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UNLOCKING the LAGRANGIAN

by Miles Mathis

Who can thus avoid all pledges and having observed,
observed again from the same unaffected,
unbiased, unbribable, unaffrighted innocence,
—must always be formidable.
He would utter opinions on all passing affairs,
which being seen to be not private but necessary,
would sink like darts into the ears of men and put them in fear.
—Ralph Waldo Emerson

Abstract: In a recent paper on Lagrange points, I unlocked the Lagrangian, showing why it works and what it is hiding. But I consider that information so important that I have extracted it and put it under its own title here, without all the other math and explanation of Lagrange points. I will also extend my comments somewhat here.

The Lagrangian is perhaps the most important bit of math in current physics, since it props up both celestial mechanics and quantum mechanics. In quantum mechanics, the Lagrangian has been extended into the Hamiltonian. The Hamiltonian does nothing to correct the Lagrangian, taking it as true and given. Therefore, any new information about the Lagrangian must have far-reaching consequences for physics, at all levels. Here, I will not only be able to unlock the Lagrangian, showing what mechanics it really contains, I will also be able to show that it is actually false in many situations.

At its simplest, the Lagrangian is just the kinetic energy of a system T minus its potential energy V.

$L = T - V$

At Wikipedia, we are told this:

The Lagrange formulation of mechanics is important not just for its broad applications, but also for its role in advancing deep understanding of physics. Although Lagrange only sought to describe classical mechanics, the action principle that is used to derive the Lagrange equation is now recognized to be applicable to quantum mechanics.

What I will show is that the Lagrangian, rather than advancing a deep understanding of physics, actually blocked an understanding of the real fields involved. Because Lagrange (and Hamilton) misassigned the fields or operators, and because this formulation has been so successful and authoritative, many generations of physicists have been prevented or diverted from pulling this equation apart. What do I mean by that? Well, if we take Lagrange at his word, we would seem to have only one field here. In celestial mechanics, the gravitational field causes both the kinetic energy and the potential energy. In quantum mechanics, charge causes both the kinetic energy and the potential. But let's start with celestial mechanics, since that is where the Lagrangian initially came from. The motions of celestial bodies are gravitational, we are taught, and the potential energy is gravitational potential. That being so, the Lagrangian must have originally been a single field differential. In other words, we are subtracting a field from itself. Our first question should be, is that even possible? Can you subtract gravity from itself, to get a meaningful energy? Or, to be a bit more precise, can you subtract gravitational potential from gravitional kinetic energy? That would be like subtracting the future from the present, would it not? Potential energy is just energy a body would have, if we let it move; and kinetic energy is energy that same body has after we let it move. So how can we subtract the first from the second?

Another problem is that for Newton, the two energies would have to sum to zero, by definition. This is clear for a single body, and a system is just a sum of all the single bodies in it. Therefore, both the single bodies and the system of bodies must sum to zero, at any one time, and at all times. In fact, Newton actually used this truism to solve other problems. He let potential energy equal kinetic energy, to solve various problems. But here, we are told that potential energy and kinetic energy don't sum to zero, and aren't equal, otherwise the Lagrangian would always be either zero or $2T$. A Lagrangian that was always zero would be useless, wouldn't it, as would a Lagrangian that was just $2T$.

Many people have told me I am off my rocker, questioning the Lagrangian. They tell me that Newton never summed V and T to zero, and no one else did either. Interesting, since the physics book I now have in my lap says otherwise. In the chapter on Gravity, subchapter on Energy Conservation, we get the problem of an asteroid falling directly to Earth:

Since gravity is a conservative force, the total mechanical energy remains constant as the asteroid falls toward the Earth. Thus, as the asteroid moves closer to the Earth and U becomes increasingly negative, the kinetic energy K must become increasingly positive so that their sum, $U + K$, is always zero.*

Of course we can see that straight from the equations:

$V = -GmM/r$
$K = GmM/r$

If it isn't those energies Lagrange is summing, which energies is it? What other energies does a body have in Celestial Mechanics? The mainstream cannot tell me E/M, since they have told us E/M is negligible in Celestial Mechanics. I will be told a body can have sideways motion, as in an orbit, but since orbits also conserve energy—we are taught—the total kinetic energy must still equal *K* and still sum to zero with *V*. Otherwise the body would either be gaining or losing energy all the time, and the orbit wouldn't be stable.

I will be told that mainstream physicists are more interested in applying the Lagrangian and Hamiltonian to quantum physics, as in the Schrodinger equation. OK, but since they have taught us that gravity is negligible at the quantum level, both *V* and *T* must come from charge or charge potential, right? In which case we should also have conservation, in which case we should have a sum to zero. They just forget all this when it comes time to derive the equations, and they let themselves say and write whatever they want.

We can see another problem in this quote from Wiki:

For example, consider a small frictionless bead traveling in a groove. If one is tracking the bead as a particle, calculation of the motion of the bead using Newtonian mechanics would require solving for the time-varying constraint force required to keep the bead in the groove. For the same problem using Lagrangian mechanics, one looks at the path of the groove and chooses a set of *independent* generalized coordinates that completely characterize the possible motion of the bead. This choice eliminates the need for the constraint force to enter into the resultant system of equations.

The problem there is that one solves by ignoring forces, looking only at the path. Why is that a problem? Because if you are studying the path and not the forces, you will come to know a lot about the path and nothing about the forces, which is what we see in current physics. The Lagrangian calculates forces by ignoring forces. It goes right around them. If that were just a matter of efficiency, it might be tenable, but we have seen that historically, the Lagrangian and action were chosen to avoid the questions of forces, which physicists were not able to answer. They weren't able to answer them in the 17th century and they aren't able to answer them now. So they misdirect us into equations that "summarize the dynamics of a system" by ignoring the dynamics of a system. Dynamics means forces.

Yes, we are told at Wiki that the Lagrangian is "a function that summarizes the dynamics of a system." So here is yet another problem. We are then told that *T* is the kinetic energy of the system. Well, shouldn't the kinetic energy already be a function that summarizes the dynamics of the system? Dynamics means motions caused by forces, so the motion of the particles should be an immediate measure of *all* the forces on them. In other words, the gravity field should already be causing motion, so there is no reason to add or subtract it from the kinetic energy. Either the gravity field is causing motion, or it isn't. If it is, then it should be included in the kinetic energy. If it isn't, why isn't it?

But physicists have never bothered themselves with these logical questions. Why haven't they? Because they found early on that the Lagrangian worked fairly well in many situations. Like Newton's gravitational equation, it was an equation that they were able to fit to experiments. This is very important to physicists, for obvious reasons. But the fact that the Lagrangian worked meant that the kinetic energy and potential energy did not sum to zero, which meant that the bodies were not in one field only. To express energy as a differential, you must have two energies, which means you must have two fields. One field can't give you two energies at the same time. You cannot get a field differential from one field. As soon as the Lagrangian was found to be non-zero, physicists should have known that celestial mechanics was not gravity only. It *had* to be two fields in vector opposition.

By the same token, as soon as the Lagrangian was discovered to work in quantum mechanics, the physicists should have known that QM and QED were not E/M only. The non-zero Lagrangian is telling us very clearly that we have two fields. Just as gravitational potential cannot resist gravitational kinetic energy, charge potential cannot resist charge. Charge potential is not charge resistance, it is future charge. You cannot subtract the future from the present in an equation! This proves once again that gravity is present in a big way at the quantum level. I have proved that in other papers, but we should have known it just from the form of the Lagrangian.

The next question physicists should have asked is this: "Given that the Lagrangian is non-zero, and that it works pretty well, what can we infer from that?" Just from the form of the Lagrangian, we can infer that we have two fields, in vector oppostion, one field larger or smaller than the other, or changing at a different rate. We can infer these things, because logically they must be true.

What this means is that the Lagrangian was an accidental and incomplete expression of the unified field. *The Lagrangian is a unified field equation.* I have already shown that Newton's gravitational equation was a unified field equation, and that Coulomb's equation was a unified field equation, and it turns out the Lagrangian is just one more unified field equation. Yes, both of the operators is are misassigned or misdefined. The only reason the Lagrangian works is that the operation works, but it turns out the operation works only because of a compensation of errors. The equation has to be pushed to work.

The Lagrangian has sometimes been interpreted as the total energy of a field, so that it really *is* like adding the future to the present. The kinetic energy is energy the particle already has, the potential energy is energy it soon will have, therefore the Lagrangian is an expression of the total field present at a given location. If we want to know where a system is heading, we add its current state to its potential, right? Sounds feasible, but that isn't what is happening. The Lagrangian isn't a sum of present and future, it is a sum of energy due to charge and energy due to gravity. As with Newton's gravity equation, the Lagrangian already includes both fields. We can tell this just because the Lagrangian includes *V*, and *V* is a restatement of Newton's gravity equation. Since *V* is already unified, *L* must be as well. *L* is not a unification of present and future, *L* is a unification of charge and gravity.

So what is *T*, by this analysis? *T* is a unified field correction to *V*, since *V* doesn't contain enough information to solve. In my unified field papers, I have shown that although Newton's equation is fundamentally or roughly correct, it doesn't contain enough degrees of freedom to solve most real problems. It contains G, which tells us the scale between the two fields, but it doesn't tell us how the two fields vary by size. Newton's equation doesn't include the density of the charge field, which is relatively small at the macro-scale, but more important at the quantum level. In other words, because the photon has real size, it begins to take up more space at the quantum level. This makes the E/M field relatively stronger at smaller scales. It is a larger part of the whole at that level, and a smaller part of the whole at our scale. But Newton's equations have no way of including this information. The Lagrangian is an improvement, because *T* goes some way in solving this problem. I don't know that Lagrange or Hamilton meant to correct Newton in that way—I suspect they didn't—but the Lagrangian, on purpose or by accident, expresses this degree of freedom. This is because the "kinetic energy" term *T* includes the mass again. Not only that, but it tells us how that mass is velocitized by the fields present. *We get the mass right next to its own velocity*. Indirectly, this must tell us how that mass is responding to the photon density, which tells us how the gravity field and charge field are fitting together in this particular problem. So the variable *T* corrects the variable *V*, giving us a total field energy *L* that is an improvement on any energy Newton could find or predict.

But why is the Lagrangian sometimes wrong, as I say? Because when you have an equation that is in a confusing and unknown form, it is quite easy to plug the wrong information into it. In its current form, the Lagrangian is potentially useful, since if you do everything right, it will work. But since most or all physicists don't know how or why it is working, they end up plugging the wrong numbers into it.

We see this in the two-body central force problem, where the Lagrangian is used to make a hash of the problem. This is apparent at Wiki from the first sentence, which begins,

The basic problem is that of two bodies in orbit about each other attracted by a central force.

In the two-body problem, two bodies are *not* in orbit about each other. One body is orbiting the other body. Is the Earth orbiting the Moon? No. The Earth may or may not be orbiting a barycenter, but in no case is the Earth orbiting the Moon. Also, in the two-body problem, are the bodies attracted by a central force? No. Each body is attracted by the other body. There is no central force. The barycenter, even were it true, would be mathematical only. No force comes from there. We have seen this sort of language in many other places, and I always find it a bit shocking. How can physicists use such sloppy language? Actually, it goes beyond sloppy, since it is demonstrably false. This language is being used as more misdirection. It is used as a purposeful confusion, so that the reader cannot make sense of anything on the page. But the problems are not just problems of semantics or propaganda, they are mathematical, for we are then given the equation

$$L = T - V = \tfrac{1}{2}\, M\dot{R}^2 + [\tfrac{1}{2}\, u\dot{r}^2 - V(r)]$$

Where M is the combined mass, $\dot{R}$ is the velocity of the barycenter, u is the reduced mass, and $\dot{r}$ is the change in distance between the two bodies (the velocity of the separation). That is a hash for so many reasons. One, if we put M and $\dot{R}$ next to eachother in an energy equation, they have to apply to the same thing. One can't apply to combined mass and one to the barycenter. No, M must be the center of mass, not the combined mass. This means we MUST put the combined mass at the center of mass. But if we do that, then we can't have any separation, and if we don't have any separation, we don't have $\dot{r}$. The same thing applies to u and $\dot{r}$. To put them together in an energy equation, they have to apply to the same thing. One can't apply to one thing and the other to another. Therefore, $\dot{r}$ should be the velocity of the reduced mass, not the change in separation. But since the reduced mass is a quotient over a sum, it can't have a velocity. And, since I have shown that reduced mass is a figment from the beginning, it can't be put into any equation. It is false, so it necessarily falsifies any equation it is in.

[To see a variant critique of this Lagrangian derivation, see my newer paper on Lev Landau, where I pull apart his textbook proof of central motion—which is similar to this one. There, I show further fudges in the polar coordinates, as well as the variable assignments in the equation above.]

But it gets even worse. Study that equation some more, and you see that it has not one but two kinetic energies in it. I thought the Lagrangian was already a summation, applying to a system, so how can you justify putting two kinetic energies in there? Shouldn't a system have only one total kinetic energy? It looks to me like (from the brackets) that we are being told that

$$V = -[\tfrac{1}{2}\, u\dot{r}^2 - V(r)]$$

Does that make any sense? Not really, because we are then told that

$$L = L_{cm} + L_{rel}$$

So I guess that $L_{rel} = [\frac{1}{2}\ u\dot{r}^2 – V(r)]$, explaining the form. Unfortunately, that means that L_{cm} is just a kinetic energy, with no potential energy component. Since when can you write a Lagrangian as just a straight kinetic energy? What possible least path is that action taking? It can't be a least or most path, since it can't vary. It is just one thing, and therefore cannot be pushed to into a least path.

Then we are told, "The **R** equation from the Euler-Lagrange system is simply Ma = 0 [where a is the acceleration of R, R dot dot], resulting in simple motion of the center of mass in a straight line at constant velocity." Well, I didn't need these equations or the Euler-Lagrange system to tell me that! Of course the center of mass is going to have an acceleration of zero, since you can't have a force there by definition. That is why we found a center of mass in the first place, for Pete's sake. This author at Wiki implies that he found the zero acceleration via these equations, but the zero acceleration was the postulate, so it cannot be the discovery. The mass causes the force, by definition, and the force causes the acceleration, by definition, therefore you cannot have acceleration at the center of mass (any more than you can have acceleration at the center of a single body). That is what center of mass means, by god.

But it gets even worse. We have already seen L_{cm} reduced to an idiotic tautology, now we also must see L_{rel} reduced to a rubble of finessed math. For the equation is then expanded via polar coordinates to this

$L_{rel} = \frac{1}{2}\ u(\dot{r}^2 + r^2\omega^2) – V(r)$

Where ω is the velocity or change in θ. Since L_{rel} is not dependent on θ, θ is an "ignorable" coordinate, we are told. It is ignorable, and there is "no dependence," which seems to be a great reason to find a partial derivative of L_{rel} with respect to it.

$\partial L_{rel}/\partial\omega = ur^2\omega = \text{constant} = \ell$

And of course ℓ is the conserved angular momentum. You have got to be kidding me. That's just pretend math, right? That equation was inserted as a joke by some mischievous math elf, right? No, apparently mathematicians and physicists really buy this stuff.

At least we can see why some of the previous equations were manufactured. We needed to get something we could differentiate into uvr or $ur^2\omega$. That is just the old angular momentum equation L = mvr. But it doesn't explain what happened to the potential energy, which just got washed down the drain. Since there is no angle in the potential energy, $V(t)$ just conveniently got jettisoned.

The only reason to take a partial derivative of L_{rel} with respect to that angular velocity is to push this equation, but there is no mechanical justification for it. First of all, differentiating requires a dependence. Remember first year calculus, where you were told what a function was? A function is a dependent variable, and in order to do calculus, you require dependent variables. Calculus requires functions, which requires dependence. But here they admit that the Lagrangian is not a function of the angle, then they differentiate the Lagrangian with respect to the angular velocity! Incredible chutzpah.

Beyond that, I have shown that angular momentum is not equal to mvr or $mr^2\omega$, which means all this equation finessing was in vain. Someone should have told them the historical angular momentum equations were false, so they could push these equations toward the right ones. As it is, it just makes it easier for me to see they were cheating. I can see that they were just pushing the equations toward what they thought they needed.

Now let us return to the Lagrangian for celestial mechanics. I have said that the Lagrangian is a poor or partial attempt to express the unified field. Since I have now written basic equations for the unified field, it might help to compare the Lagrangian directly to them. Let us use my force equation, to start with

$F = (GmM/r^2) - (2GmM/rct)$

That already looks a lot like the Lagrangian, doesn't it? Let us multiply both sides by r, as they do now, to make F into E. That gives us

$E = (GmM/r) - (2GmM/ct)$
since $GM = ar^2$
$E = (GmM/r) - (2mar^2/ct)$
and since $ar = v^2$
$E = (GmM/r) - (2mv^2)(r/ct)$

Now it looks almost exactly like the Lagrangian. I can also make it look like the Hamiltonian:

$p = mv$
$E = (GmM/r) - (p^2/2m)(4r/ct)$

The term r/ct is just a simple Relativity transform. My unified field equation is already both unified and Relativized.

I have shown what I set out to show. The Lagrangian and Hamiltonian are variants of my unified field equations. The only difference is, I would never put an orbital velocity into a kinetic energy equation. That is what we had to do, as you see, to get the Virial from my unified field equation. But since we see the mainstream do stuff like this all the time, we know this is how the Lagrangian and Hamiltonian got into the sloppy form they are now in.

Let me clarify that. Velocity is a vector, so in the kinetic energy equation $T = ½ mv^2$, it must be linear. But in the equation $a = v^2/r$, the velocity is not linear. The velocity there is *orbital*. Therefore, that substitution I used was not really allowed. Even if you allow me to correct the equation, so that it is now $a = v^2/2r$, the velocity is still not linear, and the substitution is still not allowed. In that correction, the velocity is still orbital, not tangential. To use a kinetic energy equation in the form $½ mv^2$, we have to use a linear or tangential velocity. I have shown that the corrected equation for tangential velocity is $v^2 = a^2 + 2ar$, which would make the above substitution $a^2 + 2ar = 4GM/ct$, dooming the move from unified field to Lagrangian. [You can now see how I correct the Schrodinger equation by replacing the Hamiltonian with my UFE by going here.]

What does that mean? It means that although *T* looks sort of like a kinetic energy in the Virial and Lagrangian, it isn't. In both celestial mechanics and quantum mechanics, you have to force fit the current equation to make it work. In celestial mechanics, you have to pretend that you can put an orbital velocity into a kinetic energy equation, but you can't. *T* isn't really the kinetic energy, it is just a term that mimics the kinetic energy in form. The Virial and Lagrangian aren't really using the kinetic energy and potential energy, they are mirroring the terms of my unified field equation, and my terms aren't standing for kinetic energy and potential energy. They aren't even standing for charge and gravity. They are just two terms in the equation, unassignable directly to any real field or energy.

This means that if you use a real linear velocity in the Lagrangian, you are going to get the wrong answer. You actually have to use a bad or false expression for the kinetic energy to get the Lagrangian and Virial to work. You have to use a false substitution, of orbital velocity for tangential velocity, to make the Virial or Lagrangian work. This is what I meant when I said you had to push the Lagrangian in the right way, above. You have to insert the proper numbers, which turn out to be fake kinetic energies, expressed with orbital or curved "velocities" instead of real linear or tangential velocities.

To see what I mean, we have to go back to the equations leading up to my unified field equation. These are taken from my uft.html paper.

$F = E + H$
$F = (GmM/R^2)(1 - 2R/ct)$
$F = (GmM/R^2) - (2GmM/Rct)$

E is the charge field and H is the solo gravity field. F is the unified field. But *neither* E nor H is expressed by GmM/R^2. That term is just Newton's equation, which was already unified. The other manipulation here is just my correction to Newton. That correction was found by segregating the two fields, then doing relativity transforms on both separately, then recombining them. So the term 2GmM/Rct is a correction, not a field. It is not the charge field, it is not potential, and it is not kinetic energy. But the Lagrangian is mimicking this equation, as I have shown. *V* is mimicking the first term, and *T* is mimicking the second, so that the Lagrangian is really this equation in disguise. *T* is not the kinetic energy, *T* is this correction to Newton.

And this has been another major problem with unification. Physicists since the time of Einstein have been trying to unify QM with gravity, but since the equations of QM are grounded by the Lagrangian, QM is already unified. Not realizing this, physicists try to unify their Hamiltonians, connecting them in various ways to GR (General Relativity). As I have just shown, this can only cause a mess. Everyone is trying to unify equations that were already unified. The reason they don't know this is that the Lagrangian was fudged, centuries ago—pushed to match data—and the push just accidentally matched fairly closely the unified field equation.

Yes, we can now see for certain that the equation finessing by Lagrange and Hamilton and the rest was completely accidental. We know that they didn't realize the equation was a UFT, because if they had known that, they wouldn't have later tried to unify it.

In conclusion, we have learned many things about the Lagrangian. One, the variables are misassigned. *V* is not potential, it is Newton's gravity equation, which was already unified from the beginning. And *T* is not kinetic energy. *T* is simply a term that corrects *V,* as in my unified field equation. *T* is a correction to Newton's F. It just happens to mimic the form of kinetic energy. But to make *T* work in the Lagrangian, you have to insert an orbital velocity for v. In other words, you have to insert a falsified kinetic energy. If you push the equation in the right way, you may get the right answer. But in most cases, the Lagrangian is just used as a fudge, as in the two-body problem.

In a subsequent paper, I will show that *T* also has to be pushed when the Lagrangian is used in quantum mechanics. If you use a real kinetic energy, rigorously defined, the Lagrangian and Hamiltonian fall apart. The only way to make them work is to use a fake "kinetic energy", one that has been pushed to match my unified field equation.

This means that we should dump the Lagrangian and use my unified field equation instead. We should fix all these errors, so that we can see the mechanics and fields underneath our equations. If the form of my UFE is not what is needed for certain problems, it can be easily extended into other forms, some of which I have already provided. Using my UFE will allow us to solve many problems that have remained insoluble, at both the quantum and the celestial levels. In fact, I have already solved many of these problems in other papers. My UFE brings the charge field into the light, with all its mechanisms, and a hundred problems have already fallen to its clarity.

**Physics*, James S. Walker. Prentice-Hall 2002. p. 365.
