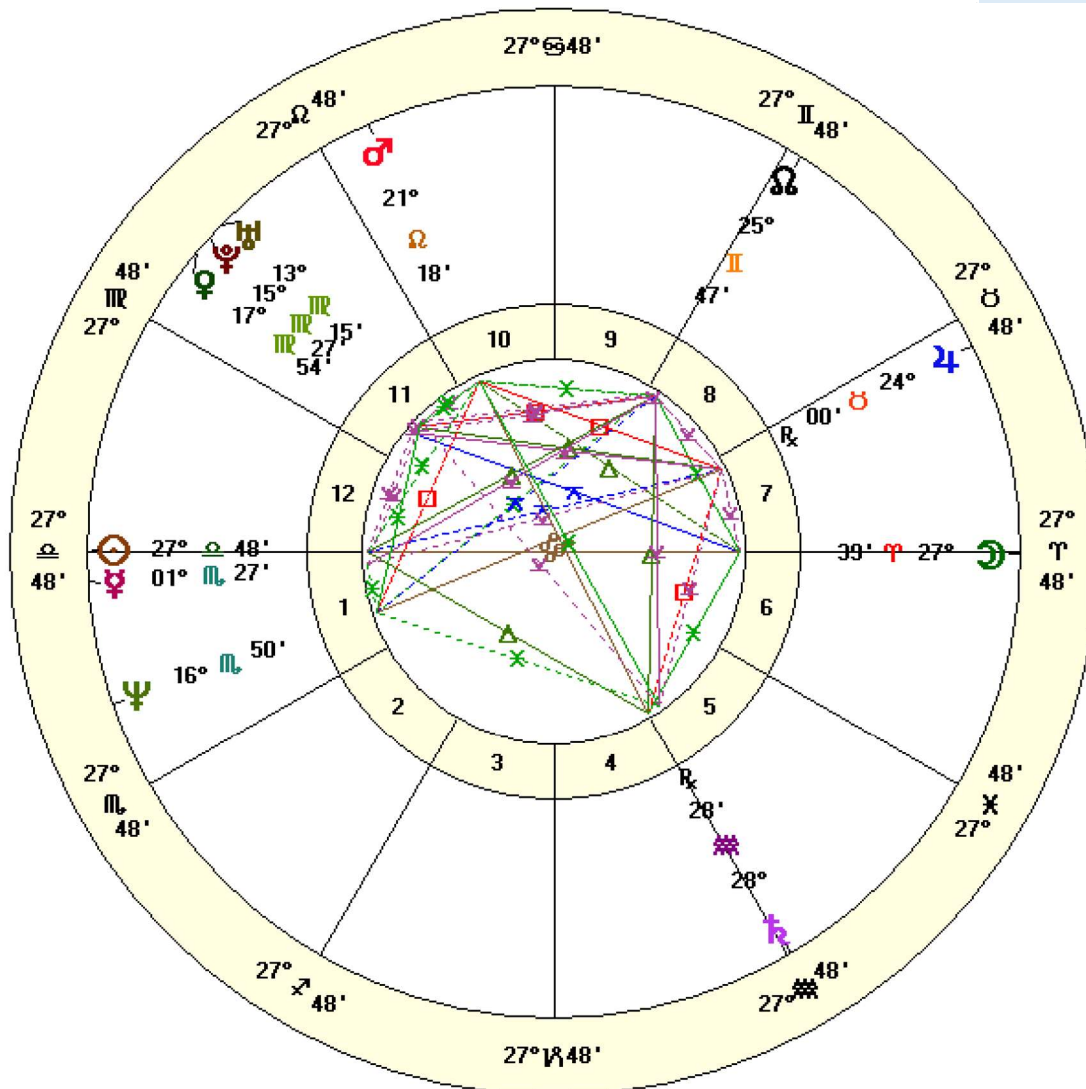In Vedic astrology in India this type of procedure has long been done to add additional meaning to a horoscope. Every sign is routinely subdivided into twelve parts of 2.5° that are called *dwadasamsas* or simply *dwad* for short. Thus, the first dwad of Aries corresponds to Aries, the second dwad to Taurus, and the last dwad corresponds to Pisces, the last sign in the zodiac. However, upon entering Taurus the first dwad in Vedic astrology corresponds not to Aries, but to Taurus. Similarly, the last dwad is not Pisces, but Aries, and then we enter Gemini where the first dwad corresponds to Gemini and the last dwad to Taurus. So what are we to make of this procedure? On the one hand, the transition from the last dwad of Aries (Pisces) to the first dwad of Taurus (Taurus) seems rather abrupt since it appears that we have skipped over Aries and gone directly into Taurus, but I would argue that such is not the case. That is, when we get to the last dwad of Aries, I claim that Aries is still present because the whole sign is Aries! In other words, every dwad of Aries will have an Aries influence, and so the last dwad of Aries is actually a combination of Pisces and Aries which then leads perfectly into the next sign and dwad of Taurus. Similarly, the last dwad of Taurus has the nature of both Aries and Taurus, and that leads directly to the next sign and dwad of Gemini.

It is actually quite common to begin new cycles with the sign that the planet of interest is in. Thus, if we want to create a horoscope for President Kamala Harris that has her Sun on the Ascendant, then since she was born with her Sun at 27° ♎ 48′, it is, perhaps, more customary to begin our chart with this part of the zodiac on the Ascendant rather than depicting this cycle for the Sun as starting at 0° Aries. In summary, when speaking of cycles generically, I usually impose upon that cycle a zodiac that begins at Aries. However, if I am dealing with a specific cycle that starts somewhere else in the zodiac, then I might begin the cycle with that specific location. And we routinely do that with other things in astrology, too, such as the Jupiter/Saturn conjunction at 0° Aquarius in December of 2020. All Western astrologers undoubtedly interpret this twenty year cycle as beginning in Aquarius and not Aries. However, whether we start a cycle at Aries or at some other sign really depends upon what works best. In my case I have my Moon in the last dwad of Taurus. If I start my Taurus zodiac at Aries, then the last dwad is Pisces, However, if I start my Taurus zodiac at Taurus, then the last dwad is Aries. Hence, the question is does my Moon feel more like Taurus/Pisces or Taurus/Aries? In my case, I seem to resonate better to those subdivisions that always begin with Aries rather than the current sign. Thus, with my Moon in the last 2.5° of Taurus, I feel myself more as a Taurus/Pisces blend than as a Taurus/Aries which the traditional Vedic dwadasamas method would use. However, others may resonate differently to each of these possibilities. Also, the fractal nature of horoscopes that such subdivisions lead us to shows us that the horoscope literally contains an infinite amount of information. Additionally, as a result of self-similarity, this information will repeat itself in infinite ways, and that helps to explain why several different techniques will often point to the same conclusion when analyzed by a competent astrologer. And finally, following the horoscope with Sun set at the Ascendant below is a table of the sign subdivisions that I use that always begins with Aries for the first subdivision.

INTERVAL	SIGN
0° ≤ Θ < 2.5°	Aries
2.5° ≤ Θ < 5°	Taurus
5° ≤ Θ < 7.5°	Gemini
7.5° ≤ Θ < 10°	Cancer
10° ≤ Θ < 12.5°	Leo
12.5° ≤ Θ < 15°	Virgo
15° ≤ Θ < 17.5°	Libra
17.5° ≤ Θ < 20°	Scorpio
20° ≤ Θ < 22.5°	Sagittarius
22.5° ≤ Θ < 25°	Capricorn
25° ≤ Θ < 27.5°	Aquarius
27.5° ≤ Θ < 30°	Pisces

Using this scheme and a little mathematics, we can easily determine things such as what point in the zodiac is the most Aries or the most Taurus and so on. For example, the sign of Taurus starts at $30°$, but we can insert another zodiac within Taurus, and the starting point of Taurus in this zodiac will add to the Taurus nature of our initial encounter. Also, to reach this second Taurus point, we have to add on $\frac{30°}{12} = 2.5°$ to our original $30°$.

$$30° + 2.5° = 32.5°$$

If we now want to take this one step further, then the next zodiac will contain segments of length $\frac{2.5°}{12} = 0.208\overline{3}°$. Hence, our position at this point is,

$$30° + 2.5° + 0.208\overline{3}° = 32.708\overline{3}°$$

Now the question is, if I continue this forever, then can we find out what the resulting infinite sum will be? Fortunately, if we analyze things properly, the answer is yes! Thus, let's review what is happening in the above sum. We first found the position of Taurus by dividing $360°$ by 12 and choosing the second interval in that subdivision. Next we divided our $30°$ by 12 to get $2.5°$, and we added that on. And finally, we divided $2.5°$ by 12 to get $0.208\overline{3}°$, and we added that on. Clearly, the next term to add on should be $0.208\overline{3}°$ divided by 12! Also, we can rewrite the sum above as,

$$\frac{1}{12} \times 360° + \frac{1}{12} \times \frac{1}{12} \times 360° + \frac{1}{12} \times \frac{1}{12} \times \frac{1}{12} \times 360°$$
$$= \left(\frac{1}{12}\right) \times 360° + \left(\frac{1}{12}\right)^2 \times 360° + \left(\frac{1}{12}\right)^3 \times 360° = 32.708\overline{3}°$$

We can extrapolate from this to conclude that the sum of the first n terms of a sum that can go on to infinity should be,

$$\left(\frac{1}{12}\right) \times 360° + \left(\frac{1}{12}\right)^2 \times 360° + \left(\frac{1}{12}\right)^3 \times 360° + \cdots + \left(\frac{1}{12}\right)^n \times 360° = S_n$$

Now we just need to see if we can reduce this to an easy-to-use formula. To accomplish that, let's multiply both sides of the above equation by $\frac{1}{12}$ to get,

$$\left(\frac{1}{12}\right)^2 \times 360° + \left(\frac{1}{12}\right)^3 \times 360° + \left(\frac{1}{12}\right)^4 \times 360° + \cdots + \left(\frac{1}{12}\right)^n \times 360° + \left(\frac{1}{12}\right)^{n+1} \times 360° = \frac{1}{12} \times S_n$$

And now we just need to do a little subtraction.

$$S_n - \frac{1}{12} \times S_n$$

$$= \left[\left(\frac{1}{12}\right) \times 360° + \left(\frac{1}{12}\right)^2 \times 360° + \left(\frac{1}{12}\right)^3 \times 360° + \cdots + \left(\frac{1}{12}\right)^n \times 360°\right]$$

$$- \left[\left(\frac{1}{12}\right)^2 \times 360° + \left(\frac{1}{12}\right)^3 \times 360° + \left(\frac{1}{12}\right)^4 \times 360° + \cdots + \left(\frac{1}{12}\right)^n \times 360°\right.$$

$$\left. + \left(\frac{1}{12}\right)^{n+1} \times 360°\right]$$

$$= \left(\frac{1}{12}\right) \times 360° - \left(\frac{1}{12}\right)^{n+1} \times 360°$$

Hence,

$$S_n - \frac{1}{12} \times S_n = S_n \times \left(1 - \frac{1}{12}\right) = \left(\frac{1}{12}\right) \times 360° - \left(\frac{1}{12}\right)^{n+1} \times 360°$$

$$\text{Implies that } S_n = \frac{\left(\frac{1}{12}\right) \times 360° - \left(\frac{1}{12}\right)^{n+1} \times 360°}{1 - \frac{1}{12}}.$$

Notice that a n increases that the value of $\left(\frac{1}{12}\right)^{n+1} \times 360°$ gets closer and closer to 0 and becomes negligible. Hence, if we represent the corresponding infinite sum by S, then we have,

$$S = \left(\frac{1}{12}\right) \times 360° + \left(\frac{1}{12}\right)^2 \times 360° + \left(\frac{1}{12}\right)^3 \times 360° + \cdots = 360° \times \frac{\frac{1}{12}}{1 - \frac{1}{12}} = 360° \times \frac{1}{11} = 32.\overline{72}° = 2.\overline{72}°$$

$$\text{♉}$$

Thus, $2.\overline{72}°$ ♉ is the point in the zodiac that is "most" Taurus. To now find the point that is most Gemini, we can modify the above formula by noting that the start of Gemini is two twelfths of the way around the zodiac. Hence, the position of the most Gemini point is,

$$S = 2\left(\frac{1}{12}\right)(360°) + 2\left(\frac{1}{12}\right)^2(360°) + 2\left(\frac{1}{12}\right)^3(360°) + \cdots = 2 \times 360° \times \frac{\frac{1}{12}}{1 - \frac{1}{12}} = 360° \times \frac{2}{11} =$$

$$65.\overline{45}° = 5.\overline{45}° \text{ ♊}$$

You might at this point begin to see a pattern emerging. In particular, the start of every sign in the zodiac is going to be equal to some fraction over 12 times $360°$. For example, Aries begins at $\frac{0}{12} \times 360°$, Taurus begins at $\frac{1}{12} \times 360°$, Gemini begins at $\frac{2}{12} \times 360°$, Cancer begins at $\frac{3}{12} \times 360°$, and so on. Thus, if we let n equal the number of $30°$ segments that the start of our sign is from $0°$ Aries, then the degree of the zodiac that, in a sense, most embodies that sign is given by the formula $360° \times \frac{n}{11}$. And using this formula we can now create a table like the one below that shows the zodiac point that represents, in theory, the quintessential essence of each sign.

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SIGN	VALUE FOR n	(360)(n/11)	THE "ESSENCE" POINT
Aries	0	0	0 Aries
Taurus	1	32.72	2 Taurus 44
Gemini	2	65.45	5 Gemini 27
Cancer	3	98.18	8 Cancer 11
Leo	4	130.90	10 Leo 55
Virgo	5	163.63	13 Virgo 38
Libra	6	196.36	16 Libra 22
Scorpio	7	229.09	19 Scorpio 5
Sagittarius	8	261.81	21 Sagittarius 49
Capricorn	9	294.54	24 Capricorn 33
Aquarius	10	327.27	27 Aquarius 16
Pisces	11	360	0 Aries

An intriguing consequence of the above is that the point which is most Pisces is exactly the same as the point that is the most Aries, and this underscores that the end of a cycle always coincides with the beginning. The end is in the beginning, and the beginning is in the end. Also, if we had pursued the above scheme using the traditional *dwadasamsas* of Vedic astrology where each fractal zodiac begins with the sign that one starts with, then the 0° point of each sign winds up being the place where the nature of that sign is felt most strongly.

SIGN	THE "ESSENCE" POINT USING TRADITIONAL DWADASAMAS
Aries	0 Aries
Taurus	0 Taurus
Gemini	0 Gemini
Cancer	0 Cancer
Leo	0 Leo
Virgo	0 Virgo
Libra	0 Libra
Scorpio	0 Scorpio
Sagittarius	0 Sagittarius
Capricorn	0 Capricorn
Aquarius	0 Aquarius
Pisces	0 Aries

Now let's dive deeper using our first scheme above where each fractal zodiac begins with Aries. In this case our "essence" points are always of the form $360° \times \frac{n}{11}$ where n varies from 0 to 11. An important thing to now realize is that each angle that we compute by this formula will also be an 11th harmonic angle. Hence, if we calculate the 11th harmonic chart, then any planet falling on an "essence" point in our original chart will appear at 0° Aries in our 11th harmonic chart. This happens because for every possible value for n, $360° \times \frac{n}{11} \times 11 = 360° \times n$ is a natural number multiple of 360° that is equivalent to 0° Aries when we do our clock arithmetic modulo 360°.

Now I want to show you something that is truly amazing to me. Namely, <u>in addition to our 11th harmonic angles all being equivalent to 0 degrees Aries in the 11th harmonic chart, they are also fixed points in the 12th harmonic chart</u>. In other words each of the essence points in the table below will occupy exactly the same position in the 12th harmonic chart! We'll look at this both geometrically and algebraically.

Aries	0	0	0 Aries
Taurus	1	32.72	2 Taurus 44
Gemini	2	65.45	5 Gemini 27
Cancer	3	98.18	8 Cancer 11
Leo	4	130.90	10 Cancer 55
Virgo	5	163.63	13 Virgo 38
Libra	6	196.36	16 Libra 22
Scorpio	7	229.09	19 Scorpio 5
Sagittarius	8	261.81	21 Sagittarius 49
Capricorn	9	294.54	24 Capricorn 33
Aquarius	10	327.27	27 Aquarius 16
Pisces	11	360	0 Aries

Recall that the quick and easy way to find the 12th harmonic position of any point in our chart is to simply multiply the value of that position as measured from 0° Aries by 12 and then express the result modulo 360° (i.e. clock arithmetic). Thus, if we start geometrically with our first segment which is about 32.72 degrees from the beginning of Aries and if we add on to it 11 more such segments in order to give us a total of 12 from 0° Aries, then you can see using the diagram below that we'll wind up right back where we started, thus showing that the 12th harmonic of 2° Taurus 44′ is again 2° Taurus 44′. Furthermore, if we start with the next point which is at about 65.45 degrees from 0° Aries and then add 11 more identical segments to it, then we once more will arrive right back where we started.
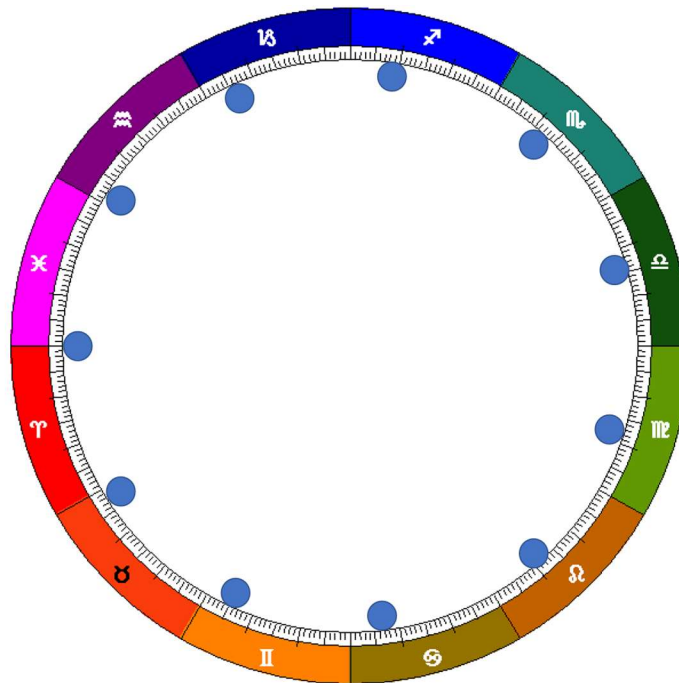
As appealing as the geometry is, let's also look at this algebraically. Hence, expressed algebraically our first 11th harmonic angle is at $360° \times \frac{1}{11} = 32.\overline{\overline{72}}°$. If we multiply this by 12, then we get $360° \times \frac{1}{11} \times 12 = 360° \times \frac{12}{11}$. However, since we are doing clock arithmetic, we start over when we get to $360° \times \frac{11}{11}$, and thus, $360° \times \frac{12}{11}$ is equivalent to $360° \times \frac{1}{11} = 32.\overline{\overline{72}}° = 2°$ Taurus 44′. Likewise, for any angle of the form

$360° \times \frac{n}{11}$, if we multiply this by 12, then we get $360° \times \frac{12n}{11} = 360° \times \left(\frac{11n}{11} + \frac{n}{11}\right)$ which in our clock arithmetic modulo 360° is equivalent to $360° \times \frac{n}{11}$, the exact point that we started with! Hence, the 11th harmonic points in our original chart will be fixed points in the 12th harmonic chart. Similarly, if your harmonic is a natural number power of 12 such as 12^2, then we get $360° \times \frac{n}{11} \times 12 \times 12$. Multiplying by the first 12 gives us back via clock arithmetic the angle $360° \times \frac{n}{11}$ and then multiplying by the second 12 produces the same result. Consequently, these 11th harmonic angles are fixed points in any harmonic chart corresponding to 12^n where n is a natural number.

Now let's see what happens if we use a natural number harmonic which is not a power of 12, for example the 3rd harmonic. Then, once again, we can find the 3rd harmonic position of each of our 11th harmonic angles by multiplying by 3 and then simplifying modulo 360°, and when we do this, we get the following results.

11th HARMONIC ANGLE	ANGLE TIMES 3	RESULT MODULO 360
(360)(0/11)	(360)(0/11)	(360)(0/11)
(360)(1/11)	(360)(3/11)	(360)(3/11)
(360)(2/11)	(360)(6/11)	(360)(6/11)
(360)(3/11)	(360)(9/11)	(360)(9/11)
(360)(4/11)	(360)(12/11)	(360)(1/11)
(360)(5/11)	(360)(15/11)	(360)(4/11)
(360)(6/11)	(360)(18/11)	(360)(7/11)
(360)(7/11)	(360)(21/11)	(360)(10/11)
(360)(8/11)	(360)(24/11)	(360)(2/11)
(360)(9/11)	(360)(27/11)	(360)(5/11)
(360)(10/11)	(360)(30/11)	(360)(8/11)
(360)(11/11)	(360)(33/11)	(360)(11/11)

From this chart we can see that in the 3rd harmonic our 11th harmonic angles don't wind up just anywhere. Instead, they always arrive at other 11th harmonic angles, thus producing what is merely a permutation of our original list of 11th harmonic angles! What all of this shows is that harmonic charts in astrology have incredible mathematical structure, and we know from experience that mathematical structure always translates into meaningful applications over time. Hence, every bit of structure we uncover is incredibly exciting to me. Furthermore, everything we've done so far can be applied to all natural number harmonics. In other words, just as the 11th harmonic points are all equivalent to zero in the 11th harmonic chart and are fixed points in the 12th harmonic chart, so will n^{th} harmonic points be equivalent to zero in the n harmonic chart and fixed points in the $n + 1$ harmonic chart. Furthermore, if m and n are natural numbers and if we want to consider the mth harmonic chart of nth harmonic angles, then there appear to be three possibilities with each one easy to verify:

1. If n is a factor of m, then each of the nth harmonic angles is equivalent to 0° in an mth harmonic chart.
2. If m is equal to a natural number power of $n + 1$, then each of the nth harmonic angles is an unchanged fixed point when the original chart is transformed into the mth harmonic chart.
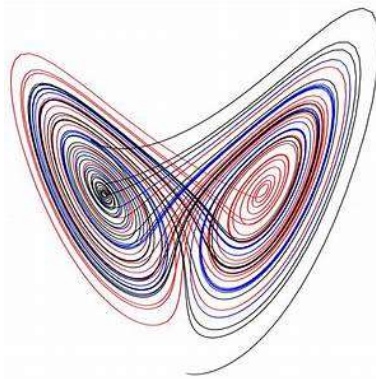
3. If m is not a power of $n + 1$ and if n is not a factor of m, then the mth harmonic chart will produce a permutation of the nth harmonic angles.
4. In all cases for natural numbers m and n, the mth harmonic will map each nth harmonic angle onto an nth harmonic angle, and sometimes it will be the same angle, sometimes 0°, and sometimes a permutation of our original list of nth harmonic angles.

Again, this is incredible mathematical structure that we are uncovering, and in particular, we see that for any natural number n, the nth harmonic angles have a special connection with the nth harmonic chart and the $n + 1$ harmonic charts, and most m^{th} harmonic charts will produce a permutation of these angles with, at the very least, n^{th} harmonic angles always getting mapped onto n^{th} harmonic angles. Thus, as I've said above, when we produce harmonic charts, things don't move about just willy nilly. Instead, 2ⁿᵈ harmonic angles always get mapped onto 2ⁿᵈ harmonic angles, and so forth for higher natural number harmonic angles. In a sense, everything always stays within the family, and this shows structure that is preserved even as we go on to higher harmonics! Furthermore, even though the original context is astrological, this has implications far beyond astrology because ultimately we are just looking at cycles within cycles and transformations of cycles, and these results apply, *mutatis mutandis*, to any situation involving cycles.

There are some other aspects of harmonic astrology that we can also examine mathematically. For example, if two planets are in a certain aspect with one another in the natal chart, then what will happen to this aspect in a harmonic chart? To understand what occurs, let's take a simple example. Thus, suppose that we have two planets exactly square one another and that the first planet is θ_1 degrees from 0° Aries and the second planet is θ_2 degrees from 0° Aries, and $\theta_2 > \theta_1$ so that $\theta_2 - \theta_1 = 90°$. An angle of 90° is a 4ᵗʰ harmonic angle, and we know that the 4ᵗʰ harmonic angles as measured from 0° Aries are fixed points in the 5ᵗʰ harmonic chart, and it would be very convenient if all 4ᵗʰ harmonic angles of separation are also preserved. Fortunately, this appears to be the case. Recall that we can find the position of each planet in the 5ᵗʰ harmonic chart by multiplying each planetary position by 5 and then expressing the result modulo 360°. Hence, the angle of separation in the 5ᵗʰ harmonic chart is $5\theta_2 - 5\theta_1 = 5(\theta_2 - \theta_1) = 5 \times 90° = 450° (modulo\ 360°) = 90°$. Thus, the angle of separation remains unchanged, and our analysis suggests, in general, that if two planets are separated by an nth harmonic aspect, then transforming the birth chart into a mth harmonic chart for some natural number m will once again map the nth harmonic aspect onto some other n^{th} harmonic angle. Consequently, the 5ᵗʰ harmonic of an angle of separation of 120° is $5 \times 120° = 600° (modulo\ 360°) = 240°$ which is just another 3ʳᵈ harmonic angle. Likewise, we expect that the 3ʳᵈ harmonic of this angle will be equivalent to 0°, and sure enough $3 \times 120° = 360° (modulo\ 360°) = 0°$. In other words, our earlier rules for finding angles in harmonic charts seem to apply to angles of separation also.

Now let's look at another scenario – harmonics that are associated with angles of separation that are not related to natural number harmonics. As an example, I'll consider the angular distance between Mercury and Uranus in my natal chart. In theory, the angle of separation between two planets could be either a rational number or an irrational number, but in either case it can always be approximated by a rational number. Plus, when we write down a planet's position in terms of exact degrees and minutes, we are always giving it a rational number value. Thus, I'll assume 100% accuracy when I express the separation between my Mercury and Uranus as exactly $57° \, 28' = \left(57 + \frac{28}{60}\right)° = \left(57 + \frac{7}{15}\right)° = \frac{862}{15}°$. To find the harmonic related to this level of angular separation, we have to divide this value into 360°. Thus, the

harmonic is $\dfrac{360°}{(862/15)°} = \dfrac{5400}{862}$, and if we multiply our original angle by this harmonic, then we can easily see that the product is $\dfrac{862}{15}° \times \dfrac{5400}{862} = 360°$, and if we multiply this angle by our harmonic plus one, then $\dfrac{862}{15}° \times \left(\dfrac{5400}{862} + 1\right) = \dfrac{862}{15}° \times \dfrac{6262}{862} = \dfrac{862}{15}° \times \dfrac{3131}{431} = 417\dfrac{7}{15}°$ which is equivalent, modulo 360°, to $57\dfrac{7}{15}° = 57° \, 28'$. Furthermore, if we multiply our angle by 5400, one of the numerators above, then we get $\dfrac{862}{15}° \times 5400 = 310{,}320° = 862 \times 360°$ which is equivalent to 0°, modulo 360°. In other words, <u>whenever the angle of separation is a rational number, then there will always be a natural number that we can multiply that angle by that will give us a result that is equivalent to 0°, modulo360°</u>, and that number is equal to 360 times the denominator of our rational number. However, if our angle of separation is irrational, then this will never happen since an irrational number times a natural number will also be irrational and, hence, never equivalent to 0°, modulo 360°. However, it is quite possible that, in cases like this, that "strange attractors" may emerge. These are images or patterns, such as the *Lorentz attractor* below where no path is repeated and yet over time a definite image appears.

At its best, statistics is a wonderful light that can bring great clarity to whatever it shines its light upon. But at its worst, statistics is just a sophisticated lie, and a major determinant in the outcome is the quality of the data. To paraphrase a past Secretary of Defense, we often do statistics not with the data we want, but with the data we have, and if that data is biased or otherwise unclean, then our results will be correspondingly compromised. However, bad data is not the only problem facing modern statistics. Below are a few additional problems, in my opinion.

- <u>An overreliance on binary interpretations has distorted our understanding</u>

  What everyone wants when they do statistics is to be able to declare something "statistically significant," but there are problems with the usual binary approach. For example, many a researcher has lamented that their result was so, so very close to the cutoff point for significance that it just doesn't seem right to deem it irrelevant. And I agree that this is a problem. Furthermore, sometimes there is more than one test available in a given situation, and quite often one test will indicate significance while the other doesn't! What is one supposed to do? Some, including me, would like to chuck the whole system and focus more on trying to assess the strength of the relationship and the degree to which results are replicated when conditions are similar. This would be a recognition that reality more often than not consists of conditions that wax and wane rather than turning on and off like a switch. By recognizing that reality is generally nonbinary and by placing more emphasis on replication of results, many of the problems of modern statistics can likely be avoided. Furthermore, in some disciplines, such as the association of genetic markers with various characteristics, traditional statistical hypotheses testing is not possible, and instead results are obtained by comparing extreme cases with a control group in order to sense the effects of certain genes.

- <u>An overemphasis on positive results has skewed our understanding in several disciplines</u>

  Typically, journals and tenure committees only seem to care about a result if it is statistically significant. However, negative results can also be quite important. For instance, it can be just as important to know that one substance causes no harm as it is to know that another can be significantly harmful. We need to know the big picture and not just a narrow point of view!

- <u>Misuse of the Bonferroni Correction has hindered research in many disciplines</u>

  When one increases the number of statistical tests that one is doing, one also increases the likelihood of getting a statistically significant result purely by chance. To prevent this kind of error, it is common to require more stringent criteria for significance in order to avoid spurious results. However, by avoiding one kind of error, this correction makes another type of error more likely. In particular, the Bonferroni Correction increases the likelihood that you will accept something that is false while, nonetheless, making it less likely that you will reject something that is true. But it makes no sense to exacerbate one problem in order to fix another! Thus, I believe that the Bonferroni Correction should be rejected along with the current binary form of

hypothesis testing. Instead, one should focus more on the strength of the relationship between the variables, the tendency toward significance, and whether the results can be reliably replicated because if there is no replication, then who cares? Furthermore, since the Bonferroni Correction is typically applied when one is doing several statistical tests, this discourages comprehensive exploration during a single study since no researcher wants to see their significant result vanish as a result of making the criteria for significance more stringent. Again, we often need a comprehensive understanding of the whole rather than just piecemeal results regarding the parts, and modern statistics has not served us well in that regard.

- <u>Important results need to be replicated and confirmed by agencies with no inherent bias</u>

  It is not uncommon for statistical studies to be conducted by those who have the greatest stake in the outcome. For example, much of the research into the efficacy of pharmaceutical drugs is done by the pharmaceutical companies themselves! Their interest in their own products is understandable, but all results need to be replicated and confirmed by outside agencies before they are accepted. Too many results are "one hit wonders" that other researchers have been unable to replicate, and yet the mythology of their claims often persists.

- <u>There has been a flagrant misuse of tests showing that a correlation is significantly different from zero</u>

  When assessing something like the coefficient of linear correlation between two variables it is important, of course, to know that it is unlikely that the correlation is zero, but knowing that the correlation is not zero does not mean that the correlation is important. Quite often what one wants is to determine that a particular variable has predictive power with regard to another variable, and in this case it is not enough to know that a correlation is probably different from zero. One also has to know that the strength of the correlation is such that it can be used as a reliable predictor. However, in the quest for the sort of relevance that our society places on statistical significance, all too often a very weak correlation is elevated in importance simply because a test has shown that this correlation is significantly different from zero, and this has led to many a bad decision. In fact, the only time I would consider something like this important is when our goal is to simply show that a certain effect is likely real albeit weak. In such an instance it should also be noted that the predictive power of the variable is weak even if the effect is real. That is how things should be done, in my opinion, but that is also not how things are often done.

These are some of the problems that I believe exist with modern statistics and some of the adjustments that I feel need to be made. However, there are also adjustments that the astrological community should make in order to successfully becom an evidence-based discipline, and I'll enumerate a few of these now.

- <u>It should be understood that many astrological effects probably have a strength that ranges from weak to moderate</u>

If an astrological effect were strong, then it would produce the same result every single time. However, since it usually doesn't, this suggests that most astrologically impulses are far from strong. Otherwise, there would be no ability to exert free will. However, astrologers have long recognized that the stars impel, but they do not compel. In other words, astrologers have long observed that astrological impulses are weak enough that the outcome is never 100% certain. Hence, what some researchers are now finding out is that certain outcomes are often more strongly related to a conglomeration of astrological influences rather than just a single influence. Consequently, it will often be more fruitful to ask what combinations of factors may yield a particular result rather than focusing on just a single factor. Hence, greater use needs to be made of techniques such as factor analysis, multiple regression, discriminant analysis and other statistical procedures that are designed to focus on the association of multiple variables rather than always supposing that a single cause always results in a single effect.

- <u>In astrology, a single effect can be the result of multiple causes, and a single cause can have multiple effects</u>

    I believe that one of the difficulties in statistically validating astrology is due to the fact that a single astrological influence can manifest in several different ways, and a specific outcome could be the result of many different possible causes. For example, success as a mathematician could be the result of a strong mind (Mars conjunct Mercury) or a focused mind (Saturn conjunct Mercury) or a creative mind (Uranus conjunct Mercury) or other astrological conditions. Similarly, while an aspect like Uranus sextile Mercury can give you the creativity desired for mathematical research, the creativity indicated by this aspect can just as easily find expression in other fields including astrology. Thus, the fact that a single cause can result in any of a variety of effects or that a single effect could be the result of any of a variety of causes makes statistical verification of astrology all the more challenging. And when you couple this with the acknowledgement that most astrological effects probably range in strength from weak to moderate, it is no wonder that statistical verification of astrology has been difficult. Nonetheless, many, including myself, have found effects here and there which hold up under replication. Thus, it is not true to say that there is no statistical verification of astrology. Instead, there exist particular challenges, such as those stated above, that have to be addressed when doing astrological research. Additionally, the scientific community has to assess these results without the bias that it has presented in the past. Many researchers in other fields have automatically assumed that any results obtained that support astrology must be in error, and so they have focused on trying to explain where in the methodology the error has occurred rather than contemplating the veracity of the results and whether they can be replicated.

- <u>Astrology needs large and complete databases</u>

    Lots of data is needed in order to determine what works and what doesn't work in astrology, and fortunately much has been done to meet this requirement. Huge data bases not only exist within some popular astrological programs like Sirius and Solar Fire, but also at Astrodatabank which can be accessed online for free. However, these databases can also include some serious gaps. For example, I was doing some exploratory research on Parkinson's recently, and I wanted