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A Complete Correction to and Explanation of Bode's Law

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PAPER IN PROGRESS

Abstract: This is not "an improved version" of the law, this is the FULL mechanical solution. In short, Bode's law, or my correction to it, is just a simple extension of the orbital equation $a = v^2/r$.

Bode's Law, also known as the Titius/Bode Law, is one of the most famous unexplained laws in the Solar System. Some have said that solving it would be like solving Goldbach's Conjecture < a href="http://milesmathis.com/gold3.html">http://milesmathis.com/gold3.html or Fermat's Last Theorem. I think it is considerably more important than either, since it is fundamental physics, rather than just a pure-math brain teaser. Which is to say that I hopped up and down longer and higher when I solved this one than I did when I solved Goldbach's Conjecture. Maybe now a few more people will look closely at my GC solution.

The first mention of the law is from 1715, so this one has been sitting around without a solution for almost 300 years. Since that time, the form of the "law" has been:

$a = n + 4$
where $n = 0, 3, 6, 12, 24, 48....$

Wikipedia glosses for us the standard model explanation:

There is no solid theoretical explanation of the Titius–Bode law, but it is probably a combination of orbital resonance and shortage of degrees of freedom.

The first explanation is just a guess, but it is a bad guess since orbital resonances have been given to gravity, but no one has ever shown a mechanical cause of any "gravitational resonance." Resonances cannot be caused by gravity, and no one in history has shown that they can. I will show that the failure of Bode's law on outer planets is caused by a charge "resonance", but this resonance has little to do with the main series of numbers and nothing to do with gravity. The second explanation from Wiki is an even worse guess, since it turns the truth on its head. What this editor means by "shortage of degrees of freedom" is that the math falls into this alignment because it can't do otherwise. But the failure of the standard model to explain Bode's Law is actually caused, in part, by a shortage of degrees of freedom in another sense. Current celestial mechanics lacks an entire field, since it hasn't incorporated the foundational E/M field into its equations. I have shown that the foundational E/M field or charge field is already in Kepler's http://milesmathis.com/ellip.html http://milesmathis.com/ellip.html and Newton's equations http://milesmathis.com/g.html, and this field may be called a mathematical degree of freedom. The equations of celestial mechanics http://milesmathis.com/cm.html lack the required complexity, so they can only be pushed after the fact, as with Laplace http://milesmathis.com/laplace.html.

Even worse than these two wild guesses is what comes next at Wiki.

However, Astrophysicist Alan Boss states that it is just a coincidence, and the planetary science journal *Icarus* no longer accepts papers attempting to provide 'improved' versions of the law.

Well, may Alan Boss take a flying leap into a pit of cankered pions and may *Icarus* catch a malign meteor in the teeth. If this isn't a case of science being shut down by fiat, I don't know what would be. These people and institutions should be shunned by all real scientists and thinkers, and I recommend that *Icarus* be put into bankruptcy, by readers refusing to read it. I have never read it and never will. If these editors will be intellectually bankrupt, then they should be financially bankrupt as well.

Unfortunately, science is now controlled by this sort of person, and it isn't just *Icarus* that is the problem. All of mainstream physics is now like this. We have "scientists" that have stated and published opinions prejudicially on things they know nothing about, and they don't seem to understand that this is unscientific. Alan Boss can't explain this phenomenon and he wants to be sure no one explains it while he is working on something else. Infantile. He probably throws a fit when his wife works on the crossword puzzle when he is out of the room. Physics has been taken over by very small people.

Since I am the one solving these longstanding problems, it is not for me to follow their policies. The ignorant do not set rules for the wise. If any of these journals wants to publish real papers instead of fake papers, they had better change their attitudes. They seem to believe it is my loss, not being able to publish with them, but it is their loss. If Einstein had not published with

Annalen der Physik, would it have been his loss or theirs? *Annalen* gets a historical mention only because of Einstein.

Remember that, *Icarus*. Signed, Apollo.

In physics, as in all else, problem solvers are primary and publishers are secondary. Publishers are just administrators and committees and gatekeepers. Historically and scientifically, they are of no import. Publishers can refuse to publish, but they cannot stop the spread of information.

Wiki also tells us this:

Dubrulle and Graner have shown that power-law distance rules can be a consequence of collapsing-cloud models of planetary systems possessing two symmetries: rotational invariance (the cloud and its contents are axially symmetric) and scale invariance (the cloud and its contents look the same on all length scales), the latter being a feature of many phenomena considered to play a role in planetary formation, such as turbulence.

There it is again, the power law used to fudge a very squishy answer. I have already shown in many papers, including my paper on Laplace http://milesmathis.com/laplace.html, how the power law is used to push bad equations to fit data, by using infinite series to assign terms to errors. These errors are called "remaining inequalities" or something like that, and a lot of fancy math is used to drop or add terms. But since I will show that Bode's law can be explained without any sort of calculus, with 9th grade algebra, all this talk of collapsing clouds is just further nebulosity. These are the types of papers the mainstream likes to publish: papers full of pompous impossibilities like scale invariance (clouds are density fields and cannot be scale invariant) and incomprehensible and undefined equations. The mainstream physics paper is little more than an institutional efflux, a career propellant adding another anti-logical pollutant to the infinite stream of modern absurdities.

As you will now see, the solution to this problem is so simple that it makes three centuries of physicists and mathematicians look like bumblers. I looked at that sequence of numbers for about half a minute before I saw it was based on the square root of 2. The "law" has been in the wrong form since the beginning, and so no one was able to see the proper sequence.

Currently, the sequence goes like this:

4, 7, 10, 16, 28, 52....

But it should be written as

$4, 5\sqrt{2}, 7\sqrt{2}, 11\sqrt{2}, 20\sqrt{2}, 36\sqrt{2}$....

Which can be written as

2^2
$(2^2 + 1)\sqrt{2}$
$(2^2 + 1 + 2)\sqrt{2}$
$(2^2 + 1 + 2 + 2^2)\sqrt{2}$
$(2^2 + 1 + 2 + 2^2 + 3^2 + 4^2)\ \sqrt{2}$

If we want to express this with Mercury as 1, then we just divide by 4.

$2^2 /2^2$
$[(2^2 + 1)\sqrt{2}]/2^2$
$[(2^2 + 1 + 2)\sqrt{2}]/2^2$
$[(2^2 + 1 + 2 + 2^2)\sqrt{2}]/2^2$
$[(2^2 + 1 + 2 + 2^2 + 3^2)\ \sqrt{2}]/2^2$

Which expands to:

$2^2 /2^2$
$\sqrt{2} + (1/2^2)\sqrt{2}$
$\sqrt{2} + (1/2^2)\sqrt{2} + (2/2^2)\sqrt{2}$
$\sqrt{2} + (1/2^2)\sqrt{2} + (2/2^2)2^2 + (2^2/2^2)\sqrt{2}$
$\sqrt{2} + (1/2^2)\sqrt{2} + (2/2^2)2^2 + (2^2/2^2)\sqrt{2} + (3^2/2^2)\sqrt{2}$

Which simplifies to:

1
$(5/4)\sqrt{2}$
$(7/4)\sqrt{2}$
$(11/4)\sqrt{2}$
$(20/4)\sqrt{2}$

You will say, "Great, you expressed Bode's Law in terms of √2. So what?" Well, the so-what is that it ties directly into my correction to Newton's equation $a = v^2/r$. I have shown that the equation should read $a = v^2/2r$, since our current expression of the orbital velocity is not a velocity. Yes, $a = v^2/r$ works if $v = 2\pi r/t$, but $2\pi r/t$ isn't a velocity. It is a curve over a time, which isn't a velocity. It is just a heuristic ratio that we like because it is easy to measure. But since the orbit curves, it must be an acceleration, and that acceleration is expressed by the equation,

$a_{orb} = 2\sqrt{2}\pi r/t$

If we use that acceleration along with the corrected equation, $a = v^2/2r$, we get the same relationship we have now with $a = v^2/r$ and $v = 2\pi r/t$. That is where the $\sqrt{2}$ comes from. And that is why our current orbital equations work despite being faulty. They are consistently faulty, so we don't see the faults except when we are in need of mechanics like I am doing now. Our current heuristics doesn't prevent us from doing engineering, but it does prevent us from doing foundational mechanics like this, or from solving simple problems like explaining Bode's law.

You will say, "$2\sqrt{2}\pi r/t$ still looks like a curve over a time to me." But it isn't because I have also shown what π is in that equation: for that equation to work, π must be an acceleration itself. We have thought that π was just a bald number, with no dimensions, but π has the dimensions of m/s^2 (as I have shown elsewhere exhaustively). This gives the orbital acceleration the dimensions m/s^3. The orbital acceleration is actually the summation of three separate velocities during any dt, so it is rigorously defined as a variable acceleration. A velocity is a Δs, a constant acceleration is a ΔΔs, and a variable acceleration is a ΔΔΔs. That is, a variable acceleration is the *third* derivative of distance.

All this has been ignored historically, so we have heuristic equations that have been hiding a lot of important information. Our orbital mechanics, like our celestial mechanics, has been a compressed engineer's math, instead of a theorist's math.

You will say, "I still don't get it. How does the $\sqrt{2}$ help us solve this?" It helps because, via my corrected orbital equation, it tells us that Bode's law comes right out of the orbital equation.

Look at my expression of the series above. We have the square law from Newton's orbital equation, but it is an additive square law. Each planet is not only orbiting the Sun, it is also orbiting inner planets. The Earth's relative distance is given by this equation:

$$r = [(2^2 + 1^2 + 2^2)\sqrt{2}]/2^2$$

In that equation, the Earth is the third term in parentheses, Mercury is the first, and Venus is the second. So we are being told that the Earth's orbit is added on top of the other two. The Earth is orbiting them as well as the Sun. You have to include the inner orbits in the equations for the outer orbits. Very simple, right? In this way, the corrected Bode equation is an analogy of the Pauli exclusion principle. But unlike with Pauli, here we have the mechanics in full view right in front of us. The Earth cannot share Venus' orbit, because the Earth's term must be added to the term of Venus. The Earth is excluded from the second orbit, because each term is added, as a distance, in a set pattern. "Two squared" cannot be at the same distance as "one squared", since the numbers determine the distance.

And it is not just the math that provides the exclusion. As I have said elsewhere, math is just an expression of the mechanics. Math cannot be a cause. The mechanical cause of this math is the exclusion provided in the unified field by the charge component of that field. Gravity cannot exclude. Only the charge field can exclude. The Earth cannot inhabit a different part of Venus' orbit because the two bodies have different charge fields. The Earth has a greater charge field than Venus, due to greater mass and density, so the Sun keeps it at a greater distance. The Sun's charge field and the Earth's charge field actually meet, in space, physically, particle to particle.

Another way to say all that is to just look at the equation $a = v^2/r$. We don't even have to look at my correction to see how Bode's law comes right out of that equation.

$a = v^2/r$ so
$r = v^2/a$

Which tells us that the radius is determined by the square of the orbital velocity. But that can apply to any radius. Any radius will give us an orbital velocity, so how does the Sun pick specific orbits for the planets? It does so with equations like this

$r = [(2^2 + 1^2 + 2^2)\sqrt{2}]/2^2$

If you drop √2, you see the similarity of the two equations. The squared terms in parentheses are actually orbital "velocities" (really, orbital accelerations). Bode's law is just an expansion of the orbital equation, but it gives us the relationship of one orbit to the other. Each orbit is some factor of two of the other orbits. And each outer orbit must orbit all inner orbits. The simple exclusion is in a simple mathematical relationship.

If that is all I had to say, this paper wouldn't have been terribly convincing to the hardliners, I admit. I have shown the law as a function of the square root of two, but unless you were impressed and convinced by my correction to Newton's equation (and that is unlikely), this will not seem very momentous. The reason this spins out into a good story of its own is that expressing Bode's law with the square root of two allows us to correct it. We have been told that Bode's law fails with Neptune and Pluto, but predicts the other orbits pretty well. I will now tell you exactly why Bode's law fails with Neptune and Pluto.

Bode's law fails with Neptune and Pluto because Bode's law is in the wrong form. It mimics the right progression by a sort of accident. This is the only possible way that Alan Boss can be seen as correct. Bode's law, as written, is nearly correct only by accident. It is a mathematical coincidence that it follows the right progression for the inner planets. Titius and Bode and the rest just matched a simple math to the data, without any mechanics, and their math is not complex enough to fit the real mechanics. It wasn't even transparent enough for us to see that it was coming straight out of the orbital equation $a = v^2/r$. I have solved that problem, but I still have to show that, although my corrected "law" is superior to Bode's, my failures can be corrected. Yes, the greatest difference between my law and Bode's is that I can show you why the planets outside Jupiter fail to fit the pattern. I will give you the pattern, show you the variance, then show you the correction to the variance, solving the problem completely.

In the current Bode list, Jupiter's number is predicted to be 52 and Saturn's is 102. That would be expressed by me as $36\sqrt{2}$ and $72\sqrt{2}$. Unfortunately, Saturn doesn't fit my pattern. In my pattern, Saturn should be $(36 + 5^2)\sqrt{2} = 61\sqrt{2}$. Then Uranus would be $(61 + 6^2) = 97\sqrt{2}$ and Neptune would be $(97 + 7^2) = 146\sqrt{2}$. Or, if we take Mercury as 1:

1
$(5/4)\sqrt{2}$
$(7/4)\sqrt{2}$
$(11/4)\sqrt{2}$
$(20/4)\sqrt{2}$
$(36/4)\sqrt{2}$
$(61/4)\sqrt{2}$
$(97/4)\sqrt{2}$
$(146/4)\sqrt{2}$
$(210/4)\sqrt{2}$

As a first approximation, that would be the series I would predict with my math. But my series diverges from Bode's series at Saturn. It fails at Saturn rather than Neptune. Why?

Before I tell you, let me show you that my series already matches the data as well or better than Bode's series. I predict an orbit for Venus of 1.024×10^8. The actual orbit is 1.075×10^8. An error of 4.77%. Bode's law predicts an orbit for Venus of 1.034×10^8, an error of 3.8%. I predict an orbit for the Earth of 1.433, an error of 4.2%. Bode's law predicts an orbit for the Earth of 1.478, an error of 1.2%. I predict an orbit for Mars of 22.52, an error of 1.18%. Bode's law predicts an orbit for Mars of 23.64, an error of 3.73%. I predict an orbit for Ceres of 4.095, an error of 1.04%. Bode's law predicts 41.37, an error of .02%. I predict an orbit for Jupiter of 73.7, an error of 5.32%. Bode's law predicts 76.83, an error of 1.3%.

My average error for the first six planets is 2.75%. Bode's average error is 2.1%.

For Saturn I predict 124.9, an error of 12.85%. Bode predicts 147.8, an error of 3.11%. For Uranus, I predict 198.6, an error of 30.97%. Bode predicts 289.6, an error of .66%. For Neptune, I predict 298.9, an error of 33.6%. Bode predicts 573.3, an error of 27.3%. For Pluto, I predict 430, an error of 27.2%. Bode predicts 1,141, an error of 93%.

So, for Saturn and Uranus and Neptune, Bode is better. For Pluto, I am better. My average error for the four outer planets is 26%. Bode's average error is 31%. But my errors are grouped much better, since they go from 13 to 34, a deviation of 10.5 points from my mean. Bode has a deviation of 46 points. I have no complete misses, while Bode's prediction for Pluto can be called a complete miss.

Just as a matter of statistics, my equations for the ten planets are better than Bode's. My average error is 12.1%, while Bode's is 15.2%; and my deviation is much less. Even so, I admit that my correction is not completely convincing at this stage. A 33% error on Neptune is not impressive, for instance, unless I can show the cause of the error. So I will now show how my errors can be taken down to almost nothing, with simple mechanics. The first thing to notice is that Jupiter causes the predictions to fail. With Bode's law, this was not the case. Bode's predictions are just as good from Jupiter to Uranus as they are for the planets inside Jupiter. Bode's prediction for Saturn is very good, and for Uranus it is astonishingly good. But my predictions go from an average error of 2.7% inside Jupiter to an average of 26% outside. This will prove to be a plus for my series, since Jupiter IS the physical cause of this variance. Bode *should* have found a variance beyond Jupiter, and he didn't. Beyond that, I will show that Bode's match on Uranus was just a fluke.

Actually, you can see the variance beyond Jupiter even without doing any math. A passing glance at the Solar System would tell you that Jupiter is a dividing line. Inside Jupiter, most things are caused by the Sun. Outside Jupiter, most things are caused by Jupiter. The fields outside Jupiter cannot be the same as those inside.

This became ever clearer to me in my recent papers on axial tilt http://milesmathis.com/tilt.html, where I did the charge field calculations for the outer planets. These four planets determine the unified field variations in the entire System, and cause the bulk of the tilts, both inside and outside Jupiter's influence. And, due to its mass, Jupiter's charge influence is crucial.

If we look at the four Jovians and list their charge field densities with Uranus as 1, we get Neptune as 1.523, Saturn as 3.544, and Jupiter as 22.84. The charge fields of all the other planets are negligible compared to those four (although Pluto will play a small part in the solution below). The charge field plays only a small part in the unified field inside Jupiter, which is why my predicted numbers work until we are past Jupiter. The outer planets all perturb eachother strongly, as a matter of charge, and so we shouldn't find orbital distances that can be predicted without the charge component of the Unified Field. What is the easiest way to show this, with the simplest math?

We must first look again at my errors for the Jovians in my predictions, above. What would it take to prove my errors were not accidents? My errors for the Jovians are 5.32, 12.85, 30.97, and 33.6. If my theory is correct, then the perturbations among the Jovians should be shown to follow that sequence of numbers. What are the charge forces between the four Jovians?

As I have shown in previous papers, the relative strength of the charge field can be calculated by multiplying the mass of a body times its density. This is because we seek a charge density, and charge is dimensionally the same as mass http://milesmathis.com/charge.html. This is one of the secrets of physics: the statcoulomb reduces to the same dimensions as mass, and the Coulomb is just mass per second. I say that this gives us a relative density, because by multiplying mass and density, we can get the charge field strength of one body as a percentage of another body. But we cannot find an absolute amount of charge that way.

We will look at Saturn first. Jupiter has a charge field that is 6.445 times greater than that of Saturn. To find the potential difference between them, we let the charge fields meet at Saturn. If

Saturn's charge field is 1, Jupiter's is $6.445^{1/4}$ = 1.593. The result is .593. We apply that potential difference in both directions, so the variance at Jupiter is 1.593. But since Saturn is smaller, it will feel a greater variance. It will feel 6.445 x .593 = 3.822. Saturn feels 3.822/1.593 = 2.399 times the variance of Jupiter.

Uranus and Neptune will also perturb Saturn, but their effects are much smaller. I will calculate Uranus' variance on Saturn to show this. Saturn has 3.544 more charge density than Uranus, so if Uranus' charge is 1, Saturn's is 1.372. But if Saturn's field is 1 (see above paragraph), then Uranus' is .729. Uranus is 2.2 times further away from Saturn than Jupiter is, so Saturn will feel a variance of only $.729/2.2^4$ = .0311. We can add that to the variance from Jupiter, obtaining 3.822 + .0311 = 3.8531.

Now Neptune. Saturn has 2.328 times more charge than Neptune, so if Neptune's charge is 1, Saturn's is 1.235. But Neptune is 4.69 times as far away from Saturn as Jupiter is, so Saturn will feel a variance of only $.81/4.69^4$ = .00167. We add that to the other variances, 3.8531 + .00167 = 3.855.

Saturn has 14,743 times as much charge as Pluto. So if Pluto's charge is 1, Saturn's is 11.02. But Pluto is 6.84 times further away than Jupiter, so that force drops to (1/11.02) x ($1/6.84^4$) = .0000415. This brings the total variance to 3.855.

But we have to add the variances on Jupiter from Uranus and Neptune. Uranus has 3.544 times less charge than Saturn and is 3.2 times further away. Which gives us an extra variance of .00269. Neptune has 2.327 times less charge than Saturn and is 5.688 times further away. So an extra variance of .000411. Adding those to 1.593 gives us 1.596. Then, 3.855/1.596 = 2.4154. Saturn has **2.4154** times the variance of Jupiter.

To see if this has filled our margin of error, we consult the earlier numbers. My error for Jupiter was 5.32%. My error for Saturn was 12.85%. That is a ratio of 12.85/5.32 = **2.4154**. If we compare the two bolded numbers, we find a perfect match.

Before we move on to find the variance for the other planets, let us pause to show why Jupiter's variance is 5.32%. I need to show that in order to finish my proof. I need it because showing Saturn's relative variance is not enough. Saturn's number depends on Jupiter's, so I need to prove Jupiter's number in order to set my baseline. The math is very simple and can be shown in only a few lines. We already know that Jupiter's relative charge density is 22.84. We compare that to all the charges from the Jovians as they exist *at the distance of Jupiter*. We can estimate this by looking only at charge from Saturn, since the other charges are almost negligible. 22.84 + $3.544^{1/4}$ = 24.2. Jupiter's own charge is 94.4% of that total charge, leaving a difference of 5.6%. That is (roughly) the cause of Jupiter's variance.

As Jupiter is pulled higher, all the Jovians are pulled higher, as a group. Jupiter sets the baseline and the other Jovians follow. This is precisely what my math shows. I was able to dissolve the entire error for Saturn because I found the variance relative to Jupiter.

Now let us look at the variances on Uranus. If Uranus' charge is 1, Saturn's charge at Uranus is $3.544^{1/4} = 1.372$. Uranus will feel 3.544 x .372 = 1.318 from Saturn.

Now Neptune's variance on Uranus. Neptune is larger than Uranus and outside it, so our previous math is difficult to apply. We will solve by an easier math. Neptune's charge is 2.327 times less than Saturn's, so Neptune's variance on Uranus is also 2.327 times less. Saturn's variance on Uranus was 1.318, so Neptune's is 1.318/2.327 = .5664. But Neptune is 1.128 times further away, so the variance drops to $.5664/1.128^4 = .350$. Because Neptune is larger and outside, this variance is negative: -.35.

Now Jupiter's variance on Uranus: Jupiter has 22.84 times as much charge as Uranus, so if Uranus has a charge of 1, Jupiter has a charge of 2.186. Uranus' variance relative to Jupiter would be 22.84 x 1.186 = 27.09. But Uranus is 1.454 times further away from Jupiter than from Saturn, so Uranus only feels a force of $27.09/1.454^4 = 6.061$.

And, finally, Pluto's variance on Uranus. Uranus has 4,160 times more charge than Pluto, so if Pluto's charge is 1, Uranus' is 8.03. But Pluto is 2.1 times farther from Uranus than Saturn is. So, $(1/7.03) \times (1/2.1^4) = .0323$.

Adding the four variances gives us 7.061. But now we have to scale Uranus' variance up to Saturn's. In the equations for Saturn above, we let Saturn equal 1; here we let Uranus equal 1. To do this we simply use the variance between Saturn and Uranus, from above. It was 1.318, so 7.061 x 1.318 = 9.307. Uranus' relative variance is 9.307 and Saturn's was 3.855. Dividing, we get **2.4143**.

So we return to our prediction errors above. The error for Saturn was 12.85% and for Uranus 30.97%. The ratio is **2.4101**. The bolded numbers again show a very good match. Here we have an error of .00173. We have brought our Bode series error down from 30.97% to .173%.

Not only have I solved the problem I set out to solve, I have found another problem to solve later. Notice we have the same number between Saturn and Uranus as we had between Jupiter and Saturn. 2.4143 here and 2.4154 above. That cannot be a coincidence. We will look at those two variances more closely in an upcoming paper.

Also, because I have shown that the charge field fills the gap between prediction and data, Bode's raw prediction for Uranus must have been a fluke. Bode's prediction was only .66% wrong, which looked impressive until I showed how the Unified Field caused the orbital distance mechanically. Bode's series is based on a straight extension of the equation $a=v^2/r$, and I have just shown that cannot work by itself. It cannot work because it ignores the E/M field entirely. Since Bode's original math contains no mechanics or mechanical postulates, it must have achieved the correct number by luck.

Now, the set of equations for Neptune. We will start with Pluto, as the nearest planet. Neptune has 6,334 times more charge than Pluto, so if Neptune's charge is 1, Pluto's is .000158.

Jupiter has 15 times more charge than Neptune, so if Neptune's charge is 1, Jupiter's is 1.968. So the variance on Neptune is 15 x .968 = 14.52. But Jupiter is 2.647 times further from Neptune than Pluto is, so we find $14.52/2.647^4$ = .2956.

Saturn has 2.327 times more charge than Neptune, so if Neptune's charge is 1, Saturn's is 1.235. The variance on Neptune is 2.327 x .235 = .547. But Saturn is 2.18 times further away from Neptune than Pluto is, so its variance drops to $.547/2.18^4$ = .0241.

Again, rather than compare Neptune to Uranus, we will solve the perturbation between them by comparing Uranus to Saturn. We just found Saturn's raw variance on Neptune to be .547. Since Uranus has 3.544 times less charge than Saturn, it's variance upon Neptune must be .547/3.544 = .1543. But Uranus is 1.159 times farther away than Pluto, so $.1543/1.159^4$ = .0855. And again, this variance is negative: -.0855.

Add them all up to get .2344. Once again, we have to scale Neptune's variance up to Saturn's. Saturn is 1.887 times farther from Neptune than from Uranus, so we can develop the transform like this: 3.544 x 6.445 x 1.887 x .2344 = 10.1. That is Neptune's scaled variance. We compare that to Uranus' scaled variance, which was 9.307. Dividing gives us **1.0855.**

According to my series errors, my error for Uranus was 30.97%; and for Neptune, 33.6%. Therefore, Neptune should have been perturbed **1.0849** times as much as Uranus. The two bolded numbers are a near match again. The error is .000533. My method has successfully dissolved the series errors for the Jovians, using very simple math. I think we can confirm that the charge field fills the variances extremely well.

Now let us look at the variance on the Earth. Notice that we are not calculating the Earth as a percentage of any other planet, as we were doing with the math of the Jovians. Instead, we are looking for an absolute motion in the field, as we did with Jupiter above. The Earth has 13.05 times the charge of Mars, so if Mars' charge is 1, the Earth's variance from Mars is $\sqrt[4]{13.05}$ = 1.9006. The Earth has 1.3 times the charge of Venus, so the variance from Venus is $\sqrt[4]{1.3}$ = 1.0679. Venus is smaller and lower, so it will pull the Earth lower, as Uranus does with Neptune. This makes Venus' number negative. Now the variance from Jupiter. Since Jupiter is larger and higher, its variance on the Earth will also be negative. We compare Jupiter's variance on the Earth to Mar's variance on the Earth. Jupiter has 997 times as much charge, but it is 8.14 times as far away. $997/8.143^4$ = .2268. Since Mars' charge was the baseline 1 in this paragraph, Jupiter's variance is just 1 x .2268. Mercury will also give us a negative variance. Mercury has 1/14.14 times the charge of Venus and is 2.213 times farther away from the Earth. That is .00295. If Mars is 1, Venus is 10.034, so we multiply by ten. The variance from Mercury is then .0296. We will also include Saturn, for good measure. Saturn has 154.7 times the charge of

Mars and is 16.64 times farther away. $154.7/16.64^4$ = .00202. Again, negative, and not completely negligible. Add them all up. 1.9006 - 1.0679 - .2268 - .0296 - .00202 = .5743. We have given the Earth a charge of 13.05 in this math, so we compare 13.05 to .5743. The total charge at the Earth of the Earth plus variances is 13.05 + .5743 = 13.624. 13.05/13.624 = .9578. 1 - .9578 = .04215. Or 4.215%. The error from my Bode series was 4.2%, so we are very close.

Now to answer some important questions about the math and mechanics. You will say, "How can Saturn pull Jupiter higher? I thought you said we didn't have any attractions in your unified field?" Good question. As you can see from my math, I am calculating charge differentials. Using these, we find that planets are pushed higher either by larger planets below or smaller planets above. Conversely, planets are pushed lower by larger planets above or smaller planets below. With this simple rule, we see that Jupiter will push Saturn higher, and Saturn will also push Jupiter higher. They both go higher. But why is that, as a matter of mechanics? Haven't I said that charge is a straight bombardment, which would imply that bodies can only repel eachother via charge? Well, yes, in the simplest case, that is true. If two bodies aren't already in the field of a third larger body, that is true. They could only repel eachother. But that isn't the situation we have here, is it? To look at Jupiter and Saturn, we must be aware that they exist in the greater field of the Sun at all times.

I did not calculate absolute charge above, as I have already admitted. I calculated relative charge, or a charge differential. I calculated the four Jovians relative to eachother, leaving the Sun out of it. But if we want to find a motion in the field relative to the Sun (inward or outward), we have to bring the Sun back into the question. In the closed system of Jupiter/Saturn, I found that we have "more charge out." It is clear why that would move Saturn out. But the charge is not just moving at Saturn, it is moving across the whole system. Charge is moving out at Jupiter as well. If we put that closed system into the greater system of the Sun, then charge will be moving out in the entire vicinity. Even charge below Jupiter will be moving out, because our J/S system has created a low pressure across the entire J/S system.

It is very useful to think of charge like wind, creating low pressure and high pressure. This analogy is much more useful than the idea of potential or pluses and minuses, in my opinion, because you can visualize the field blowing from one place to another. This isn't just a metaphor, it is what is physically happening. The charge field is a very fine particulate wind, and it moves from high density to low density. Density and pressure are the same thing, in this regard. So the charge wind is blowing Jupiter just as much as it is blowing Saturn, and it is blowing in the same direction. For this reason, they both go higher.

You will now say, "Since you mention that paper, why is your math different there than here? In those tilt papers http://milesmathis.com/tilt.html you let the outer planet increase as the charge goes in. Here you don't. For instance, you keep Saturn at 1 in the equations, and take the fourth root of Jupiter's charge. In the tilt paper you increase Saturn's charge by the distance."

Another good question. All you have to do is notice that in the tilt papers I am calculating perturbations against the Sun. Here I am calculating the perturbations against eachother. There, I have three bodies, with one in the middle. Here, I have two bodies, and no middle. So although the math looks similar, it isn't really the same.

Conclusion: I have completely solved Bode's law, and I think we are due for a name change for that law. Both Titius and Bode failed rather spectacularly to apply the right equation. The solution is rather simple, as you see, and there was no reason for this to sit in mothballs for 300 hundred years. Physicists couldn't look at it without scales on their eyes, since they had bought the “gravity only” interpretation. Laplace “solved” the perturbation equations 230 years ago, and no one has had the gumption to look closely at them since then. Mathematicians failed to solve this, too, and we may assume it is because they got deflected in about 1820, or 190 years ago, by new maths. They weren't interested in simple algebra like I do here: they wanted to use curved fields and infinities and complex numbers and quaternions and lord knows what else. Actually solving a simple problem of mechanics was beneath them. It really makes you wonder how anything ever gets done.

In physics and math, nothing much does get done, as I have shown. The history of physics and math has not been a wonderland of brilliance and fast progression; it has been a shocking wasteland of deflection, misdirection, and complete incompetence, and it is only getting worse. I expect the response to my papers to continue to be vicious, since there is nothing more reactionary than a field of sinecures. It will be like trying to overthrow the Aristotelians or the French Academy or any other nest of nepotism and privilege and corruption. But they had best put on their waders, because the water is high. I am coming right at them, and I am used to deep currents.

Addendum: many have asked why these charge photons have not been discovered. My answer is that they have. All the photons we already know about are part of the charge field. The entire electromagnetic spectrum is the charge field. We do not have to propose new photons, we can use the ones we already have. I have given all photons mass and radius, so all photons must cause mechanical forces by contact. This has long been known (see the photo-electric effect) but not fully interpreted.
