

*“Relativity is like the virgin’s hymen, in how it
prohibits travel faster than the speed of light.
Temporal Mechanics is the buxom broad
behind it all.”*

T.K. Leforge in Crashdown

Temporal Mechanics

a visual introduction

william h. clark ii



SPQR Media

Knoxville

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Preface

Please don't take the absence of hardboiled mathematics in this book to mean the lack of solid analytical proof. The Three Body Problem (3BP) of Celestial Mechanics is the most famous math problem of all time. It forms the basis of virtually every idea and theory in this book. Fortunately, the 3BP lends itself very nicely to a visual presentation. One graphic may have required volumes of mathematics to create, but the understanding thereof is easy to grasp just from the visual.

The content requires only a solid grasp of basic scientific principles to follow. It's not easy reading; I'll grant you. You'll need your thinking hat on (and perhaps an Internet connection to Google a term that peaks your interest now and again). You'll be asked to recognize the similarity between two math equations, for example, but nothing much beyond that.

Chapters 2 and 3 use basic diagrams from orbital mechanics to illustrate psychological ideas, as a way to ease the reader into a conceptual comfort level with the technical material. Everybody can relate to social situations and psychology. Posing "The Rocket Science of Relationships" relates easily to the gravity of attraction, and close approaches to an object of your desire.

Chapters 3 and 4 present two rigorous theories of psychology, both compared explicitly to the Earth-to-Mars interplanetary trajectory – which sounds kind of scary; except, again, everybody

can relate to the psycho-sexual stages of human development and to the dramatic structure of screenplays (films and TV shows).

Chapter 5 builds on your new conceptual understanding of orbital mechanics to present a simple case of the 3BP, illustrated with well-known examples from planetary astronomy and the orbits of planets.

Chapter 6 introduces the idea of fractals into the discussion, patterns that repeat at regular intervals in many natural systems. Up to this point, for example, the 3BP was repeated at several different levels, so you've already been witness to a fractal development. Virtually every illustration hereafter will be another fractal level.

Chapter 7 discusses three-phase electrical current (hint: three phases – so you can imagine already where that leads). Chapter 8 is a more detail discussion of the Two Body Problem (a satellite orbiting Earth or a planet orbiting the sun). Chapter 9 delves into the Four Body Problem, which you already know because that's the interplanetary trajectory, where the four bodies are the sun, Earth, Mars, and the spacecraft going from Earth to Mars while, all the while, under the steady influence of the sun's gravity. Chapter 9 is the only chapter with any number of math equations.

The subject of Chapter 10 is solid state physics or the dynamics of the semiconductor junction. This also is modeled on the now familiar Mars trajectory problem, i.e., what we now know is in reality a 4BP.

A whole new model of the solar system is presented in Chapter 11, beginning with a fairly simple least-squares averaging of planetary positions to find a common, averaged orbital plane. Chapter 12 looks at the motion of the nine planets and the sun relative to this new "invariant plane," to arrive at a dramatic String Theory-esque graphic that explains all the orbital parameters of the planets in a single graphic (nine planets times four orbital parameters per planet equals 36 variables).

Chapter 13 ties up some loose ends, explaining how the material presented thus far represents more than a fractal theory based on

the 3BP but also a Unified Field Theory. That is, the 3BP already explains atomic orbitals and gravity; so it already includes two of the four fundamental forces. Chapter 7 discusses the third primary force, and Chapter 10 the other.

Chapter 14 brings Relativity into the mix, and Henry Poincare's own theory of Relativity, presented a decade before Einstein's Special Theory of Relativity. Poincare's theory is based on the Many Body Problem (can you guess what that means?), whereas Einstein's is strictly electromagnetic in nature. Can both theories be right? If so, what are the consequences?

Chapter 15 reflects on the math, and Chapter 16 has the full source code for a model of the Earth to Mars trajectory, as well as the code used to arrive at the "Invariant Plane" of Chapter 11.

WH Clark

9.15.2018

I.

Temporal
as in
“Between the Temples”

1

Introduction

The book title Temporal Mechanics is to distinguish the content from Celestial Mechanics, i.e., traditional astronomy, astrophysics, and orbital mechanics. The “visual introduction” subtitle refers to the many graphical illustrations to present the material in lieu of hardcore mathematics.

“Temporal” is defined as: “of or relating to the physical world, earthly” as opposed to celestial. In this context, Temporal Mechanics is the real-world, engineering application of orbital and celestial mechanics. Temporal also refers to time, which is important here, if only by indirect inference. Finally, temporal can refer to between the temples of the head, indicating the psychology theories in the first few chapters.

The idea was to differentiate this material from Celestial Mechanics which is strictly concerned with orbital theory involving planets, suns, solar systems, or galaxies; hence the notion of Temporal Mechanics, which will focus on engineered applications beyond the scope of astronomy.

The ancient Egyptians believed it was their sacred duty to “copy the images of the sky on Earth.” And so, the layout and structure of their major monuments, like the pyramids and the Sphinx, had an exact alignment to the position of the stars at a specific epoch and time of year. Here we “copy” the patterns of the stars in the sky down to Earth, but in physical models of worldly systems.

There’s no statistics in Celestial Mechanics. It’s all pure mathematics, and it’s all derived from a single equation: Newton’s Law of Gravitation.

$$(1.1) \quad F = G \frac{m_1 m_2}{r^2}$$

Where

F= force

G = Gravitational Constant

m = mass

r = distance

Historically, the patterns in the stars have been used with considerable success to model terrestrial phenomena. The Two Body Problem, one planet orbiting a sun, was the original nucleus-electron model of the atom posed by Niels Bohr. To this day, we understand the atom as a central nucleus with a cloud of atoms circling with the lowest orbitals occupied by electrons in circular orbits, just like a planet orbiting a star.

This atomic analogy is mathematically exact. The equation for Coulomb's Law of electrostatics, describing the force between charged particles, is the same as Newton's Law of Gravitation except for a constant of proportionality (G and K) to account for the different scales involved.

$$(1.2) \quad F = K \frac{q_1 q_2}{r^2}$$

Where

F= force

K = Coulomb's Law Constant

q = charge

r = distance

Gravity and the electrostatic force between charged particles

are both inverse-squared forces. The strength of the force changes at a rate equal to the distance squared between the bodies. Sound, light, and electromagnetic radiation (e.g., radiation for x-rays) are also inverse-squared forces.

The principles of orbital mechanics (the application of Newton's Law of Gravity to celestial bodies) have been applied in the subatomic realm in the study of the atom. Ernest Rutherford shot a beam of alpha particles at a sheet of gold foil and concluded the deflection of the negatively charged particles was caused by a dense, positively charged nucleus. This scattering of high-speed electrons by matter follows the same equations as the deflection of satellites flying close to planets, or the motion of comets traveling close to a star.

There are also applications of the Three Body Problem at the subatomic level. This is the study of a small object under the influence of two much larger ones; for example, a satellite (the infinitely small body, relative to the others) traveling from Earth to the Moon (the two primary bodies). This problem has been solved only for very specific circumstances, i.e., when all three bodies move in the same plane.

FRACTAL THEORY

A fractal is a pattern that repeats at many different levels. Fractals are very common in nature. For example, the nautilus shell, buds of the Romanesco broccoli, pine cone seeds, the patterns of ice or copper crystals forming, and the flow of electricity between charged poles across the surface of a metal block, to name but a few.

This material will be organized as a fractal theory. We've already defined the two extremes, atomic orbits, and planetary orbits. Other principle levels will be offered to establish a series of intermediate fractals. They will all share the same structure of the Three Body Problem. Several levels will be shown in great detail, while others will be obvious from just a single illustration

(once you're familiar with the pattern of the Three Body Problem and can recognize the similarities).

Only essential, basic math will be used here. Much more mathematics is, of course, embedded in the Three Body Problem, but you don't need to know the math to appreciate the applications.

Nor do you need to know anything about the Three Body Problem, because your conceptual understanding will be developed in the first few sections, literally starting from scratch with junior high geometry – circles and ellipses.

A UNIFIED FIELD THEORY

There are four main forces in nature: (1) The strong atomic interaction that holds protons and neutrons in a nucleus, (2) the weak electromagnetic interaction of atomic bonding, (3) a weak interaction that occurs in some forms of radiation, and (4) gravity. The Holy Grail of physics is a theory that explains all four forces in a single set of equations known as the Grand Unified Field Theory.

As you may have observed, the Three Body Problem (3BP) already explains the (2) and (4) forces, simply because the equation for electrostatics is the same as for gravity. Consequently, everything we know about the 3BP at the astronomy level translates subatomic physics; in theory. If we add more levels where the 3BP applies, conceivably one or more of these could include the remaining two fundamental forces.

As you build out even more fractal levels of the 3BP, you have the potential for a "Theory of Everything" which physicists define as a system of equations that defines all forces in the universe and the interactions between and among them. It's not hard to see that, as stated, a fractal 3BP has the potential to be a Theory of Everything. We just need to fill in the missing intermediate levels between the subatomic and the intergalactic.

The presentation here will concentrate on the real-world, practical aspects, up to and including the solar system. Beyond that is Relativity and then cosmology, both of which can also be framed

in terms of the 3BP, but these introduce the “time” aspect of “Temporal,” and this requires a deeper understanding of orbital theory that takes a few chapters to familiarize (i.e., Lagrange Point Dynamics).

Lagrange Points are a set of five stable points inside the 3BP. The Trojan asteroids orbit two of these Lagrange Points in the Sun-Jupiter 3BP. At the subatomic level, where everything is in 3D instead of planar, these Lagrange Points are stretched into p-type electronic orbitals occupied by electrons. And the stable orbits within the greater 3BP become bonding orbitals between atoms in a molecular matrix.

We then take this notion and translate it back up to the planetary level, and when we bump it all back down from 3D into a single plane, we find that all the planets move in stable orbits around the Lagrange Points of the Sun-Jupiter 3BP.

Hence the power of a fractal theory like this: What you learn about one level applies to all the other levels, permitting a rapid development of the body of work.

All of which is to say, this book is written not to suggest a theory that could possibly result in a unified theory of everything, but an actual presentation of the theory itself. This doesn't exclude the possibility that other such theories could exist, except that this theory must by definition be a subset thereof.

REGULARIZATION

The process used to develop the various parts of The Big Theory is called regularization, which is a method of substituting an expression in a model to simplify the model and to reduce the number of variables; as such, to make the model more accurate.

Consider the current state of modern science, where everything we know about virtually every science from psychology to astrophysics is based on statistical models - probabilities. To regularize any such model would be to find an equation that replaces the statistical probability, or at least simplifies it; thus, providing a

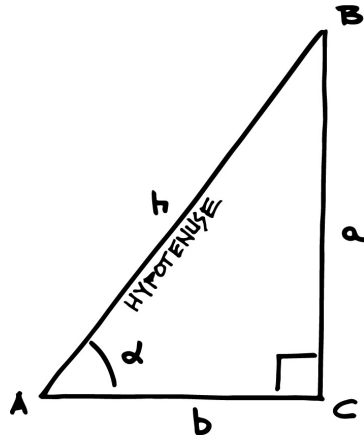


Figure 1.1 **Right Triangle**

more concise representation of the data and, hopefully, a better comprehension of the natural system.

As an example, consider the trigonometric sine function. It began with the Greeks as a fundamental construct of the geometry of a right triangle (a triangle where one angle is 90°).

In analytic geometry, the value of the sine α in Figure 1.1 above is the ratio of the length of the opposite side to the hypotenuse.

$$(1.3) \quad \sin = \frac{\text{opposite}}{\text{hypotenuse}}$$

A general value for the sine of any angle is the infinite series:

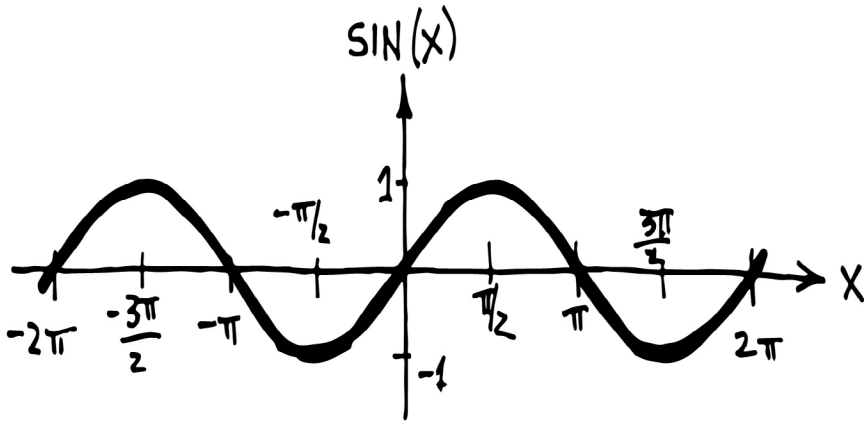
$$(1.4) \quad \sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots$$

Where ! represents the factorial of the number; i.e.

$$(1.5) \quad 7! = 7 * 6 * 5 * 4 * 3 * 2 * 1$$

This infinite series is how your calculator or spreadsheet computes the value of sine. There are an infinite number of digits to the true value of sine, which is typically truncated at 16 significant digits in scientific and engineering computer applications.

Consider, the value “ $\sin(\beta)$ ” is a regularization of the true, “statistical” value given by (1.4). It’s an approximation, a simplification. Instead of using the infinite series in any given calculation, we just replace it with $\sin(\beta)$.



A graphic of the value of $\sin(\beta)$ versus the angle β in radians

Figure 1.2 Sine Wave

is a sine curve, where $\sin=0$ at an angle of 0° and $\sin=1$ at an angle of $\pi/2$ or 90° with a uniform variation between and beyond, as indicated in Figure 1.2.

The cosine function is also an infinite series.

$$(1.6) \quad \cos(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots$$

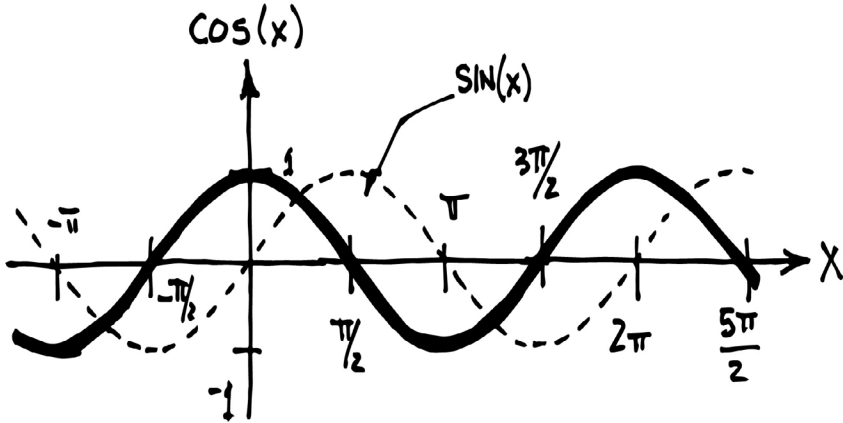


Figure 1.3 **Cosine Function**

Adjust the sine curve in Figure 1.2 by 90° to the left, and you get the cosine wave function in Figure 1.3.

This regularization of the sin and cos functions can be taken one step further, to show that “ $\sin(\beta)$ ” is the projection of a point rotating on a circle. Moreover, $\cos(\beta)$ is a projection at a 90° angle, as shown on the following page.

The significance of Figure 1.4 is that the 90° phase shift referenced in Figure 1.3 is modeled physically so that the **sine and cosine functions coexist relative to a point rotating on the unit circle**.

In a numerical analogy to Figure 1.4, the series expansions of sine and cosine are intimately related by virtue of the series expansion for the exponential function, e.

$$(1.7) \quad e = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \dots$$

Referencing the imaginary number $\sqrt{-1}$ or “j” these three functions can be related by Euler’s Identity.

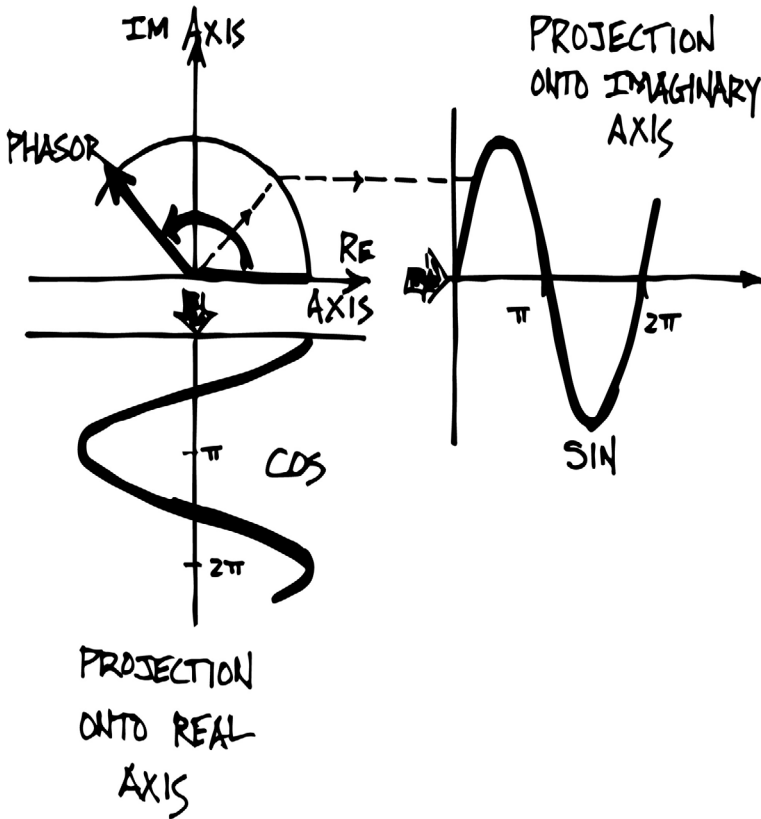


Figure 1.4 The Complex Plane

$$(1.8) \quad e^{j\theta} = \cos \theta + j \sin \theta$$

Where $e^{j\theta}$ is a point on the unit circle at an angle of θ to the positive x-axis as illustrated in Figure 1.4.

This is a vector (a line with magnitude and direction) rotating around a point; the length of the vector is constant, so it forms a circle as the direction moves through 360° . This particular drawing

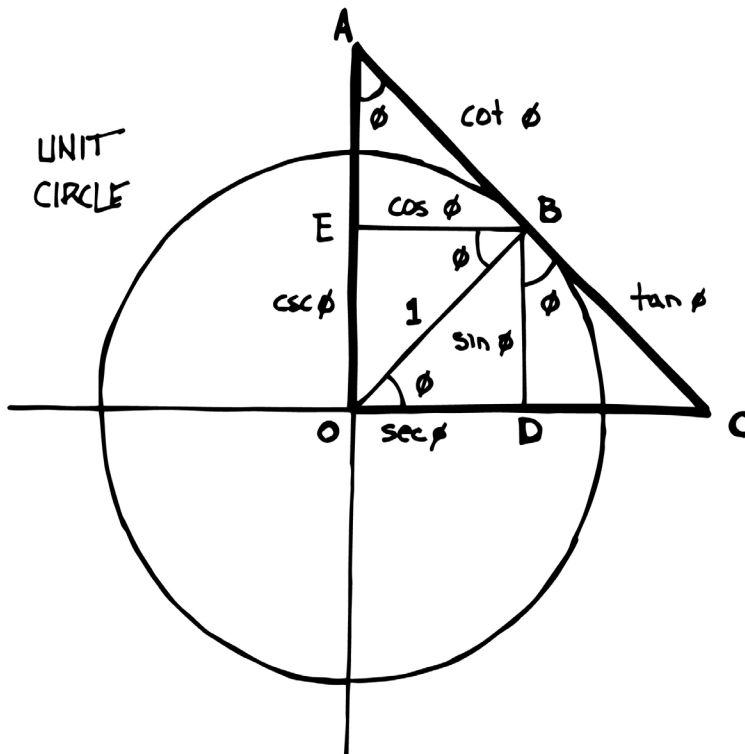


Figure 1.5 The Trig Functions

shows the two projections to be onto the real and imaginary axes, showing an intricate relationship between sine and cosine that is not at all evident in their series representations.

Figure 1.5 shows the relationship between all the trigonometric functions to the unit circle (a circle of radius=1). Regularization, then, leads to a deeper understanding of the phenomena.

The objective of The Big Theory is to develop similar visual models of statistical phenomena, all based on fundamental concepts of Orbital and Celestial Mechanics. These visual models will give greater insights into the natural world than vague statistics, just as the graphic regularizations of sine and cosine are far more insightful than the infinite series which gives an accurate value but no conceptual depth.

MATHEMATICAL PHYSICS

Celestial Mechanics is a branch of a larger field called mathematical physics, which is the exploration of the real-world, physical aspects of abstract mathematics. For example, the abstract notion of sine or cosine re-packaged into their dynamical relationship on the unit circle and the projection of a line onto the x- and y-planes.

Otherwise, the general trend of the material goes from simple to complex problems. We'll begin with the Two Body Problem (a very small object in motion relative to a very large primary body; i.e., a satellite orbiting Earth or an electron orbiting a nucleus), then move to the Three Body Problem (a very small object moving between two primaries; e.g., a satellite going to the moon from Earth).

The study of the Earth-to-Mars trajectory is a Four Body Problem; that is, a mission going from Earth to Mars, both of which are orbiting the fourth major body, the sun.

A model of the solar system is a Ten Body Problem (nine planets plus the sun). The two largest bodies, the sun and Jupiter, exhibit all the characteristics of the 3BP, as does the sun-Mars system

within the Mars trajectory analysis. Likewise, for embedded Two Body Problems, and so forth.

Finally, there's the Many Body Problem, or N Body Problem, which is an infinitesimally small (relative to the primaries) body moving under the influence of many primary bodies. Remember this principle:

The equations of motion for a small object in the N Body Problem reduce down to the exact same equations as for static flow in fluid mechanics.

The famous French mathematician Henri Poincare' used N Body Theory to conjecture that space behaves like a very thin fluid, or aether, in local time-space; and from this, he developed the equations for General Relativity twenty years before Albert Einstein, whose calculations were based on electromagnetic theory.

Celestial Mechanics actually has its own explanations for the various phenomena used to "prove" Einstein's Relativity, without resorting to the immensely complex, contorted tensor calculus and the warping of the space-time continuum. These counter-theories based on classical (pre-Relativistic) mechanics draw upon concepts from all the above classical problems, the last chapter in this discussion, and the presentation of Temporal Mechanics.

Where applicable, each section will conclude with future topics of exploration in mathematical physics or other disciplines, things to ponder and discuss so that you become more comfortable with the concepts herein.

FUTURE TECH

Poincare's N Body assumption has a solid mathematical proof, but Einstein's doesn't. What if both theories are correct? Light has a dual nature, as an electromagnetic wave and as a quantum bundle of energy called a photon.

Consequently, deep space should have a dual nature as well, Einstein's electromagnetic field and Poincare's aether, which can be thought of as a deep space populated by photons or tiny particles of light mass. Depending on your relative velocity to a non-inertial reference frame, space is electromagnetic at sub-light velocities and an aether at speeds faster than light. That is, an object moving through N Bodies (e.g., stars) can only be influenced by all N Bodies if it's going faster than the speed of light.

The main "proof" of Relativity is the bending of light as it passes the sun, which Relativity says is caused by a distortion of space-time around the star. If you take a beam of light and represent it as a photon (a valid assumption in classical physics), i.e., the very small mass in a Two Body Problem, with the sun as the primary; the path of the photon will be deflected exactly half that observed. What if Einstein's and Poincare's field theories cause photons to pair off as they approach a massive gravity source like a star, moving perhaps in a helical pattern (like DNA); this pair of photons will be deflected exactly as we observe the phenomenon.

Set up a calculation of $\sin(x)$ using the infinite series. How many terms would you need to calculate to get the result accurate to 16 significant digits? Using the construct "sin" makes this an almost trivial operation. How many significant digits do you lose every time you calculate $\sin(x)$, and what is the cumulative effect for a complex trigonometric calculation?

The Three Body Problem is set up in rotating coordinates. How does such a coordinate system affect the use of sine or cosine (which are ubiquitous in 3BP calculations) which themselves are a rotating construct?

Error is cumulative in a repetitive calculation, such as the integration of forces by a computer algorithm, in studying orbital motion. If trigonometric functions are used repeatedly, thousands of times, in determining the future orbit of a satellite to be launched, how much error would truncating the true value of sine or cosine to 16 significant digits, i.e., using the computer's estimate of sine or cosine using a truncated series equation?

In modeling the Earth's gravity field with a giant 100-by-100 matrix, scientists are able to predict orbital motion of satellites with great accuracy. When they match the calculated versus the actual, observed orbit, the difference is attributed to a "Relativity Constant," which is added to the calculated value so that it equals exactly the observed path of the satellite in orbit. This is one of the major "proofs" for Relativity. Since each of the 10,000 elements in the gravity matrix of Earth is itself an estimate; since the thousands of sines and cosines used in the equations are each an estimate; since all the numbers in every equation are truncated to 16 significant digits; and all of these errors accumulate; what does this say about the Relativity "constant?"

The graphic illustration of the 3BP is very reminiscent of the plots of poles and zeroes in complex analysis. It would truly be a dramatic breakthrough to show the 3BP exists in the complex, rotating plane because then you could apply all the sophisticated analysis methods of Systems and Controls Theory (which is all done in the complex plane). The Figure 1.4 projection of sin and cos onto the real and imaginary planes (i.e., the complex plane) is a possible starting point.

The distances involved in Relativity theory are quite large. One light year is 5.879×10^{12} miles; the closest star to Earth, Proxima Centauri, is 4.24 light years away; the Milky Way galaxy is 100,000 light years across; the Hercules A galaxy is 1.5 million light years across. Convert each number from light years to miles, and determine the accuracy of calculations done to 16 significant digits. If an astrophysics calculation uses trigonometric function approximations a hundred times, how accurate is this result, after accumulating all the errors? Enough to make space and time appear warped when traveling at the speed of light?

We now consider these questions in further detail, beginning with a gentle introduction using psychological phenomena to model the fundamental notions of "Rocket Science."

2

Rorschach Trajectories

The next four chapters begin with a subject everybody is familiar with, psychology. This discussion will not only introduce new models of the human mind but, in the process, familiarize you with fundamental concepts of orbital theory with some simple, graphical models of the unconsciousness.

Psychology majors now must take more classes in probability and statistics than engineering majors because so much of their work requires statistical analysis and computer modeling. The practice of mental health is no longer about helping the individual but applying to all, what works for the majority. Talk therapy is practically nonexistent in the modern cost-conscious healthcare system, replaced by the much cheaper and “more effective” drug therapies.

Arguably, a new model of the human consciousness is no longer even a priority, unless it allows the psychiatric profession to find, assign, and prescribe more effective drug therapy. The applications (and the research funding) for advertising or the media or public relations to build such a model far outweigh in significance the mental health benefits (priorities) for the individual.

Consider the so-called “narcissism epidemic” as a case in point. The advent of smartphones and social media has transformed the human psyche, especially that of the younger generations. Everybody is an instant, selfie celebrity on YouTube, Twitter, Instagram, and Facebook. If you aren’t self-obsessed, if you don’t have a large Internet presence, you won’t have friends and may not even get a decent job. If you want to survive in the modern

world, much less excel, you have to promote yourself endlessly in the social media-verse.

The ancient-history myth of Narcissus, and his obsession with himself has itself fallen victim to the Facebook generation. So many people exhibit narcissism, it's become practically universal among humans. "Narcissism" has recently been removed from the Diagnostic and Statistics Manual (DSM) because if they hadn't done so, almost everybody would be mentally ill. Now it's the people who aren't narcissistic who are in the minority. No doubt they're the ones who will soon be in the DSM, and who will find themselves in group or individual therapy to learn how to worship themselves and to project their greatness worldwide on the web.

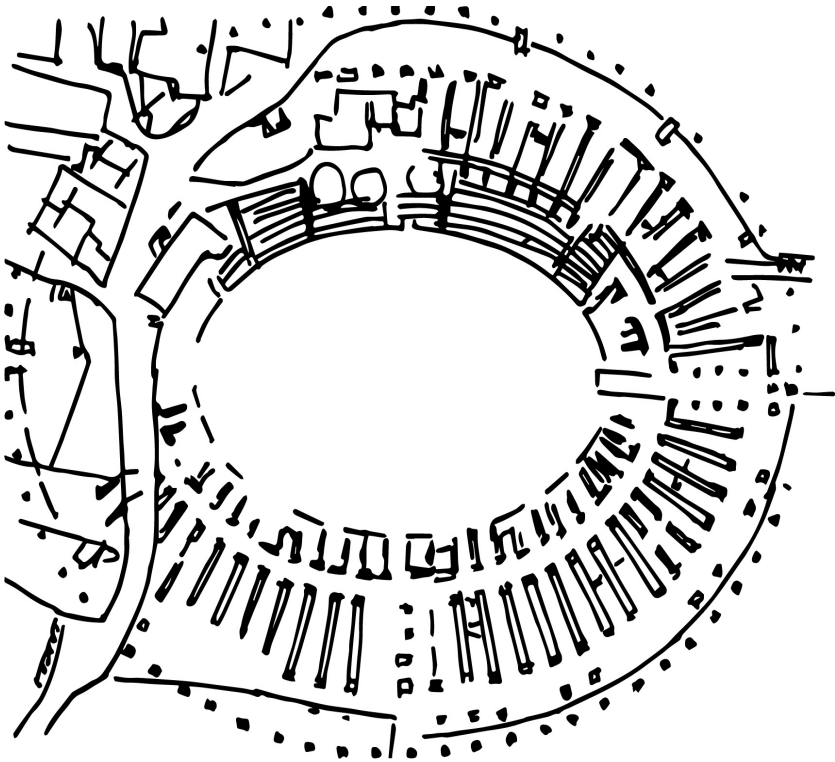


Figure 2.1 **Roman Amphitheater in El Djem, Tunisia**

And so, it is with many reservations, that a new, quantitative model of the human psyche is offered here. It begins with a series of line drawings of orbital phenomena, as a kind of high-tech Rorschach Inkblot test, to see what you can read into them and how you can relate the forces and principles to human relationships. The examples here will be in real, face-to-face relationships; I'm sure young people will find many similar possibilities for their virtual friends in the social media world.

THE ELLIPSE

The Greek thinker Menaechmus, working at Plato's Academy around 350 B.C., was the first to discover the ellipse as a conic section. Figure 2.1 is a sketch of a Roman forum built in the shape of an ellipse.

No doubt the Romans used the same method to lay out an ellipse as children do. You peg a piece of string at two points, pull the string tight with a pencil, and draw a shape as you move around the circumference, as illustrated in Figure 2.2.

In 1609 Johannes Kepler proposed that the planets moved in elliptical orbits around the sun, with the sun at one of the fixed points in the middle, called foci. In orbital mechanics and the study of the Two Body Problem, the Earth is at one focus, say F_1 in Figure 2.1. The satellite orbiting Earth moves fastest when closest to the planet at apogee (F_1), and much slower at perigee (F_2), at the opposite end of the elongation of the ellipse.

What do these two images bring to mind?

A family unit, where everything revolves around one spouse, and the other feels left out, a "third wheel" or an "empty focus"?

A similar situation at work or in some other relationship?

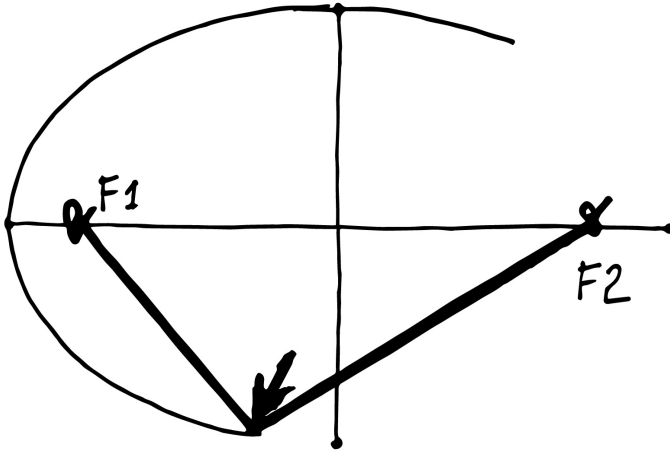


Figure 2.2 **Constructing an Ellipse**

You feel trapped, unappreciated, and maybe even useless? Pressured by all the people watching from the stands?

Take heart, because the truth is that you're as important a part of the relationship as the person at the main focus.

Maybe the ellipse reminds you of your love interest, how everything seems to move so fast when you're near them, at aphelion (a Sun-based orbit); and so slow when you are far away, at perihelion.

Does the attraction you feel seem stronger when you're nearby; weaker when far away and out of sight?

Perhaps you're obsessing on this individual, making them the "center of your universe," and you need to center your attention, at least a part of it, on an "empty focus," if only to make the object of your affections jealous, more attracted to you, afraid of losing you to another person's foci.

Or perhaps you're in the stands, watching with a sadness, as this drama plays out in another couple. Your life is moving in a circle, where both foci are at the same point: yourself.

Maybe the "Ground Hog Day" repetition of life in an endless elliptical orbit bores you; or perhaps you're enamored by the power of your ego, the perfection of your life; happily, distanced from others as if by an invisible barrier, unwilling to let anybody inside your comfort zone to throw your life into an ellipse, and to then become a focus for your life outside of your own self.

THE HOLLOW SPHERE

Figure 2.3 shows the gravitational force relative to a hollow circle. Observe the gravity felt inside the hollow shell is zero and that outside the shell it decreases by $1/(\text{the distance squared})$.

We borrow this diagram from Celestial Mechanics, which can show by a clever integration that no gravity is felt anywhere inside of a hollow sphere. The gravity outside the sphere drops as

$$(2.1) \quad F \approx 1/r^2$$

This force of gravity outside the hollow shell is as if all the mass was concentrated at the exact center of the sphere.

What ideas does this image trigger in your brain?

Maybe you live inside that hollow sphere, in a bubble of social networking; but you feel no attachment to anything, as though you're floating in zero-gravity.

Or perhaps you're on the outside, your life full of gravity and stress, and you yearn to escape it all, into a tranquil, peaceful zone where nothing matters and you're at one with the cosmos.

Sure, you can escape all that responsibility and angst by escaping it, going far, far away; or you can find a quiet place inside yourself, relax, and meditate until you find the magical oasis.

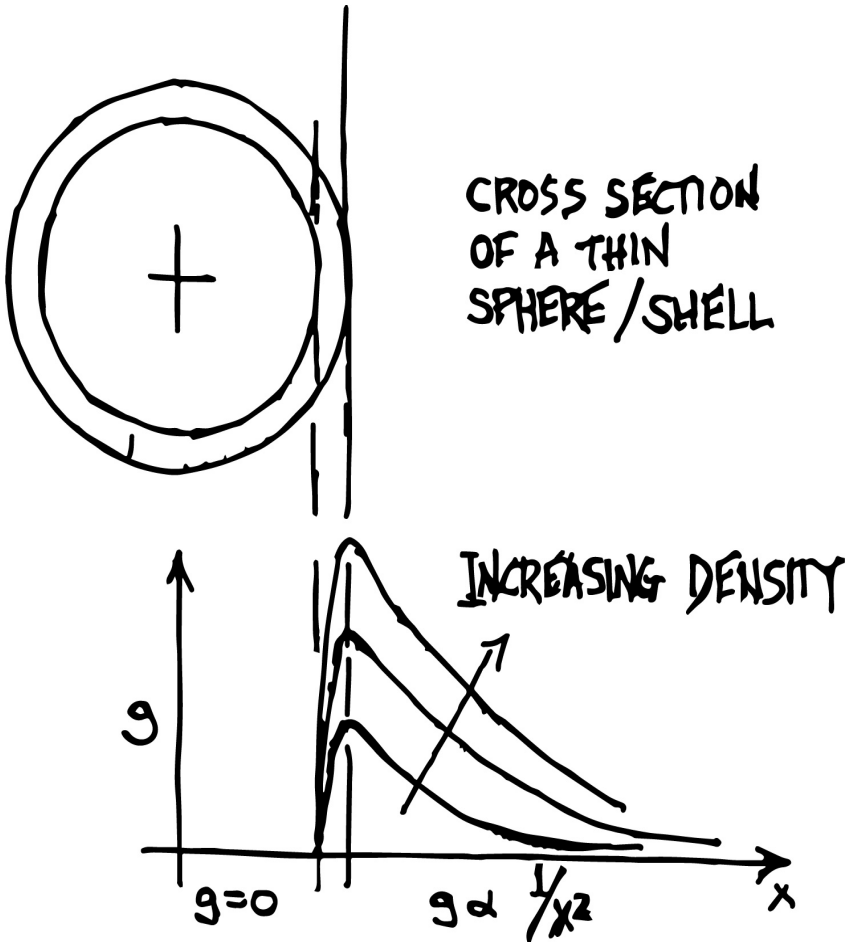


Figure 2.3 Gravity Inside a Hollow Sphere

THE PARKING ORBIT

Figure 2.4 shows a spacecraft approaching a planet on a heliocentric orbit (with the Sun at its main focus). The Sphere of Influence (SOI) is an imaginary line where the force of gravity from the Sun equals the force of gravity from the planet.

Outside the SOI, the Sun is the focus of its elliptical orbit; inside the SOI, the planet is the focus of its orbit, in this case, a hyperbolic approach trajectory.

The spacecraft does a reverse thrust at apoapsis (closest point of approach) and transitions the hyperbola into an ellipse, thereby orbiting the planet. Then, over time, the drag from the atmosphere makes the ellipse get smaller, more and more circular until it ends up in a low-altitude parking orbit.

Is this love at first sight, where the entire trajectory of your life is changed by a close encounter with the man/woman of your dreams? Where the affection two people feel draws them closer despite (or because of) difficulties that would drag down any other relationship, until they're united in holy matrimony, to remain in a parking orbit until "death do us part?"

Perhaps it's a person who zeros in on that special someone, the apple of their eye, but the gravity of their close encounter isn't enough to pull you out of that hyperbolic approach effort? So, you soon right on back into your heliocentric orbit, in search of Mars or Venus?

Perhaps your approach angle was wrong; you were too direct, or not direct enough; so that the gravity of opposites attracting didn't come off so well?

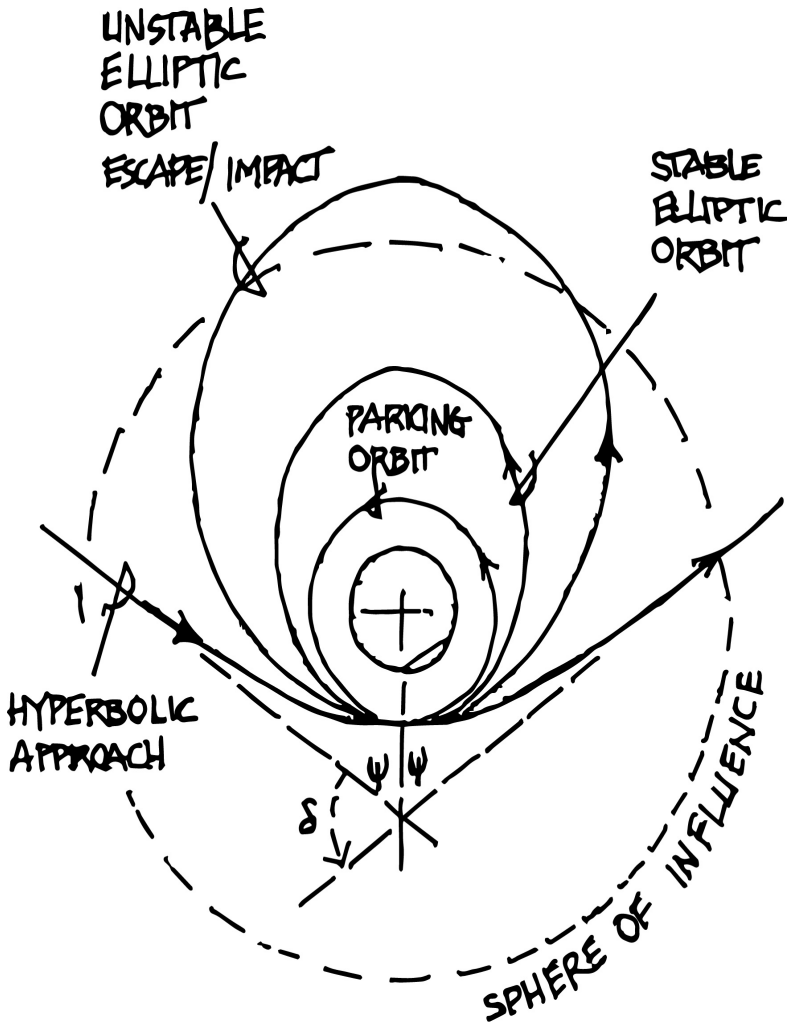


Figure 2.4 Parking Orbit Inside the SOI

THE INTERPLANETARY TRANSFER

Maybe, instead of focusing on that final objective; the love interest or dream job or dream career; you need to take a sharp look at the bigger picture, the heliocentric transfer ellipse. Instead of an all-or-nothing approach, where you stake so much emotional cash on the success that failure leaves you nothing in reserve, and you careen off into deep space after failing.

Keep a little in reserve so that if things don't work out right, you can at least make a course correction after the approach to the planet of your desires, and return to your original Sun-centered life.

The delta-v arrows are thrusts. In this case, a positive change in velocity at Earth to jump out ahead onto a heliocentric ellipse that will put you on a path to Mars, and another positive delta-v once you arrive at Mars because your speed at perihelion is less than the orbital speed of Mars.

What, you didn't think it took a great deal of effort to put your life on a new trajectory? That often, once you reach your goal, you still need some fuel in reserve for that one last effort – to pass your final exams, to romance your objective into the marital ceremony; or to finally convince the Big Boss that you're ready for that promotion.

Or you didn't realize that even if you fail at that long-term effort to land on Mars or to land that promotion; it's not the end of the world? You can always just drift on by Mars and follow the heliocentric ellipse right on back to Earth; except – Doh! – by the time you return to aphelion Earth won't be there any longer. Bummer.

Relax, enjoy the view; if you can't return home for a couple hundred revolutions, at least you've learned some important ideas in orbital mechanics, and maybe in life, too.

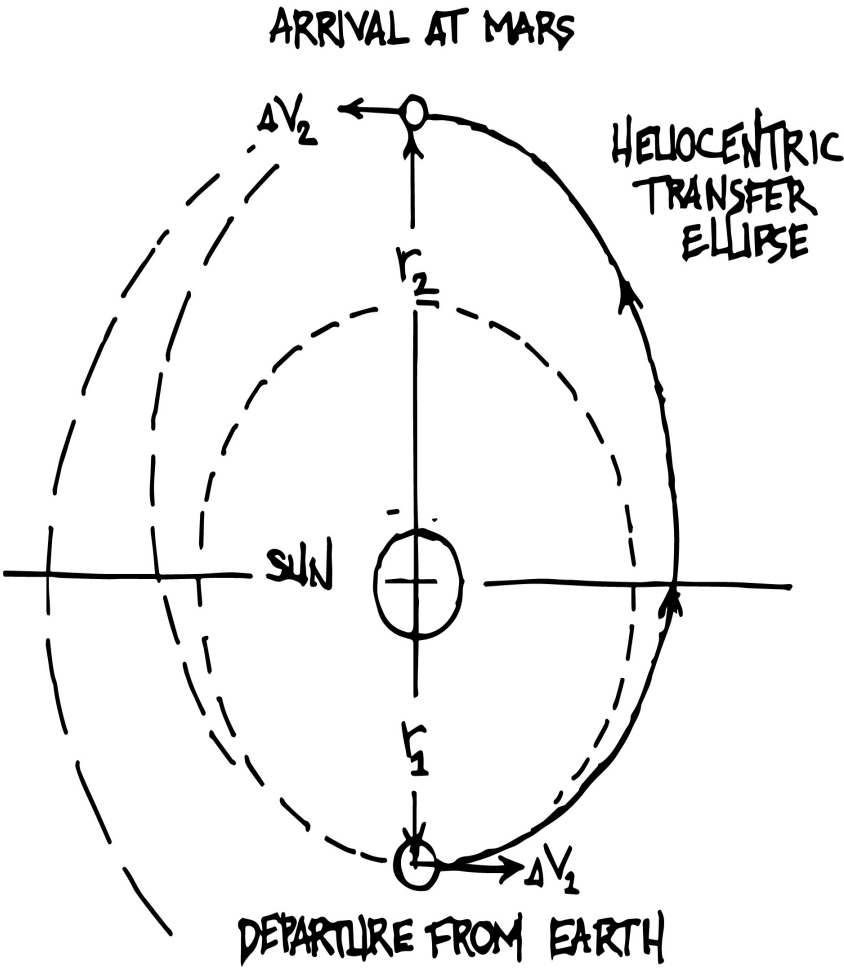


Figure 2.5 The Heliocentric Transfer Ellipse

FUTURE TECH

Any new model of the human mind will likely be better received by computer experts in Artificial Intelligence than the mental health community, especially if the model is adaptable to computer algorithms, like this model. This screams of the “Dune” prohibition against building machines that emulate the human mind. Is this a real danger?

3

Id, Ego, Superego

Chapter 2 introduced you to the One Body Problem (the hollow sphere), the Two Body Problem (a planet in an elliptical orbit around a star), and the Three Body Problem (a sun-centered elliptical transfer orbit from one planet to another). These cover almost the entire scope of the orbital theory that you need to know. This is the method to be used to help you learn the “rocket science,” comparing common-sense things to high-tech diagrams.

It wasn't coincidental that you learned a little bit of practical psychology along the way. The intuitive logic of the comparisons leads directly to the notion that there might be some physiological basis for the similarities.

THE ICEBERG THEORY

Figure 3.1 shows a graphic of Freud's model for the human psyche. This is the most sophisticated model of the human mind that exists in all psychology, the "iceberg theory." Ice has 9/10ths of the density of water, which means that 90% of the mass of the iceberg is below the surface of the water.

This model was proposed by Sigmund Freud over 100 years ago and has not since been changed. Psychiatrists call it Freud's "topographical model" of the mind. It shows very clearly that we are aware of only a tiny part of our mind, and everything else takes place in the subconscious, sight unseen; or, thought unknown.

Freud's model of the mind, and his analytical methods of talk therapy to bring hidden issues to light so that they can be resolved, setting the mind at peace; has long since been out of vogue. It's too expensive, too time-consuming, and not always successful. It's now largely the exclusive privilege of the wealthy. Psychoactive meds are so universally popular that this model is thought of more like the "root canal theory" in the profession. Why save the tooth if you can just yank it out with caustic drug therapy at a fraction of the cost?

The orbital mechanics games of the previous chapter were so much fun, and full of so many clever insights; well, maybe there's something to this "gravity theory" of the mind. We've seen the advanced applications, all the way to the very complicated (mathematically, if not conceptually) interplanetary transfer orbit; let's return to scratch and build up this gravity psyche model from the very, most basic geometry concepts, and see if this leads to any new insights.

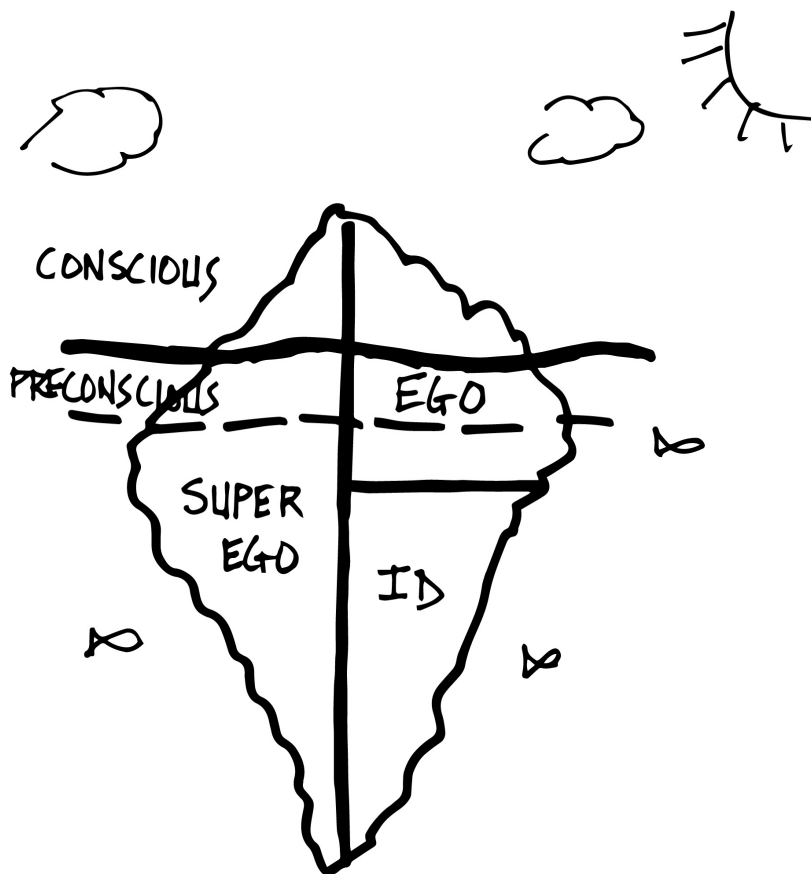


Figure 3.1 **Freud's Model of the Subconscious**

THE ID CONSTRUCT

At conception, the infant's whole world is the womb, and everything the child receives is via the umbilical cord, it's focus or center. This tiny union of sperm and egg contains all the instincts and primitive aspects of personality, which psychologists call the id. Graphically, and physiologically, Figure 3.2 is the beginning of life.

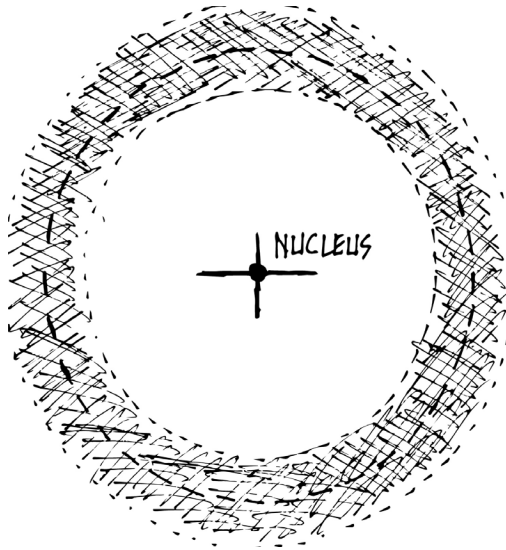


Figure 3.2 **Conception**

As the embryo grows and begins to take on a human form, the picture becomes more complicated. The unborn child becomes aware and is influenced by the mother's chemistry and emotional state and a hundred other subtle things. It's still a pretty small world, and a circle symbolizes it well because everything is perfectly climate-controlled, and all the nutritional needs are met as needed.

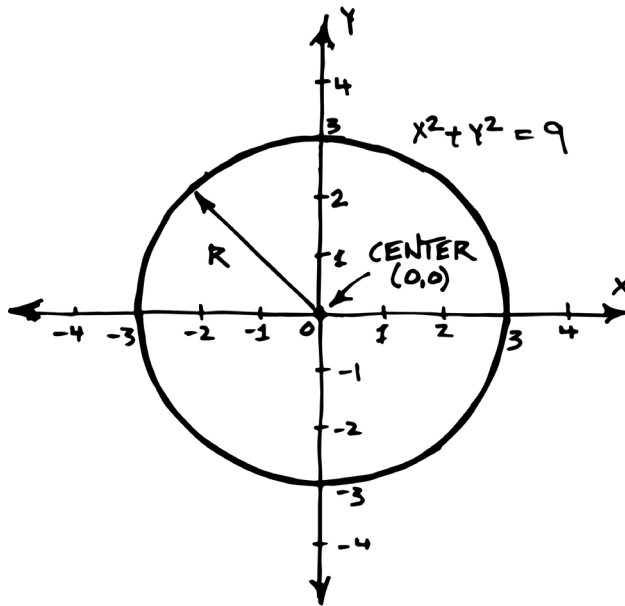


Figure 3.3 **Inside the Womb**

The personality of the newborn child is all id, and it has already learned in the incubator of his mother's entrails how to respond instinctively to its surroundings. Figure 3.3 shows the infant orientating itself to its world.

At birth, the central focus is no longer just the mother, but also a whole, new, great big world out there. The mother is still the main focus, but the orbit is not a circle anymore but an ellipse, which has two foci. The empty focus “serves to mediate between the instinctive demands of the primitive id and the outside world.” This is exactly the function of the empty focus, F_2 in Figure 3.4 below. The empty focus is what Freud called the ego.

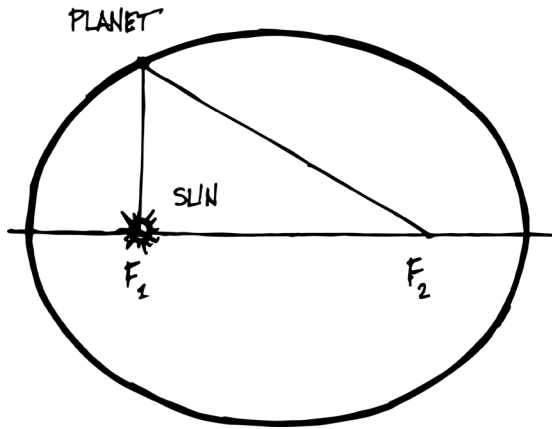


Figure 3.4 **The Empty Focus F_2**

It doesn't take very long for the newborn's focus to move beyond the mother, to the many fascinating things in her environment. The vertical line in the next illustration is called the directrix. As illustrated in Figure 3.5, the ratio is the same for any line drawn from the focus to any point on the ellipse versus the distance of that point from the directrix.

Here we see the newborn's cycle of life defined not just by the main focus but by external influences. Notice that as the pattern becomes more elliptical, the distance to the directrix increases.

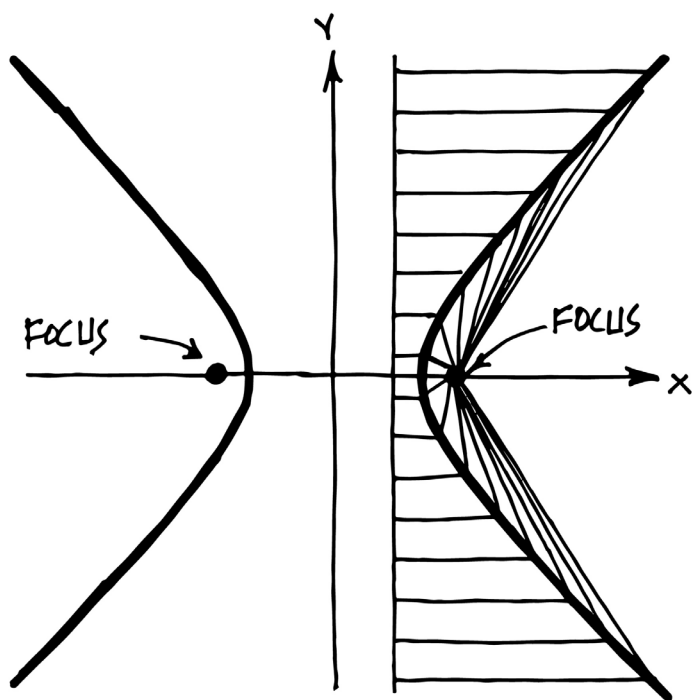


Figure 3.5 **The Directrix**

This suggests the emerging superego, by which the values and moral of society begin to influence the behavior of the id and ego. So now we have a complete psyche with the id and ego as the focus and empty focus, respectively; and the projection of outside influences upon this model via the directrix or superego.

Another way to visualize the relationship between the embryonic circle and the infant ellipse is via conic sections (Figure 3.7). A circle is a horizontal section of a cone, and an ellipse is any section at an angle to the horizontal. In our current analogy, the angle increases as the infant matures, and the ellipse becomes more pronounced.

If external influences overcome the child's natural balance, to the point where the ellipse becomes a hyperbola; or worse yet, a parabola, then this implies a dramatic change, at least for an infant. In our current paradigm, either would imply an extreme connection to external influences, to the extent that the primitive self is extinguished or at a minimum diminished.



Figure 3.6 **One Baby Step at a Time**

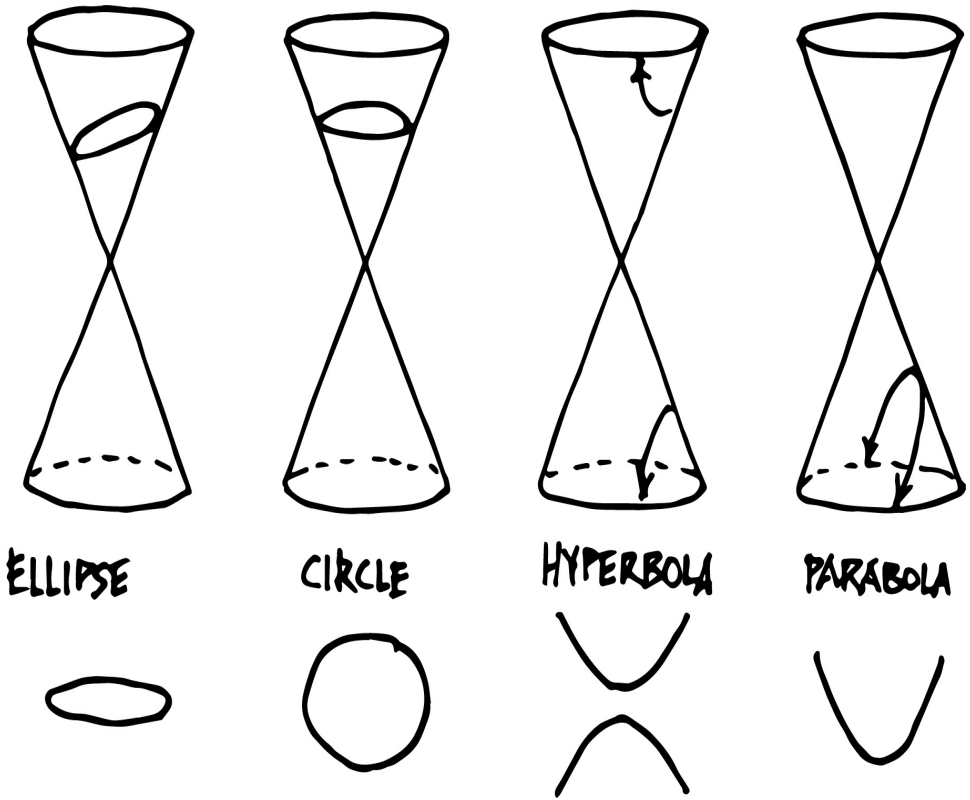


Figure 3.7 Conic Sections

Perhaps they are the extremes of extroverted and introverted personalities, which may be seen even at this early age, in the child's behavioral mechanics.

Generally, it seems more natural for the newborn to not exhibit extreme conic behaviors, but at least for now to remain within a limited range of behavioral norms.

Figure 3.8 shows a slight deviation from the circle, into a low-eccentricity ellipse. Naturally, you don't want to shock the nascent psyche as he becomes acquainted with the outside world, but to limit exposure and do so gently.

This figure also shows the awareness growing from the apex of the cone, the embryo at conception; gradually increasing in awareness as it moves upward, and the initial focus expands to become the focus of a circle of awareness. Then, upon birth, external influences mitigate the circle into an ellipse, which is still a stable formation, but with a second focus, firmly grounded in the outside world.

The graphic in the lower half of Figure 3.8 shows that the deviation from a circle to a low-eccentricity ellipse, when projected, is itself a circle.

The hyperbolic and parabolic phenomena imply that this conic section remains a part of the psyche, a depth of awareness always accessible via meditation, prayer, or study.

Now consider the quintessential diagram of the id, ego, and superego from basic psychology books. Hopefully, the geometric approach will appeal to you and suggest more possibilities than “tip of the iceberg” psychology in Figure 3.1. The id, ego, and superego are specific entities that are flexible, but always within a carefully structured relationship; i.e., the conic section.

If we continue developing this mathematical model of the psyche and do it correctly, then we'll be able to perceive behavioral anomalies and extremes, how they differ from the norm, and what's needed to return to the normal balance. For example, the external influences to transition a parabolic personality to/from a hyperbolic one, and then to/from the elliptical ideal.

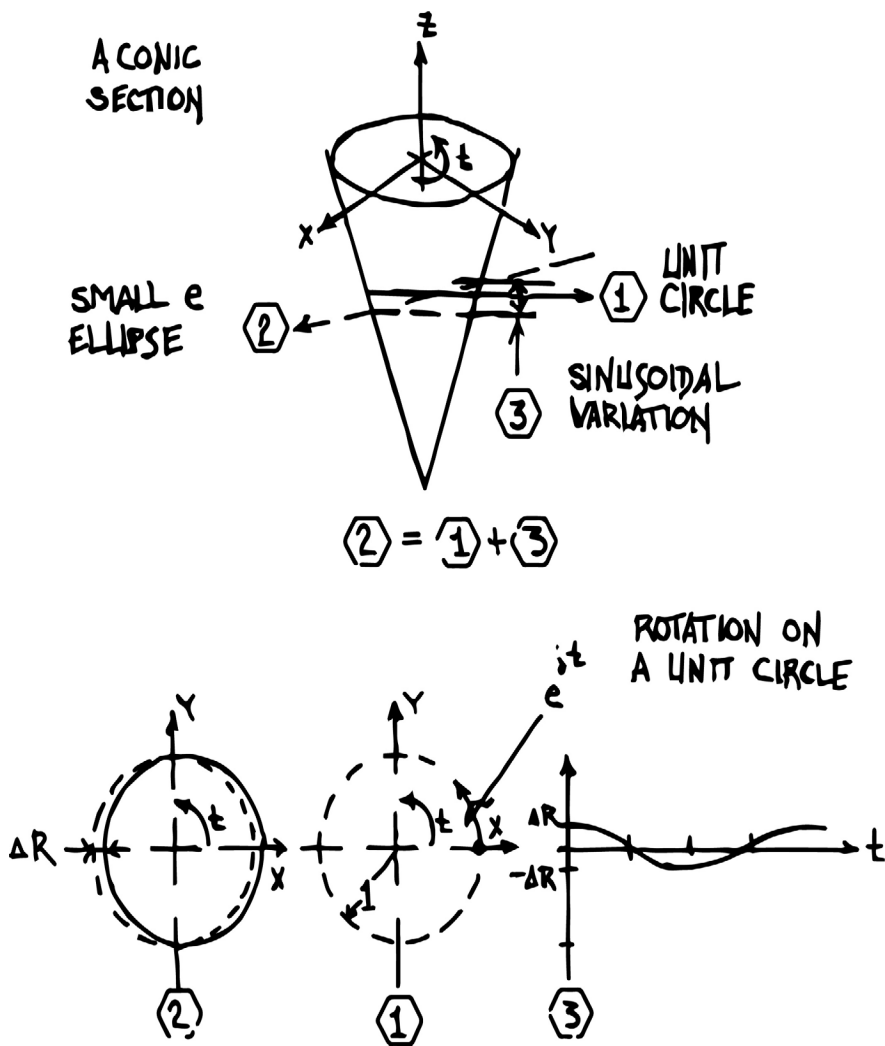


Figure 3.8 Vibration on a Unit Circle

FUTURE TECH

Let's ramble a bit, and test this new model. Is it robust enough to withstand a real knock-down punch, shown graphically in Figure 3.9?

What does our model tell us, if the infant is overwhelmed with stimuli? Compare this directrix to the earlier, gentler one. Think of the line L as a television screen projecting powerful images directly into the infant's delicate, subconscious brain. We have suggested that the primary focus is the id, the collection of primitive instincts. Might this bombardment change those instincts in some way? Is there any way it couldn't do just that?

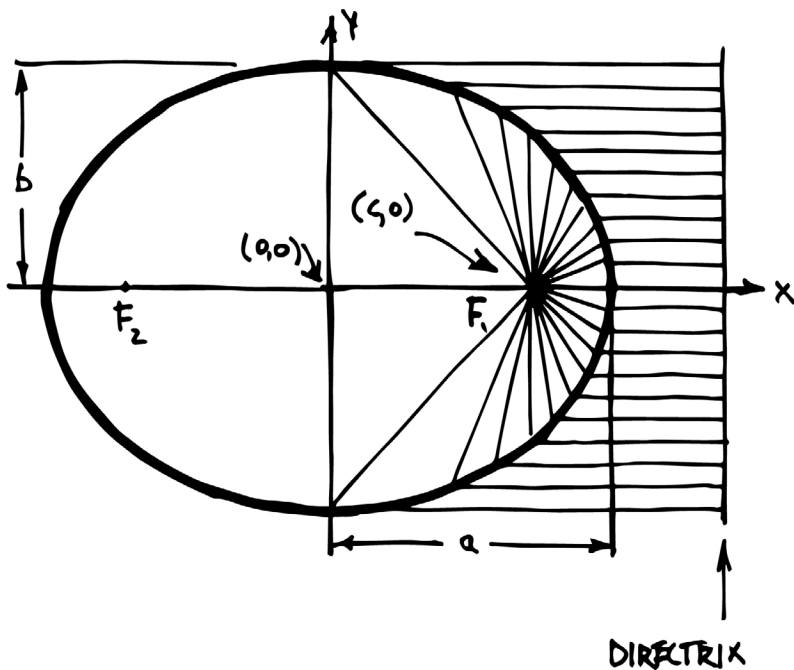


Figure 3.9 Concentration of External Influences

Recent studies show that the first abstract symbol infants recognize is McDonald's golden arches. Note the curvature of the mother's breasts, but McDonald's arches, in very much the same profile. A triumph of advertising, for sure; but at what cost? Is this what happens when parents use the "boob tube" as their go-to babysitter of choice?

What happens if children don't have quality time, not just with family, but alone? What if they don't have the strong family bonds that let them explore the depths of their psyche, via occasional hyperbolic or parabolic trysts with the deep dark unknown (i.e., reading books, forming images in their mind; not sitting idly by while it's all done for them on the silver screen). If they never have that experience, that connection, then they never develop faith and confidence and trust. They remain shallow psychologically, doomed to a life of tiny variations outside of a boring circle; driven inexorably to get all the intellectual nourishment from external phenomena. This is, of course, exactly what our culture wants – materialistic citizen without an ounce of self-esteem.

Can this new model explain a playground full of young kids interacting via texting and sexting and social networking tools. Kids never learning the 80% of communication that's nonverbal. Kids never plumbing the depths of the cone of consciousness, doomed to deriving what little satisfaction they get out of life from – Doh! – fast-food excursions to McDonalds!

Are you content with a floating block of ice for your consciousness, or do you want a complex machine with many moving parts and a thousand variations on a theme to show you how you have erred and exactly how to achieve peak performance?

Do you want to fantasize about one-dimensional Jedi in the movies, or do you want to build out your psyche and experience the real McCoy?

Figure 3.10 below shows how social networking simulates “religion” by creating a fake empty focus in the same plane rather than natural flexibility as a conic section.

A similar situation exists in a gay marital relationship, where both eliminate their “conic section” so that together they’re a completely isolated planar construct. Of course, there’s nothing wrong with this; in fact, it’s the ideal in a pure social-networking world. It’s their lifestyle choice, to deprive themselves of a full, multi-dimensional spiritual experience (as the case may be)... They say every theory must be inclusive; if your model includes gays, is it discriminating or inclusive?

In our model, this is restricting the individual to a narrow range of psychic reality, that which characterizes the development of an infant of age 2 or so. This corresponds exactly to Freud’s psychosexual theory of development. Was he right?

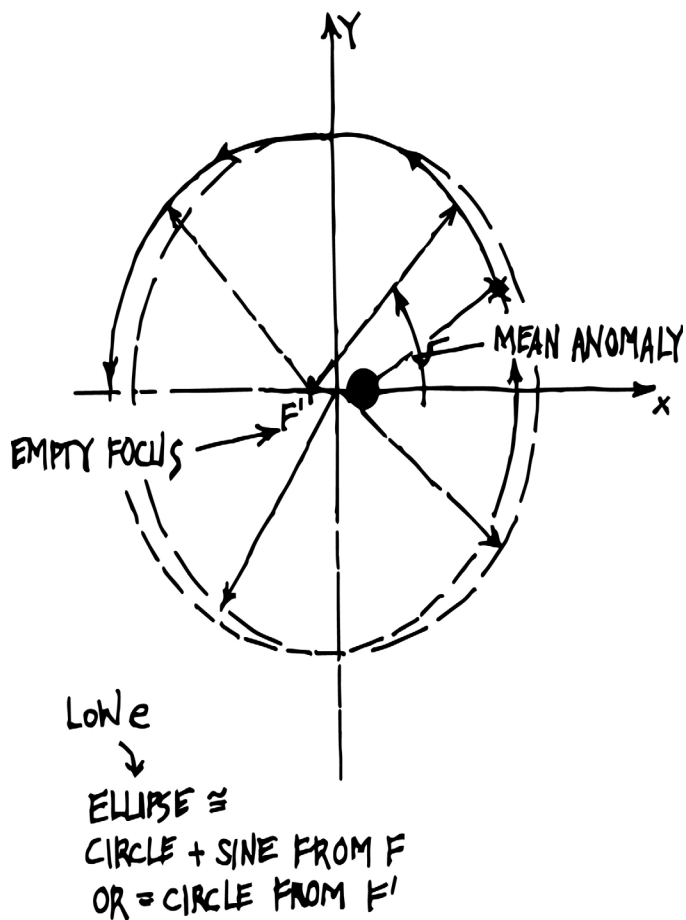


Figure 3.10 The Evolution into an Ellipse

4

Psychosexual Stages

Freud theorized that the individual advances through five stages of psychosexual development: oral, anal, phallic, latent, and genital. These can be fit into our same geometric model, to further our understanding of the human psyche.



Figure 4.1 **The Oral Psychosexual Stage**

The newborn infant is in the receiving end, all its nourishment orally from the mother's breast. The child has a very small world, the nipple, aureole, and breast; represented graphically in Figure 4.2 below.

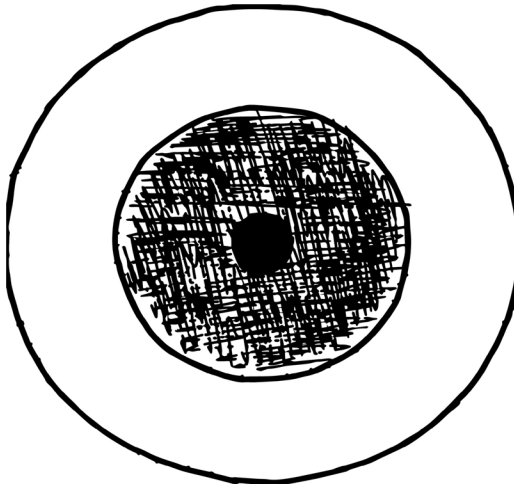


Figure 4.2 **The Circle of Concern**

As the infant grows and becomes more independent, she explores the world around her. The “circle of concern” becomes an orbit around Mommy and Daddy, nurturing tethers to support the child’s wanderings, reference Figure 4.3. This is the phase-out of which an empty focus develops.

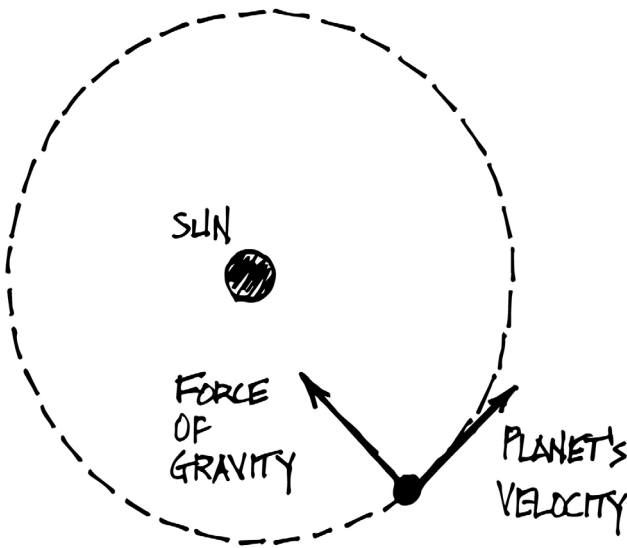


Figure 4.3 **A New Circle of Concern**

Think of the planet as Jupiter, Figure 4.3; which has such a large mass that the center of mass of the Sun-Jupiter system is not the center of the Sun but a point at approximately the Sun's radius. (This is the center of mass of the entire Solar System, called the barycenter.) Relative to the Sun, the planet now moves in a low-eccentricity ellipse. And so, we're now in the anal phase, where motion fluctuates between circular and a nearly-circular ellipse. When manifested in an adult human, the anal phase is narcissism.

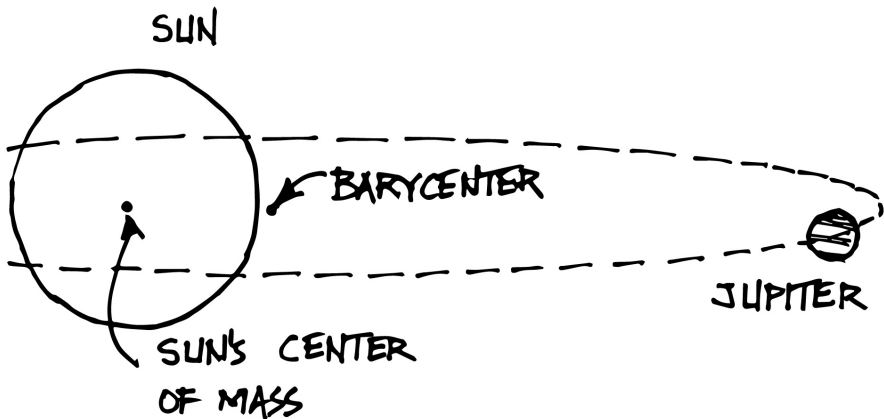


Figure 4.4 Barycenter of the Solar System

As the infant's psyche keeps developing, influences from the external world become stronger and more varied. The world is more than just a bangle of figurines dangling above the cradle, but a whole new expanding universe of possibilities, each one of which exerts an influence upon the child's imagination, Figure 4.5.

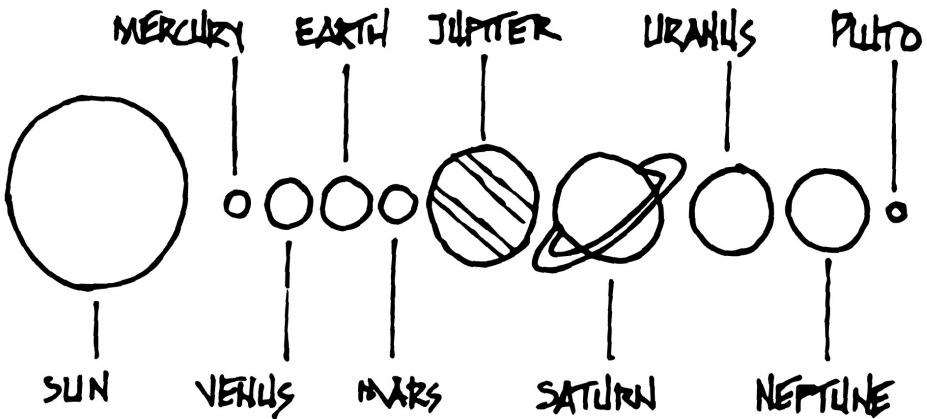


Figure 4.5 **Practicing Infantile Astrology**

The urge to explore all this wonder is irresistible, and the child's psyche reaches out to form connections to the environment that go beyond the parents and familiars. This is the phallic stage of development, where bonds form that allow the complication of the psyche beyond the primitive, basic circle and the tentative low-eccentricity ellipse.

A mass held in place by four springs oriented at cardinal points, as in Figure 4.6, will vibrate in an elliptical motion; where the circle is the simplest, initial, low-vibration case. The springs are attached to an inertial reference frame; that is, the outside world, society; the morals and values that nourish and evolve the superego.

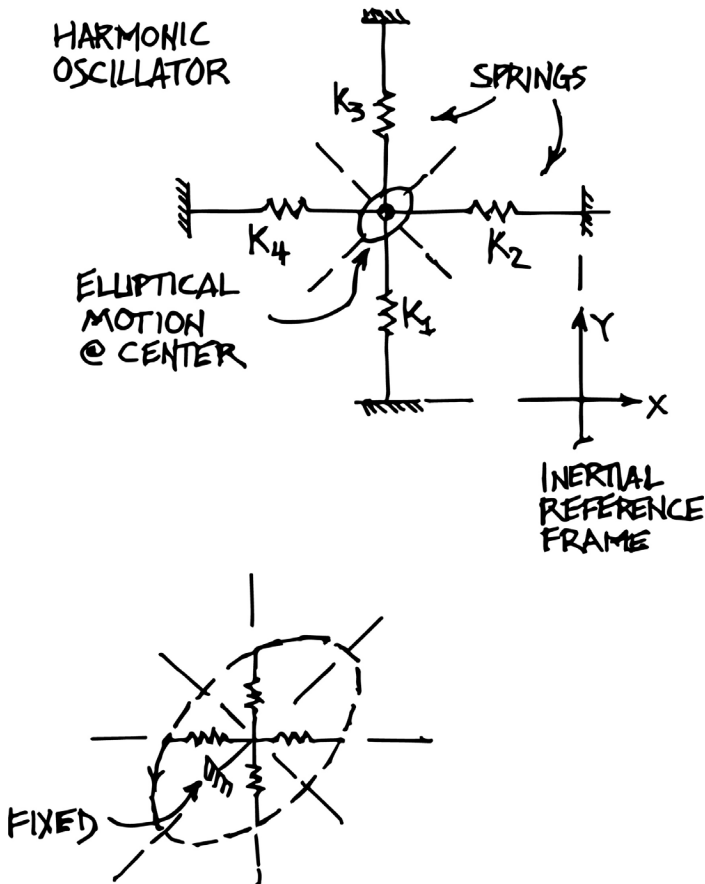


Figure 4.6 An External Reference Frame

Absent this inertial reference frame; the child will never advance beyond the anal phase. Thus, narcissism or extreme egoism or selfishness, as the case may be. Likewise, if the four springs are a continuum of many springs around the perimeter, the motion will be almost as restricted as if there were no inertial reference frame at all.

As before, elliptical motion within this inertial reference frame is characterized by a main focus and an empty focus. The development and stabilization thereof represent Freud's latent phase of development.

In the modern social-networking world all of this remains coplanar; that is, all motion is in the same plane; a very thin slice of the conic section.

What, exactly, does the mature genital phase look like in this geometric context? Look at the planets in our solar system. They all move in different planes, as you can see in Figure 4.7. That seems a whole lot more normal than everything being forced to happen in one plane as required by cultural narcissism (enforced by a ruthless political correctness).

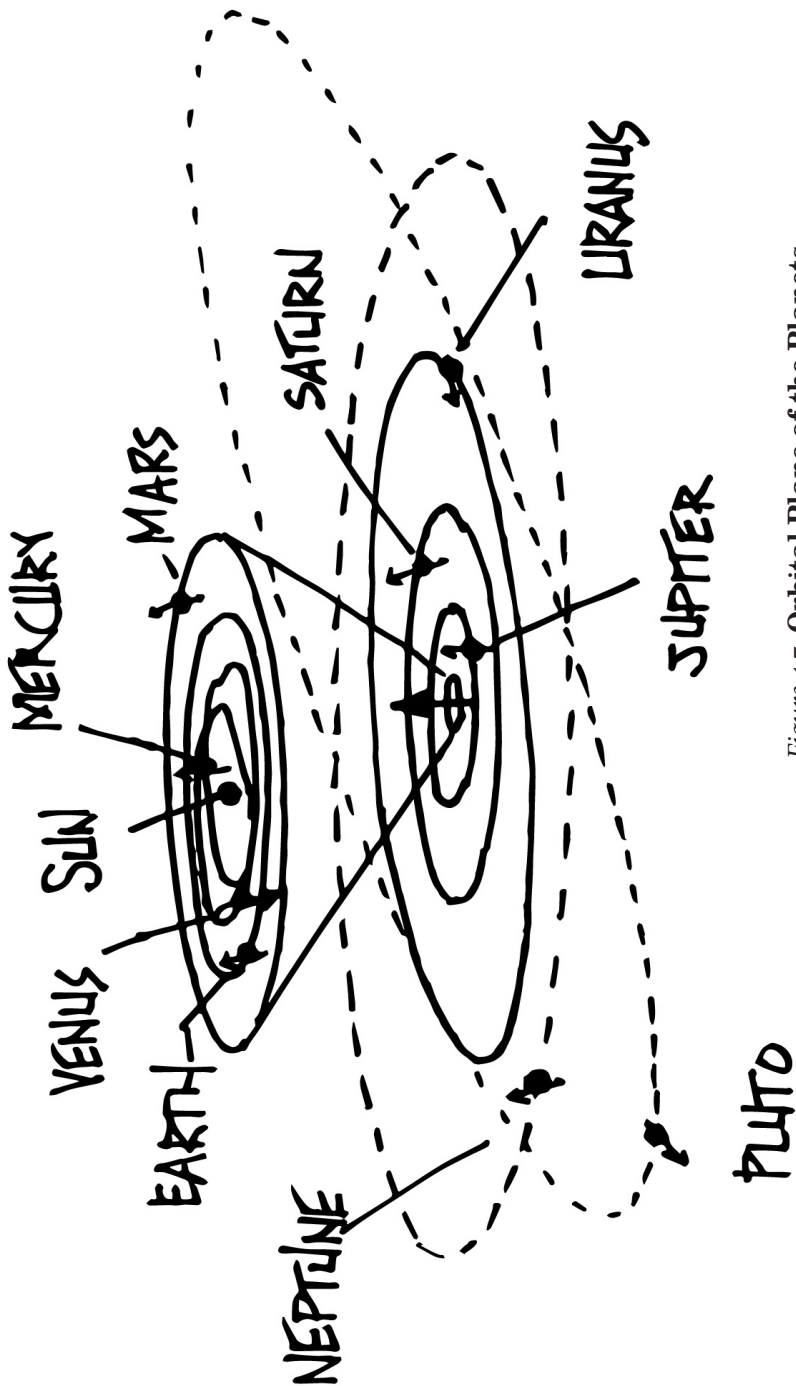


Figure 4.7 Orbital Plane of the Planets

Planetary motion is still limited, to a certain extent; what happens if there's full freedom of movement, in three dimensions? Consider Figure 4.8, a graphic of small vibrations between circular and low- eccentricity ellipse. If you look only at the variations from the unit circle and let this figure rotate along the x-axis, the image it generates is a barbell-shape.

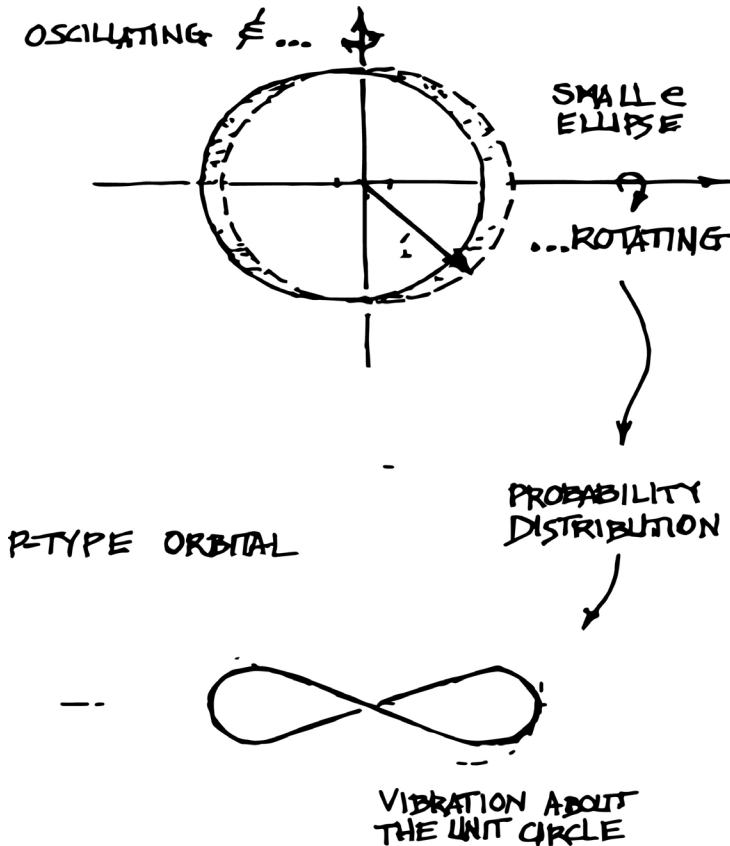


Figure 4.8 A Rotating Coordinate System

Now, if we return to the Sun-Jupiter system and look at the motion of Jupiter in this kind of a rotating coordinate system, we can conceptualize what this p-type orbital pattern (as it's called in atoms) means for the solar system model. Figure 3.9 shows L_4 , an equilateral Lagrange point in the rotating Sun-Jupiter system.

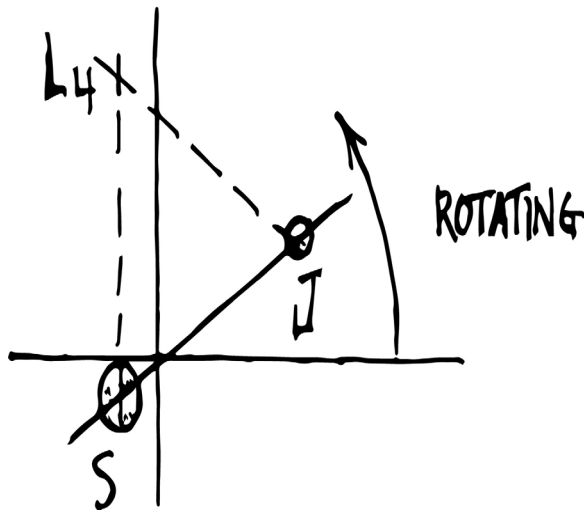


Figure 3.9 The Sun-Jupiter Three Body Problem

Now we consider this as a Three Body Problem, where a small object like a spacecraft or asteroid moves under the influence of two primary bodies, one of which is orbiting the other. (Thus far we've been looking at the Two Body Problem.) If we rotate the coordinate system at the same rate as Jupiter's orbit around the sun, then Jupiter will remain at the same point on the x-axis. The mathematics of this problem shows there are two stability points L_4 and L_5 at the apex of two equilateral triangles. Figure 4.9 shows L_4 ; L_5 is a mirror image along the Sun-Jupiter axis shown in Figure 4.10.

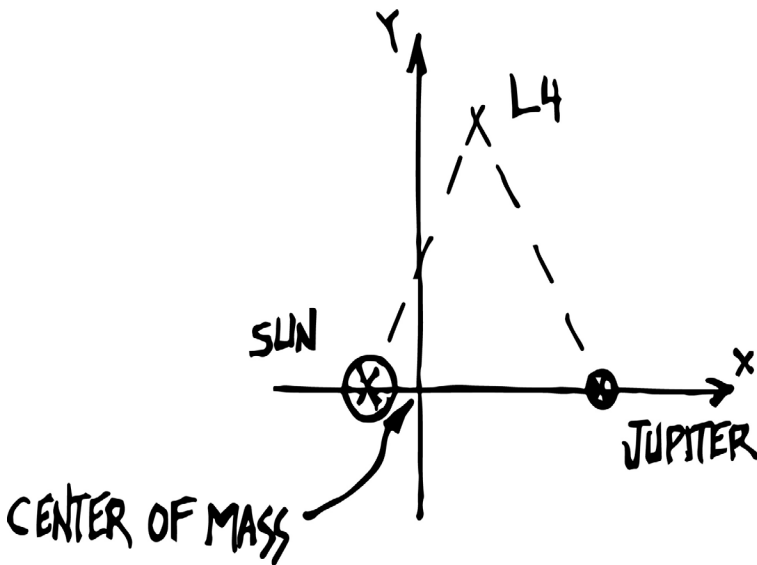


Figure 4.10 **Barycenter of the Sun-Jupiter System**

The Trojan and Apollo asteroids orbit these Lagrange Points L_4 and L_5 , respectively. That is, they move in small orbits in the rotating coordinate system, always maintaining this exact, equilateral relationship to the Sun and Jupiter, as in Figure 4.11.

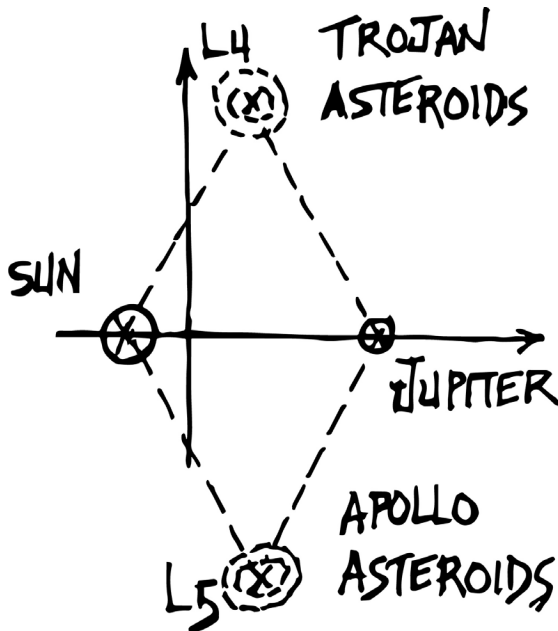


Figure 4.11 Asteroids Orbiting Lagrange Stability Points

Now, in this rotating coordinate system, there are three Lagrange Points along the Sun-Jupiter axis. And there is a stable figure-8 shaped orbit around these three stability points called a free-return orbit in Figure 4.12.

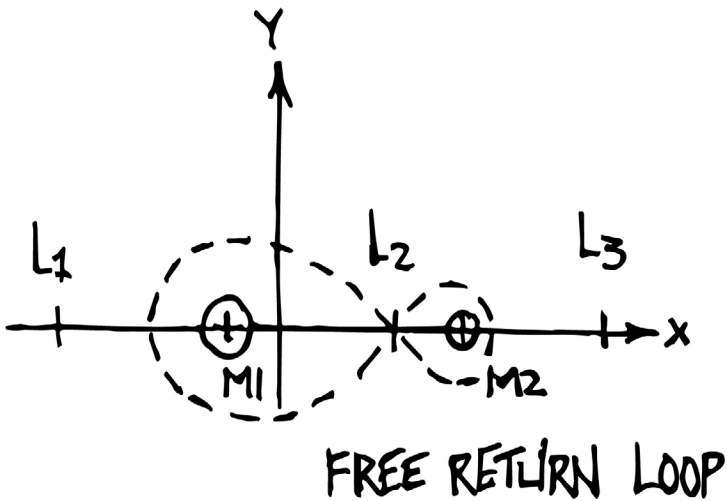


Figure 4.12 The Free Return Orbit in a 3BP

The points L_1 , L_2 , and L_3 along the axis of the primaries are also Lagrange Points. The so-called colinear Lagrange Points are not as stable as L_4 and L_5 , not stable enough for asteroids in the Sun-Jupiter 3BP to remain in orbit around them for very long.

And so, this is what happens when you cut loose from its anchors the four-spring inertial reference frame, in what you might call the post-genital phase. That is, mature relationships that lead to heterosexual matrimony, and then the introduction of a third body into the relationship; a child.

Think of L_2 as the first child; who eventually moves to L_1 or L_3 into stable orbits near Mom or Dad (the primary masses). We still have the L_4 and L_5 stability points – further children, perhaps; or family members.

Or, if there are no children yet; then the collinear stability points could be the three closest friends of the couple; L_4 and L_5 the next closest, perhaps siblings or childhood friends L_1 , L_2 or L_3 .

This is only a very simple solution to the Three Body Problem; there are many more configurations still, to exhibit every situation and personality type.

What happens to all this complexity if a person remains in the id-stage, everything coplanar? As the newborn matures and its psyche grows in strength, its “circle of comfort” grows and grows, outward from the original directrix.

Figure 4.13 is not of an individual who lives in an inertial reference frame organized by an external society. He creates his own inertial reference frame, the parabola in the figure below, and enforces his own rules on society at large. For lack of a better term, we’ll call this the super-id stage.

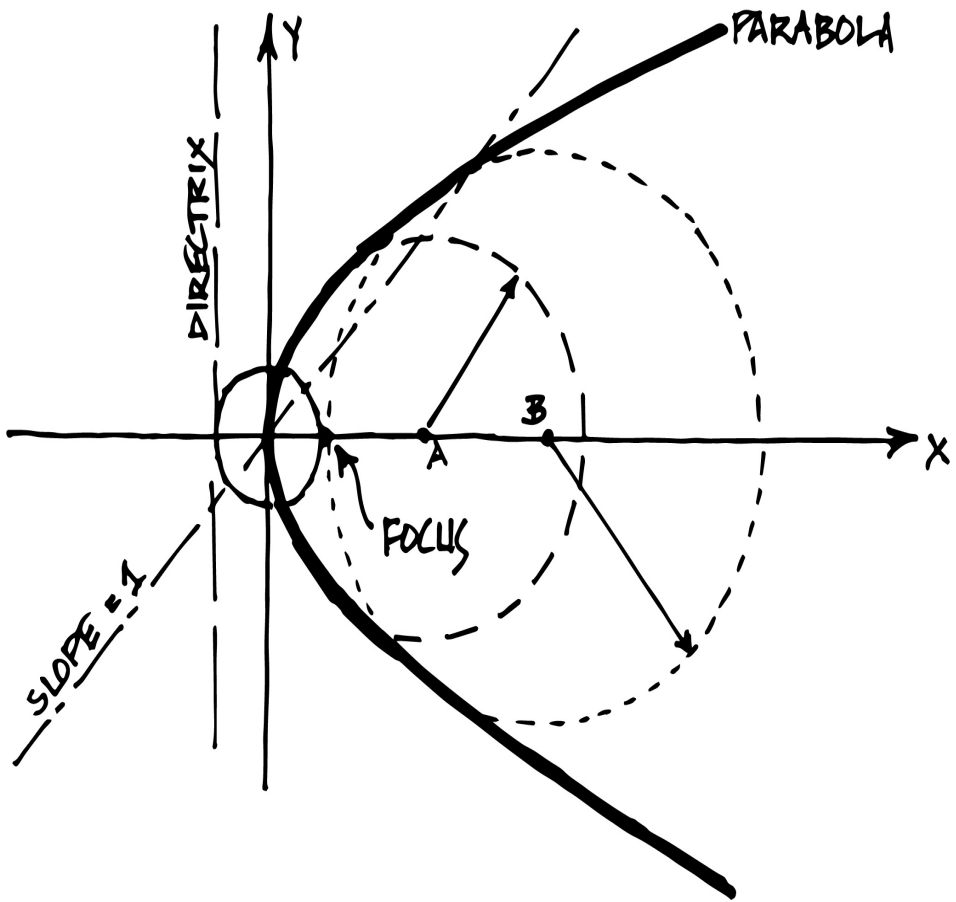


Figure 4.13 A "Complex" Developing of the Psyche

Here we see the power of the super-id-dominant individual to concentrate all their planar psychic energy on their victim, to break you down and turn you into one of their kind. The quintessential narcissist.

None of this would be possible if an extremely permissive society didn't define the directrix, legitimizing bullies and pandering to their constant need for new victims. Figure 4.14 shows the psychological effects of peer pressure or social conformity or political correctness upon the psyche, all focusing on the innermost private core of the individual's identity. How many individuals can withstand that kind of influence?

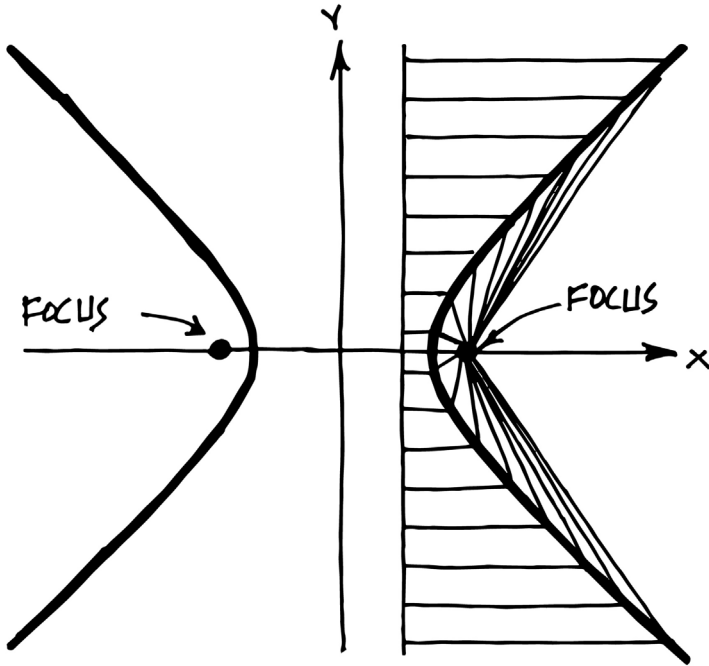


Figure 4.14 Social Pressures to Conform

Traditionally, the role of religion (and formal philosophies) has been to tame this primitive, primeval super-id and to eliminate it entirely, where possible. As religion fades in its influence on society, the super-id takes its place in the human psyche. Without any influence to replace the role of religion in suppressing the super-id, chaos rules supreme. Clearly, if you follow world news at all, this is exactly what's happening, everywhere.

4

The Hero's Journey

A general theme throughout the rest of this discussion will be fractal theory, the notion that patterns repeat at steadily increasing scales. This phenomenon is very common in nature, from seashells to mountain ranges, snowflakes, the pattern in leaves, and a hundred other disparate phenomena.

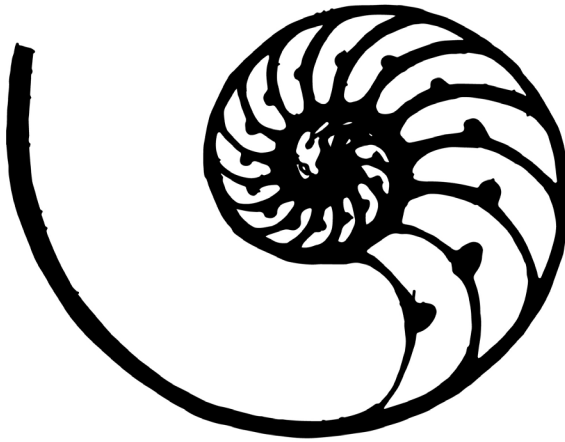


Figure 5.1 A Nautilus Shell

The objective here will be to show the Three Body Problem as a fractal theory. We're already familiar somewhat with the Two Body Problem – an object orbiting the Earth or Sun; and, in fact, the hyperbolic approach trajectory to a planet (or escape trajectory, depending on your point of view) is a Three Body Problem – the Sun, the planet, and the spacecraft, being influenced by the two major bodies.

The original model of the atom came from Celestial Mechanics, a Two Body Problem; the notion of an electron orbiting a nucleus. The equations for electrostatics, at the subatomic level, are exactly the same as gravity, but for a constant of proportionality. What we know about the Three Body Problem has been found to often have corollaries at the subatomic level.

The beauty of a fractal theory is that if you know it applies in two different situations, then if you know one level very well, it will give you insights into the other realm. For example, we know the mathematics of the Three Body Problem very well; but all we know about the subatomic atom is crude statistics. If a link can be established, then the relationship will allow a much deeper understanding of subatomic physics.

A true Fractal Theory is not just the extremes, but everything in between as well. We'll be exploring many such intermediate steps here; some may seem irrational, but others are quite intuitive. The true value is if we can find a fractal level that's virtually unknown, and apply all that we know about other levels that level we'll be able to increase our understanding of the unknown fractal.

Take the human psyche, for example. It's pretty clear that we don't really know anything at all about the psychology of the brain. Every year we add new mental conditions to the Diagnostic and Statistic Manual of Disorders (DSM), the Bible of Psychology; and have yet to take any conditions out, with the possible exception of narcissism. At least half the people in the world still believe it's a mental illness, or at the very least, a bad lifestyle choice. Although, since the DSM is the global standard, very soon narcissism will be universally an esteemed virtue.

Would anybody be surprised if they added “Trump fan psychosis” in the next edition of the DSM?

Be that as it may, wouldn't it be helpful if a discrete model of the human psyche could be fashioned; for example, posing the Id, Ego and Superego in the context of our Three Body Problem? Instead of dozens of different, competing theories on the psyche, there could be one, fundamental theory based on mathematics: A Diagnostic and Mathematical Manual of Disorders.

How many psychiatrists do you suppose would support such a mathematical model; being forced to give up their ability to apply whatever theory they want? There would be a total riot! These are the professionals we trust our mental health to? Instead of diving directly into that quagmire; we'll take an indirect approach.

THE MOVIE BEAT SHEET

Every film has the same basic structure with “beats” or critical events at very specific points in the drama. The industry standard is the Blake Snyder Beat Sheet developed in his book Save The Cat.

THE BLAKE SNYDER BEATS (page number)

1. Opening Image (1)
2. Theme Stated (5)
3. Set-Up (1-10)
4. Catalyst (12)
5. Debate (12-25)
6. Break into Two (25)
7. B Story (30)
8. Fun and Games (30-55)
9. Midpoint (55)
10. Bad Guys Close In (55-75)
11. All Is Lost (75)

12. Dark Night of the Soul (75-85)
13. Break into Three (85) 14. Finale (85-110)
15. Final Image (110)

There's on average one page of a script per minute of screen time, where the ideal script has 110 pages.

This standard is enforced ruthlessly by Hollywood. For example, when you enter a script in a contest, the readers typically turn to page 26, and if you don't have a major, dramatic event on that page, they toss it. "Clearly, this moron doesn't know structure."

My personal opinion of this rigid structure is that Hollywood enforces it so that it jives with commercial breaks when the film is broadcast on TV. Advertisers want viewers to stay tuned after the standard station break after 26 minutes, so you need a "cliff-hanger" before that ad segment.

OUR HERO GOES TO MARS

Reference to Figure 5.2, the similarities of standard screenplay structure to the interplanetary trajectory are uncanny.

At this point in Act One you're still inside the Earth's Sphere of Influence, an imaginary circle (dashed lines in the above illustration) where the Earth's gravity-force equals the Sun's gravity-force on the satellite. The focus of the hyperbolic escape trajectory is Earth, while inside the SOI, but the gravity force from the Sun becomes stronger and stronger until, once passed the SOI, the focus of the new elliptical orbit is the Sun.

In screenplay terms, there's a debate once the catalyst punches you beyond the set-up parking orbit, until you break into two upon reaching the SOI, after which time the B story begins; that is, the heliocentric ellipse, alias Act Two. Typically, there's a whole new set of characters; or gravitational forces, in the case of our trajectory allegory.

By this point in the drama, you're all caught up in the story.

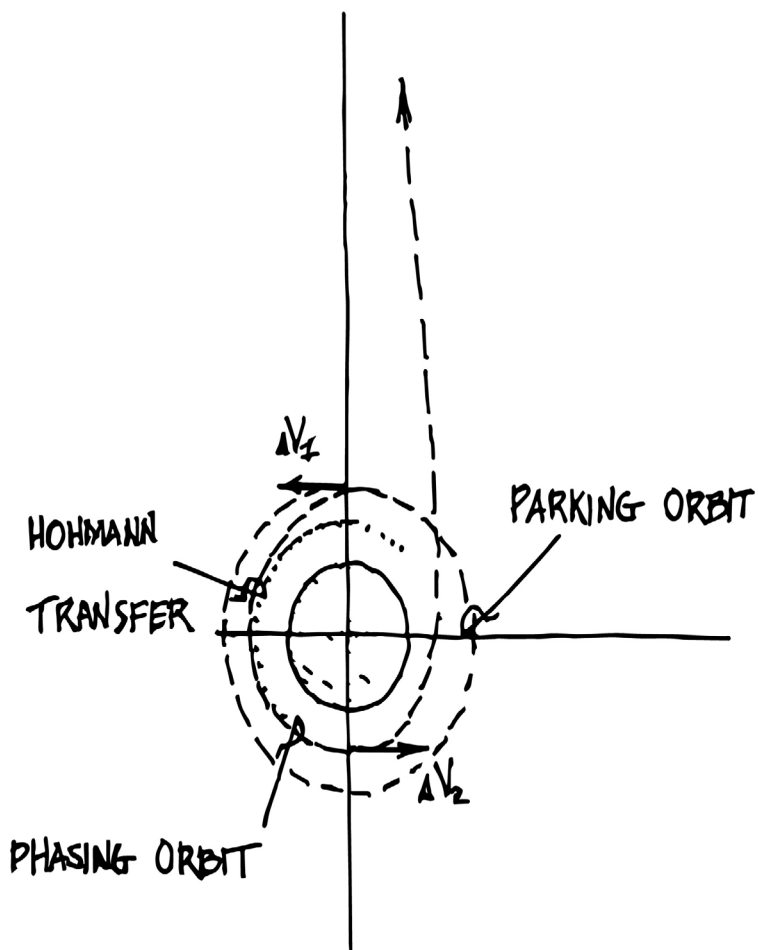


Figure 5.2 Escape from Earth

Screenwriters say that you've suspended belief, and are ready to accept almost anything. For example, in a sci-fi flick, new laws of physics or time or space. The theater is dark, the atmosphere intimate; and you're all wrapped up in this strange new world. . .

There are two phases to Act Two, or the heliocentric transfer ellipse (Figure 5.3, also Figure 2.5), divided roughly at the midpoint or conjunction (when the Sun-Earth-Mars are on a direct line). Prior to the midpoint, the spacecraft is gaining on Mars, but very slowly. This is the fun and games part of the script, where the romance builds, and where there are no major impediments in sight to their happiness, or to reaching their goals.

Then at midpoint there's a dramatic increase in stakes; a major event that changes everything for the worse. In an interplanetary trajectory, this is typically where the spacecraft applies a thrust to change from motion in the Earth's orbital plane to Mars's orbital plane. It's an important maneuver which, if done correctly, can save a lot of valuable fuel.

After midpoint, the bad guys close in. The Earth has now moved well ahead of the spacecraft, and its gravitational influence drops off rapidly. But now Mars is moving into influence, and quickly. Recall that the slowest velocity of an object on an elliptical orbit is at perihelion, which is where the spacecraft will reach Mars. Their relative velocities at this point are such that it's like waiting at a railroad crossing for the train to arrive, Mars is moving in so much faster!

There's a moment, as the spacecraft approaches this critical juncture; the bad guys (Mars) closing in reaching the Sphere of Influence of Mars, passing it – all is lost if this maneuver is only a fraction off...

Then there's an approach to an inner planet like Venus, where you can approach behind the planet, and use its gravity to pull you in for a landing. (Think romantic comedy, where you know there will be a happy ending.) If your maneuvers are a little off, no big deal – you'll still be able to achieve a parking orbit at a little higher altitude, then just wait for drag to circularize it.

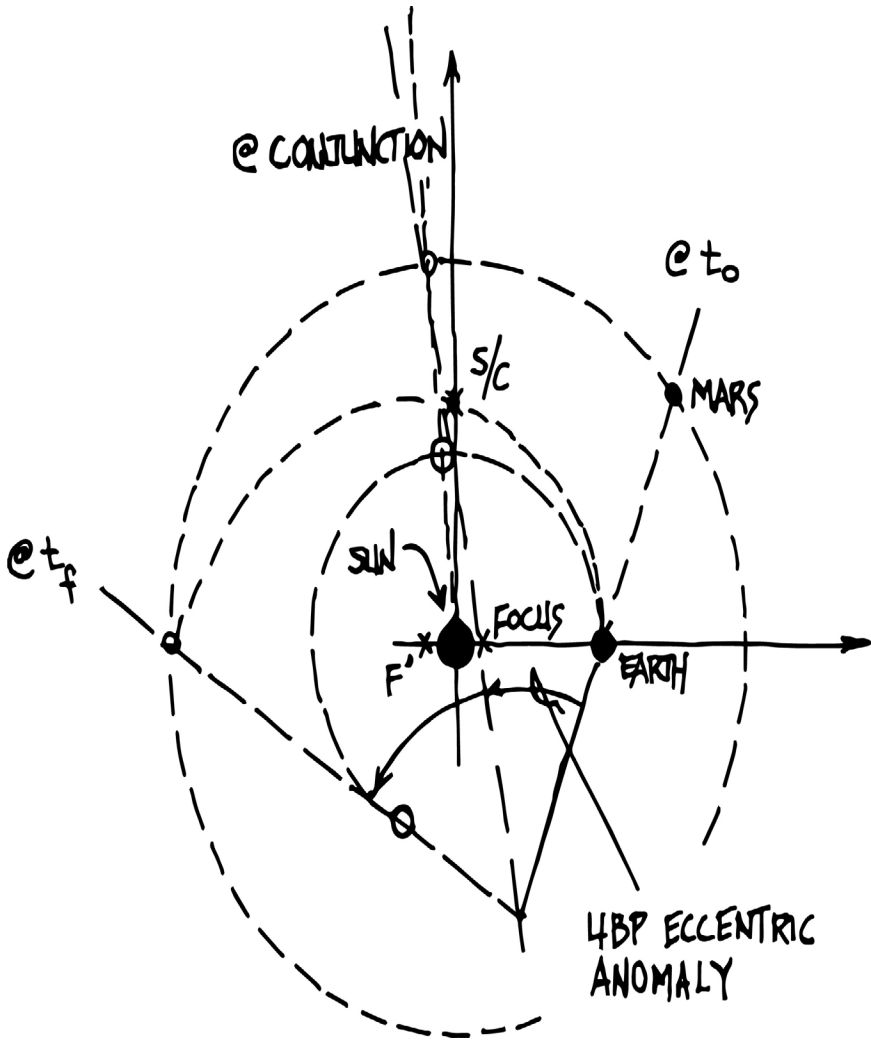


Figure 5.3 Heliocentric Transfer Ellipse

In the Mars approach (Figure 5.4, also Figure 2.4), the suspenseful action-thriller; the approach vector is on the leading side of Mars. Your little spacecraft drifts out ahead of Mars, then literally waits at the railroad crossing. Almost 30 US and Russian Mars mission were lost, trying to anticipate this maneuver. It's the dark night of the soul in Houston (or Moscow) flight control, waiting to see if the mission will survive the maneuver. . .

There's a time delay of about 24 minutes for radio signals to reach Earth from Mars. By the time the signal arrives, the spacecraft will already be lost (or not).

This final approach, inside of SOI, takes place must faster than the slow, leisurely escape trajectory while leaving Earth. Mars is much smaller, so it's SOI has a much smaller radius; and the relative velocity between Mars and the spacecraft is much higher, so the s/c trespasses the distance to Mars very fast indeed.

So, we're at the break-into-three point. From beginning until the break-into-two point is 25 pages; from the break-into-three until the grand finale is only 15 pages, just like in the interplanetary Mars trajectory. Will the final image be a lander pattering around on Mars, a pile of junk scattered on the dusty red landscape, a spacecraft careening off into deep space – or a fleeting glimpse of an alien ship lurking on the dark side of Mars?

THE PSYCHOSEXUAL STAGES

The five stages of psychosexual development: oral, anal, phallic, latent, and genital fit nicely with the five stages of the interplanetary trajectory:

- (1) launch to Earth parking orbit
- (2) escape trajectory inside Earth's Sphere of Influence
- (3) heliocentric transfer ellipse
- (4) capture trajectory inside Mars' Sphere of Influence
- (5) Mars landing

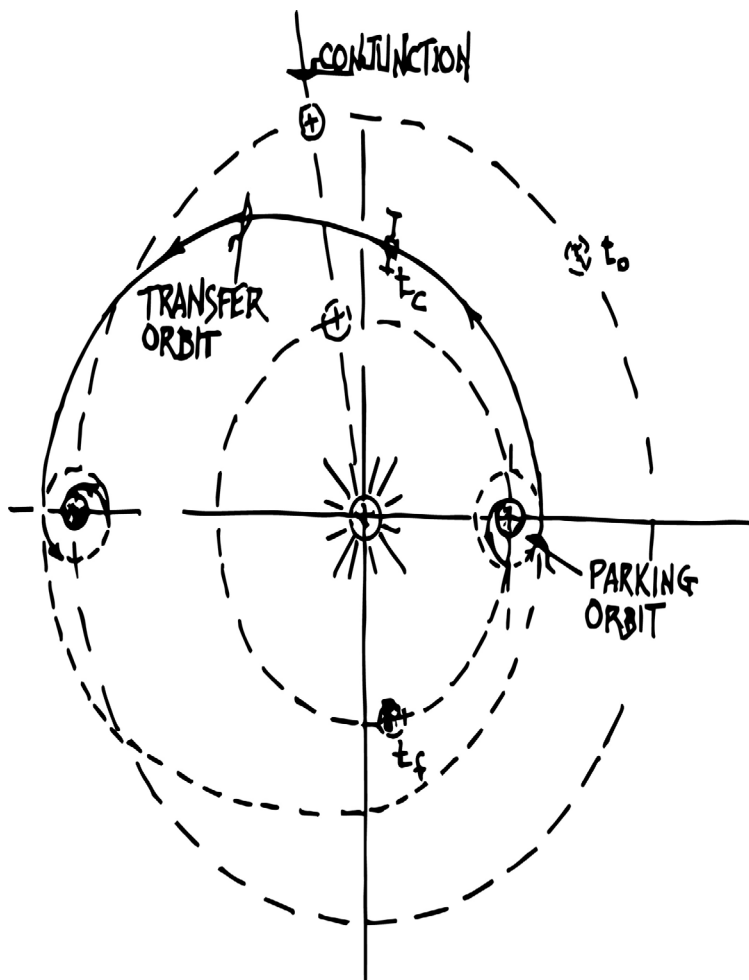


Figure 5.4 **Final Approach to Mars**

The heliocentric transfer ellipse (Act Two) is the superego, society's values and morals that function to control the id's impulses (Act One), persuading the ego (Act Three) to turn to moralistic goals rather than the self-serving. The superego consists of two systems: the conscience and the ideal self.

Traditionally society's values and morals have guided individuals carefully toward the sexual ideal, maturity – Mars; fraught with dangers and threats, as it may be. One tiny deviation from the norm; and – crash!

– the genital phase is out of reach.

That's the current state of modern society. The gentle coaxing and guidance of traditional values no longer exists; and the path to sexual maturity is all but out of reach; forbidden, even.

Narcissists are trapped in the anal phase; unable to move beyond Earth's Sphere of Influence into the grand journey across the cosmos, under guidance of "Son-centered" values.

The millions of young adults who embrace the new sexual continuum of trans-sexuality are trapped in the latent phase, in the chaos of Mars approach; afraid, unassertive; without any guidance whatsoever from society. While, before our very eyes, they crash – or careen off into deep space – and never, ever land on the gentle landscape of sexual maturity.

Indeed, all the forces of society are amassed to dissuade, block, or turn aside those who seek sexual maturity. Hollywood has abused the trust we place in them, by taking advantage of the "suspended belief" phenomenon to cram their unorthodox philosophy directly into our subconscious, bypassing all conscious filtering.

Granted, this is not an exact theory, nor is it intended to be anything more than a rigorous structure allowing debate, research, and possible resolution - one way or the other. The idea is simply to eliminate outside pressures and allow science the freedom to reach it's proper and rightful ends.

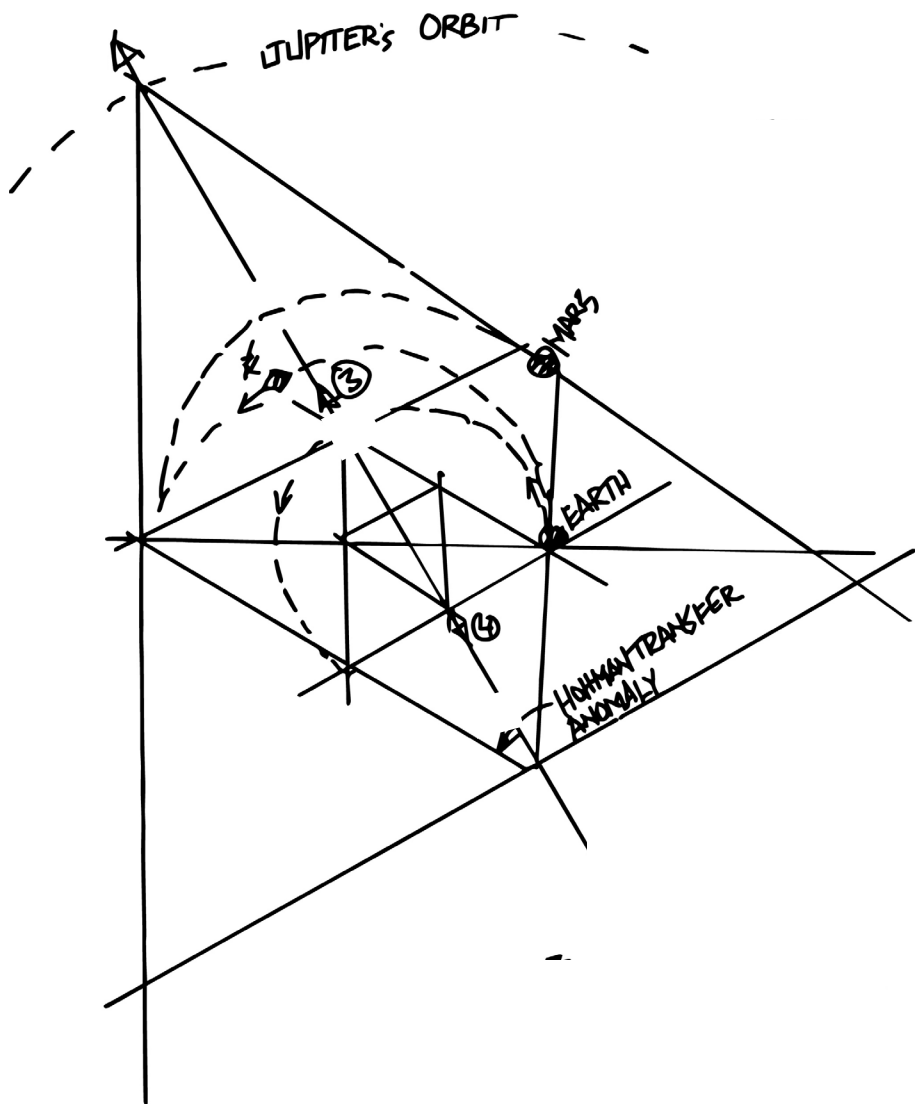


Figure 5.5 A Five Body Problem