

GENDER *MATH*

The book is dedicated to everybody who loves
mathematics.

“In math we trust.”

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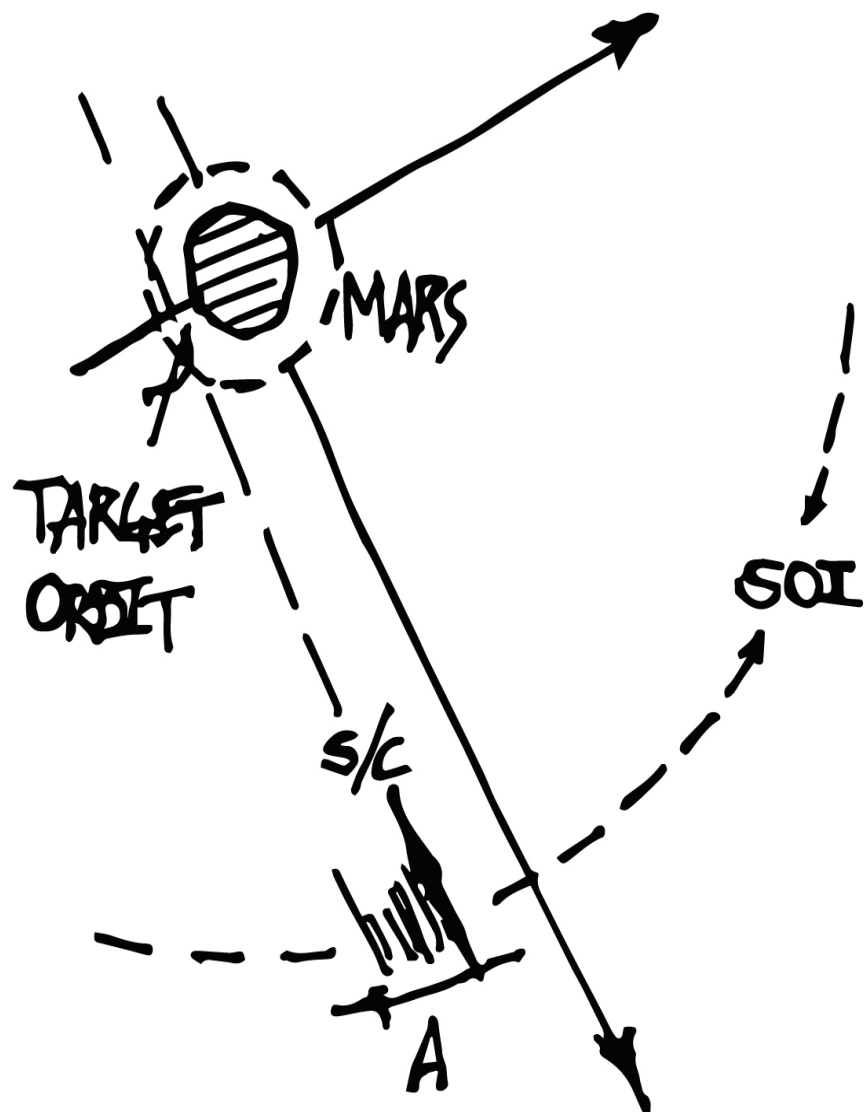
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GENDER MATH

by WH Clark

Illustrated by WH Clark



-1

I want to thank the University of Texas at Austin for expelling me with such extreme malice back in 2002 that I was left with a math phobia. I was one of the top consulting engineers in the U.S. at the time. An engineer with a math phobia is useless. Dangerous!

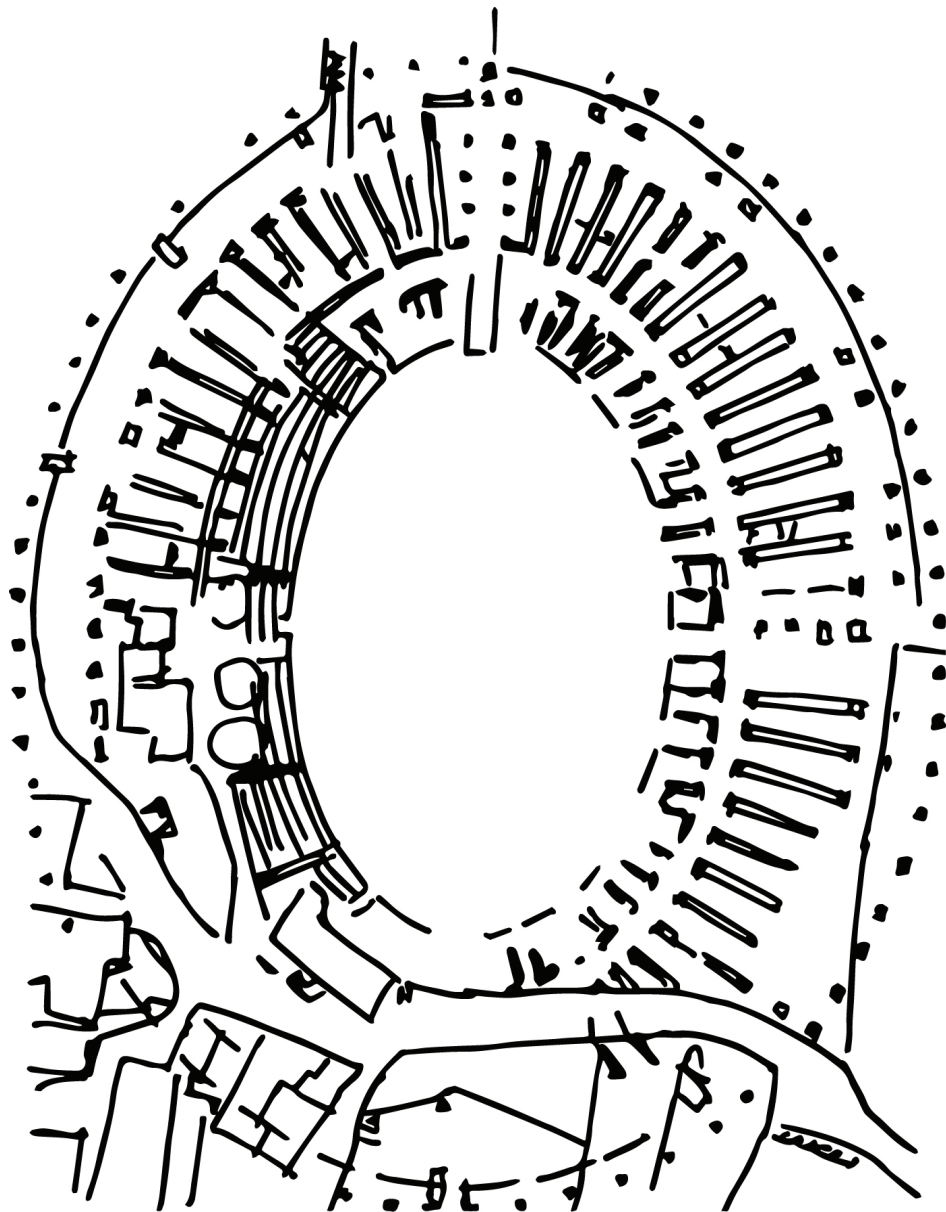
I was a semester short of a Ph.D. in celestial mechanics when they booted me. My research was a computer optimization of the Mars trajectory. It didn't matter that I was a member of three protected groups: older-than-average students, disabled veteran, and Special Vietnam veteran.

Almost all the illustrations in this little book come straight from my dissertation. That's the extent of the math I've done in the last 25 years. The good news is that you won't be blown away by any complicated equations.

This psychology kick started a few years ago when I created a protest website (one of many over the years), trying to explain some basic orbital mechanics ideas for lay readers. The psychology analogies were so compelling that I ended up writing three books on that theme.

This small book is a distillation of The Big Theory of the human psyche, based on ideas from orbital and celestial mechanics.

WH Clark



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Many people, especially young adults, still wonder who they are. Their self-portrait is blank. They feel like an elaborate frame has been built around them, and that everybody else knows who they are but themselves.

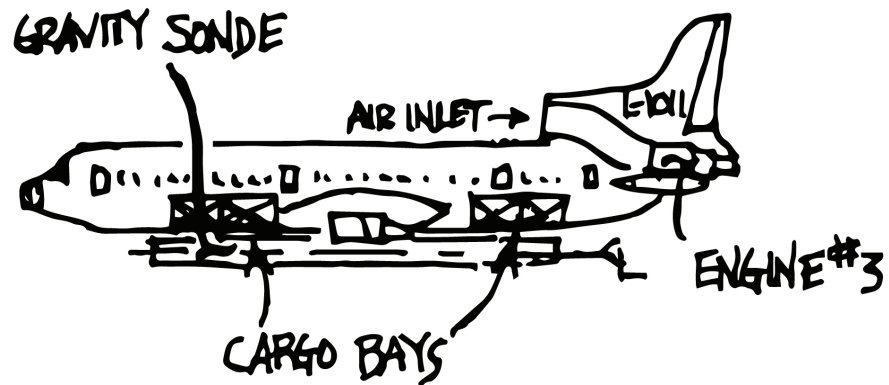
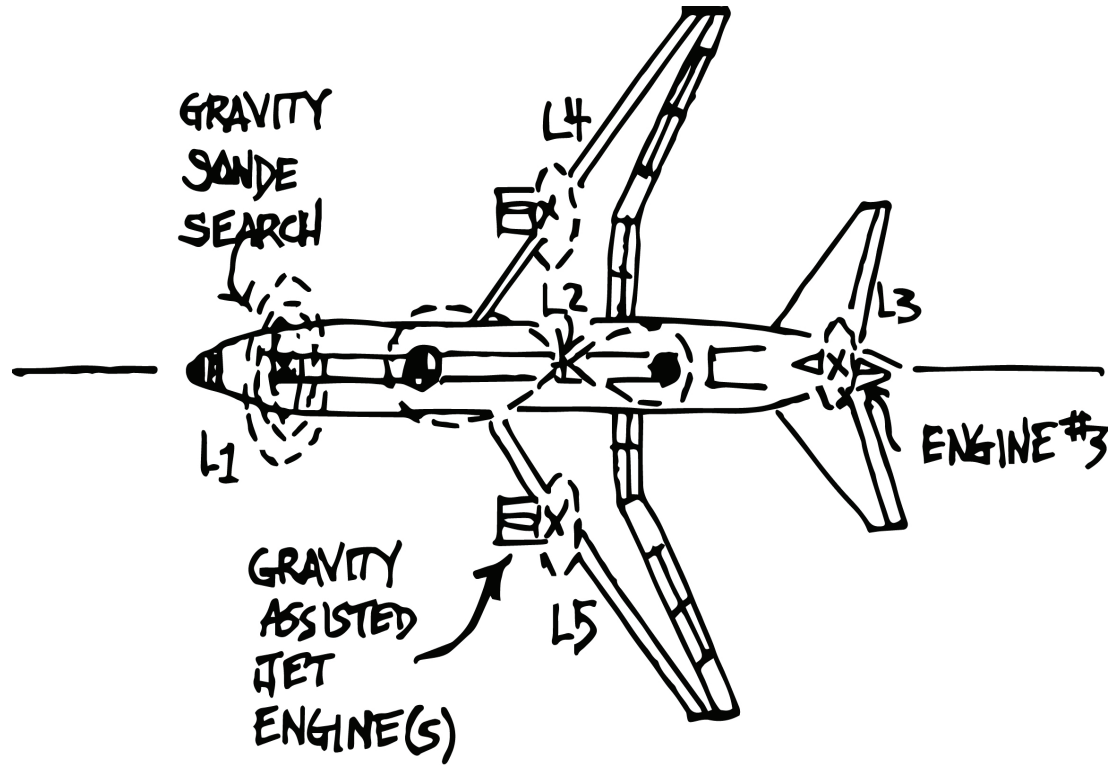
Google knows who you are. Their algorithm has stored your every search since the first time you went online. Politicians know who you are. They have tens of thousands of data points on every voter.

Everybody sells your data to advertisers and marketers around the world, even adversary governments. They know exactly how to convince you about what you want, what you need, and what cannot possibly live without.

Psychology to the rescue. Doh! Dream on, baby... Modern psychology is based on statistical methods. There are no people in psychology research, only averages, norms, and standard deviations.

The graphic is actually a Roman arena, now just stone benches looking down upon an elliptical playing field. This book aims to put real people in that theater, and action in the arena. (Yes, absolutely everybody will be outraged at the intrepid gladiator, alias Inviticus.)

The principle actors in the drama are math concepts, geometry, and simple forces in the natural world that we all recognize and live by.



1

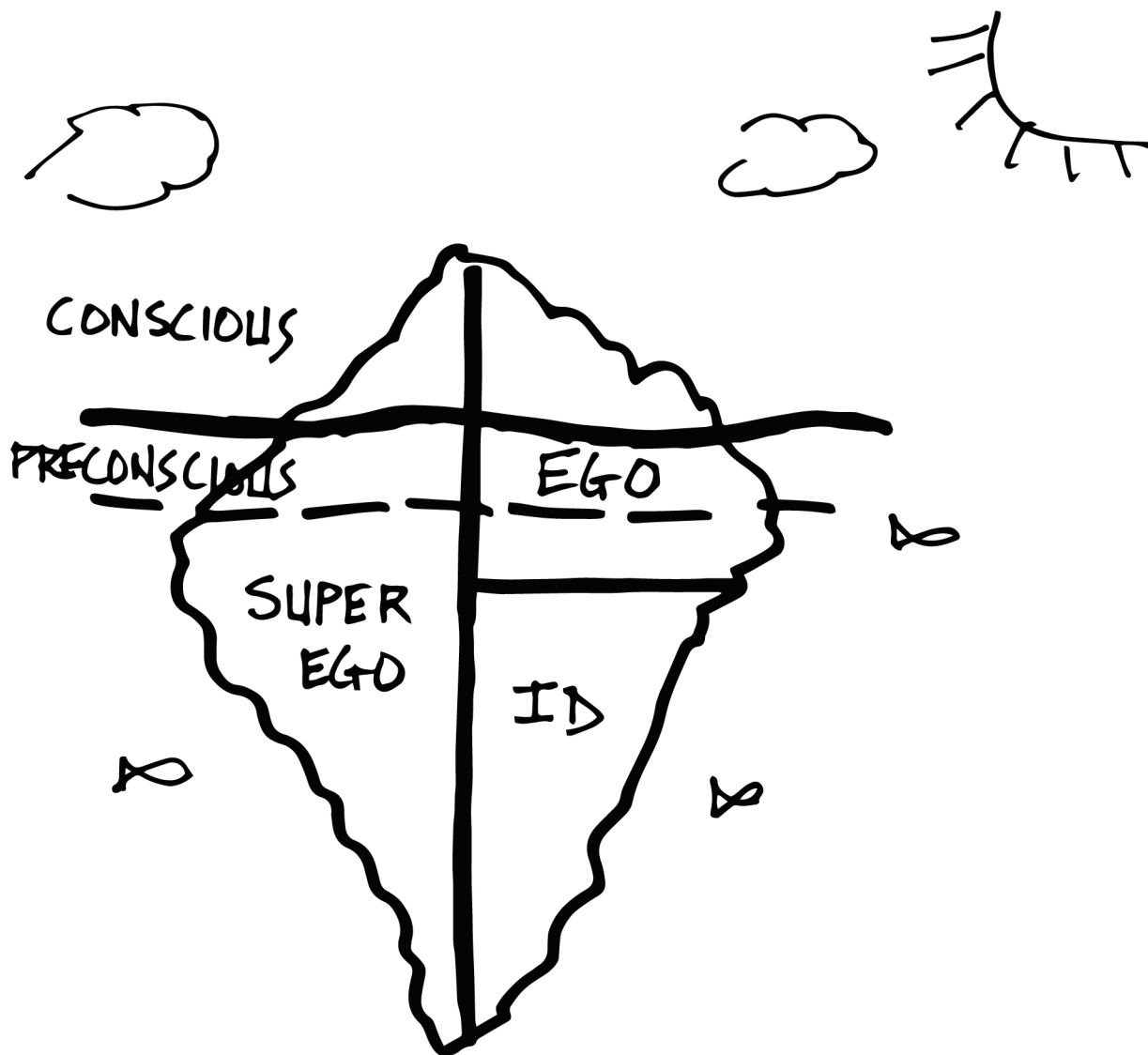
There are no equations in this book, although the diagrams represent a great deal of math. The objective here is to present a theory with concepts. You don't need to be an aerospace engineer to realize a commercial jet is designed with exquisite precision right down to the screws and rivets.

Birds have been flying for millions of years (albeit originally on leather wings) without knowing how they actually do it. Somehow, knowing the complicated science takes a bit of the magic out of it.

Notice the dashed lines in the diagram. You'll know exactly what they mean by the end of this book and recognize intuitively how math can make better aircraft - and perhaps even better people. At a minimum, you'll end up with a healthy new perspective on the human psyche (and physiology), especially concerning sexuality.

We will end up with a comprehensive new model of the psyche. It poses a continuum of sexualities. Heterosexuality is fundamental to the model, like the aircraft framework in the diagram, but we'll discover subtle nuances that suggest the LGBTQA+26 variations.

The gist of The Big Theory is fleshed out here. I'll do the math - albeit visually - and leave the psychology to others.



2

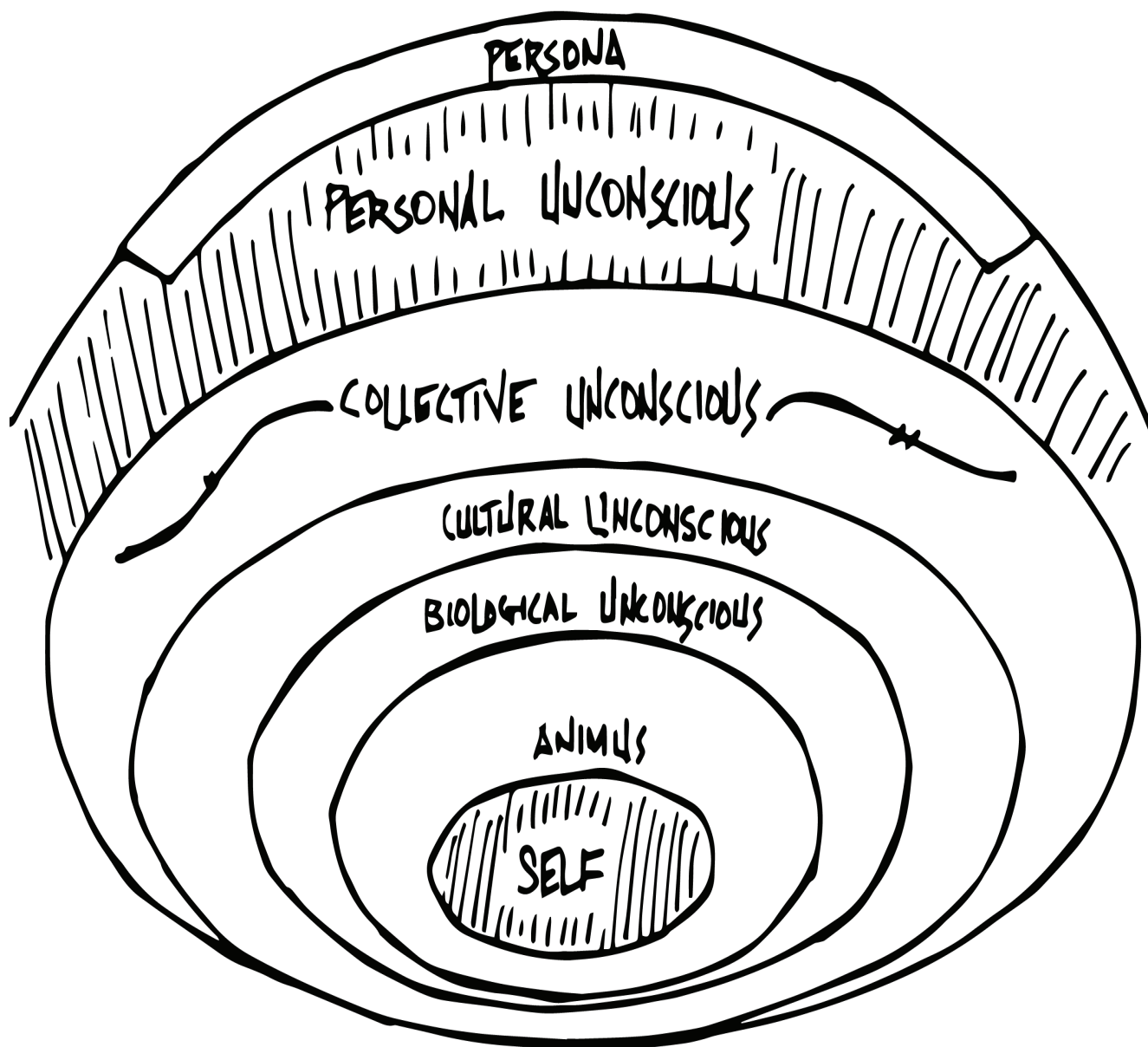
We begin where modern psychology began, with Sigmund Freud's id-ego-superego theory. He used the iceberg metaphor (also used by Ernest Hemingway at about the same time), suggesting a deep, subconscious involved in the psyche.

Mathematically, the upward force holding the block of ice afloat is called the buoyant force (also called Archimedes' principle). This upward force equals the weight of the volume of water displaced by the ice.

What happens if you apply math to this iceberg psyche idea?

In talk therapy, the fluid might be more viscous – heavier, like olive oil. The iceberg floats higher, revealing more of the subconscious mind. An introvert might have “heavier” ice, so the psyche floats deeper. Intense scrutiny, as during a job interview or giving testimony in your own criminal trial, might shine a bright light on your psyche and melt your resolve, so you reveal what's in your subconscious. (Or you can always rely on body language!)

These notions can be quantified mathematically, giving Freud's (now all but discarded) theory a whole new complexity. That's the power of math. Technically, a model like this is in the realm of mathematical physics, using math to model natural phenomena.



3

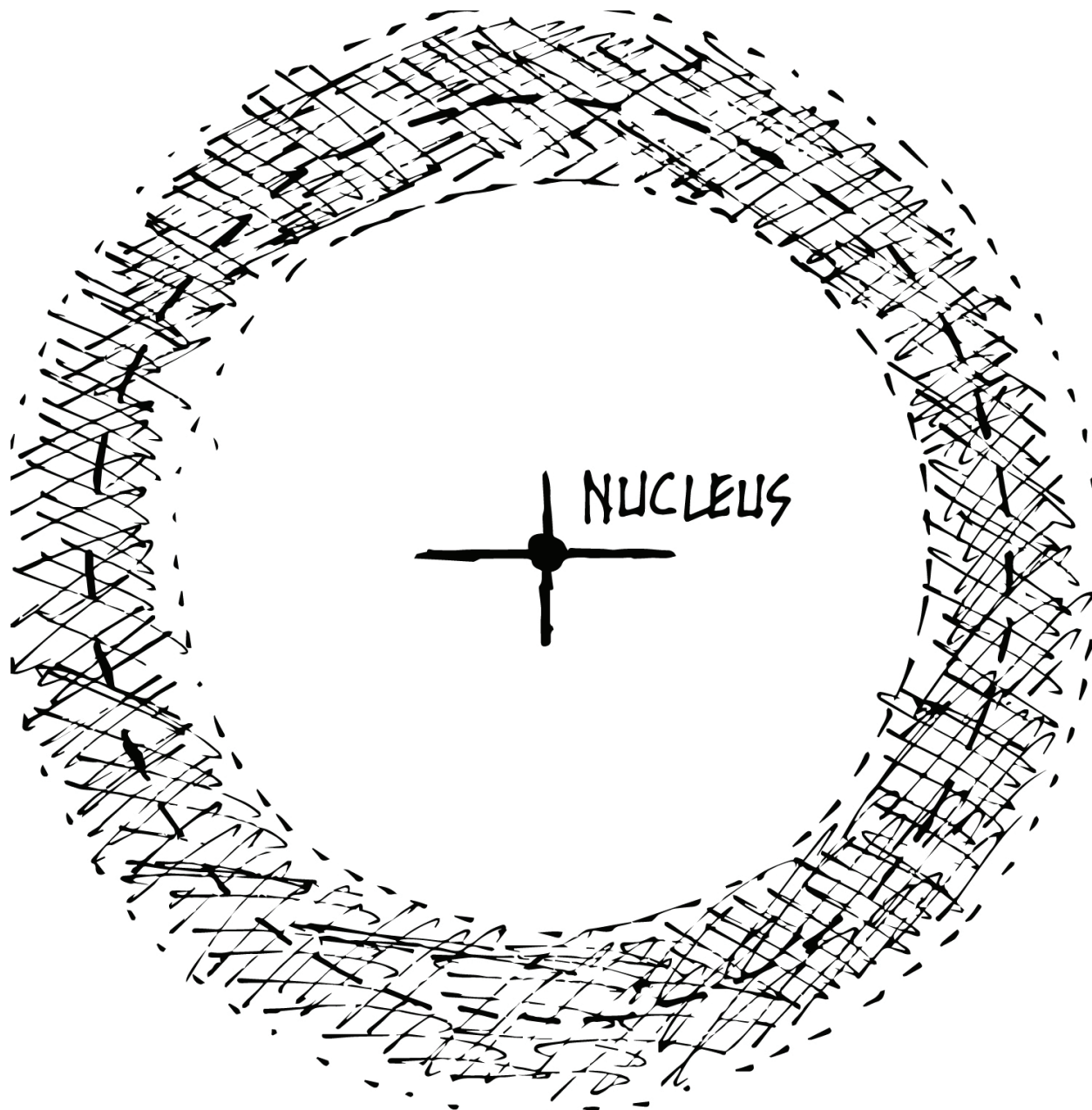
Compare the insights suggested by Freud's iceberg diagram to this modern depiction of the psyche. Freud's ocean is the "personal unconscious" here. The sunlight might be "animus," and so forth.

Personally, I think it's very creepy how little of this model is unique to the individual. It's like they want to create a hive mind, like the Star Trek Borg Collective. *Resistance is futile! You WILL be assimilated.* (Sadly, that's exactly what Wall Street aims to do.)

Modern psychology has no further diagrams. It's all based on probability and statistics. No math! It's enough to make you, well - go crazy.

Statistical models offer no insight. The "consciousness" is a vague concept, even more fuzzy statistically than it is in the real, physical world. There are no forces to quantify, no physical criteria to adjust. No ice, sunshine, water, wind, density, or endangered polar bears weighing down your psyche with their albatross friends.

Mathematical physics is the polar opposite of statistics. Equations vs. averages. Mathematical models have form, function, and an intuitive veracity. You can support almost any viewpoint with statistics. Not with math. (I tried! No luck.) You can EXPLORE consequences, and INVESTIGATE subtle nuances. There's no politics, no excuses, and no - escaping.



4

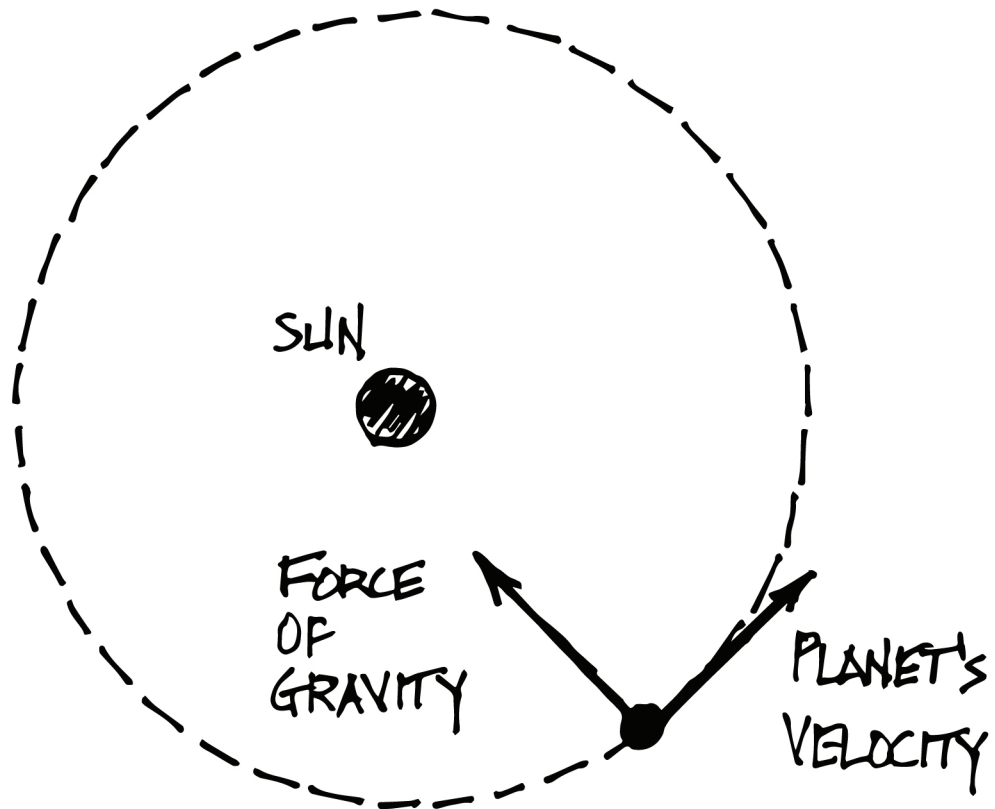
The branch of mathematical physics used in this book is called “celestial mechanics,” the mathematical study of astronomical phenomena: stars, planets, moons, and spacecraft. Gravity is easily illustrated, and people have an intuitive understanding of force, speed, and motion.

Quantum mechanics – STATISTICS – says the atom is just a cloud of probabilities. “*It’s impossible to know the exact position and velocity of an electron.*” (Sounds like an excuse to me.) The original mathematical model of the atom came from celestial mechanics. It’s called the Two Body Problem (2BP), one large sun/planet/moon and a tiny spacecraft.

The 2BP is an EXACT model for the atom because the equation of force for gravity is the same as for electrostatics, but with a different constant of proportionality to account for scale.

Both gravity and electrostatics forces are equal to the mass/charge of the two bodies multiplied, divided by the distance squared, and everything multiplied by a constant, G and k . They’re called “inverse squared forces.”

In mathematical physics, then, an electron is a physical object. In quantum mechanics (statistics), it’s just a cloud of possibilities. In statistical psychology, you’re just a STATISTIC, an average – a norm. In mathematical psychology, you’re an individual... Which dot has your name on it?



5

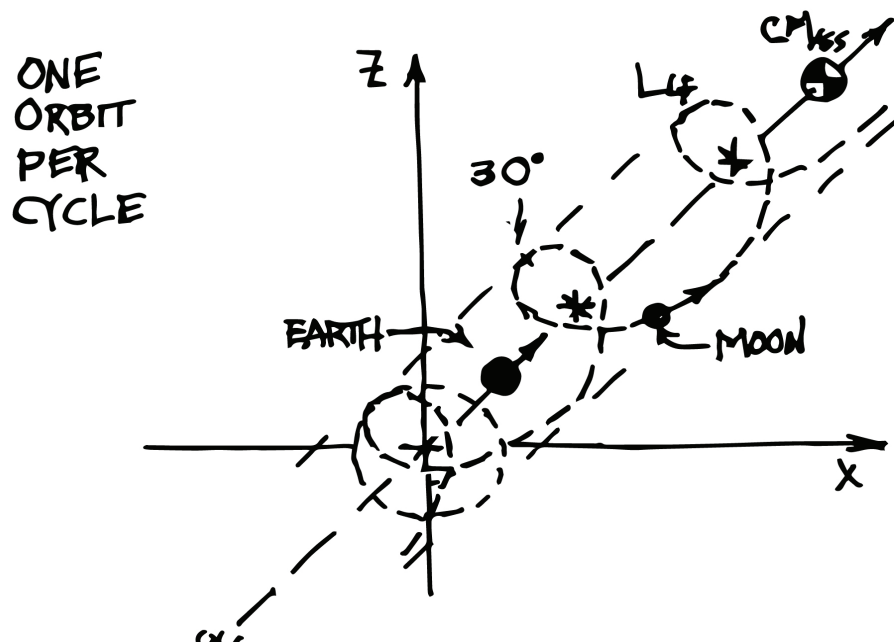
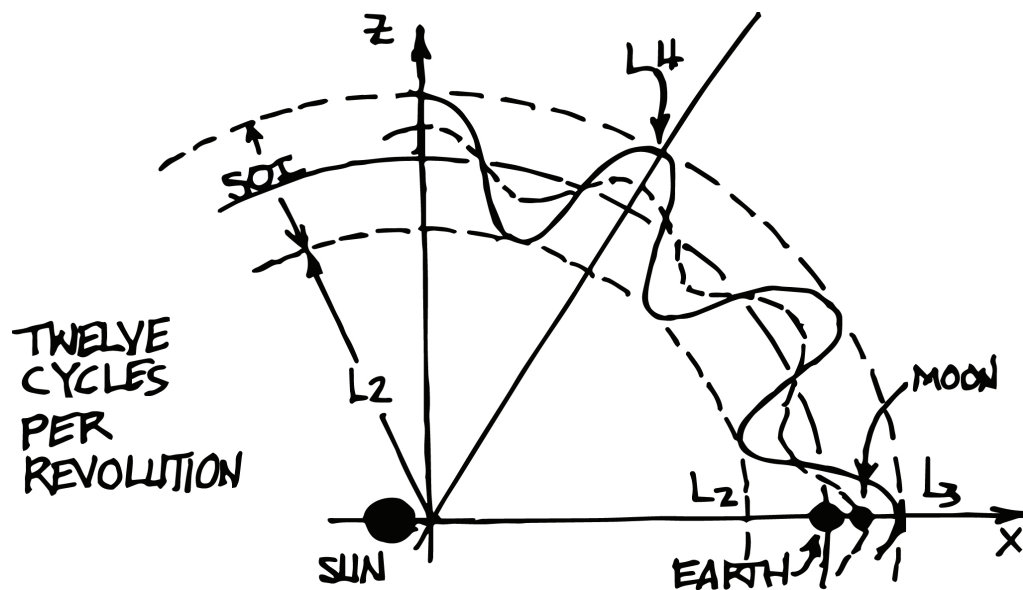
Here's the original Bohr Model of the atom, i.e., the Two Body Problem (2BP) of celestial mechanics. This is our answer to the probability cloud distribution of quantum mechanics.

The force between the nucleus and the electron is an inverse-squared force (proportional to the inverse of the distance squared – i.e., you divide by that number), just like gravity. The only difference is that electrons move in three dimensions, meaning the electron cloud is a 3D sphere.

This is the classical 2BP – a much, much smaller object moving under the influence of a single star/planet/moon. The 2BP is the basis of orbital mechanics, the investigation of satellite motion around Earth (Mars, the moon, and so forth), and interplanetary missions by manmade spacecraft.

The force of gravity is along the line between the two bodies. The smaller body moves in a conic section (circle, ellipse, parabola, or hyperbola). The 2BP dynamics apply to ANY tiny body (satellite, asteroid, rock) moving under the gravitational influence of a much larger body.

NOTE: Using gravity for our psyche model doesn't imply our brains are influenced by gravity. Only that the constructs of gravity are useful in visualizing sundry human attributes. This is a THEORY, and the book is written to provide you with the supporting evidence.



6

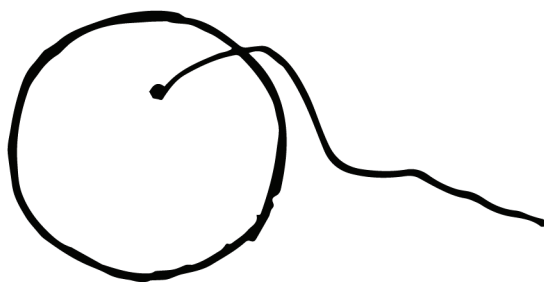
The female menstrual cycle has the same period as the moon's orbit around Earth, roughly 29 days. This is not unique to homo sapiens. Many marine plants and animals have circalunar cycles, especially those whose reproductive cycle is tied to the tides. And many deep-sea creatures exhibit a lunar rhythm in melatonin production.

Instead of cosmic coincidence, perhaps mensuration is proof that early humans lived near the ocean, or maybe even evolved from the ocean.

The diagram of the lunar orbit in space-time shows the actual motion on top – weaving in and out, always keeping the same face toward Earth. The lower diagram isolates on Earth and the moon in 3D space-time.

Together, the illustrations portray a dizzy, disorienting cycle that haunts the female physiology year in and year out. For seven days out of each month, the whole body is caught up in a whirlwind. Up is down, and inside is out. A week to get your sea legs back, two weeks of relative calm, and – boom – back on the merry-go-round.

And not just the physical systems are discombobulated, but the emotions and senses, too. Surely a theory that puts coordinate axes and numbers of this phenomenon is worth a go.



7

Here we see a giant circular egg and a tiny sperm cell. A physiological Two Body Problem in scale. A good 200 to 300 million sperm cells swarm a single egg. Only the best, most determined swimmer makes it to the egg and achieve conception. Survival of the fittest or dumb luck? (Ask Mom when her kid grows up)

This magical dance takes place in the fluid environment of the womb. Again, gravity has nothing to do with this process, but the analogy is worth an honorable mention here because...

The N Body Problem of celestial mechanics (called the Many Body Problem in electrostatics) studies the motion of a tiny body (spacecraft) acted upon by the gravitational forces from many (N) large bodies. Think the Star Trek Enterprise ripping through a solar system at warp speed, or a conventional probe zipping through the asteroid belt.

All these force equations, when added together, reduce directly down to the same equations as for static flow in fluid dynamics. Space behaves exactly like a FLUID. The same applies to electrons and nuclei at the quantum level. Electrons FLOW by fluid dynamics principles.

Huh. Freud's iceberg theory is looking pretty clever.



8

Okay. Conception proceeds to birth, and a child is born.

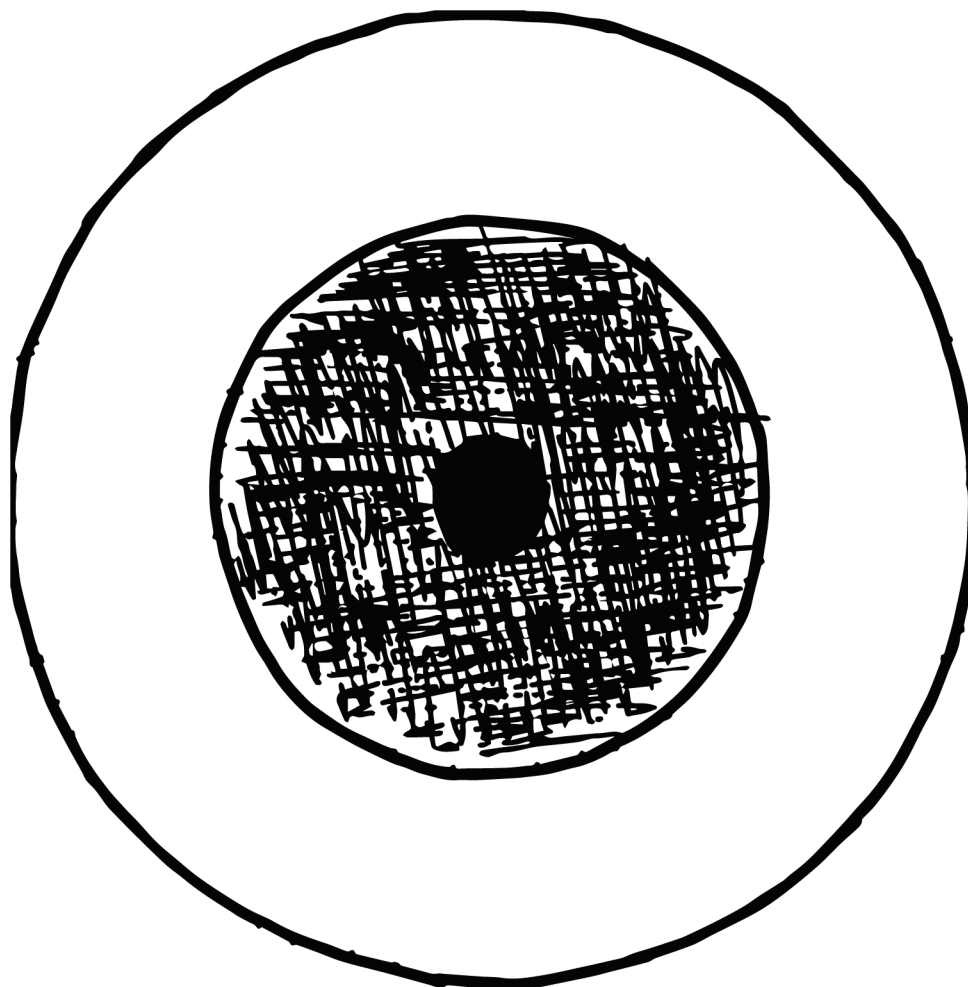
Mathematically, we have a new “Two Body Problem” in the child-mother bond. For this brief moment, nothing else exists for either the mother or (especially) the newborn.

Bonds are very important in psychology. They can take many forms: mother-child, father-child, and so forth. Add all these forces together, and you have a family/tribe/community/society/civilization.

At the higher levels, the collective force of these bonds is fluid (and incompressible, whatever that might mean). This is not necessarily a moving fluid as in a stream, but at a minimum supportive. Life is bonding. For seniors, that social network can add 6 years to their life expectancy.

Gravity is a central force. If there are only gravity forces in your model (no friction, atmospheric resistance, solar wind), you can integrate the equations of motion backward in time. Think untoward stress, high responsibility, anything out of the ordinary.

Human nature isn't all forward. Relationships can regress, whole societies can de-evolve. Therapists regress patients back in time to resolve conflicts. Things don't always go forward. Our gravity math supports that.



9

So. A child is born. At first, his/her whole world is – right THERE. The mother's breast. Nipple. Aureole. Breast tissue. That's all that matters to the newborn for the moment. Everything is nice and clean and symmetrical. Life is good!

Psychology endows this moment with all sorts of confusing things – environment, nurture is nature. The cold, cruel statistics world welcomes the child with a SLAP on the buttocks.

“Welcome to life, dude or dudette.”

Forget all that drama. Enjoy the moment. Keep it nice and simple. Mathematical. Baby is hungry. Mother suckles baby. Baby is happy.

But, yeah. We're in a big new world now. Ugly statistics threatens everywhere you look – disease, viruses, and a whole slew of environmental and emotional and physical hazards unseen.

But we have our math. A fluid environment that's supportive and nurturing. You can handle all those external vector forces. Focus on the internal drives – hunger, nurture, nature.

“In math we trust. “



10

Um, excuse me, but there's a whole body attached to that breast. And... And... There's a whole big new world out there to explore!

Will it be a statistical world, governed by abstractions and norms? Or a kind and caring and (fluid) supporting world that helps you to achieve your potential, and to be happy every step along the way?

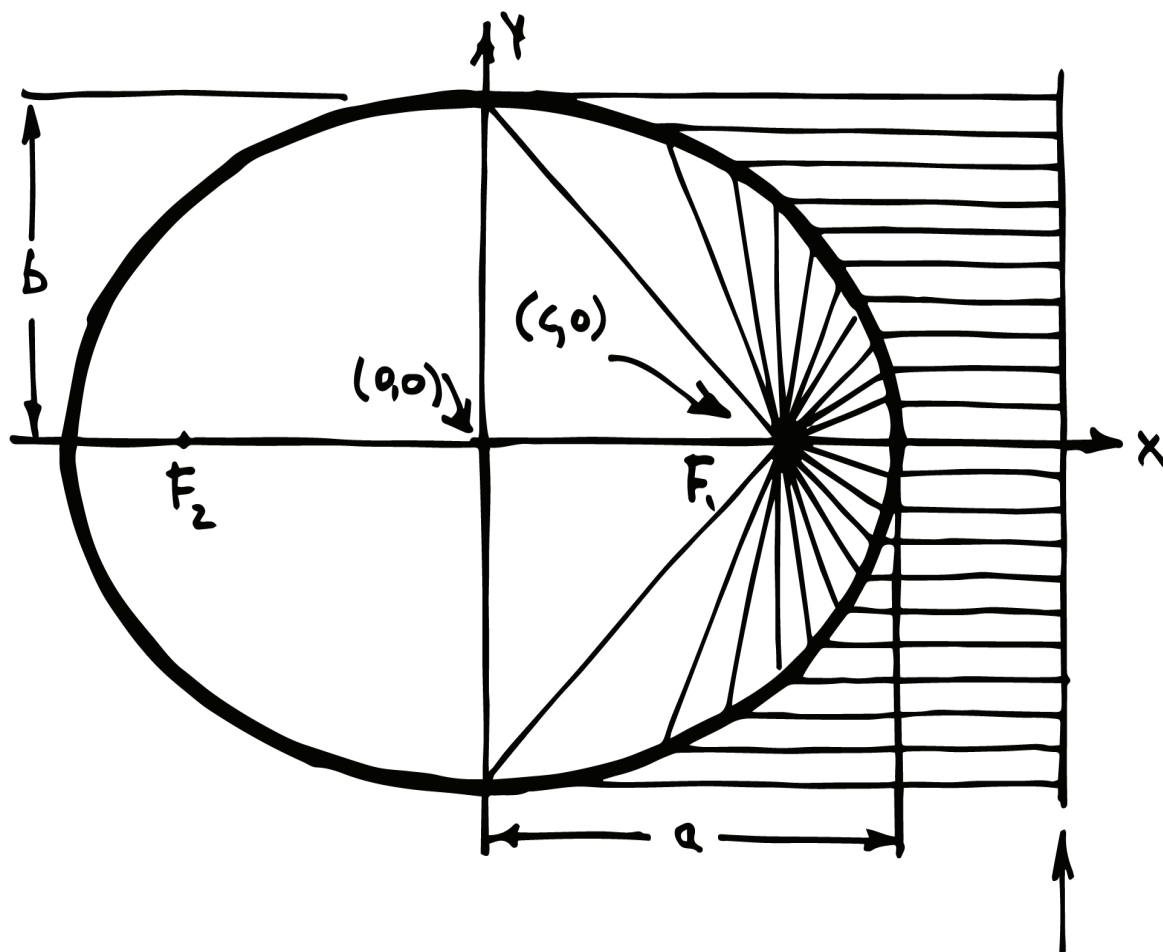
Statistically, that's a pipe dream. Impossible! Don't delude yourself. Best to aim low, blend in, and do unto others before they run you down. Surely, a statistical world can't be so cruel and uncaring. Oh, really?!

Narcissism is so common now that psychology no longer classifies it as a disease or mental condition. When our math child grows up, will humility be so much the exception that, statistically, being humble is classified as a serious mental illness?

I can happen. It IS happening... Statistical methods have no moral compass. We're all just faceless numbers to modern psychology.

Talk therapy is too expensive, and therefore, new psychology models like this one are moot. Drugs are the solution.

Got Attention Deficit Disorder? We have a drug for you to take for the rest of your life. That's not psychology. That's pharmacology.



DIRECTRIX

$$x = \frac{a^2}{c}$$

11

Back to the math. A child is born. His/her initial focus is on Mom's breast. A few minutes later – oh, wow. There's a whole world out there!

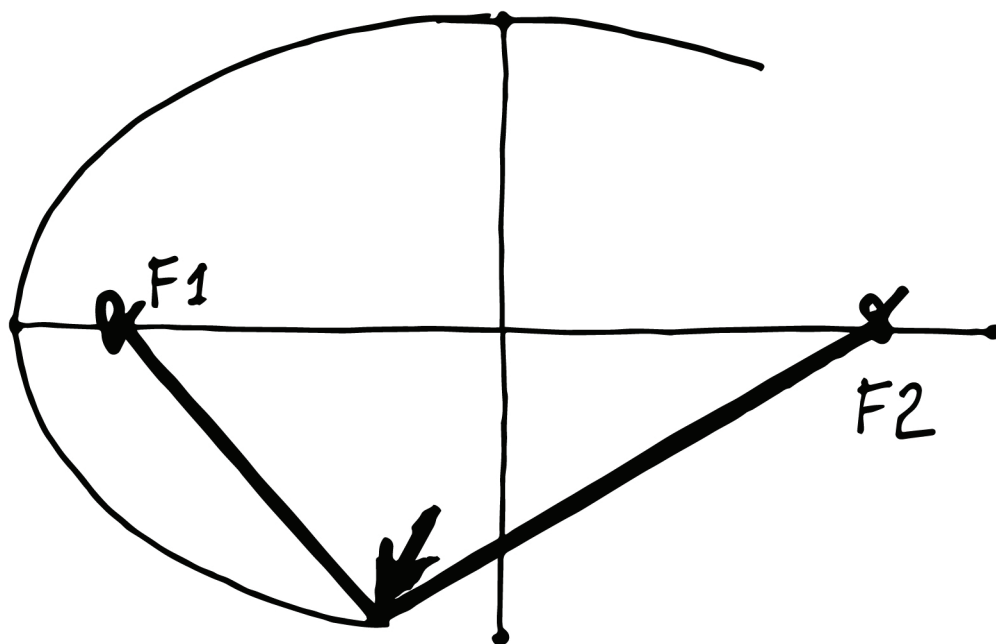
Full disclosure: I spent my first six weeks in an incubator, so I'm winging it here. Surrounded by screaming babies, fluorescent lights on 24/7. Ouch!

Anyway, a circle is an ellipse with eccentricity = 0. We're in the ellipse place now. Still just two bodies, but with an external environment projected onto our new reality.

The diagram opposite shows the geometry of an ellipse. Two foci, and everything is symmetric around the origin. In orbital mechanics, one focus is always empty (F2). The other focus, in an earlier example, was the sun (F1). Orbital motion follows the ellipse.

Here we simulate the child's focus on the outside world versus the center of his/her world – Mom. Think of the directrix as a screen-view of the environs. The regular orbital motion – heartbeat, circadian motion – establishes stability.

The child focuses beyond. But. That psyche is as yet infinitely impressionable by that (directrix) screen. It will be some time before a psyche evolves as a first line of defense against the evil statistics verse.



12

How do you think the Romans built that perfect ellipse for their coliseum earlier? They drove two iron rods into the ground, tied a string to them, and traced out an ellipse. (If both foci are at the same point, you end up with a circle.)

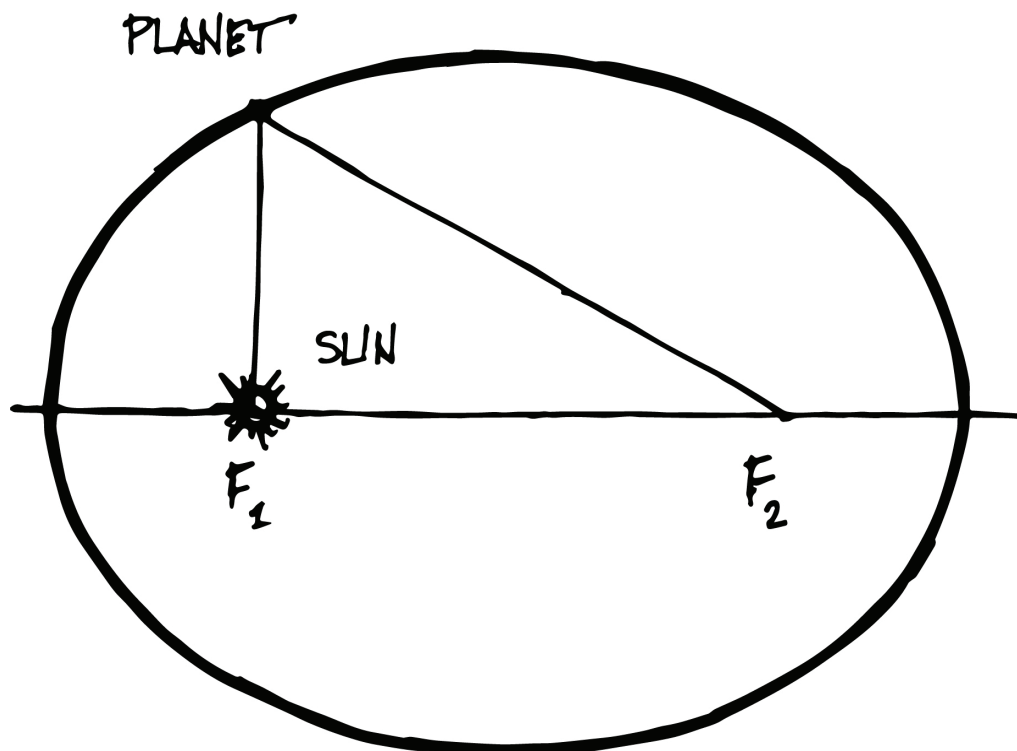
In our child's world, there's (ideally) a second focus that soon becomes important – the father. Together, Mom and Pop create a nurturing environment for the child's safety and development.

It shouldn't be controversial to say this, but a child is best served by a mother and father, forming a family unit. Statistically, this is the ideal scenario for a child to reach their potential and live a happy, productive life.

Absent statistics? What matters are two stable, dependable individuals who take on their responsibilities with diligence.

So, this is the home arrangement after birth and the maternity ward (incubator!). Our math requires two mature foci and two important forces influencing the child. (For a single parent? A circle; less flexible, but doable.)

Any other outside forces are what we call third-body perturbations. These always exist. What's important is that the stable elliptical harmony is consistent and – there. And the string remains attached.



13

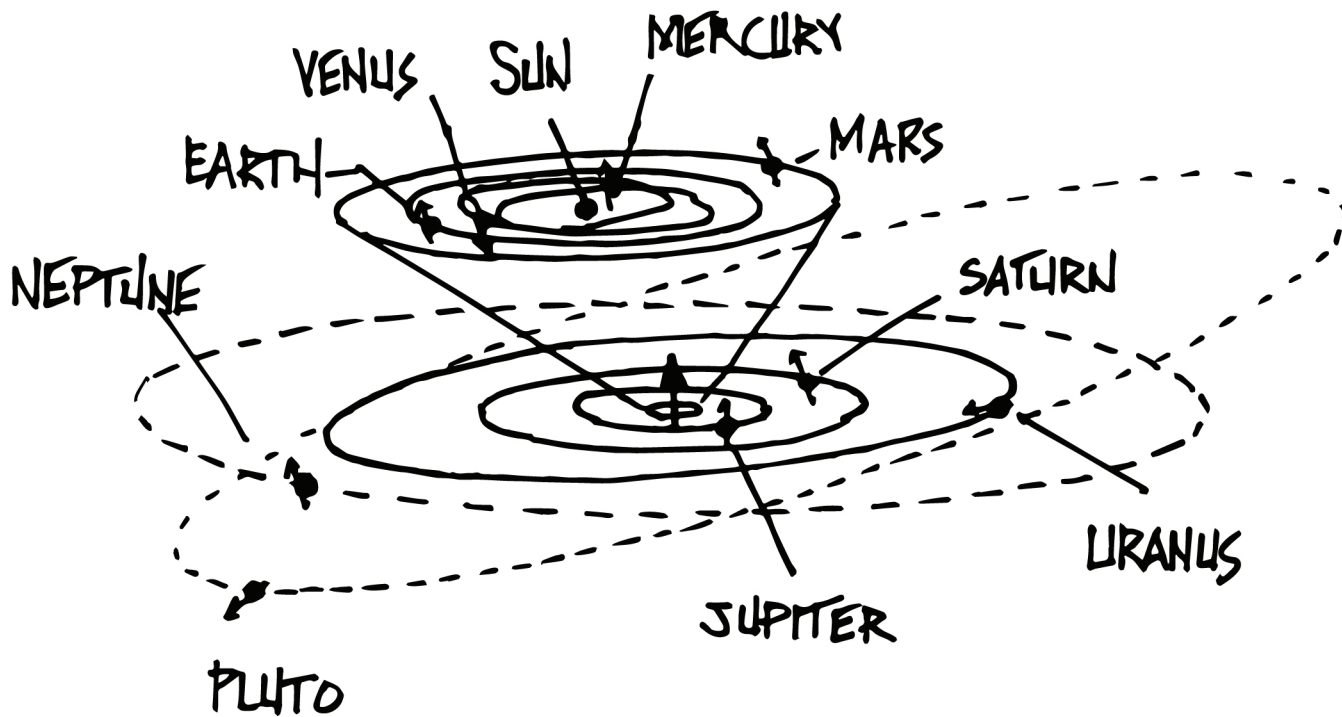
How important is the second parental figure? Gravity only exists between the sun and the planet, in the figure. Intuitively, that “empty” focus seems quite influential, though. So, yeah. The father is key. Be there for your kiddo.

Our poster child quickly adjusts, and the world begins to form. A routine of sorts forms a nurturing environment to safely challenge his/her bounds.

The math supports two main foci, one primary (warm and nurturing sun) and the other (Roman strength and honor ~ abstractions?). Absent both fundamentals, a safety net doesn't exist, and you have problems. (A single parent still needs that 2nd all-important influence.)

The math makes no pretense that F1 is Mom, and F2 is Pop. This works, of course, but what matters is that the child requires two anchors. Two different anchors, playing unique roles. (If they're the same, you have a THREE BODY PROBLEM, which we'll see later gets extremely complicated.)

Dynamically, we're still a Two Body Problem, but F2 gives a certain complex flexibility, challenging the child's little world. The stronger those foci and the more coherent the family unit, the less impact any external forces have upon the newborn psyche.



14

What if the child's new family has many siblings or an extended family in the household? Math has you covered.

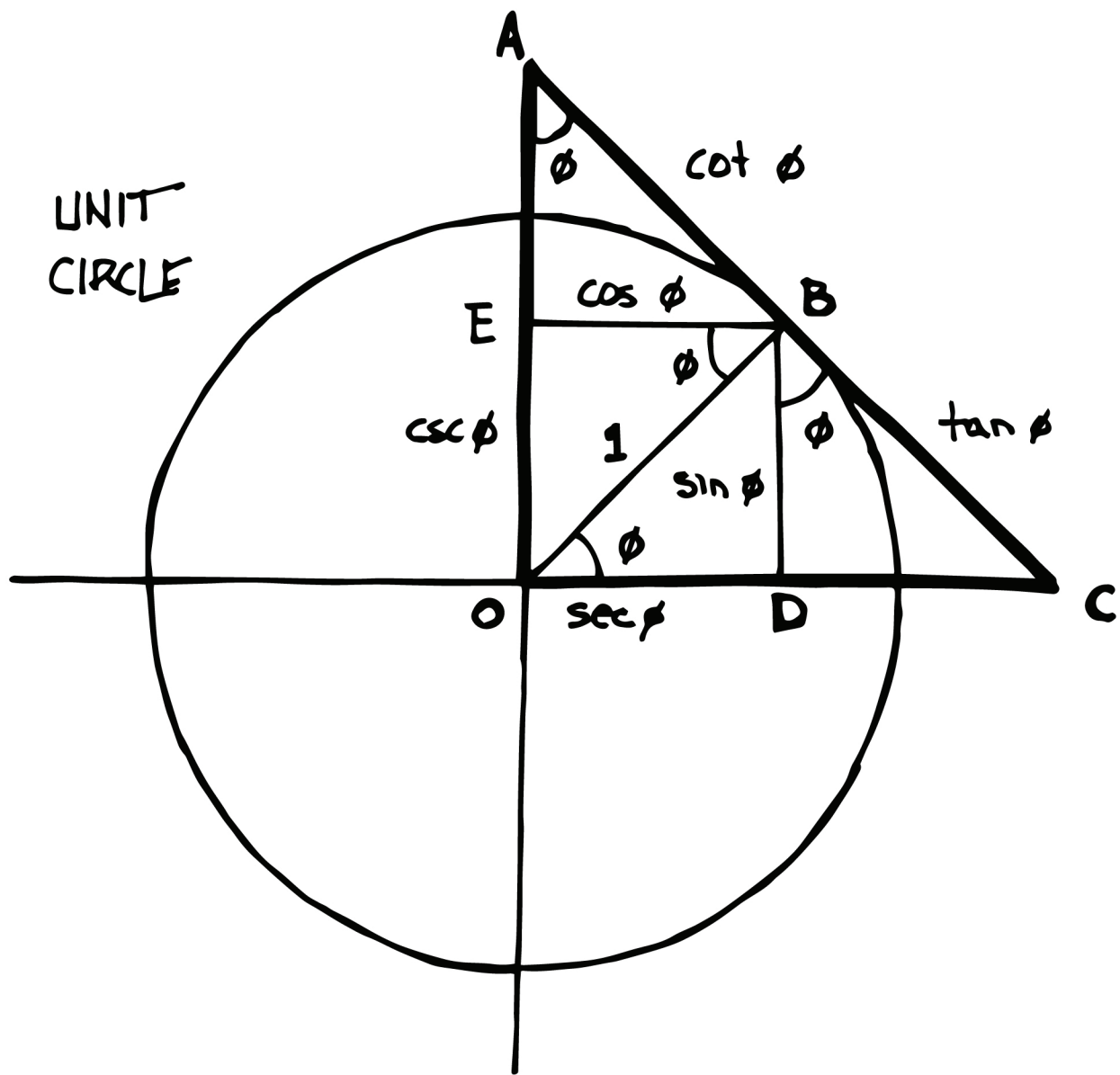
In our ideal family, there's one main focus for all the orbits. Of course, in a two-parent (or multi-caregiver) household, each parent can be a focus for one or more children. What's important is that EACH child has that ONE consistent, main focus.

The math only suggests some sort of order to the family chaos. It does NOT say everything should be constant, consistent, and – boring! Our newbie needs that stimulation and matures because of it.

Of course, these “planets” are PEOPLE, physical people. Eighty percent of communication is nonverbal. Plant your kid in front of an electronic babysitter, and all they see are blank faces and forced body motion.

Meta wants to substitute AI bots for those external influencers. Sure they do! Statistically, they raise YOUR child to be a materialistic, hedonistic CONSUMER. If the child doesn't have that stability at home, park him/her in a daycare center. At an elderly/disabled/single neighbor's place.

Meta has already created “friend” bots on Facebook to suit all your needs... You want to raise a human being or a robot slave for Big Tech?



15

Initially, the child's psyche is a "simple" circle. The diagram shows that all the trigonometry functions are defined by a unit circle (radius = 1) and an equilateral triangle.

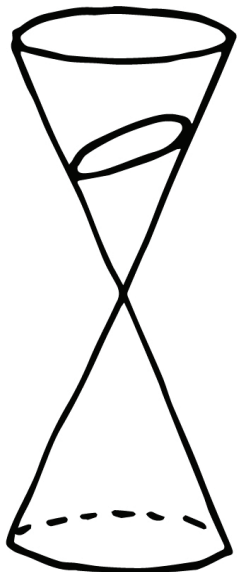
This is the single Mom's situation: she has to be both the triangle and the circle focus. Possible, but OMG look at the strength and infrastructure needed to pull it off. Kudos!

The "psyche" is an ubiquitous phenomenon without form or fashion. Statistics doesn't help because statistical methods are very inaccurate.

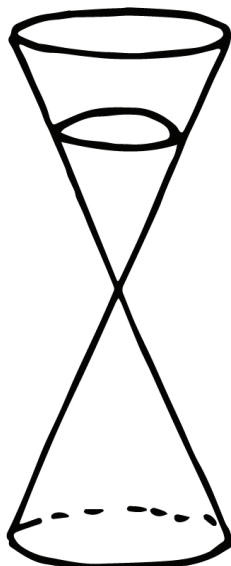
Mathematics, on the other hand, offers a simple model with a common-sense mechanics. Simple at first glance, but with enough complexity implied as to offer the kind of multifaceted structure we seek for a psyche model.

Matter is composed of atoms, and the simplest atom has one electron in a circular (spherical in 3D) orbit. The circle is therefore a common denominator for all matter, and – in living beings – the soul/psyche is what unifies all the constituent atoms in a sentient amalgamation.

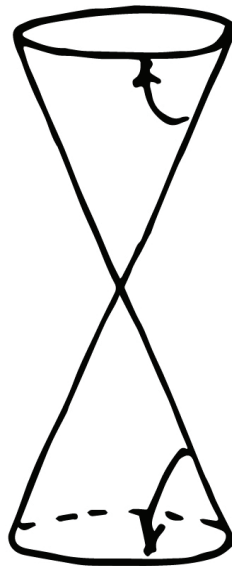
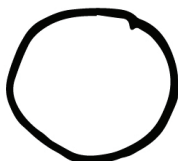
Life is energy. Electrons and atoms, molecules and nuclear – they're all in a constant state of motion. In every case, the circle is a least common denominator and is therefore an adequate model for the nascent psyche.



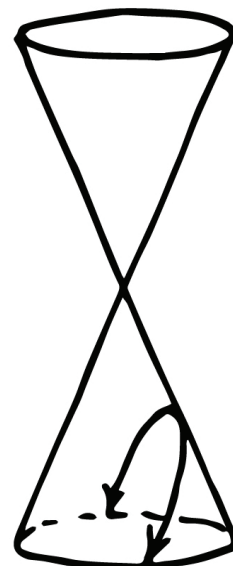
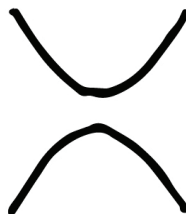
ELLIPSE



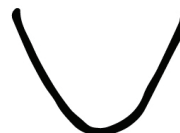
CIRCLE



HYPERBOLA



PARABOLA



16

The circle/equilateral triangle model has a lot of room to become more complex (intricate) as the infant's psyche matures. The 2D circle/triangle planar construction is now a three-dimensional cone.

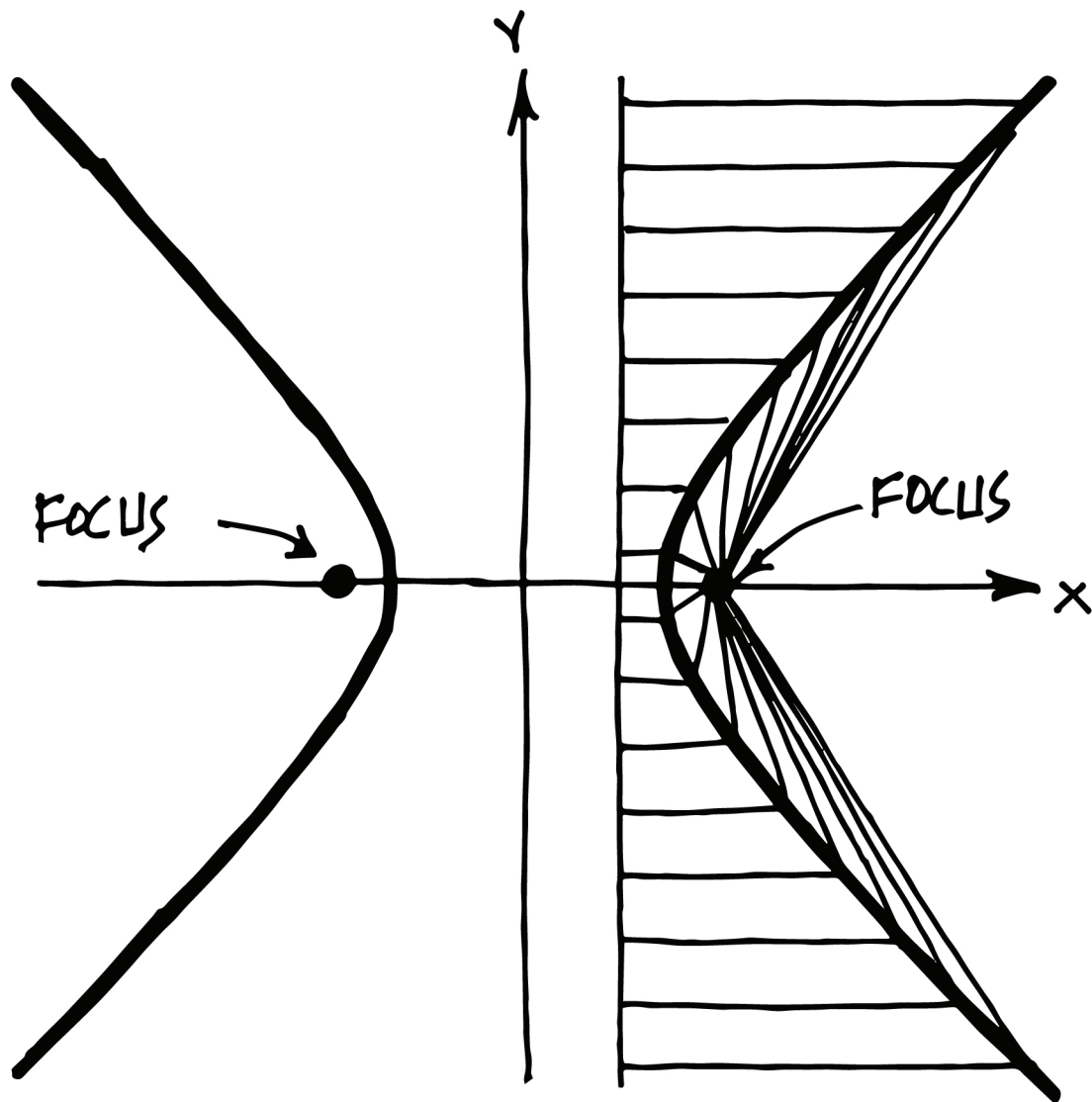
Note: As with every diagram, this one has flexibility built in: a narrower/wider cone, to account for a wide range of (racial, cultural, circumstantial) possibilities.

A horizontal slice/plane through the cone creates a circle. As the child matures, the dot at the apex grows into a larger and larger circle as the horizontal plane moves upward or downward (male/female?).

Think of the plane as the real world. The child's awareness/psyche expands as the "size" of the world expands – from Mom, to family, house, neighborhood, and daycare or community care.

Angle that plane and other geometric shapes are formed, first an ellipse, then the hyperbola (relationships?), and finally the (independent?) parabola.

The parabola's "feelers" extend into the world – too far? Ease back into a more comfortable configuration. The psyche is flexible at every level, and for any circumstance (alone with Mom or Pop, family meetings, hanging out with siblings or other children), each with a different world view.



17

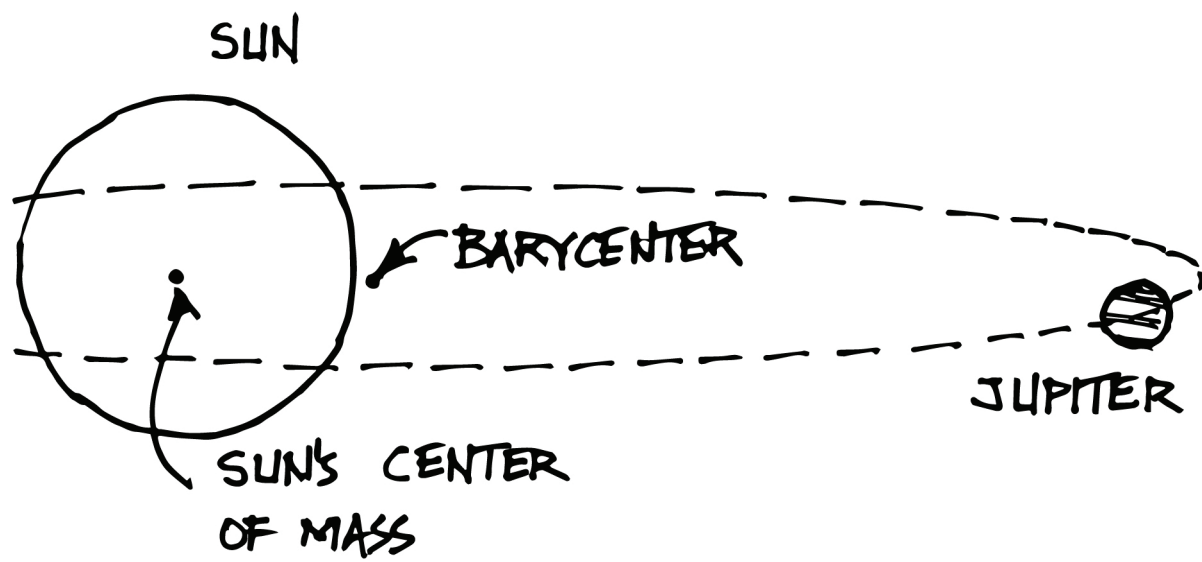
A hyperbola has two foci just like an ellipse. In a previous section, the directrix of an ellipse was a projection through the lens of an ellipse, suggesting the influence of the outside world on the newborn psyche.

This figure shows an expanding world view (and, conversely, an increasing influence of the environs on the nascent psyche), but the “view” is wider than for the ellipse. Especially for a more open hyperbola – or a narrower aperture as the focus moves away from the origin. Flexibility is crucial for the young psyche, able to retreat after overexposure or take a baby step ahead when emboldened by a stable family situation.

Perhaps the “empty focus” here is the child’s inquisitive mind, processing all of this in the calm privacy of cogitation. Out of Mom’s arms and into the crib. Bobbles hanging (ideally, little planets on a string). Toys! Accent lighting. A KITTEN... A window!

As the conic section changes (the horizontal plane adjusts), the scope changes too. Like a magnifying glass – think of a 3D hyperbola – a narrower or wider landscape comes into focus.

If the child experiences too much “excitement,” he/she can ease back. Retreat into the calm, nurturing ellipse if necessary. Or, craving “stimulation,” adjust the aperture (range) for – more!



18

This figure is a reminder that we're not just playing games with shapes and conic geometry. All of this is going somewhere! The mathematical matrix is, alas - celestial mechanics.

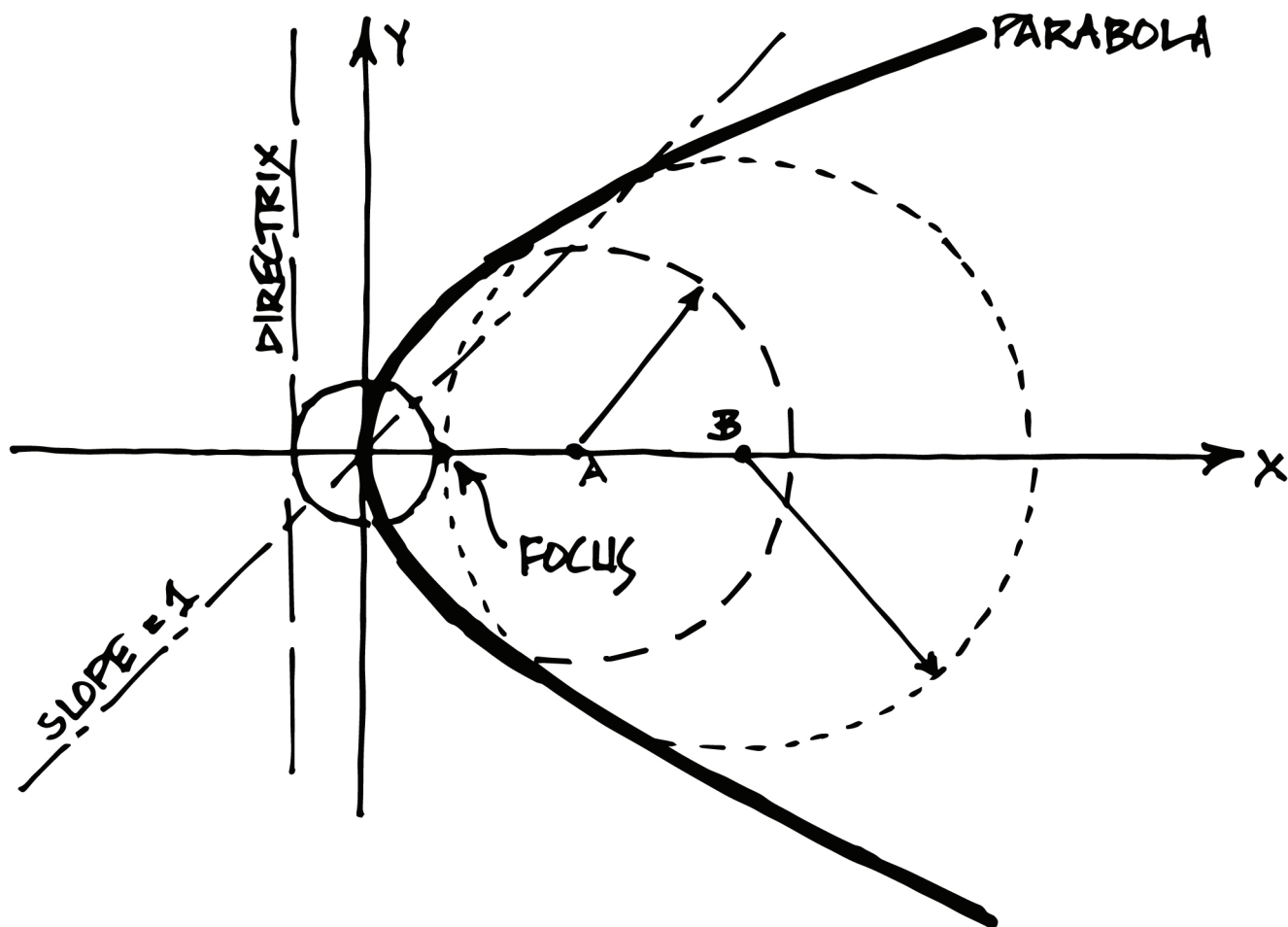
Every celestial object moves in a conic section - elliptical orbits, hyperbolic "fly-bys," or parabolic escapes. These aren't just convenient approximations, either. They're actual paths required by gravity.

Every spacecraft escaping Earth is on a hyperbolic path. Every planet is in an elliptical orbit around the sun. These are exact functions; the only approximations NASA makes on trajectories are where the two intersect (e.g., going from Earth escape to a Sun-based ellipse).

Here we see the Two Body Problem again. Instead of an atomic nucleus with a single orbiting electron, we have a "galactic atom," formed by the Sun and the planet Jupiter.

Observe that Jupiter is so massive that the center of gravity of the Sun-Jupiter system is slightly beyond the Sun's corona. (This point is called the "barycenter.") The sun orbits that barycenter, as does Jupiter.

In our psyche model, we now have influence beyond the family that impacts everything, but the symmetric resonance remains, steady as she goes.



19

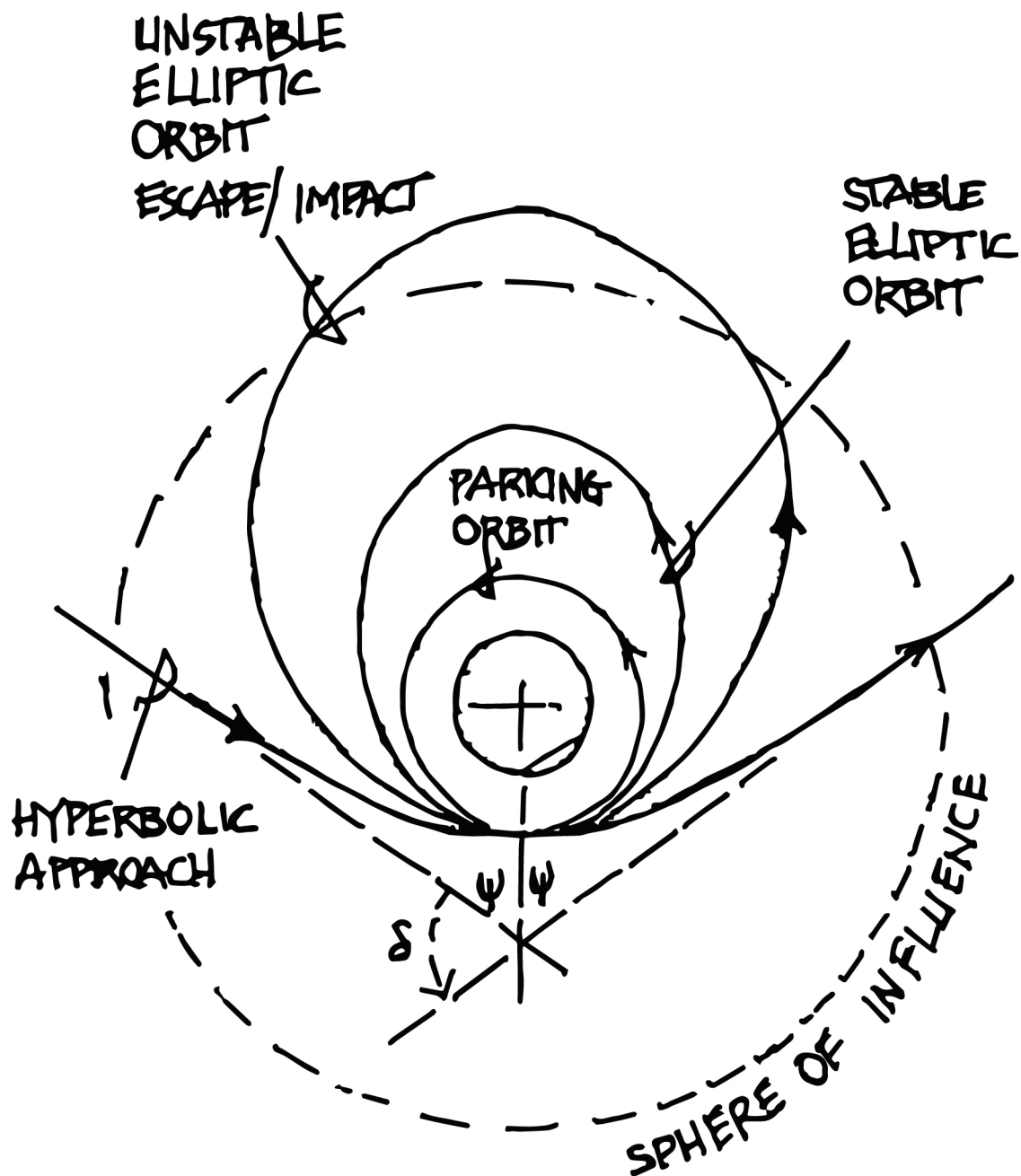
In the parabola, the horizontal plane no longer intersects two sections of the double-cone construct as before, but only one. There's still a directrix, but just a single focus. Perhaps the child is becoming more independent or self-aware.

This diagram explores the geometry and symmetry of the shape, with the dashed circles. The inner structure, as sketched, suggests Freud's iceberg diagram (on its side). Notice that you can rotate the parabola around the x-axis to form a cone shape.

The nested circles suggest the different (personal, collective, cultural, and biological) conscious paradigms in the modern Freud diagram. If you move the focus down the +x axis, the 3D parabolic cone shape narrows, and the nested spheres are less differentiated. Move the focus back toward the origin, and the parabola opens up like a flower (to soak in Freud's sunshine).

Moving the focus moves the directrix as well. The space between the y-axis and the directrix might represent vulnerability, as an introverted individual who might live "in a shell."

Again, we have a mechanism for growth and change, maybe introspection, with an evolving subconscious relative to the external world, but still structured around the child's inner focus.



20

Here's a spacecraft (s/c) flying by a planet. The "Sphere of Influence" (SOI) is where the gravitational force from the planet is balanced by the gravity from the sun. (There are many SOI analogies in life.)

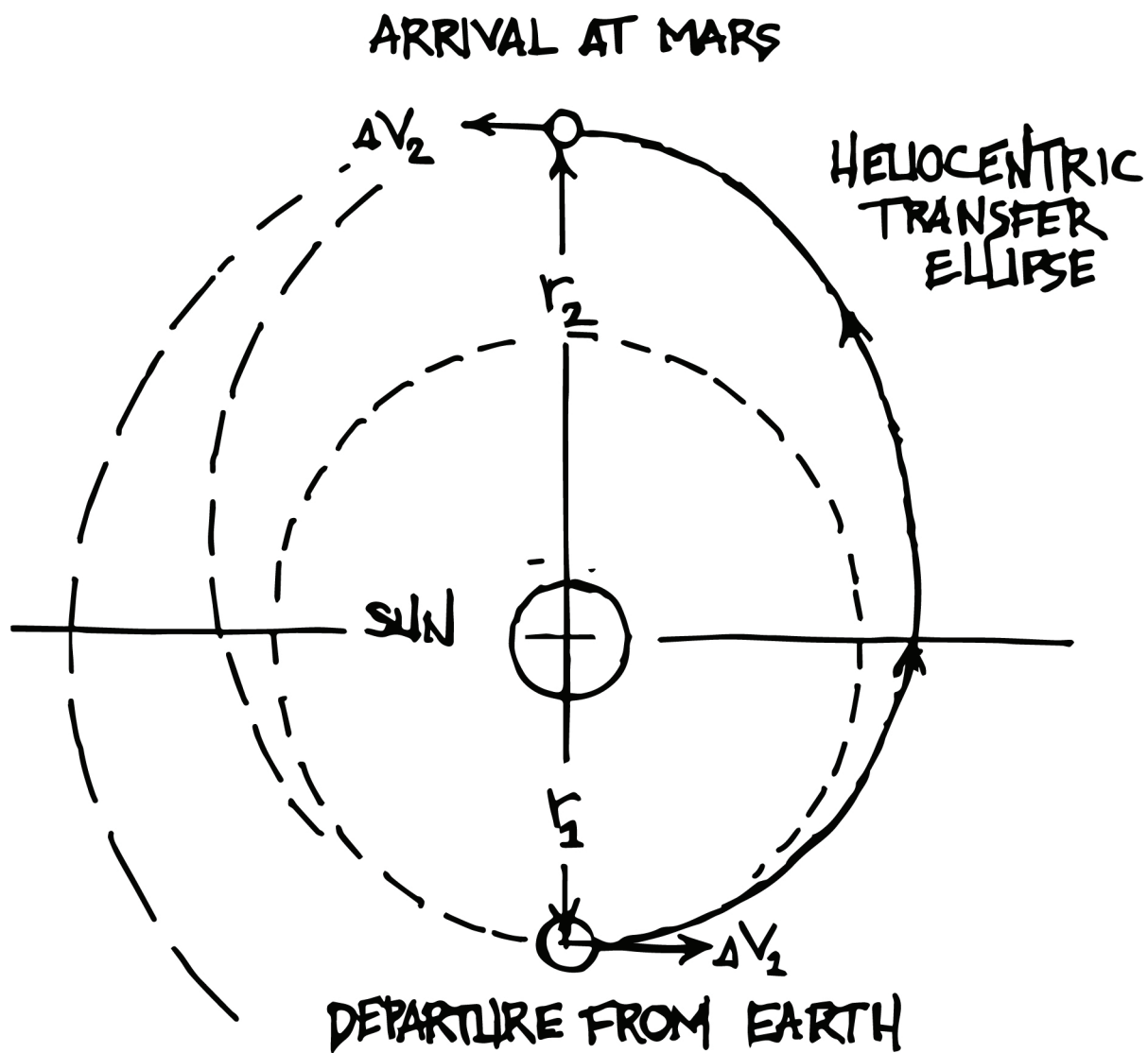
A s/c approaches the planet on a hyperbolic path as shown. The s/c flies close enough to the planet so that it's captured by the gravity field. After which time the s/c loops around in the largest ellipse.

Atmospheric drag, over time, circularizes the orbit, as indicated, until the s/c is in a low-altitude circular orbit around the planet. (The classic romance maneuver, "domesticating" the object of your desire.)

For our nascent child psyche, as the spirit gains strength and confidence (having a single, internal focus now, although the parental star lurks forever in the shadows) within the stable confines of the SOI.

Initially, that SOI might be Mom, then the family unit, and so forth. As time goes on, this SOI could be kindergarten, school, a sports team, or (don't let your kid get hooked on) social media.

That atmospheric drag – think friction, conflict, drama – allows the psyche to slowly adjust to this new paradigm. (Women instinctively know this whole play-hard-to-get scenario.)



21

Men really are from Mars (an outer planet, aloof in the boondocks), and women are from Venus (an inner planet near the sun and civilization). The Pill and Rogain kind of mess with that, but we're not there quite yet.

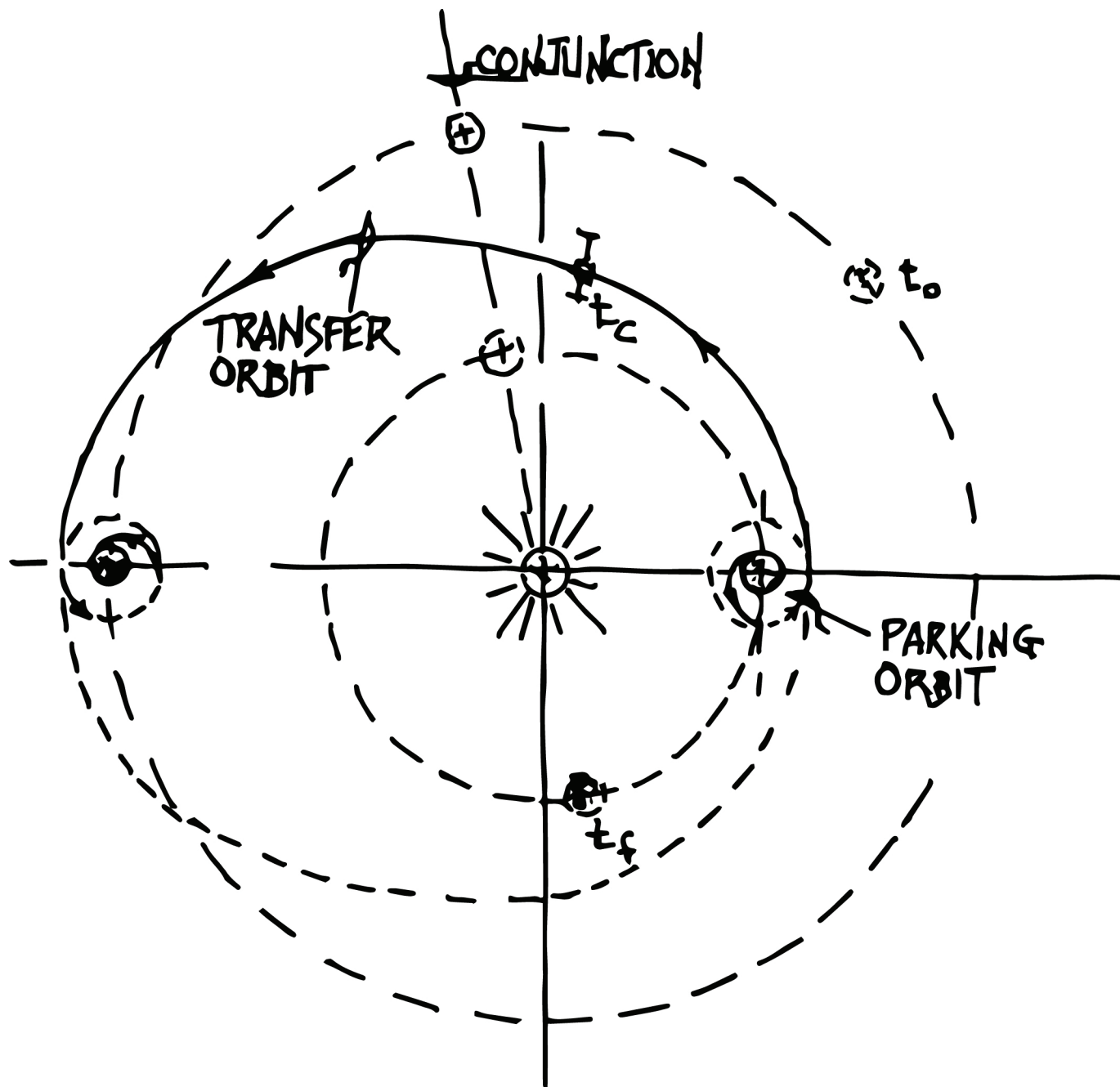
This figure shows a spacecraft (s/c) going from Earth to Mars. The s/c gets booted out of Earth orbit (graduates from kindergarten, etc.) and accelerates into an ellipse-shaped trajectory toward Mars. Life's full of journeys, objectives, and untoward trajectories.

Upon reaching Mars, the Red Planet is going 6000 MPH faster than the s/c. Try catching that train at the railroad crossing.

Our youngster is making friends now. It takes a burst of self-confidence to muster the effort to get out there and rumble. Then, once you hook up, a good deal more effort is needed to maintain and nourish that friendship.

Life is replete with these kinds of processes. Working hard to nail a job interview, then even harder to earn your pay. Marriage. Learning a new skill or trade. Getting a college degree and then applying that skillset to an actual job. (They never teach you what you need to know.)

In all of this, the sun is the (unseen) focal point that you leverage to achieve your goals. It's the core of your psyche, now internalized. Strong. Confident.



22

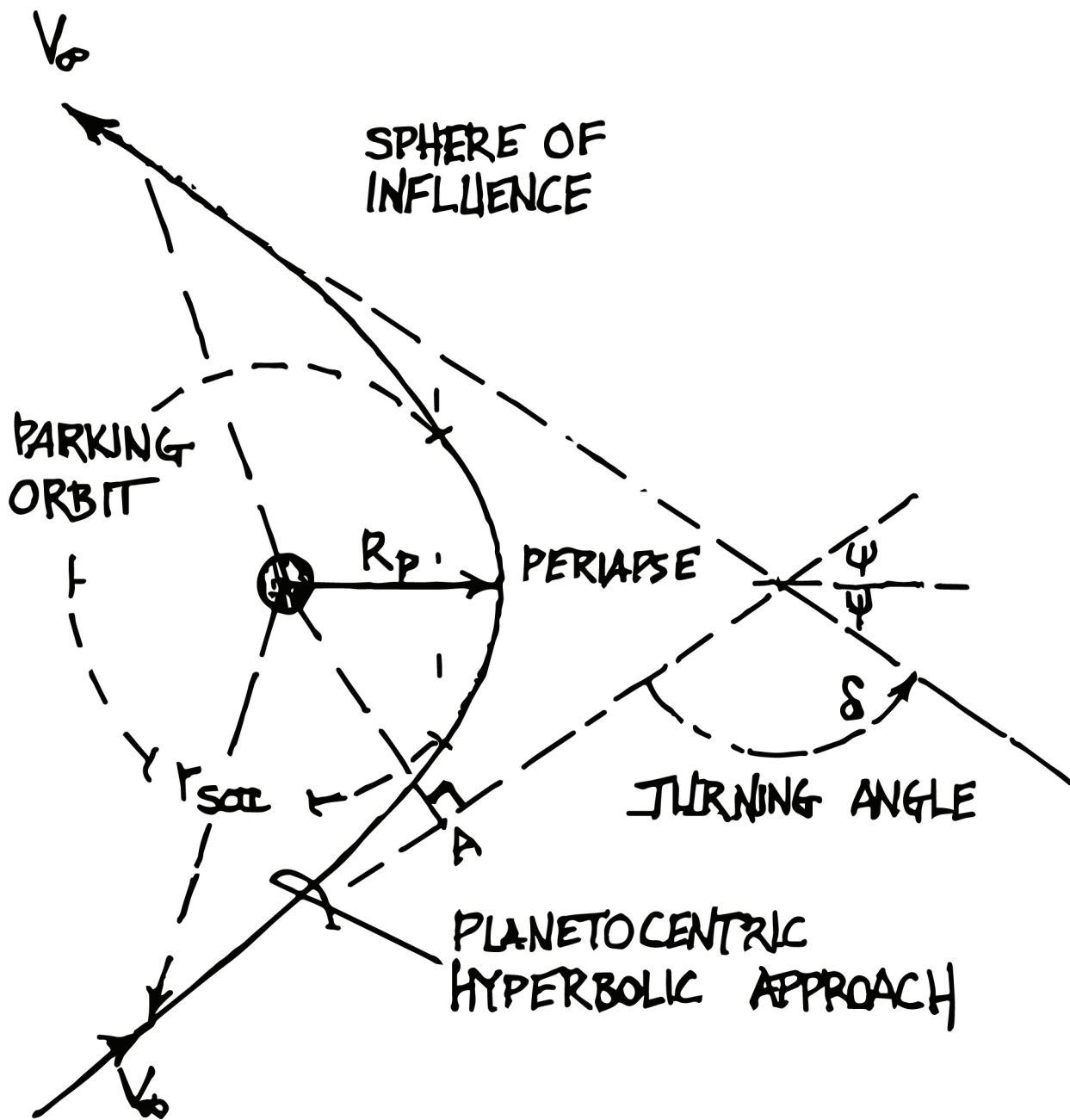
Every mission starts and ends at a small parking orbit around Earth and Mars (or Venus), respectively. Then another thrust once you pass the Sphere of Influence (SOI) puts you on a sun-centered ellipse to your objective. (Getting to Venus is a mirror image of the Mars trajectory; you're just going from Mars to Earth, closer to the sun.)

This matches the Three Act structure of modern dramatic productions. Movies. Screenplays. TV shows. The story begins with the protagonist's mundane world. Then there's a catalyst that gets you started on the journey. I.e., the thrust to leave your boring parking orbit in life.

Then you reach SOI and break into Act Two with a dramatic beat. You fall in love (with a person, job, academic major, a hobby), and your trajectory into the wild unknown begins. Wahoo!

Halfway there, you have a major setback. (Every NASA mission has a thrust at this point, too.) It takes a huge effort to tighten your belt and continue into Act Three. After that, the "bad guys close in." You can see Mars by now, but OMG it's going thousands of miles faster than you are!?

Upon final approach to Mars, it looks hopeless. But you pull another switcheroo, find a new idea – pass Mars' SOI, and (en route to the climax now), reach that coveted parking orbit around Mars (Venus).



23

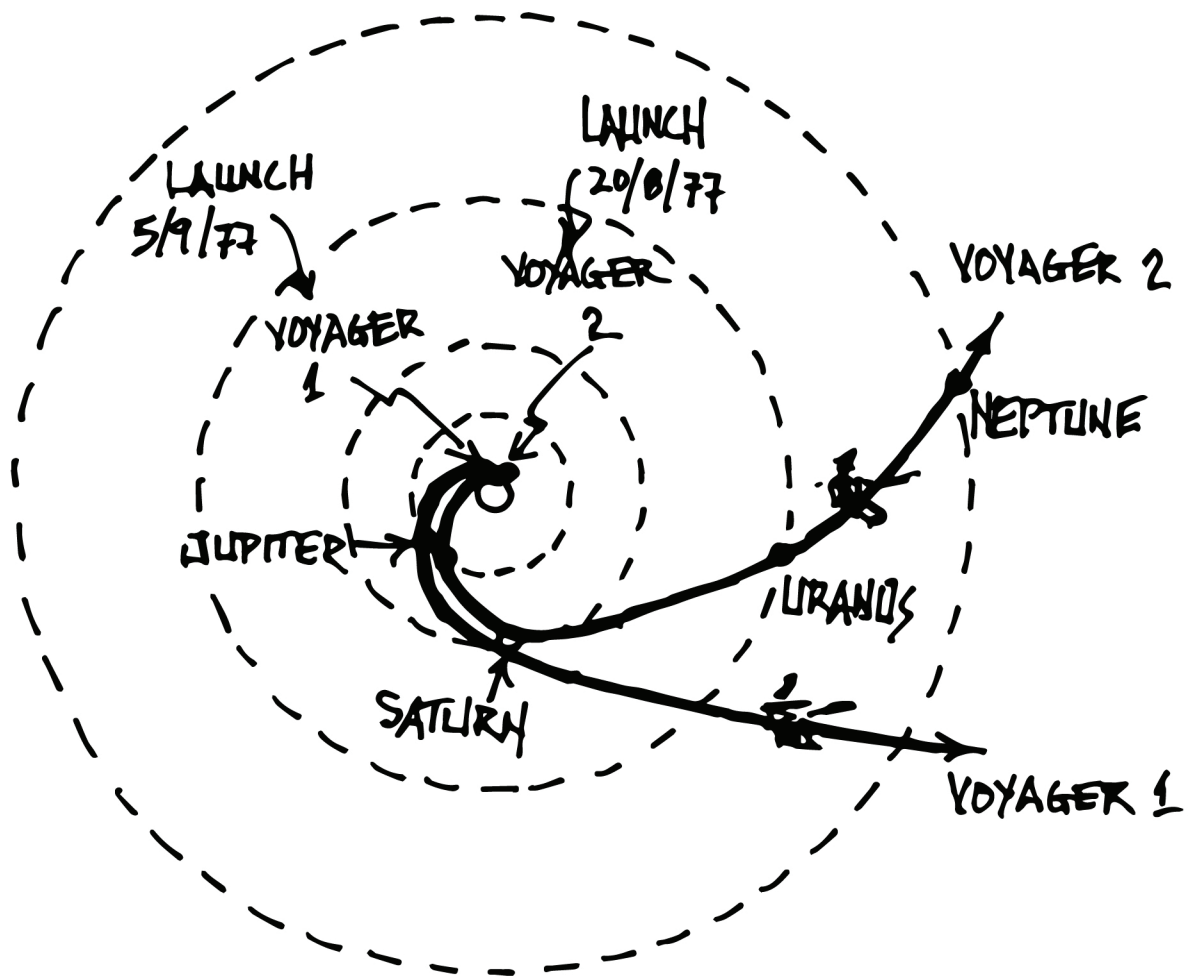
To review our progress to date: A spacecraft (s/c) spirals out to Earth's Sphere of Influence (SOI) where your model must change coordinates from a hyperbolic escape flight path with Earth at the focus to an ellipse with the sun as the focus. At SOI you apply a thrust to accelerate onto that heliocentric ellipse toward Mars.

At Mars, the s/c transitions (with another change of coordinates) onto a hyperbolic capture trajectory with Mars at the focus. Your target is a "parking orbit" around Mars, which has a radius equal to the focal radius for the hyperbola indicated.

A thrust is applied at periapse, and you achieve Mars capture. Then Mars' atmospheric drag slowly circularizes that ellipse into the parking orbit.

This is a complex maneuver that everybody (even NASA) screws up the first time. You have a fatal attraction to another person. If you move in too fast – zoom, away you go into deep, dark, lonely space. If you move too slowly, you fall short and careen down into the inner solar system like Prometheus. Crash! A brief flareup on the solar surface.

It's a dismal feeling, that failure. But if you know the math and understand just how tricky it is, you'll find the resolve to try and try again until you succeed.



24

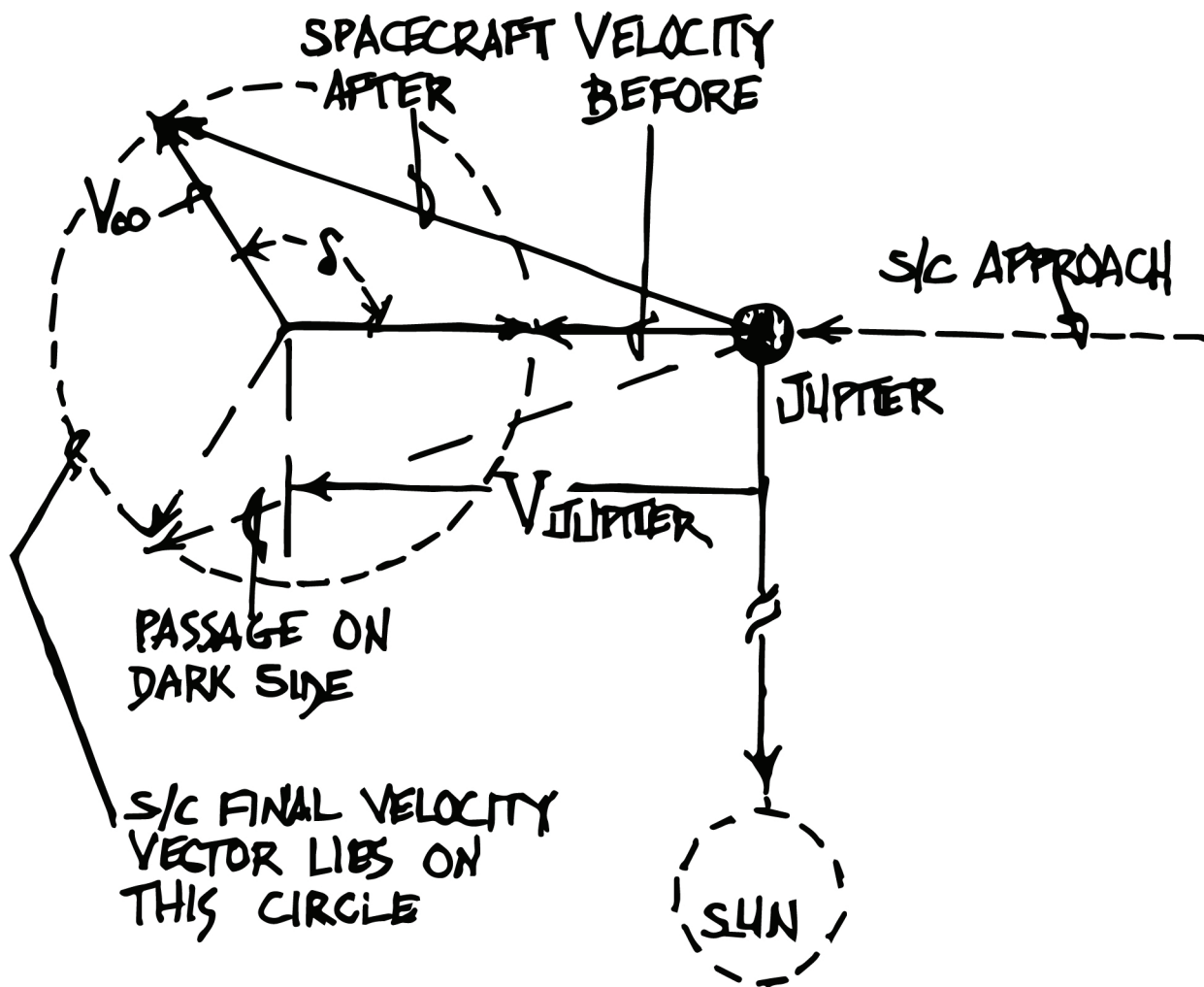
What happens if your heart's set on a person in another social sphere? Or if your dream job requires a college degree, an apprenticeship, and a licensing exam? Achieving high ambitions takes a sustained effort and careful planning, but if you trust in the math, you'll get there.

NASA plans deep-space missions so that the spacecraft (s/c) flies close to Jupiter, so close that the "slingshot" effect speeds the s/c toward the next target – Saturn! Where there's a second slingshot flyby – and you're moving even faster still.

Between these dramatic flybys, the s/c is on a regular ol' elliptical orbit with the sun at the focus. Just like with the Earth to Mars mission.

That's life. Grinding through a routine most of the time, getting yourself ready for a few crucial, brief moments of intense drama. Long, hard hours in the weight room, getting ready for the big event. Pumping that iron, fighting back the pain, and focused on your important goal.

Everything worthwhile in life requires a sustained effort, careful planning, and diligent preparation for the final exam – the marriage proposal, the presentation to the Board of Directors, even vacations... Without this math diagram, you might lose heart and forget that you're still on the way, right on schedule!



25

Here's a detail of that most challenging of maneuvers in life, the slingshot flyby. Your BFF poses as your girlfriend so that your true love notices you and gets jealous. And the dance begins!

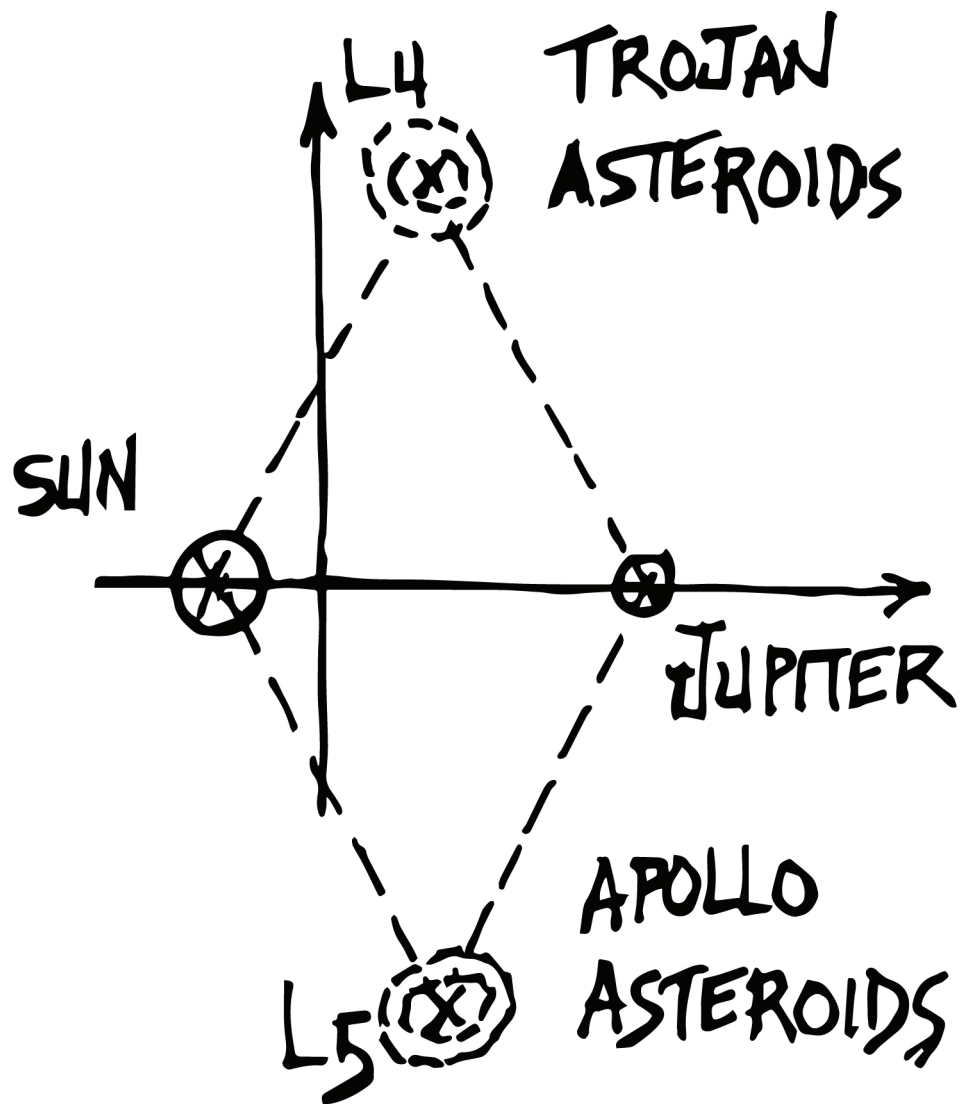
This figure is a Jupiter flyby. As the spacecraft (s/c) approaches Jupiter, you fly so close that Jupiter's gravity GRABS you, speeds you up (in the process altering your trajectory), and then z-zoom, you're accelerating away toward the outer planets.

The timing of the maneuver determines your final velocity vector – i.e. your speed and direction. Your velocity on approach is the short, dashed horizontal line to the right of Jupiter.

The “spacecraft after” velocity is almost three times faster!

The final velocity vector will terminate somewhere on the dashed circle. In relationships, this is a dramatic change – a big risk! Just like in real life, big rewards require even bigger risks. Are you up to it?

You can always experiment on a smaller planet first. An easier golf course, a less talented/attractive lady, a second-string lineman on the football team instead of the star quarterback, or a simpler task at work. Build up your confidence! Verify that this whole matharoo thing really works.



26

The last few exercises have actually been the Three Body Problem (3BP) – the sun, a planet, and the spacecraft (s/c). The Earth escape, the Mars capture, and the Jupiter flyby all assumed (included in the underlying math) the sun was there, keeping the planets in orbit.

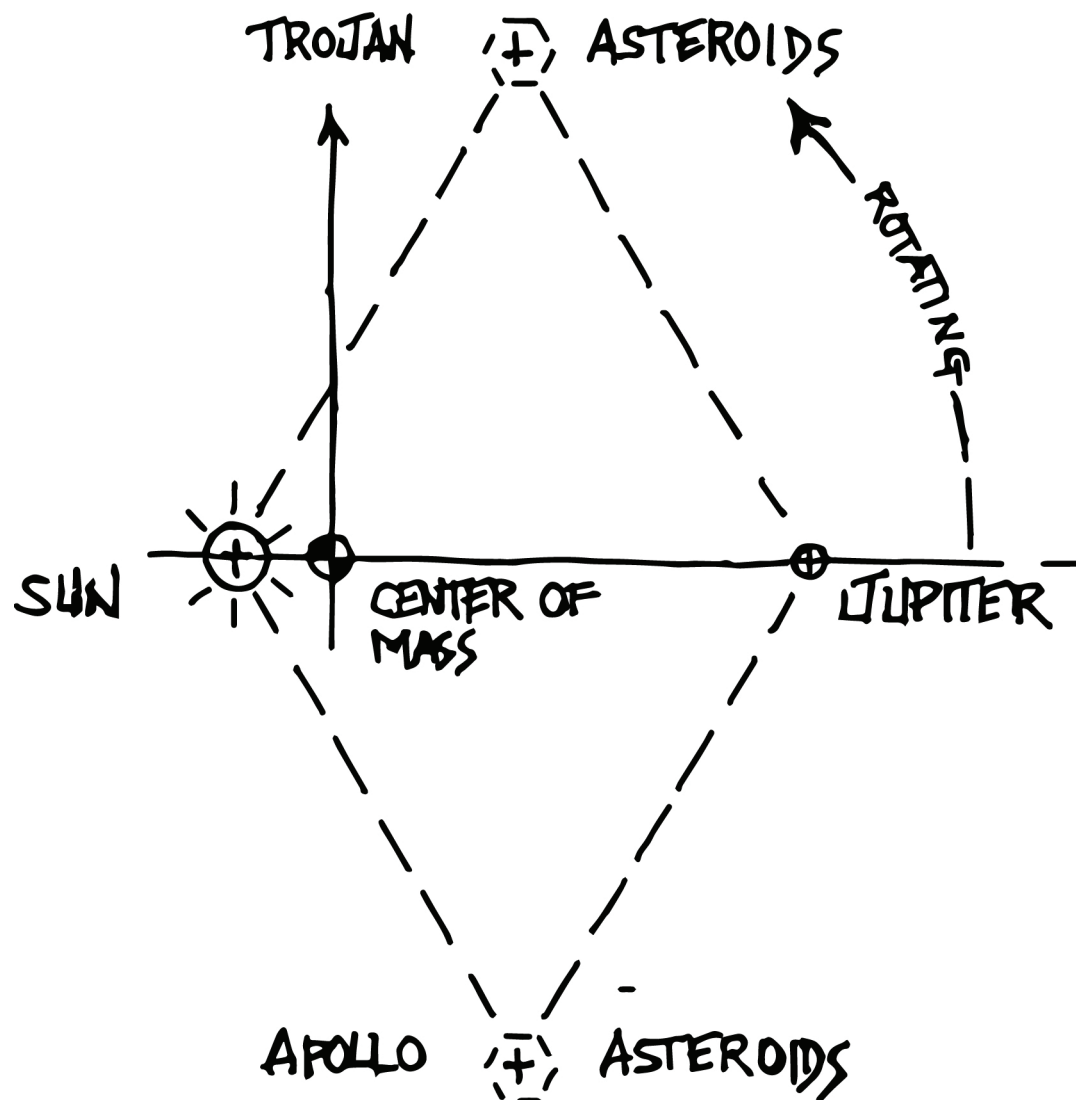
In our psychology analogy, the sun can represent a prevailing culture, or social standards. (Notice Freud's iceberg triangle shape again.)

The figure shows a fun new aspect of gravity. If you look at the Sun-Jupiter system in rotating coordinates (Jupiter is fixed on the x-axis as shown), there are two "Lagrange Points" at the apex of two equilateral triangles.

The Apollo and Trojan asteroids ORBIT the L4 and L5 Lagrange points. This double-triangle (which is fixed here) rotates right along with Jupiter, maintaining this EXACT relationship.

In our psyche model, the child has long since ventured beyond the Mom-centered focus. We played with Two Body problems. Now we have not just one major body of influence but two. The family unit can be one, and the other school, daycare, or (heaven forbid) an electronic babysitter.

Do you want your child to have real friends and learn to scrabble in the schoolyard? Or for Meta's L4 and L5 AI bots to CONTROL them forevermore.



27

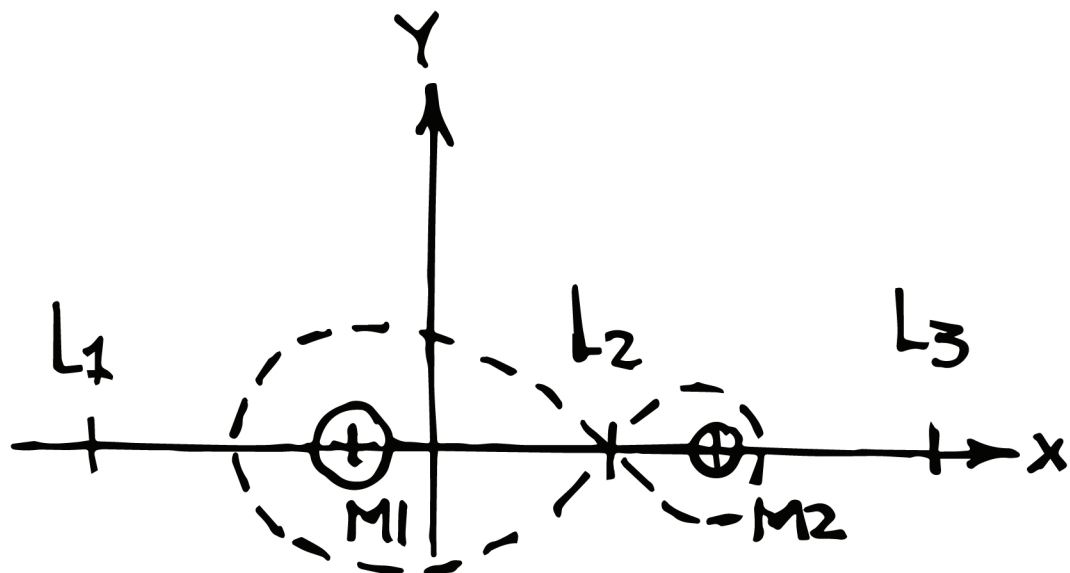
An earlier figure explained how, dynamically, Jupiter doesn't have the Sun at the focus of its elliptical orbit. The actual foci is the center of mass of the Sun-Jupiter system, called the barycenter.

Note: this applies only to Jupiter because of its extreme mass relative to the Sun. All the other planets have the Sun at one foci. Well, until you get into Relativity and quantum mechanics, which use the barycenter of all the planets.

The figure isn't quite to scale because the center of mass of the Sun-Jupiter system is right at the edge of the Sun. However, the Apollo and Trojan asteroid groups at the apex of equilateral triangles are exactly as indicated (the length of each side of the equilateral triangle equals the distance from the Sun to Jupiter).

Again, this is in rotating coordinates, as indicated by the arced arrow. Both triangles rotate with Jupiter as the anchor point. These are STABILITY POINTS. Stable into perpetuity.

Call this the model family, if you will. Mom, Pop, and two kids in perpetual motion around stability points (their developing psyches). There are three more Lagrange Points along the x-axis for larger families. We'll talk about L1, L2, and L3 in the next exercise



FREE RETURN LOOP

28

This figure is a detail of the full Three Body Problem (3BP). M1 and M2 are the primaries – Earth and the moon, for example. Any two large bodies follow these rules: Sun-Jupiter, Sun-Mars, Sun-Earth, etc.

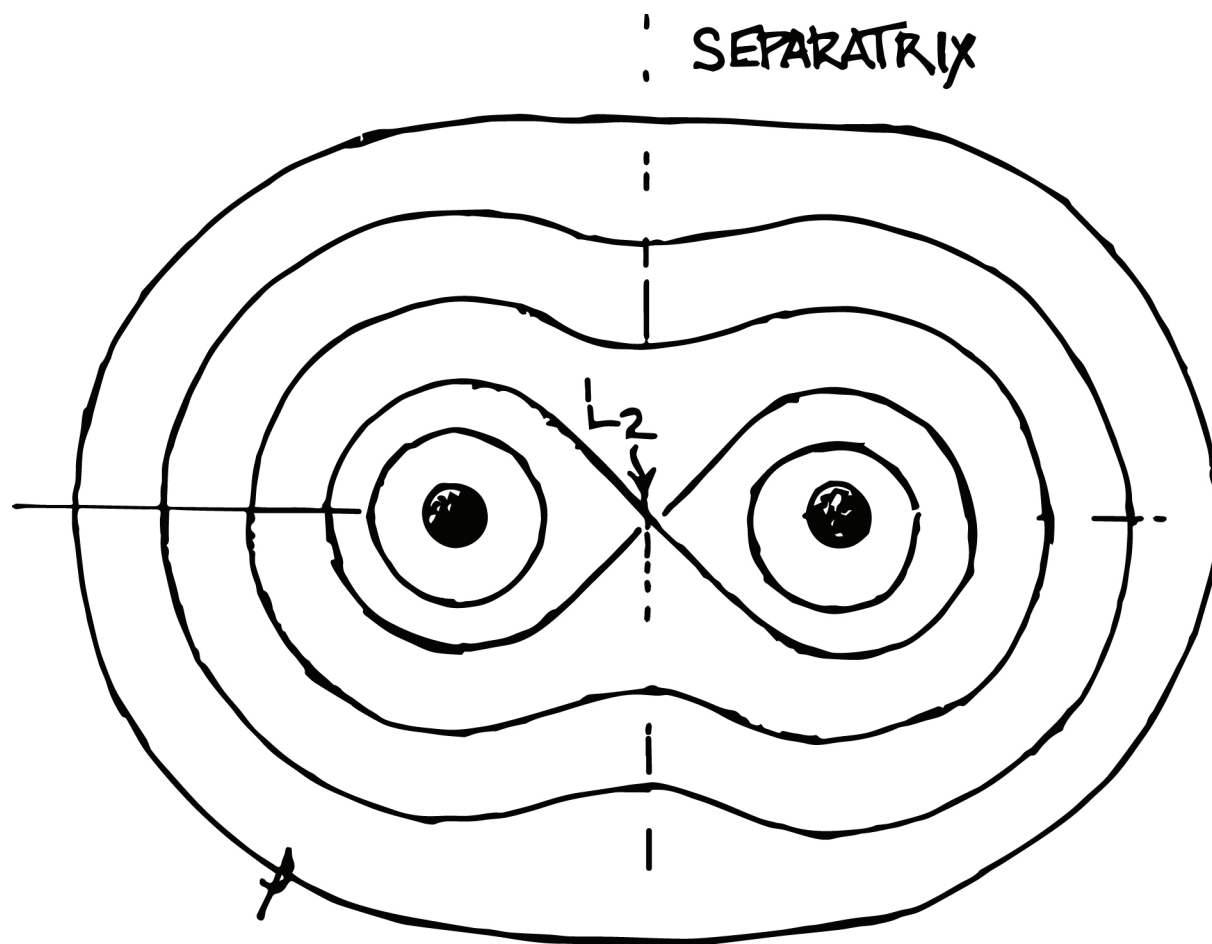
The origin of the x-y coordinate system is at the center of mass. Again, this is in ROTATING coordinates, so that M1 and M2 remain FIXED on the x-axis.

The dashed figure-eight-shaped orbit (which ROTATES with M2) is called a “free return trajectory.” Once a s/c is on that path, it remains there without the need for any thrusts. (This is a “zero velocity curve” because no energy is required to remain on that path. We will find many more of these no-energy paths as we investigate the 3BP further.)

The Apollo missions to the moon were on the free return trajectory in the Earth-Moon 3BP. Apollo 13 didn’t require any fuel to return to Earth after they ran out of propellant on the moon.

L1, L2, and L3 are three more Lagrange stability points. Satellites orbiting the L3 point to observe the dark side of the moon remain fixed at that point relative to the moon.

In our psyche model, perhaps the figure-eight indicates you always have a second chance. Well, theoretically. Math can’t save you all the time.



ELLIPSE WITH
 M_1 & M_2 @ FOCI

$$M_1 = M_2$$

29

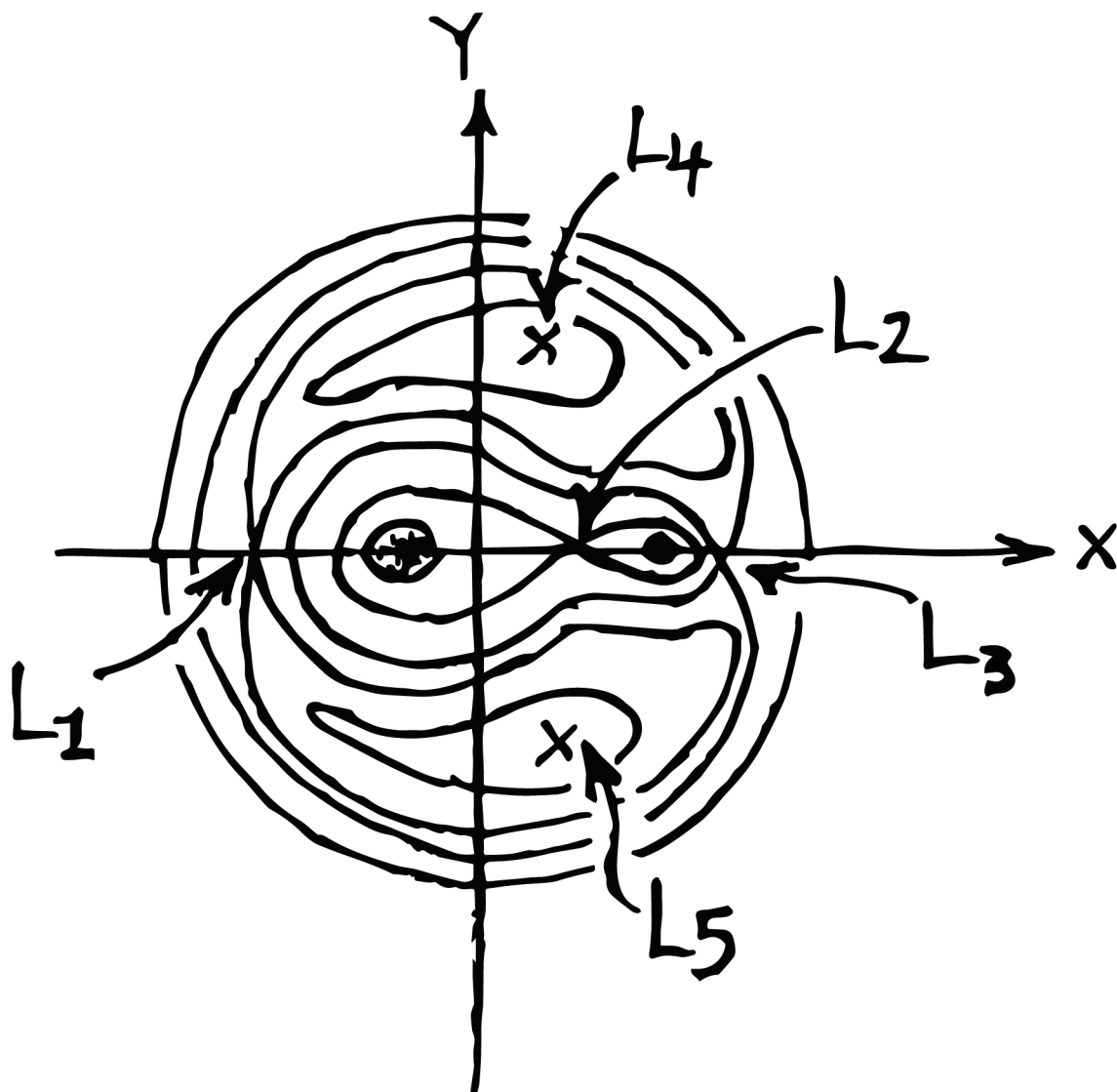
How about let's "see where we are." This fun diagram shows stable orbits around a system of two large bodies of equal mass.

Each closed loop in this figure is a "zero velocity curve." (You'll recognize the "free return trajectory" intersecting at L2.) A spacecraft (s/c) on any of these closed loops will remain there indefinitely, without needing to spend any fuel. The outermost curve is our old friend the ellipse, but now with M1 and M2 and the foci. (Note: there is only one possible ellipse around two equal masses.)

All motion is in the plane of the page. M1 and M2 are in circular orbits. This is called the "Circular Restricted Three Body Problem." This is the only configuration of the 3BP that has a mathematical solution. We'll see others later, discovered by computer simulations.

You might think of this as a family unit with both adults taking on equal roles. L2 could be an only child (perhaps overprotected?). Or the couple might have other children in a range of orbits (ages) with the eldest in the outermost ellipse, on the verge of going away to college or otherwise becoming independent.

Perhaps we're back to the beginning, and this is cell division, a single zygote (fertilized egg) dividing after conception.



30

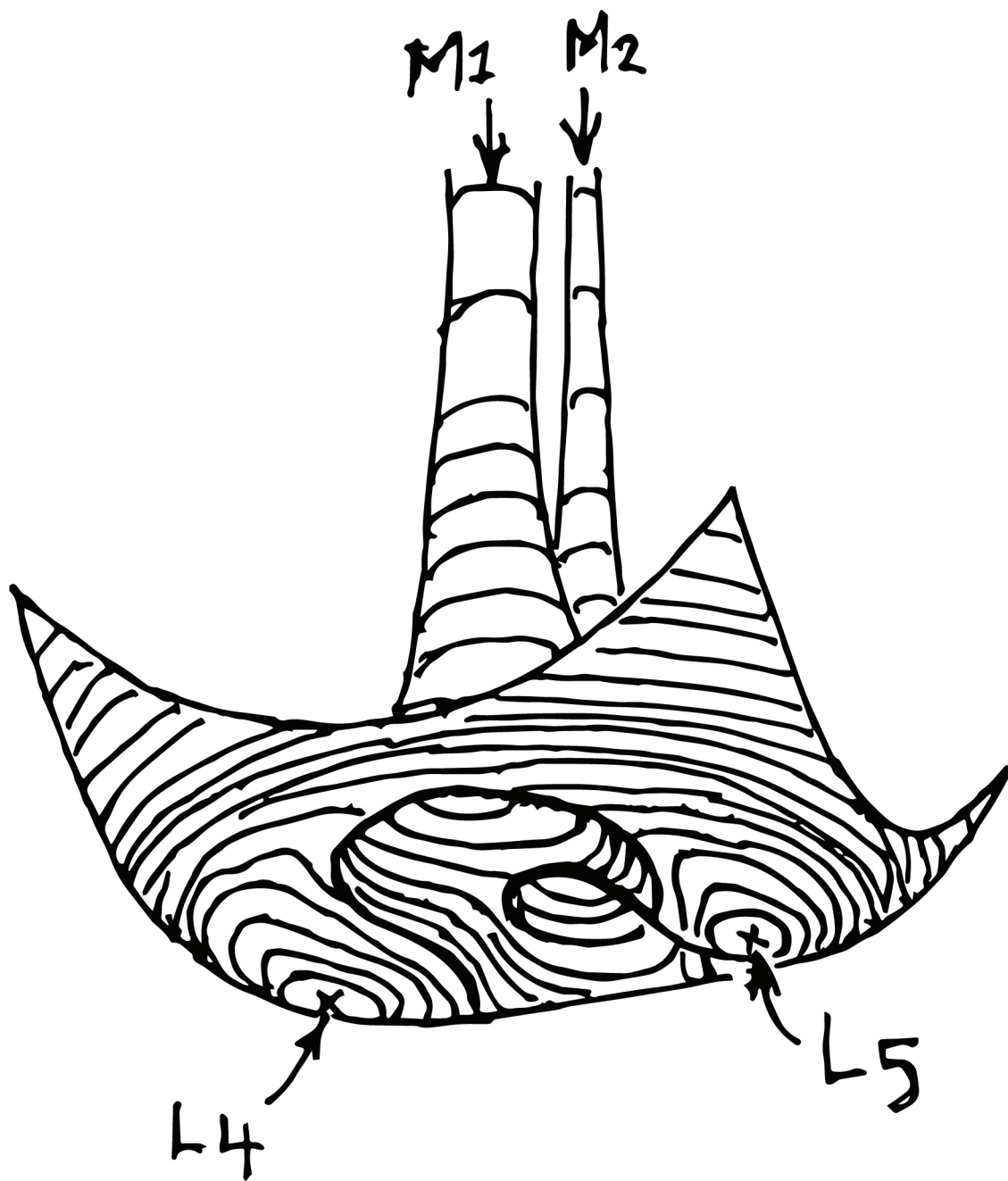
Here's the Three Body Problem (3BP) where M1 has a considerable larger mass than M2. This is in rotating coordinates as M2 orbits M1 in real time. The tiny third body is confined to the closed curves.

The five Lagrange stability points are labeled L1 through L5. You'll recognize the "free return orbit" and the L2 point. The outermost "zero velocity curve" is an ellipse (almost a circle here).

In our psyche model, this represents the cusp of the pre-teen years. Puberty is about to happen when the nice, tidy rules go away and all hell breaks loose. Our clever, artsy model will explode or, at least, that's what should happen if it's a good model.

To date, the hormones have been somewhat subdued. Sure, there are relationships, flybys, and even close approaches – crash! And the lonely s/c careens into deep, lonely space. But Mom and Pop are there, stable M1 and M2, dutiful parents (or some other influential figures OUTSIDE OF THE INTERNET) who maintain good and proper order.

Eccentricities are allowed, of course, even encouraged. Hobbies, sports interests, trade skills like carpentry or gardening, fav subjects in school (social media does NOT count). All the kiddos have their own zero-velocity curves, and the family overall is a synchronous machine of organized chaos.



31

Puberty is when everything blows up into three full dimensions. And here it is, folks. Exactly what you'd expect. Although. Absent math, parents might think they're absolutely losing control. Well, they are, absent a mathematical construct like this diagram.

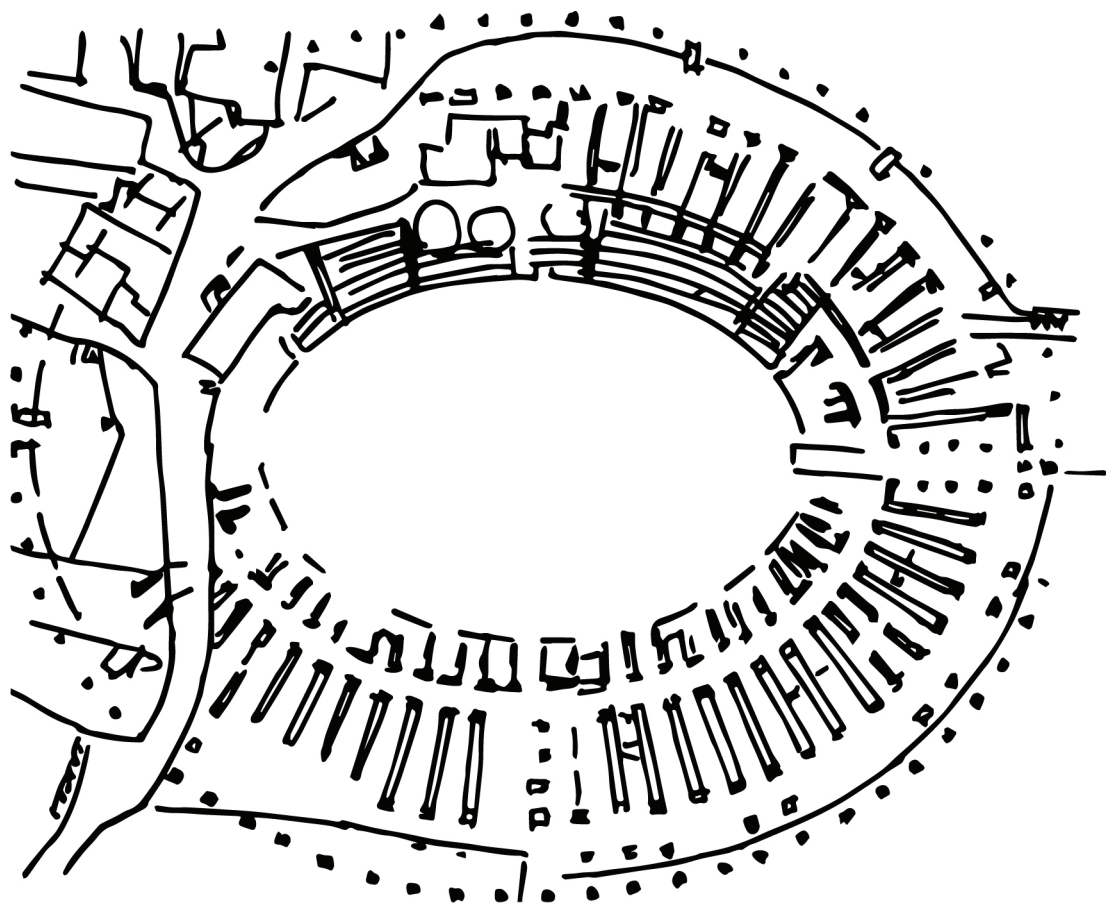
This is the full 3D Three Body Problem plot of stable, "zero-velocity" curves. The five Lagrange points are there (the previous 2D graphic is a section from the base of this figure). The primary masses $M1$ and $M2$ are there, too.

And, yes, everything still rotates – while maintaining this nice, elegant geometry. Rotation means everything is dynamic. This brings to mind the tides and the female circadian rhythm.

You'll find the "free return" trajectory. That figure-eight-shaped orbit (Mom and Pop taking turns as the lead parent, or one losing out to an influential peer or teacher?) is in the trough between the two peaks over $M1$ and $M2$.

But, OMG, what is this family of new subtle orbits above $M1$ and $M2$? Hormones?! Versus the male and female archetypes, presumably. Because that's how the model has evolved.

We can either stop right here and label it a conservative heterosexual proof, or go boldly where no man or woman has gone before...



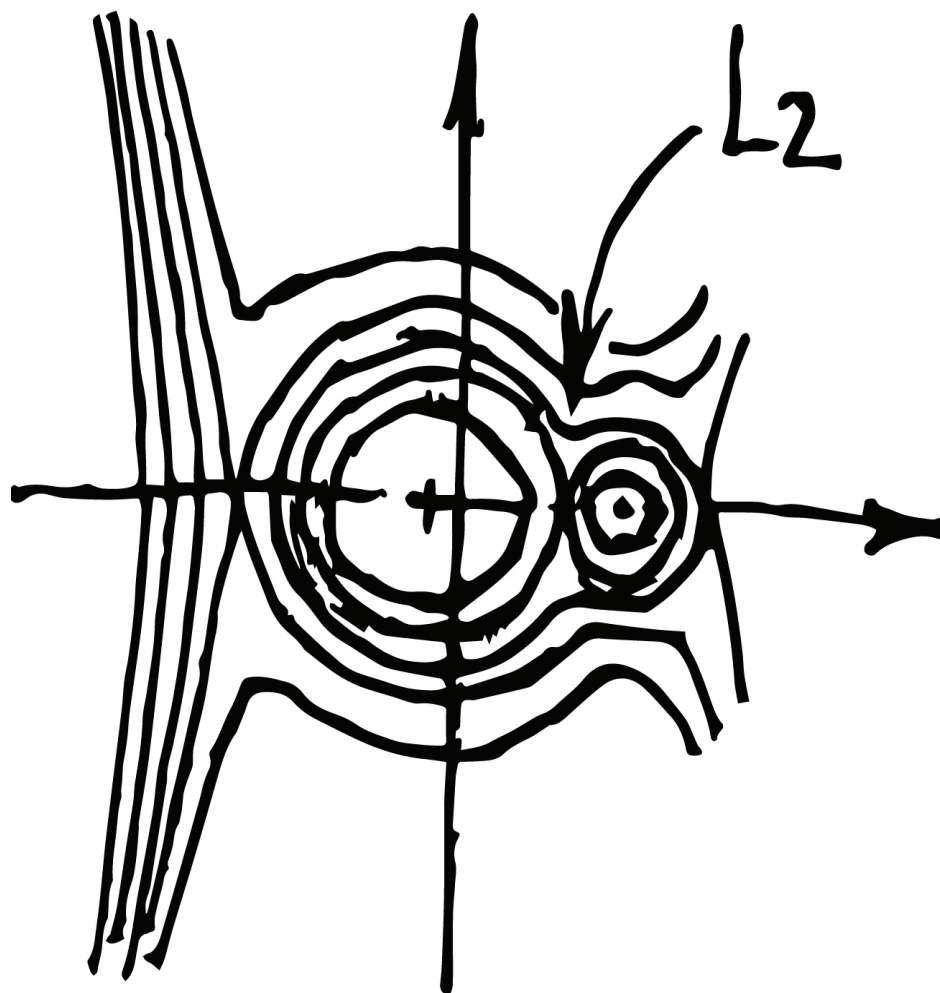
32

We're back in the Roman arena, taking a breather from all that heavy math to put things into perspective. We started with fundamental geometry and then transitioned from static figures (circles and ellipses) to conic sections with a movable horizontal plane, then into dynamic motion in orbital theory. Everything was Two Bodies at first, but as life got more complicated, we evolved into the Three Body Problem.

Throughout, Mom has been the main focus and prime mover. Pop was there but as a lesser, although just as influential, figure. In the 3BP, these two anchors were crucial for stability as the child (spacecraft in our orbits model) explored relationships and matured.

The model has abundant flexibility to account for variables like race, culture, economic status, and the school/social/sports/neighborhood environment. (I refuse to include the internet among these variables.) "Anchor activities" are sources of stability in the child's life, simulated potentially by the "zero velocity curves," which allow for growth and the progression of skill.

The one thing not truly quantified is sexuality. While the kids wrestle with that beast at the granular level, let's close out the psychology model and move along to physiology.



33

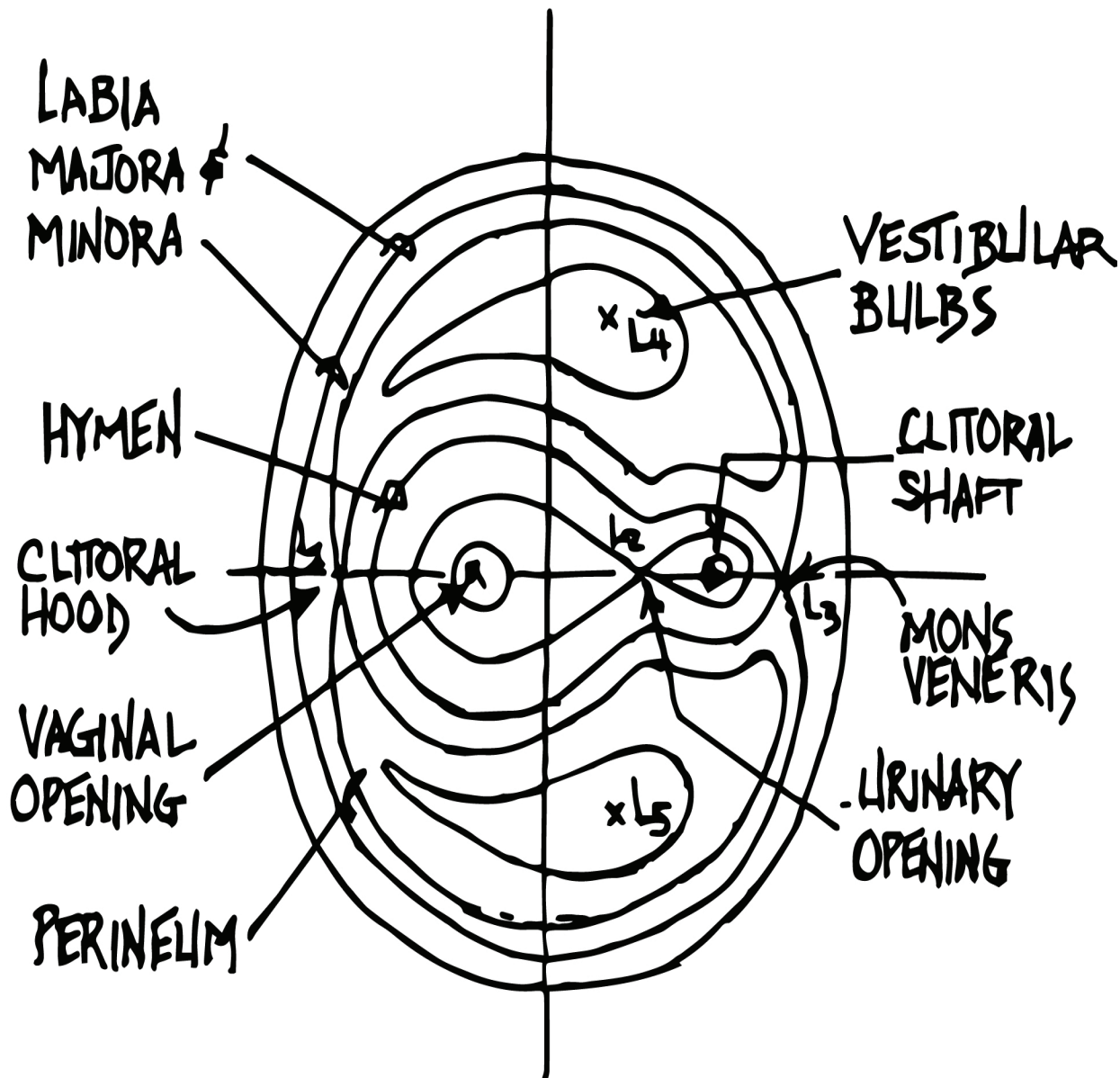
Everything so far has been rank heresy and hand-waving analogy. There are many compelling features, but precious little concrete evidence. It's a fun way to learn a few things about space science, but a whole new psychology model? P-lease. Based on orbital mechanics?

In scientific terms, we DO have a theory. That Theory becomes stronger with every new phenomenon it explains. We've covered quite a few possible proofs so far, but nothing definitive to make it a THEORY.

The only realistic "proof" has been the lunar aspect of the menstrual cycle. Doh! You might as well call the figure opposite (a detail of the 3BP that you'll recognize as a section of the planar section through M1 and M2) a model for the female orgasm vs. the body-cavity openings.

Which isn't such a bad analogy, actually. The female anatomy has openings in proximity – vaginal, urinary, and anal – all nicely aligned with the three co-linear stability points. Beyond lie two more high-sensitivity elements, alias the breasts (the triangular Lagrange points). The male anatomy is organized in very much the same fashion.

The contours in this diagram are reminiscent of the pelvic floor muscles and the dynamics of which lies the mother of all mysteries, the female orgasm. The full 3D 3BP can't touch that complexity, but; well, it's a start.



34

Here's a more detailed look at the female sexual anatomy, juxtaposed on our planar slice of the 3BP graphic. The analogies are interesting and - it's in ROTATING coordinates! Tell me the period doesn't make you feel just like that!? It's uncanny. What could this possibly mean?

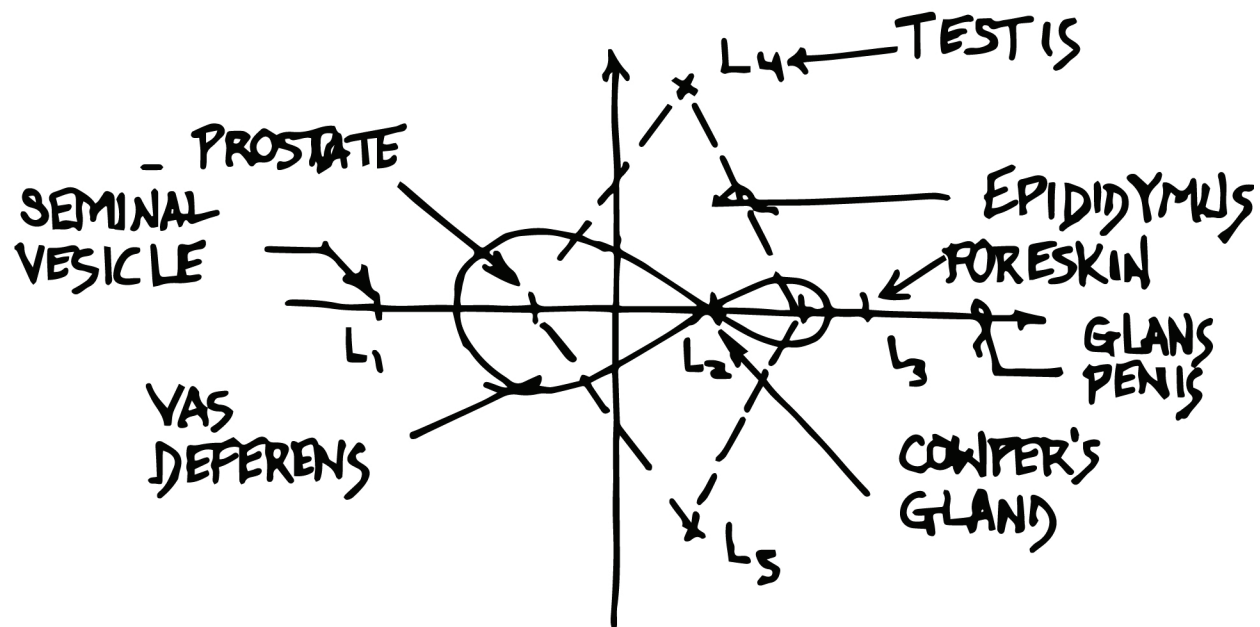
Human beings evolved under the constant influence of gravity. If the female reproductive cycle evolved to sync with the lunar month (which isn't as far-fetched as you might think at first blush), why not the entire reproductive and sexual plumbing?

We're not looking for a whole new sexual anatomy theory here. All we need is substantive support for using gravity theory in our psychology model. Anything that correlates to some PHYSICAL aspect of human anatomy lends credence to our idea of a PSYCHOLOGICAL association as well.

I hate to admit it, but statistical methods would certainly support this idea.

As a bonus, if there ARE such connections, then perhaps the dysfunction of one can be remedied by the other (i.e, the physical vs. psychological). Humanity did just fine for 100 million years before doctors came along and confiscated all our natural healing tech.

Do you want it back!?



35

Here's the male sexual anatomy superimposed on the "free return loop" of the 3BP. All the working parts are there. Again, this is the infrastructure of the male pelvic floor muscles.

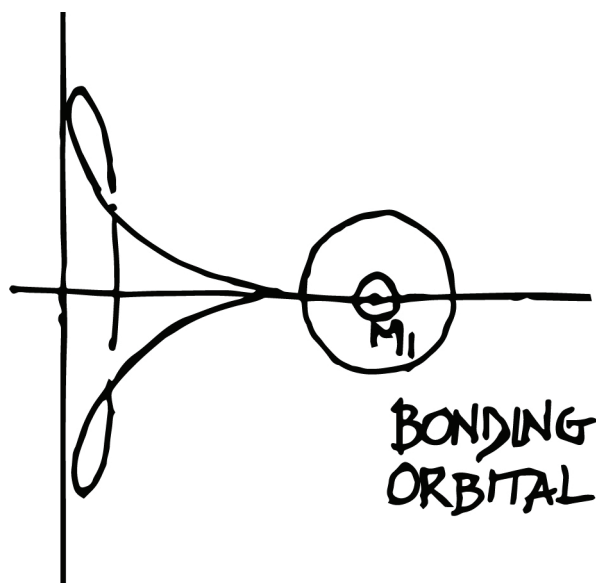
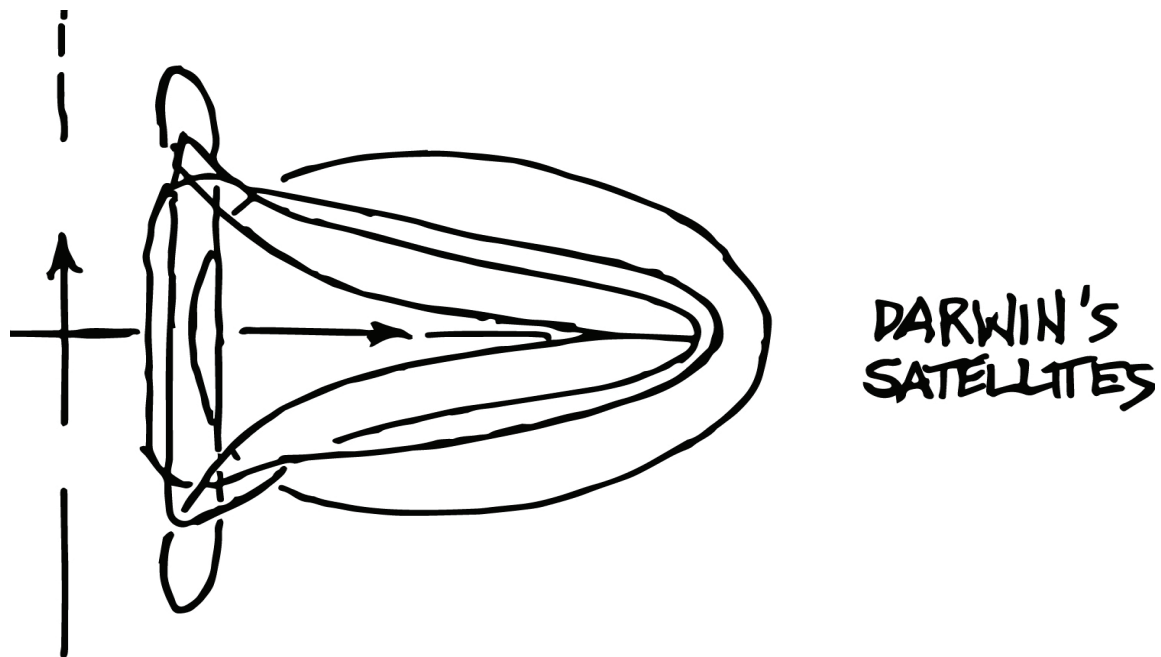
There aren't quite as many gears in the male sexual anatomy, at least according to STATISTICS. That is, STATISTICALLY females get to orchestrate the entire parade because they're harder to arouse.

Umm, excuse me? Absent The Pill from this dialogue so we can talk about NATURAL sexual orgasm, and we'll see who revs up better and longer.

These two figures of the male/female sexual anatomy need not be taken literally. Clearly, there's a certain mystique to orgasm. All sorts of buttons, feelings, signals, and emotions conspire to resolve in a satisfactory climax.

If the 3BP math can give insights into the psyche, why must sexuality be excluded? During puberty, which is where we left off with our psyche model, sexuality is of super-primary importance to the teenager, and to their health, well-being, and self-esteem.

We do the human orgasm a disservice by separating psyche and sexuality. If mathematics can bridge the divide, that's a strong support of the whole theoretical premise here.



36

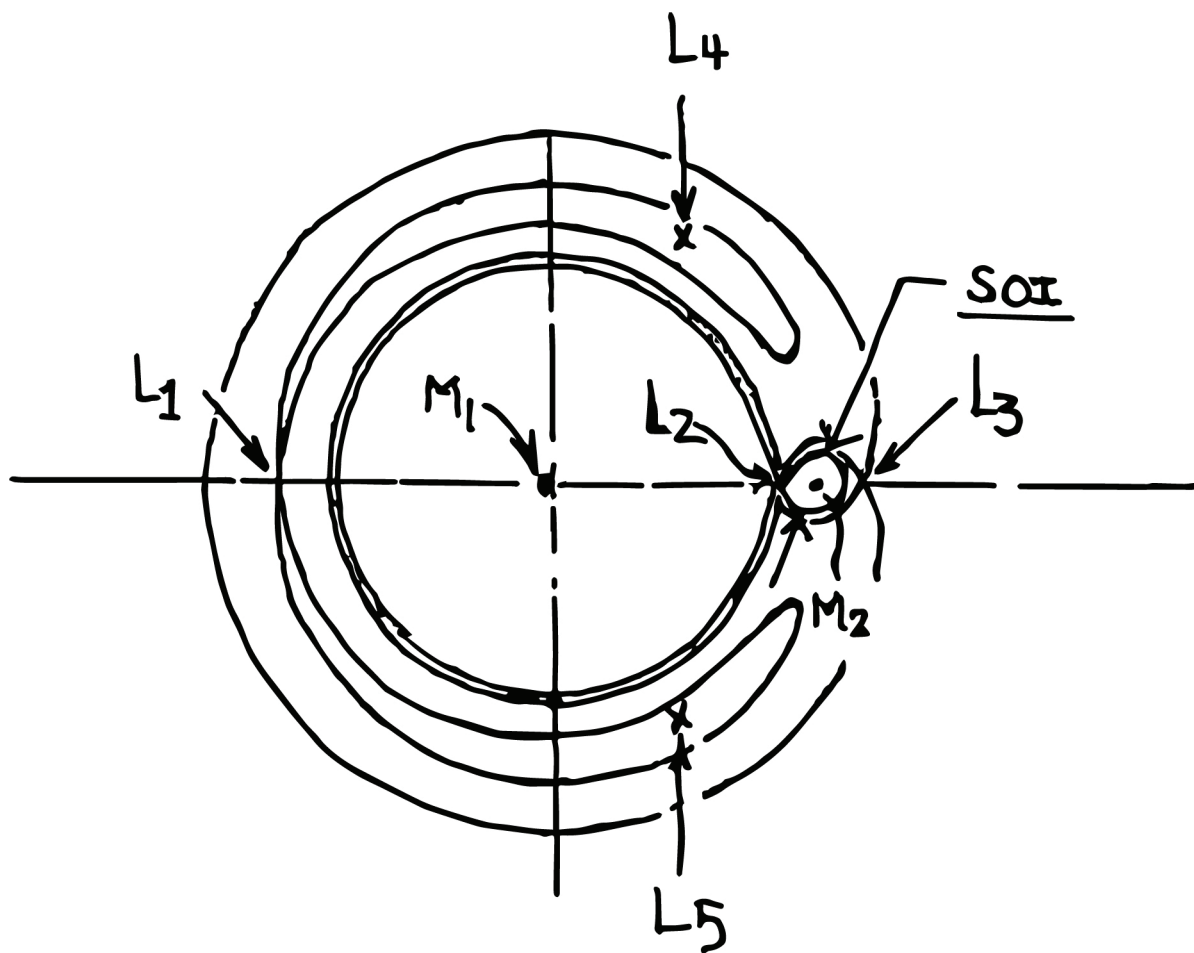
So what have you learned so far? Well, all orbital motion takes the form of a conic section. The Two Body Problem has applications in electrostatics and subatomic orbitals. Orbital mechanics solves the 2BP and uses it for satellite orbits and interplanetary missions

The Three Body Problem has applications on the subatomic level as well. Isolate on one electron orbiting two nuclei. Same 3BP graphic. Gravity bonds between two large masses? If you put those masses into vibration mode, that gravity bond looks just like an electron bond. Because it IS.

The 3BP is the most famous unsolved problem in mathematics. A closed-form solution is possible only with the example discussed here, the “circular restricted planar problem” where (1) M1 and M2 orbit in the same plane, (2) M1 and M2 are in circular orbits, and (3) there are no outside perturbing forces (planets, stars).

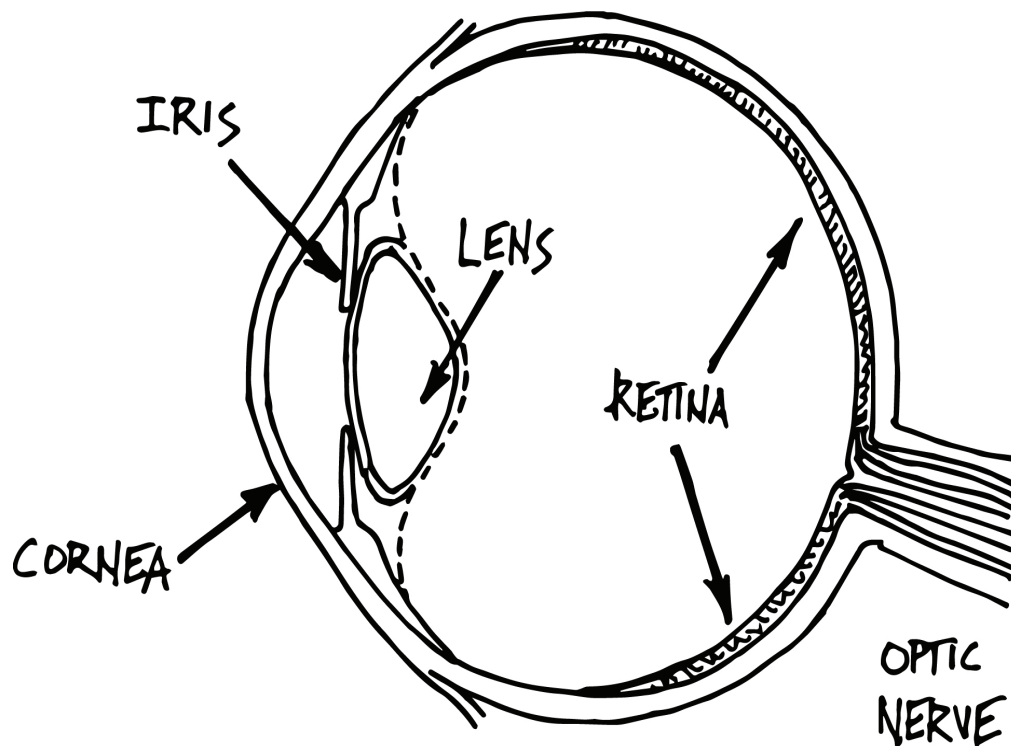
Many solutions have been discovered using computational methods. “Solutions” meaning stable orbits in “zero velocity curves” as we have discussed at length.

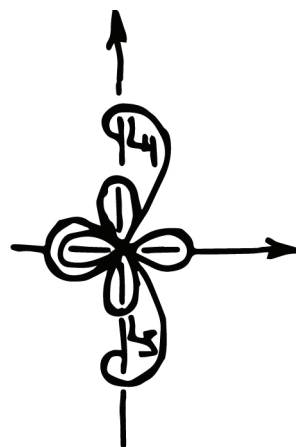
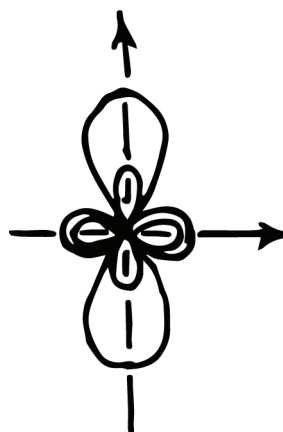
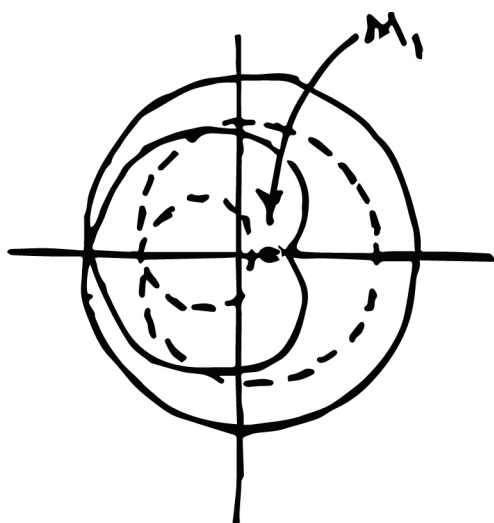
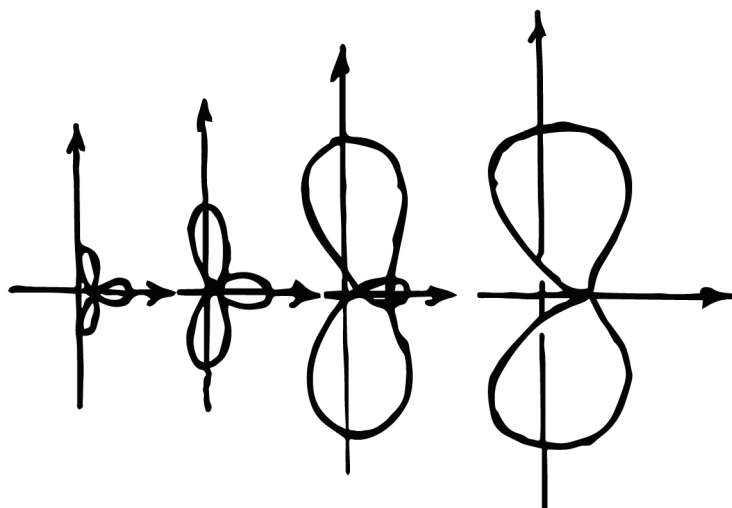
We’ll close out this discussion with a few of the fun solutions as they might apply to The Big Theory. Opposite are a couple of close-up views of the female anatomy, umm... down there. The infamous G- spot? GRAVITY spot?



37

Anatomy of the human eye.





38

The top series of 3BP solutions is reminiscent of an evolving fetus. Bottom left, cell division, or perhaps - birth? Bottom right might be cell division or maybe even bonding orbits, on the subatomic level.

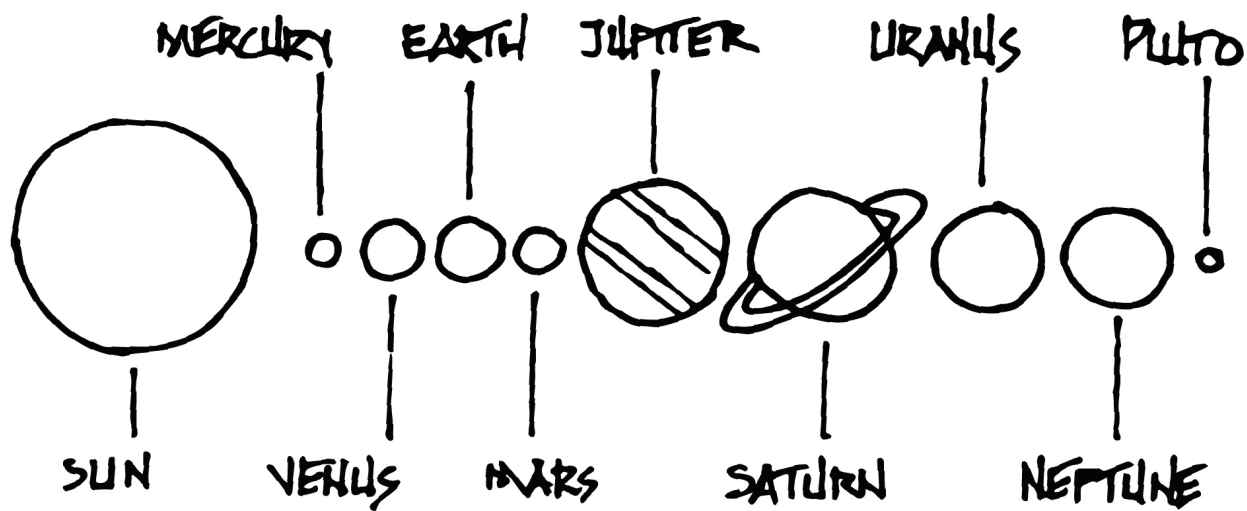
Many readers were anxious for the LGBTQA+ sexualities to be identified, likely as elements in the “towers” of the full 3BP graphic.

I can only do the math, and the math doesn’t say anything about what they mean. Only that they’re not as stable as orbitals in the L1-L5 plane, and that the 3BP as posed excludes any external forces that might make the “tower” loops even more stable or even impossible.

For those mini-loops to be stable, the “rainbow coalition” has to eliminate all external forces, which is not healthy. It’s possible those alt-sexualities fade after puberty and the psyche matures into adulthood.

That’s up to the psychogy experts to hash out. Like these final diagrams, it’s not going to show up in the mathematics. Numerical methods using simulations will be required.

The good news is that here you have a model that for the first time actually includes non-heterosexual sexualities. They might be permanent, they might fade with puberty, or might even indicate how they can be reversed.



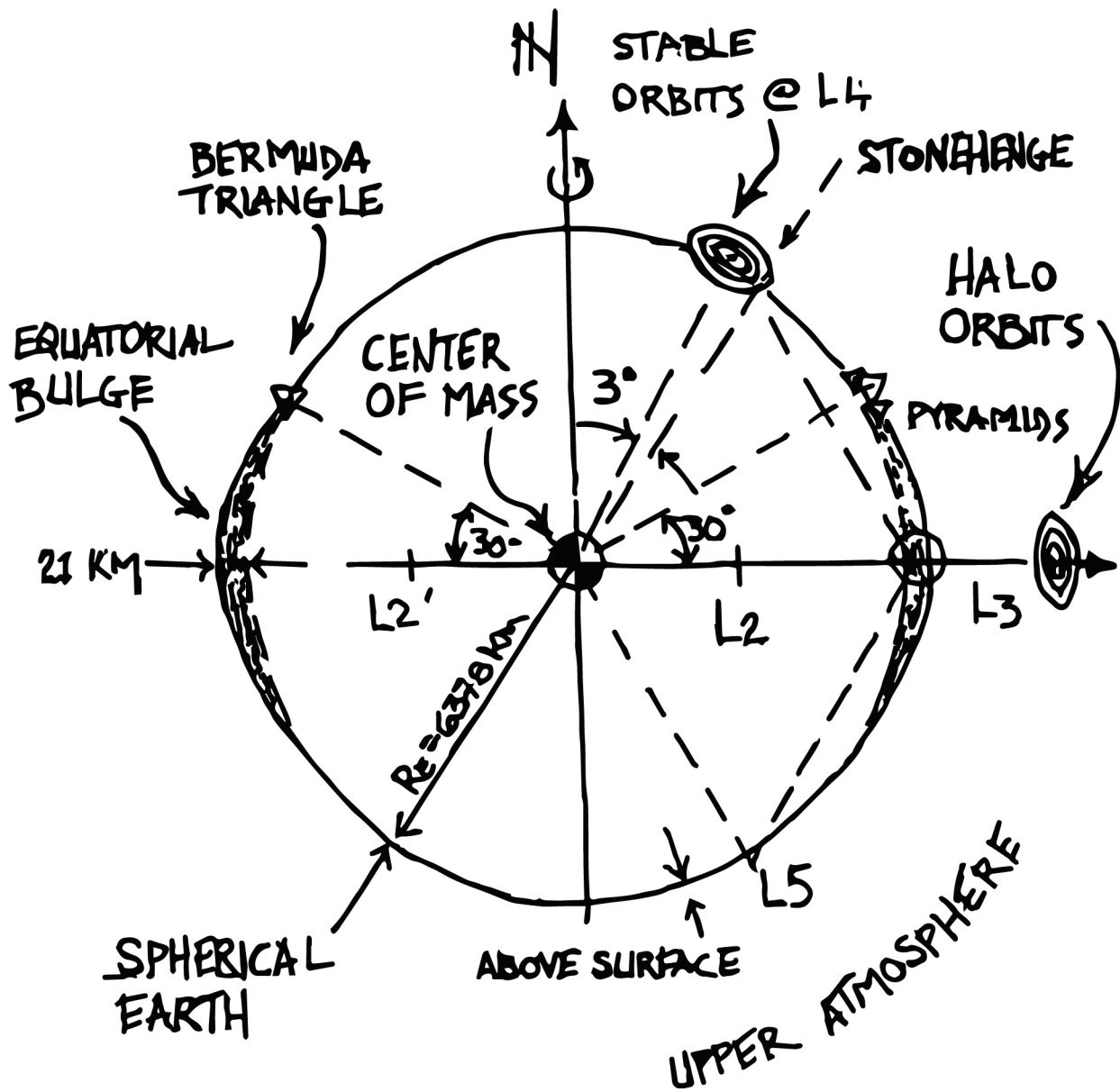
39

So, we have a new psychology theory with lots of new archetypes in the family. That's good! The more complicated the basic theory, the better, because the human psyche is extremely complex.

Originally - in my books - I never got past the planer 3BP diagram, which convincingly is heterosexual. It wasn't until recently that the whole LGBTQA+ movement blew up that I really even noticed. I figured the equilateral Lagrange points represented the homosexual outliers, possibly with the co-linear ones to compete the matching set of four needed for the homosexual dynamic (two of each sex, one the "male" archetype, the other "female").

That leaves the L2 "free return orbit." Maybe it represents bisexuality, which is the most common among the non-heterosexual sexualities, especially among women.

Overall, there are many references to outside influences, from birth onward. Absent social media, marketing (Wall Street loves non-heterosexuals because they spend the \$250,000 need to raise and educate each child on conspicuous consumption), the Meta verse - there'd be a lot less of all that drama. Regardless of my personal opinion, I've tried to present the math without bias or prejudice. I apologize if I failed to be balanced. Absolutely nothing is more important than family for a child. Just. Be. Good. Family.



36

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