just come out and say so. In fact, they have preferred to imply, in the constants and fields they have created, that the vacuum does have characteristics. It has permittivity and permeability, which, if they really existed, would be types of resistance. But the electrical field has no resistance that it does not create itself, with the same matter that is creating the field in the first place. The only thing that resists the sub-particles are other sub-particles. The only thing that resists the gaseous object is other parts of the same object. The gas is material and it therefore resists itself. The radiation interferes with itself in a purely physical way, with no help from the vacuum.

When a Standard Model gas, made up of normal molecules, resists itself, we do not try to assign this resistance to the vacuum. We do not make up absurd abstractions like the permeability or the permittivity of the free space. We simply assign the resistance to molecule collisions. We could do the same thing with the electrical field, but we have so far preferred not to. Why?

Everyone knows that it is because once you admit that the E/M field is composed of radiation, you have to explain why the proton and electron aren't diminished by this radiation. We can create the sub-particle called the quark with no guilt or sin, since it doesn't immediately threaten to undermine the conservation of energy. But if the electrical field is composed of radiation, and if this radiation has mass, why doesn't the proton lose mass in radiating it? It is simply to avoid this question that the great mess of the electrical field has been left to sit. Physicists prefer a big mess and a big cover-up to an honest question.

My cosmology and mechanics answers this question in a very direct manner, without a lot of esoteric new theory. But despite the simplicity of the obvious answer, physicists are not interested in it since it requires they give up a lot of Standard Model gobblydegook that they have gotten very attached to. Piles of research money depend on sticking with the old assumptions, and money speaks louder than elegance or simplicity or logic.

Now let us show the first major outcome of my change in theory. I have shown that charge must have a mass equivalent. Charge is the summed mass of sub-particles that are impacting the objects being repulsed or attracted. The electrical force cannot be imparted by an abstract field or a mechanically undefined charge; it must be imparted by something capable of imparting force, and the only thing that is mechanically capable of this is mass or mass equivalence.

If we give the radiation that causes the electric force the mass required to achieve this force, then we have a form of mass that must be opposed to the mass that creates the gravitational field. By that I mean that the two fields are in opposition to eachother mechanically. One must be negative to the other. By this I do not mean anything esoteric. I am not creating some sort of mystical negative mass. I only mean to point out that every particle's radiation must have mass, and that this radiated mass creates a vector field that points out, whereas the gravitational mass points in. We already know that, in a sense. However, we have not included the idea in the math.

In another paper I have theorized that the E/M field is always repulsive, at the level of quanta. All forces are ultimately caused by bombardment. Electrical or magnetic *attractions* are always only apparent, caused not by real attraction but by relative attractions. This means that the proton does not actually attract the electron. It only repels it much less than it repels other protons. This leads to an apparent attraction, since the ("gravitational") expansion of the proton allows it to capture the electron, but does not allow it to capture other protons. This leads to the appearance of attraction, in the dual field that is the gravity-E/M field.

When we measure the mass of a particle—either by using a scale or by looking at deflection—what we must be measuring is the sum of the two fields. We are measuring the gravitational force minus the force of the E/M radiation. This is simply because (to take the example of the scale) the radiation is bombarding our equipment, offsetting the "weight" of the particle itself. It is as if the particle is a little rocket, and our scale is the launchpad. The particle has it engines on all the time, and therefore we are not measuring the full weight of the particle. We are measuring the gravitational force minus the radiation force.

Notice that the rocket analogy is not quite right, since a scale on the launchpad would actually measure the force of the exhaust. But when we are calculating the mass of a particle, we are not putting it on a scale in that way. At the quantum level, we are measuring its deflections from other particles, and calculating its mass from the summed forces. But these forces must be compound forces. The expansion of the quantum particle makes it appear to attract all other particles; its radiation makes it repel all other particles. The total force is a vector addition of this attraction and repulsion.

What this means is that the true mass of the particle must be greater than the mass we measure or calculate with our instruments, whatever they are. If you take the mass of the particle to mean *only* its ponderable, gravitational characteristics, or *only* its force due to expansion, then that mass must be greater than the one we always measure. We are measuring the mass of the particle minus the mass of its radiation. Therefore its true mass is the measured mass plus the mass of the radiation.

In the end, this is not because the radiation mass still belongs to the central mass even after it has been radiated—not in any sense at all. No, it is simply an outcome of the math. It is due to vector addition and only to the vector addition. It is a straight outcome of the fact that the expansion creates an apparent gravitational field with vectors that point in, and radiation creates a real bombarding field with vectors that point out. This makes the true mass of the central object the addition of the absolute value of both fields.

Once you absorb that, it is time to consider the fact that calculating the true mass in this way must vastly increase the total mass of the universe. Over any dt, the mass of a given object is given by the expansion of the object in that time. But we can only measure the force due to expansion (gravity) minus the force due to the mass or momentum of all the radiation in that same time. Therefore the true mass must be the measured mass *plus* the mass of the radiation.

Also notice that this change in mechanics gives us a *double* addition of mass to the universe, since we gain both the mass of the radiation itself as well as the higher true mass of the radiating particle.

Both these statements are true:

1) The mass of the radiating particle must be greater than the mass measured by our instruments, since our instruments measure a compound mass.
2) The radiation itself has mass or mass equivalence due to energy, which is a second addition to the total mass of the universe. A radiating particle does not lose mass, which means that the "holes" left by radiation are filled by some creative means.

Radiating quantum particles do not dissolve or diminish. This is known. Therefore "creation" happens at all times, from every material point. The universe is banging all the time.

[1] *General Physics*, Douglas C. Giancoli, p. 435