

An Introduction to Pythagorean Sphaerics

*A skit intended to provoke curiosity
about why we study the heavens*

by the Los Angeles LYM Sphaerics Group

*This skit was written for a March 2004 Los Angeles cadre
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Induction

[*California. Bronze Guy, Silver Girl, Steve.*]

BRONZE GUY: Whoa! This is so cool, look at how many stars are out!

SILVER GIRL: We need to get out of the city more often. I know we are always talking about things that we should do, that we never get around to, but seriously, sometimes I just need to get away from the whole college/party scene and chill.

BRONZE GUY: Isn't that what we usually do when we go to college and party—chill?

SILVER GIRL: You know what I mean. Sometimes it's just kinda nice to get away and get into something kinda deep.

BRONZE GUY: Oh, yeah, remember what we were talking about last time?

SILVER GIRL [*amusedly reminiscing*]: Oh, yeah, there was that hippie guy in our econ class, who was so excited to take us up here and get us blazed. And he had just taken an astronomy class, so he was completely stoked on how many stars there were . . .

BRONZE GUY: And he had the connects for the best herb ever.

SILVER GIRL: Yeah, that was back in the days when Steve still knew how to have a good time, before he turned into a total geriatric.

STEVE: C'mon, that was like two months ago, you guys talk about it as if it were ancient history.

SILVER GIRL: And that was probably the last time you even smoked.

STEVE: Sorry if I think that we should be able to get into deep stuff all the time. We sure aren't getting into anything too deep in school, and I don't think that I should need to smoke in order to think about something profound.

BRONZE GUY: But, last time you did smoke you were totally getting all deep, remember? You were lying on top of the car, and you were, like, "We don't even really matter, imagine how big the galaxy is." Remember, you were, like, "Just imagine that, how do you find yourself in the universe, it's like looking for yourself on a sesame seed."

SILVER GIRL: Oh yeah, the sesame seed. . . . That should have taught us all the lesson that watching the Discovery Channel while under the influence of the recreational drug marijuana can be hazardous to your mental health. Remember how freaked out we were, when we got up here, all because of that show, because it had William Shatner or some other cheesy guy walking on the beach, and he had sand in his hands and he was, like, "If a grain of sand were a sun, then all the sand on the Earth would equal all the stars in the universe."

BRONZE GUY: Whoa! That's fucked up. Wait a minute, you better shut up, or we're going to go through it all over again.

SILVER GIRL: I wouldn't even mind, I kinda like to think about the whole cosmos thing, but it's just so inapprehensible, totally unknowable.

BRONZE GUY: It's times like these that I always say: Just look at it and enjoy it Just look at it and enjoy it. It's simple . . . so just *be* simple.

STEVE: I really don't think that's necessarily the case. I'm starting to think that we could know it. I went to another one of those LaRouche meetings . . .

SILVER GIRL: Oh, God, not another one! Steve, you are going to turn into one of those freaks.

BRONZE GUY: Hold on, I'm getting lost here. What does politics have to do with the stars? No, better yet, what does politics have to do with my buzz?

SILVER GIRL: You and your buzzes.

BRONZE GUY: Bzzzz. Bzzzzzz Hold up! [*to Silver Girl*] You and your buzzes!

STEVE: Look guys, I'm telling you, you wouldn't be so skeptical, if you had actually been there. I don't know yet whether or not I agree with everything; but I do know that people have to start thinking about the kind of stuff that they talk about, because I know that we never would have gotten so messed up from thinking about space, if we had seen what they were talking about. They were saying that "our very existence is actually pivoted on the knowability of the universe."

BRONZE GUY: Huh?

STEVE: Yeah . . . they started . . . with the Egyptians . . .

Ancient Egypt

[*Sutimes, Ma-aht, Heru.*]

SUTIMES: “Watir-weh-nebu-tah-mury-iw-wahi-wud-wahara” “ha-weh-teh-mutir-wan-weh-neht-wap-wutir-nab-suwat.”

MA-AHT: There’s our friend recounting once again the old tale of creation. I can hear him, in fact. He is now speaking of that black void known as Nun, the vast and endless ocean of darkness from which a great shining egg spun forth, the sun known to mortals as Almighty Ra. Apparently, it was from the receding black floodwaters that the various gods and goddesses would emerge. Ha! Hear how he describes the canopy of stars above us as the goddess Nut, whose arms and feet stretch from one horizon to another, whose starry body bending over us is held up by Shu, the god of Air, standing upon Geb, the god of Earth. From that point on, though, he loses me with all this talk of the battles of Osiris, and the journey of Isis. What this has to do with a procession of lions and fish, beats me! Yet, he always manages to connect these stories to the heavens above. Wait, he’s finally stopped. [*pause*] Look how motionless he stands, how intently he has fixed his gaze.

HERU: It’s getting late, Sutimes. What on Earth are you staring at?

SUTIMES: That plateau over there.

MA-AHT: Near the suburb of Giza?

SUTIMES: Yes, solid bedrock rising several hundred feet above the western bank of the Nile.

HERU: What of it?

SUTIMES: It’s a perfect location for observing the heavens. It has a flat, near-perfect horizon, which allows one to see almost everything found in the night-time sky.

HERU: Still, what of it? What good is there in missing a good night’s sleep to look up at the same old . . .

SUTIMES: . . . To improve your soul, Heru; and, to elevate your mind above the limits of your sight, in order to grasp the unseen principles which generate all that is laid before your eyes. Besides, it was taking the time to look up, which has produced all the strength and riches of our great civilization, the backbone of our economy, of which we have everything to be thankful.

HERU: I see you’ve been spending too much time with

that cult of Imhotep. He was just a scribe, you know. Okay, maybe the world’s best architect. But, you’ve let all his philosophical writings go to your head; there’s no relationship between economy and the stars!

SUTIMES: In these two kingdoms of Egypt, from what is all our wealth produced?

HERU: The Nile, of course.

MA-AHT: That’s right, it’s her regular flood-waters that allow our skilled farmers to plant and harvest such a rich crop every year.

SUTIMES: And, how do you know when to plant for the best harvest?

MA-AHT: I know that one. Just count a certain number of full moons till the next flood. Twelve moons, I believe, just about one every month.

HERU: Oh, no, Ma-aht, now *you’re* into this as well?

SUTIMES: Great idea, Ma-aht, But I think if you pay close attention, you’ll find your method only works for a year or two.

MA-AHT: How so?

SUTIMES: It’s about 12 months, but the phases of the moon don’t quite match up perfectly with the seasons. It falls a little short from coming back to the same position at the same time each year.

HERU: Wait, where are you getting this from? The sky appears to me just a random splattering of stars across a dark backdrop.

SUTIMES: Okay, what’s the shape of the backdrop onto which these stars are splattered?

MA-AHT: I’ve never thought about the shape of the sky before . . .

HERU: [*mumbles*] Who cares about the shape? . . .

SUTIMES: Well, take a look. How does it appear to you?

MA-AHT: How can I begin to describe what I’m seeing, Sutimes?

SUTIMES: Well, let’s try an experiment, Ma-aht. Using one eye, point to a star with your finger.

MA-AHT: Which one?

SUTIMES: The first one that catches your eye. Hold your finger right there. Now, pick another star, with your hand still outstretched, and with a single gliding motion point to that new star.

HERU: How does pointing at something tell me anything about it?

MA-AHT: Wait, it was what we did *between* pointing at the two stars.

SUTIMES: Moving our finger in a circular way around us . . .

MA-AHT: . . . Creating an arc, that's right! [*pause*] Wow, the more I think about it, the more everything around me takes shape. Whichever direction I point toward, I find myself moving about the inside of what appears to be a great . . .

SUTIMES: . . . sphere. What the priest-astronomers call the celestial sphere. [*pause*] And now, dear friend, you've been initiated into the secrets of observational astronomy known to the wisest since ancient times, and with which all our knowledge of the heavens has been produced. It's by tracking the positions of stars, both moving and fixed, and the relationship between them severally, across the inside surface of this celestial sphere, that we have discovered the tools of mathematics, tracked the seasons with which to plant our crops, and mastered the calendar around which our society runs.

MA-AHT: Please, describe this celestial sphere a little more.

SUTIMES: Let us then anchor ourselves in this great sphere! Now, point to the spot straight up and directly overhead. This imaginary point is commonly referred

Astronomy Of the Great Pyramid

Modern day “establishment” historians of science will fulminate against the notion of an advanced ancient-Egyptian astronomical tradition. Apparently counterposed to them, the “alternative” Egyptian history movement, created under the influence of the Synarchists, claims that ancient Egyptian astronomy derives from either space aliens, or psychotropic drugs, or secret societies. Plato, Herodotus, Diodorus Siculus, and the Great Pyramid itself tell a different story.

In his 1982 *The Toynee Factor in British Grand Strategy*, Lyndon LaRouche hypothesized that Egypt was founded by the remnants of an earlier Atlantean civilization, moving eastward from the Straits of Gibraltar, as the last Ice Age was ending, and carrying with them a knowledge of astronomy. The First-century B.C. historian Diodorus Siculus described Atlas, the father of such an Atlantean civilization, as

the man who “discovered the spherical nature of the heavens.” Plato’s masterwork on the physical principles governing the universe, *Timaeus*, not only cites Egypt as the fount of Greek astronomy and mathematics, but dates Egyptian civilization back to at least 9600 B.C. And Herodotus reports that the Egyptians had knowledge of the precessional astronomical cycle of 25,900 years.

Sphaerics, or astronomy, dominated the architecture, religion, and economy of ancient Egypt, especially the magnificent Old Kingdom (2700-2180 B.C.), which built the Great Pyramid of Khufu as an astronomical observatory. Located on the Giza plateau, the Great Pyramid is stunning in the precision of its construction, a construction which could only have been meant for astronomical study. It is located precisely at 30-degrees



The Sphinx, on the Giza plateau, site of the Great Pyramid.

to as the zenith. Now, imagine another point directly underfoot, extending out into the universe below the Earth on which you stand, as if the Earth were transparent. This is known as the nadir. Now, trace out a great circle around you, that lies exactly half-way between these two points . . .

MA-AHT: . . . The horizon, Sutimes! It traces out the horizon!

SUTIMES: Wonderful, Ma-aht, your mind has now divided the infinite whole of the visible universe in half. These two equal divisions of our great sphere have given us a geometry around which to navigate our voyage of discovery. Let us now sail to the northernmost point on our heavenly ocean.

[They locate the North Star and elaborate.]

SUTIMES: Now, let us create more equal divisions of the sphere with our mind, by tracing out another great circle, starting from the North Star, and arching across the zenith directly above us. This is called a celestial meridian. It's crucial for describing the changing posi-

tion of stars. We can now describe and locate all night-sky phenomena within this newly created geometry. And so you begin to see, Heru, that what to your initial frustration seemed nothing more than the complete randomness of stars splattered about, is in fact highly ordered in the most divine and beautiful of fashions. In fact, the sun and moon, and even the planets which everyone would expect to fly about all over the place, follow roughly the same arc across the sky. We call it the ecliptic, on which the Zodiac lies. And interestingly enough, the twelve constellations or signs of the Zodiac that lie equidistant from each other on its path, appear to march across the sky on an annual basis, giving us a reliable reading of the season we're in.

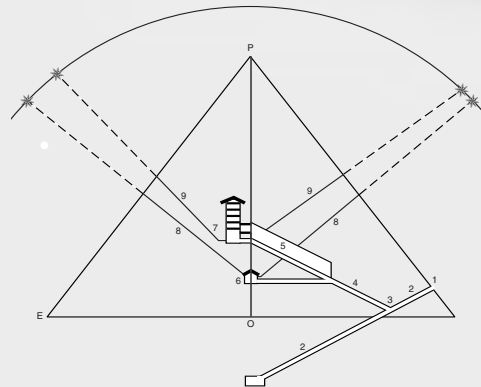
MA-AHT: And that's how you know for certain when to plant for the best crops along the Nile?

SUTIMES: Almost, but not quite, Ma-aht. Actually, it is the perfectly synchronized movement of another constellation (not of the Zodiac, though) that signals with precision the beginning of the flood season. It is Sirius, the Dog Star, that pokes its head above the eastern horizon at the beginning of early dawn just before the sun rises, which tells us the flooding of the Nile's life-giving waters. Her flood-waters are so important to



Frank P. Roy/2002 <http://egyptphoto.nef.ca>

Above: *The Great Pyramid of Khufu.*
Right: *Diagram of the Great Pyramid, showing observation shafts.*



For the builders of the Great Pyramid to have accomplished such a task, the understanding of the regular motions of the stars and the celestial geometry of sphaerics had to have existed long before such an undertaking. The Pyramid Texts carved on the smaller pyramids of Saqqara,

describe important astronomical cycles as myths in which, for example, figures such as Osiris and Isis are represented by the constellation Orion and the star Sirius, respectively. Although carved in stone during the Old Kingdom, the Pyramid Texts are presumed to be much older.

—Susan Kokinda

latitude, and is more accurately aligned to the four cardinal points than modern structures built to the same end. Within that alignment, the shafts built into the Pyramid, at crucial angles, allow for precise observations of key stars, such as Sirius, the North Star, and Orion's brightest star, as they transit the celestial meridian.

the strength of our great kingdom, that the rising of the Dog Star marks the beginning of our civil calendar every year.

HERU: And your point is?

MA-AHT: Ignore him, Sutimes, he's caught up in the dog days of summer . . .

SUTIMES: . . . Quite literally . . .

MA-AHT: . . . but this is profound. Tell me, are you implying that there are indeed regular cycles of motion to everything in the heavens above?

SUTIMES: Almost. And although the daily motions are subsumed by seasonal motions—which, in fact, are

observed to repeat with some regularity over the years—there *is* some discrepancy. For instance, I recently visited the great temple and scientific complex around Saqqara, built by the great astronomer-architect Imhotep himself, 72 years ago. To my surprise, all the markings used to track various cycles, such as the rising and setting of key stars, and yearly phenomena such as the equinoxes and solstices, were off by exactly one degree!

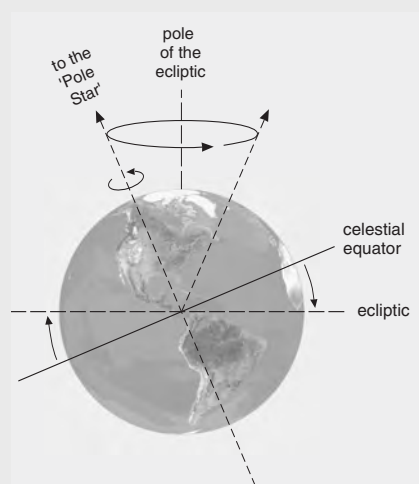
MA-AHT: I'm not quite sure what that means.

SUTIMES: Well, I doubt the great Imhotep could make such a simple mistake as that. Which leads me to believe that the whole image of the sky, with its cycles and all, is in fact moving within a greater cycle which, to complete one rotation at a rate of one degree every 72 years, would take at least . . .

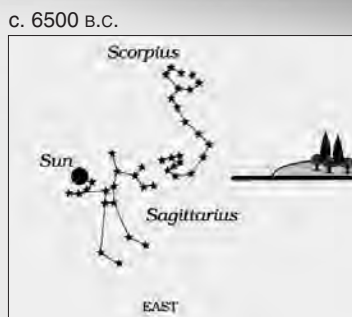
MA-AHT: . . . 25,920 years to come back around, given

The 'Precession Of the Equinoxes'

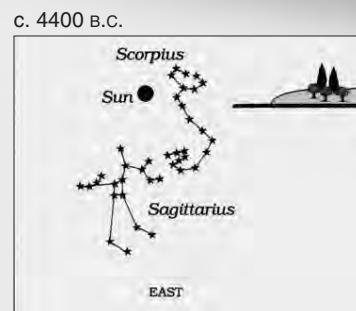
The "precession of the equinoxes" is an observed effect caused by the slow, top-like wobble of the north-south axis of the Earth over a period of 25,900 years. Hence, the "North Star"—which is, by definition, the star to which the axis points—shifts over that period. Today it is Polaris, but during Egypt's



Earth's axis of rotation itself rotates around the "pole of the ecliptic."



Shift in the heliacal constellation, 6500 B.C. (Sagittarius) to 4400 B.C. (Scorpius).



Old Kingdom it was Alpha Draconis. This shifting celestial geometry (1° every 72 years) results in another important change in observations: The constellation of the Zodiac which rises just before the sun on the vernal equinox, which is called the heliacal constellation, also changes slowly over time, as if the band of the Zodiac were sliding backwards against the fixed annual position of the equinoctial sun. This effect is known as the "precession of the equinoxes."

The 12 constellations of the Zodiac are the ones which follow the

same path as the sun along the ecliptic, and Egyptian mythology and religion are filled with images of them. The dominance of a particular image, such as the scorpion, the bull, or the ram, often corresponds to the historical period in which it was the heliacal constellation. For example, the death of Osiris, which Freemasons and Synarchists make a great mystical to-do over, can be seen simply as the disappearance of the constellation Orion from the sky on the vernal equinox, which occurred around 6700 B.C.

—Susan Kokinda

360 degrees in a circle.

SUTIMES: Remarkable, no? In fact, this precession is most noticeable when observing the rising of the sun in a particular constellation of the Zodiac at dawn on the vernal equinox of each year, in other words, the first day of spring, in which night-time and day-time share an equal number of hours. In fact, many of the markers honoring this phenomenon, now taking place in the constellation of Taurus, are beginning to appear more suited for the constellation Aries instead. These constellations act as flagships heralding in a new Age and Season. In fact, imagine this: Over the course of the next 4,000 years, the position of the equinoxes will proceed from one Zodiacal sign to another, in like manner, remaining a little while longer in a period of Taurus, then continuing into Aries, shifting for a time into Pisces, and eventually one day looking east at dawn we'll find ourselves in the Age of Aquarius.

MA-AHT: Isn't it strange, given how short our lives are, to even conceive of something 26,000 years into the future?

SUTIMES: [*pause*] Of course it's only a working hypothesis. Certain proof of it requires greater experimentation. Fortunately, I have plans for a massive work-station, modelled off the design of the Great Step Pyramid of Imhotep built under the reign of Zoser. Amazingly, the exact latitude at which we find ourselves here at Giza, permits the perfect witnessing of the conjunctions which mark the beginning of various ages in this heavenly precession. Such a viewing station would have to be taller than any known structure ever built by the hands of men, and be perfectly aligned to the celestial meridian (which we mentioned before), to give us accurate measuring of the cardinal directions.

HERU: I figured. Look, I respect your passion for these ideas, but charming as they are, I doubt you'll see them take shape anytime soon.

SUTIMES: Of course, Heru, such a great project will require at least a generation to complete. But once completed, think of the advances in science and technology that could be made. Think of the impact on our society, a renewed outlook for our great nation, and because of it, it shall be the pride of all the known world.

MA-AHT: The question is, how such a thing is feasible!

HERU: What authority has the power to mobilize on a national scale for such an ambitious project?

SUTIMES: That stubborn ass, the Great Pharaoh.

HERU: Sutimes! Such name-calling, against the very living god-incarnate of these two kingdoms of Egypt!

SUTIMES: But, is it true?

HERU: Yes—but have you no shame?

SUTIMES: Shame, for saying that which is true?

HERU: Regardless!

MA-AHT: If the Lord Khufu is as you say he is, how then shall you move the Pharaoh to such noble action?

SUTIMES: As you would any stubborn ass—appeal to his sense of immortality.

Plato's Greece

[*Herdsmen and son.*]

BOY: By Zeus, father, this most astonishing view of the blazonry embedded on that heavenly canopy, overwhelms my soul with such a sense of wonder and beauty that it nearly approaches a painful threshold!

HERDSMAN: True, my son, it is a most enthralling sight, which has been crafted to circumscribe our vision's domain. But to advance towards manhood, is to grasp the hands that have stitched this most wondrous tapestry, which envelops us at twilight and warms our souls after dark. You see, our midnight dome has been crafted by the most skillful hands in the entirety of the cosmos. The night-time stars are not mere burnished jewels embedded as on any tapestry you have ever seen; but rather, these illuminations are ablaze, and are in motions congruent with divine justice itself!

BOY: They do seem to me to be ablaze. But father, I do not believe that I have ever seen them move.

HERDSMAN: And see them move you never shall. Not with your eyes, at least. And this, then, is my objective for you, as concerns perfecting yourself into adulthood: That you must begin to become able to hold these images firm in the waxen tablet inscribed in your soul, so that a comparison of those mental after-images, with new images you impress onto that waxen tablet, will allow your mind to see the motion that your eyes can not. We men have not been given the eyesight that reaches into the night, as has the cat; nor the wings to fly unbounded, as has the eagle; nor the longevity to live many generations, as has the cricket. But, if you take course to see that which is unseen, you shall soar to a level of immortality envied even by the

gods themselves; and that, and only that, is what makes us human. Suitably spoke Socrates on this subject: “For the soul which has never seen the truth, can never pass into human form. For a human being must understand a general conception formed by collecting into a unity by means of reason, the many perceptions of the senses; and this is a recollection of those things which our soul once beheld, when it journeyed with God and, lifting its vision above the things which we now say exist, rose up into real being.”

BOY: So it wasn't really the case, as they say, that Prometheus ran out of gifts of abilities and talents, after bestowing them on all the other creatures, leaving humankind with nothing else but fire?

HERDSMAN: Now you are starting to perceive the true meaning of our origin. For it is true that we were not given any physical prowess, as that had already been

doled out to the animals. But Prometheus knew that none of these creatures had bodies that could house a spirit capable of governing the world around. So, crafty Prometheus had the foresight to know that the seed of heaven lay sleeping in the Earth. He scooped up some clay, moistened it with water from a river, and kneaded it this way and that, and shaped it into the image of the gods. In order that we might have life, the core of many animals was locked in our breasts; but our true nature came only after Athena marvelled at it all, and breathed into us the spirit, the divine breath, which made us completely alive. Even so, we aimlessly moved about. We saw, yet we did not see; we heard, yet we did not hear. We wandered as figures in a dream, until Prometheus stole for us the sacred prize of Olympus, fire. Then, when we sheltered ourselves from the elements with our gift of fire, and our eyes started to follow the smoke up into the night sky, did our souls float upward following after. For then Prometheus taught us about the rising and the setting of the stars, discovering for us the art of counting in true number, and communicated to us the music of poetry.

The Legacy of Plato

A physical concept of magnitude was already fully developed by the circle associated with Plato, and expressed most explicitly in the *Meno*, *Thaetetus*, and *Timaeus* dialogues. Plato and his circle demonstrated this concept, pedagogically, through the paradoxes that arise when considering the uniqueness of the five regular solids, and the related problems of doubling a line, square, and cube. As Plato emphasized, each species of action generated a different species of magnitude. He denoted such species by the Greek word *dunamis*, the root of the English ‘dynamo,’ translated as ‘power.’ The meaning of the term *dunamis* is akin to Leibniz’s use of the German word *Kraft*.

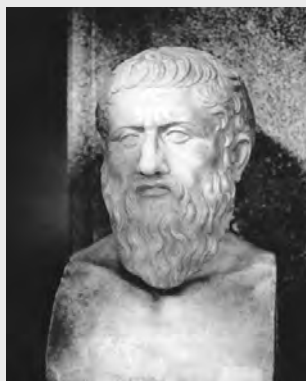
That is, a linear magnitude has the *power* to double a line, whereas only a magnitude of a different species has the *power* to double a square, and a still different species has the *power* to double a cube. In Bernhard Riemann’s terminology, these magnitudes are called, respectively, simply-extended, doubly-extended, and

triply-extended.

Plato’s circle emphasized that magnitudes of lesser extension lacked the potential to generate magnitudes of higher extension, creating, conceptually, a succession of higher *powers*.

Plato’s circle also emphasized, that this succession of magnitudes of higher powers, was generated by a succession of different types of action.

Specifically, a simply-extended magnitude was produced from *linear action*, doubly-extended magnitudes from *circular action*, and triply-extended magnitudes from *extended circular action*, such as the rotational actions that produce a cone, cylinder, or torus. Plato’s collaborator, Archytas, demonstrated that the magnitude with which a cube is doubled, is not generated by circular action, but by extended circular action, i.e., conic sections.



Plato (427-347 B.C.)

EIRNS/Philip Ulanowsky

—Bruce Director

BOY: But what about the barbarians, who never look up?
What do they have to live for?

HERDSMAN: Do you know of the demi-god Asclepius?

BOY: Assuredly, he was raised by the centaur Chiron and became the greatest master of the art of medicine. Socrates spoke of his importance even in his dying words.

HERDSMAN: But did you know that he also goes by another name, a name from his native land?

BOY: What name is that?

HERDSMAN: He is the great Egyptian city-builder, physician, and the father of the Great Pyramid, Imhotep. You see my boy, while it is true that we are most favored and fortunate to be Greeks, do not think that all the barbarians have always been as they are now. We are not the first group of people to study the sphaerics of the heavens, and we will not be the last, either. For whenever men wish to advance the cause of humanity, they first need to attempt to contemplate the eternal. And that humbling act, as we were just humbled now, produces all the curiosity needed to investigate the true nature of all physical things. Indeed, astronomers know that there are Vedic peo-

ples who have stories of the heavens that are older than time itself, and our own ancestors from Egypt succeeded in unfathomable deeds without which we would not even exist. And, furthermore, that no civilization could ever have even survived without this kind of understanding.

BOY: That sounds beautiful, but I can not help but think that I can imagine one society that would not: What about a simple group of farmers, who would only have need to know how to plant a seed, and how to water it?

HERDSMAN: And also *where* to plant it, insofar as is best?

BOY: Certainly.

HERDSMAN: Then, I take it they would also need to know *when* to plant it, insofar as is best?

BOY: I suppose they would.

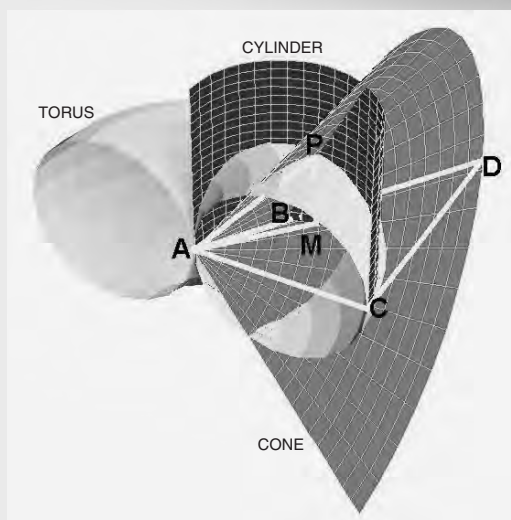
HERDSMAN: Then, suppose they needed to plant a certain seed in a certain place, right at the beginning of the season called spring, how would they know when to do the planting?

BOY: It wouldn't take an astronomer to count the phases of the moon. Just find the right time to plant, then wait 12 cycles of the moon, and you would be back at the beginning of spring.

HERDSMAN: Except that what actually determines our

Archytas's Construction For Doubling the Cube

Archytas developed a construction to find two geometric means between two magnitudes, AC and AB. Magnitude AC is drawn as the diameter of circle ABC; AB is a chord of the circle. Using this circle as the base, generate a cylinder. The circle is then rotated 90° about AC, so it is perpendicular to the plane of circle ABC; it is then rotated about point A, to form a torus with nil diameter. (The intersection of the torus and the cylinder produces a curve of double curvature.) Chord AB is extended until it intersects the perpendicular to AC at point D; this forms triangle ACD, which lies in plane of circle ABC, AB, and AC. Triangle ACD is then rotated around AC, producing a cone. The cone, torus, and cylinder all intersect at point P. Perpendicular PM is then dropped from P along the surface of the cylinder, until it intersects circle ABC at point M; this forms right triangle AMP. Through this construction, a series of similar right triangles (only partially shown) is generated, which produces the continued proportion, $AB:AM::AM:AP::AP:AC$. Thus, AM and AP are shown to be the two geometric means between magnitudes AC and AB.



seasons is not the cycles of the moon, but a different set of relations, which we think has to do with where we are in relation to an orbit that the Earth takes around the sun. There is a battle raging on right now as we speak, over whether it is our Earth going around the sun, as Aristarchus and the Pythagoreans think, or as Aristotle says, the sun is going around our Earth.

BOY: Why do they not all agree?

HERDSMAN: It is not so easy. It requires a proof of somewhat higher causes, and may take many generations to prove. Here is why: Take your finger and orbit it around your eye, with your other eye closed.

BOY: It looks like my finger is circling my eye.

HERDSMAN: Now, orbit your eye around your finger.

BOY: It looks the same, my finger still appears to be orbiting my eye.

HERDSMAN: From the point of view of the observer, there is no difference in the perceived motion from a relatively stationary body observing a body in motion, or the inverse, from a moving body observing a relatively stationary one.

BOY: If it is so difficult to figure out what is actually going on, how then can it be of such fundamental importance?

HERDSMAN: Perhaps you have heard the story of how Thales was able to achieve a fundamental peace treaty between warring states, simply by outflanking the heads of state with his ability to forecast an eclipse based upon his knowledge of the true motions. But even more fundamental, is how these ideas have been used by sea travellers.

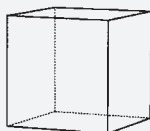
The Platonic Solids

Among the many startling discoveries of the application of universal physical principles to the organization of the visible world found in the scientific investigations of Plato and his associates, was the recognition of the unique constructability of the five regular (Platonic) solids. The most important aspect of this discovery did not lie in the visible world, however, but in the necessary implications for the existence of what Carl Gauss would call the “complex domain” two millennia later.

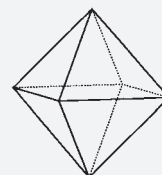
The proof that no other regular solids but these—the pyramid, cube, octahedron, dodecahedron, and icosahedron—could be constructed in visible space, was tantamount to the assertion that, contrary to



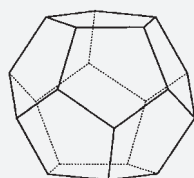
Tetrahedron



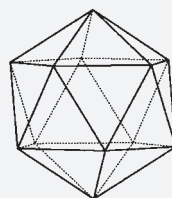
Cube



Octahedron



Dodecahedron



Icosahedron

textbook Euclideanism or the dead world of Isaac Newton, physical space was not “empty,” but instead shaped by unseen boundary conditions inherent in the possibilities of physical action. What appear to be the axioms, definitions, and postulates of mathematics, must yield to the causal relations of physics; in

fact, the very proof of the uniqueness of the Platonic solids—one of the greatest achievements of Greek geometry, which required the development of a

theory of proportions able to deal with incommensurable species of magnitudes (*powers*)—represented, paradoxically, a complete overturning of the method of deductive (logical) proof upon which it was based.

Although Plato presents these issues directly in his *Timaeus*, they are also embedded at the heart of the *Republic*, in the twinned metaphors of The Cave and Divided Line. Here, we see that what we know truly, we know metaphorically—but only by reference to an unseen *Power* which animates and unifies the more immediate aspects of our experience.

—Ken Kronberg

BOY: How is that?

HERDSMAN: Before man conceived of a ship, we had no way to explore the planet and discover what else there was, including the discovery and colonization of our Greek islands by ancient seafaring cultures. With ships, the pilot's art was given birth—the essence of which lies in more than just how to steer a ship.

BOY: But isn't that the essence of the pilot's art? How to steer a ship, insofar as is best?

HERDSMAN: And by "best," would you mean any way that would get you somewhere, or the most direct way to get where you intended to go?

BOY: The latter, of course.

HERDSMAN: Then, as one final exercise, I would like you to imagine yourself in the middle of the ocean. What do you see when you look around?

BOY: I see water, in every direction I look.

HERDSMAN: So, if you want to go to some island directly

east of you, which way do you steer?

BOY: Well, I know where the North Star is, so I just keep going in the direction to my right when I face the North Star.

HERDSMAN: And, if you were going slightly northeast or slightly southeast, how would you know?

BOY: Well, I don't know.

HERDSMAN: Or, if you were going a lot northeast, or a lot southeast, then probably you would miss the island you were aiming for?

BOY: I suppose, then, that you are going to tell me that there is something more to the astronomy of the pilot's art, than simply knowing where to find the North Star?

HERDSMAN: First off, there are problems with trying to map out the activity of a sphere, onto a flat plane of papyrus. These mappings explode at the edges of the map, where they start to lose all accuracy the closer you get to the edge. But, Platon rediscovered the lost method of mapping the sphere onto the plane, with his now-famous regular divisions of the sphere.

BOY: I would like to know more about that.

HERDSMAN: Then you should try to figure them out for yourself, on your own, and maybe they will accept you into the Academy at Athens.

BOY: Regular solids, huh? But, that still doesn't explain how pilots can go east or west without missing their targets.

HERDSMAN: If the pilot goes too far north or too far south, what do you think happens to the North Star's position in the sky? If you watch it from here every night, it will appear to always be in the same position, wobbling a little here or there, but always in the same position, with the rest of the stars circling around it. However, if we travelled south to Alexandria, it would drop a bit in the sky.

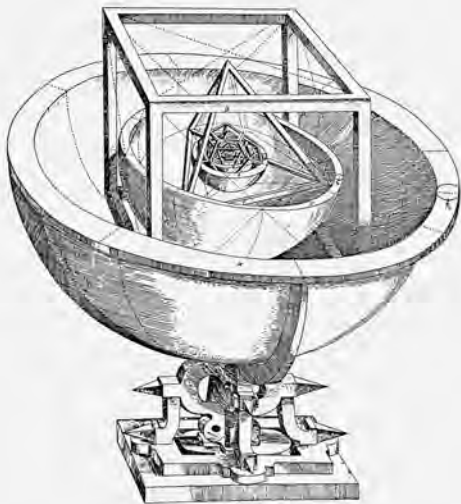
BOY: How can that be?

HERDSMAN: Well, imagine that the Earth is a sphere, and that the North Star was very, very far away. What would happen as you moved along the surface of the sphere toward the top?

BOY: What do you mean by "top"? I thought you said a sphere.

HERDSMAN: A rotating sphere always spinning.

BOY: Then, by "top," I guess you mean one of those two



Johannes Kepler discovered that the ordering of the visible planets corresponded to the ordering achieved by inscribing and circumscribing spheres around the five Platonic solids, in the order depicted in this illustration from his "Mysterium Cosmographicum."

poles that correlate to where the sphere meets the axis of rotation.

HERDSMAN: Exactly. Now, if that axis of rotation lines up with some relatively fixed star in the sky . . . then?

BOY: The North Star!

HERDSMAN: And, where would it be if you stood at the top of the sphere and you wanted to look at the North Star?

BOY: Directly overhead, at the zenith point in the sky?

HERDSMAN: Then, where would it be if you stood at the half-way point between the poles on the surface of the sphere?

BOY: I suppose it would be straight out at the horizon.

HERDSMAN: And, if you walked a little more than half-way up between the middle and the top, say 50 degrees up from the middle?

BOY: I think I need to draw it out in the dirt.

HERDSMAN: Nonsense! You are a Greek: you need to be able to do geometry in your head. Just think about it and you will get it.

BOY: Okay, I will. But, do you think that I am ready to learn about something that I heard some of the older shepherds talking about, called “the retrogradations of the wandering stars”?

HERDSMAN: Are you familiar with the Pythagorean student of Archytas by the name of Eudoxus?

BOY: Indeed, he is the mathematician from Cnidos who attends all of Platon’s lectures at the Academy at Athens.

HERDSMAN: Well, you do seem to be familiar with him. But one thing you may not know is, that he is now studying astronomy in Egypt with the priests of Heliopolis, and just before he left he had discussions on this very subject with one of the oldest herdsman I know.

BOY: And you were present when these dialogues took place?

HERDSMAN: Not exactly, but I do from time to time run into that old herdsman, and he has been more than happy to repeat for me the discussions in their entirety.

BOY: Could you?

HERDSMAN: Could I what?

BOY: Could you repeat those conversations, so that I might be enlightened?

HERDSMAN: I could and would, so long as I can remember them, that is. For as of this very moment, I am not entirely certain that I will be able to fully recall them.

BOY: Well, by Zeus, I hope you can remember.

HERDSMAN: For your sake, my son, and mine too, I hope I can as well.

Kepler and Tycho Brahe

TYCHO: On this instrument, a small quadrant of gilded brass, where there would otherwise be a blank surface, I had an artist paint a young man, wreathed in laurel, sitting on a square stone near a tree that is green and leafy on one side. In one hand he holds a celestial globe, and in the other a book, all the while stretching his feet out upon the green grass and herbs that cover the root of the tree.

KEPLER: Yes, it all looks very beautiful—and expensive.

TYCHO: I must admit, Johannes, that over the past few months you have done a most excellent job in assisting

Mathematical

In *The New Astronomy*, Johannes Kepler demonstrated that Ptolemy’s, Copernicus’s, and Tycho Brahe’s planetary

systems gave exactly the same computational results, so there was no way to tell which one was true. Despite the fact that all three were radically different, there was a common error that pervaded them.

All three were

mathematical models for the purpose of predicting the motions of the planets, while making no attempt to discover the physical causes.

Consequently, all three imposed the mathematics of perfect circles and uniform motion onto the planetary



must reflect the flawless work of God, and that which he ordained us to do—which is, simply to admire and record.

KEPLER: It is widely known throughout all Europe that you excel, above all men, in these so-called art forms.

TYCHO: Therefore, I am *a god!* For he who is unable to live in society, or who has no need because he is sufficient unto himself, must be a god—as Aristotle has said.

KEPLER: Or a beast, as Aristotle has also said.

TYCHO: Is that Aristotle’s bad opinion?

KEPLER: Think about the root of these things. If one holds these instruments, and asks, “What are their uses?,” then one may come to a better understanding

of what prosperity is. We use them to further our knowledge of the world and the heavens, in order to increase our children’s well-being, do we not?

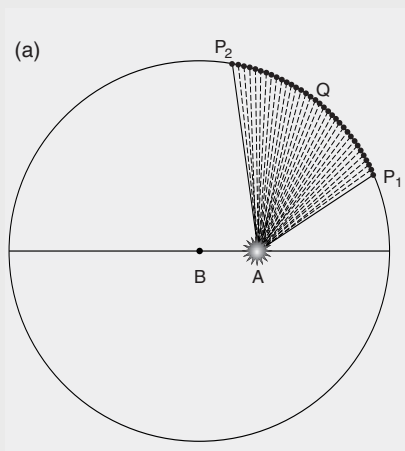
TYCHO: I don’t understand. To better our children’s well-being?

KEPLER: It is well known, today, that those awe-inspiring pyramids standing on the shore of the Nile, built by peoples so long ago, however beautiful, are meaningless to a civilization out of harmony. And by “out of harmony,” I signify the reckless disregard of human reason in seeking to further mankind. Man goes about the world seeking knowledge, and using that knowledge to better his surroundings, in order to live better and happier. If only we had a nation based on that today—a nation whose sole purpose was to perpetuate the happiness of men’s souls, by allowing them to participate in a process of making discoveries and implementing them to the benefit of themselves and their posterity. Today, war

Kepler’s Physics of Non-Constant Change

Kepler’s revolution was, to derive the principles of planetary motion from physical principles, not mathematical ones. He conceived that the sun moved all the planets by a virtue (*power*) emanating from it, whose intensity diminished with distance. Thus, if the planet were moving in an orbit in which its distance from the sun varied, it would physically speed up and slow down as it moved around the sun.

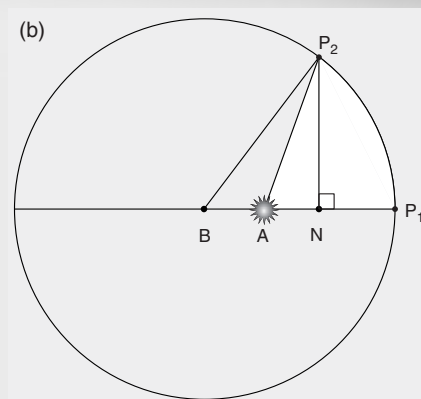
(a) The planet at P_1 is closer to the sun A , than at P_2 . Thus, as the planet moves from P_1 to P_2 , it is always slowing down. This



means that equal portions of the planet’s period do not correspond to equal distances along its orbital path. Kepler showed that these equal portions corresponded to equal areas swept out by a line connecting the planet to the sun.

(b) Kepler measured these areas.

The area swept out as the planet moves from P_1 to P_2 is the white area (P_1-P_2-A). That area is measured by the portion of the circle, P_1-B-P_2 minus the triangle P_2-B-A . The area of that triangle is the distance BA times the height P_2-N . But, the line P_2-N ,



as Nicolaus of Cusa showed, is incommensurable with the arc P_1-P_2 . Thus, the principle of non-uniform planetary motion is dependent on magnitudes which are not susceptible of precise calculation. This gave rise to the famous “Kepler problem”: If Kepler knew where the planet had been, he could calculate what portion of the orbit (time) had elapsed. But, owing to the transcendental relationship between

and disease are all that nations seem to perpetuate.

TYCHO: Oh, Johannes! The young are easily deceived, because they are quick to hope. We make war, so that we may live in peace.

KEPLER: Where's the peace? Religious warfare has been raging since before my birth. In war, truth is the first casualty, our fathers the second.

TYCHO: Truth? We will never know truth.

KEPLER: So, even you don't think that man can know the truth, and that the truth sets men free?

TYCHO: Man can never and will never know the truth. All man can do is sharpen his eyes, so that he may better perceive that which is happening; but sadly, he will never know why it is happening. Do not look too much into the underlying causes of things; simply try to find a nice model that everyone can accept, which fits the description of what you see. And if at some time it no longer works, don't worry, just make whatever adjustments are needed to your system . . .

KEPLER: But . . .

TYCHO: . . . as long as it fits your observations, it will do just fine. Besides, you can never really know what is going on, especially up there in the heavens.

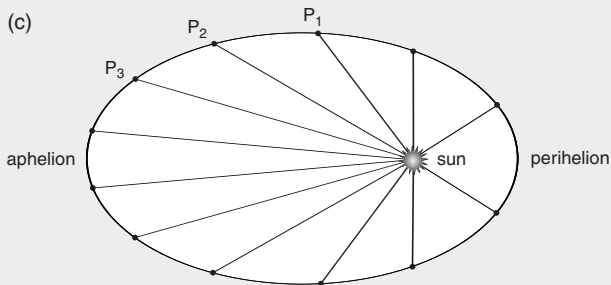
KEPLER: Take, for example, the observed motion of the planet Mars, god of war. See how he marches steadily across the sky, relative to the fixed stars behind him, in the same eastward direction as the rest of the planets and our moon. Yet, every two years he turns back westward, pausing for a brief moment before looping back eastward to resume his annual track. He certainly is a troublesome god, for not being able to proceed regularly along his perfectly circular orbit like this. [pause] The paradox leads me to wonder . . .

TYCHO: You and I can't solve that. All we can do is provide a model that best represents what is happening.

KEPLER: In other words, an *opinion* about what is happening?

TYCHO: Yes, an opinion.

KEPLER: Your beloved Hippocrates said, "There are, in fact, two things, science and opinion; the former begets knowledge, the latter ignorance." So, then, the question becomes, are we—but more specifically, you—a scientist at all?



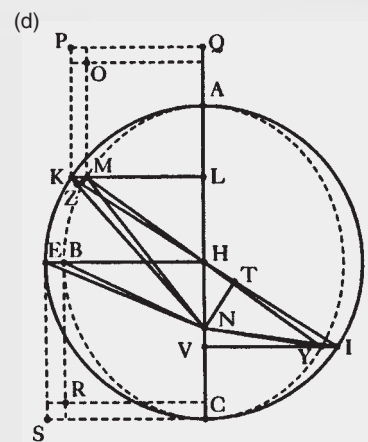
sun at an eccentric point. After comparing his results to the true observations, Kepler found he was 8' of arc off. It is a tribute to Kepler's

the line and curve, he could not precisely calculate where the planet would be when an equal amount of time would have elapsed. Kepler called on future geometers to solve this problem, which provoked Leibniz to develop the calculus.

(c) Kepler's initial discovery of the "equal areas, equal times" principle was developed under the assumption that the orbit was circular, with the

genius, that he saw that this small discrepancy was a matter of principle, not simply a minor error. He subsequently revised all his work, and discovered that the planetary orbits were ellipses with the sun at one focus.

(d) Kepler's diagram from *The New Astronomy*. The dotted curve is an ellipse. As you can see, this ellipse is very close to a circle, but as Cusa



had forecast in *On Learned Ignorance*, there is no perfectly circular motion in the created world.

—Bruce Director

TYCHO: I would certainly like to say so.

KEPLER: Should scientists avoid ignorance, and seek to be wise?

TYCHO: To the best of their abilities.

KEPLER: Does the scientist search for the rational order in things?

TYCHO: Yes.

KEPLER: And, would it be reasonable to call that rational order, a sort of harmony?

TYCHO: Certainly.

KEPLER: Do we, then, after finding that order and harmony, communicate both the former and the latter, in the language we call mathematics?

TYCHO: Yes.

KEPLER: Then, the chief aim of all investigations of the external world, should be to discover the true rational order and harmony, which has been thorough-composed by God, and which He has revealed to us in the language of mathematics.

TYCHO: Yes, Ptolemy's god-like system explained the heavens to the best of his ability. Well-known to both you and me, he proposed that at the center of the universe we find the Earth, as is self-evident. Around us revolves everything: Closest is the moon, then the planets Venus, Mercury, and next, of course, the sun. Anyone with eyes can see that much. After which we are circled by the outer planets, Mars, Jupiter, and Saturn, and finally a transparent backdrop of fixed stars. Each one revolving about in a perfect circle; an exquisitely beautiful model, yet sadly out of date.

KEPLER: Copernicus, to whom I am most sympathetic, no more than 50 years ago—echoing what Aristarchus had proposed 2,000 years earlier—spoke of something different. Copernicus hypothesized that the sun lies at the center of the planetary system, and that Mercury, Venus, our very Earth, and Mars, Jupiter, and Saturn, in that specific order, orbit around it in similar, perfect circles.

TYCHO: Yes. And because my model is the perfect combination of both, my dear Johannes, it follows that my system is the best. I don't know how many times I must explain this to you before you get it, but I will keep trying. The moon of course revolves around us, and the sun revolves around us, along with the rest of the so-called planets, which circle about the sun like moons. The whole planetary system is composed of perfect circles, while the Earth, because we here are furthest away

from heaven, lies idle and unable to move.

KEPLER: I must object, m'lord. For all idle things turn stagnant, like water.

TYCHO: Yes, we lowly creatures on Earth are stagnant and foul, which keeps us far below and ever distant from those things which are higher.

KEPLER: Plato would argue otherwise, you know.

TYCHO: What of it? And what does Plato have to do with astronomy? He's just a philosopher.

KEPLER: In the dialogue called *Republic*, Socrates speaks of people chained inside of a cave, entertaining themselves with shadows; in other words, acting as if it were science to master the images. These fettered men's folly lay in the fact that they had no idea that what they were observing were merely shadows, until one day one of the men happens to escape. Not only did this man find that it was only a candle generating these shadows, but also that there existed a whole beautiful world outside the cave. He came back to free his friends, but not only did they not believe him, they even sought to kill him, for defying what they were set in believing! They didn't get too far away from their beloved shadows though, being chained, to harm the newly enlightened man.

TYCHO: Are you calling me a "Shadow Gazer"?

KEPLER: Well, in a sense we all are. As we sit here gazing at the stars, how would we know if we were just looking at another lifeless shadow?

TYCHO: Well, we wouldn't.

KEPLER: Unless we knew that ember we call the Cause, which, because of its quality, is too hot to touch, and too bright to look at directly.

TYCHO: I'm not following you.

KEPLER: Well, in another one of his dialogues, *Timeaus*, Plato harks back to Egypt by discussing the nature of the solids, according to which the pyramids themselves were built. Those solids, which come from the divisions of spheres cut by great circles, reveal some striking secrets. Those same solids, on which my hypothesis of the solar system is based, gave man more power in the universe. The ancients were able to discover, through spherical geometry, the order of things displayed in the stellar canopy, using their minds alone, and prove through the physical construction of great astronomical structures, that the world is lawful. This didn't happen because of the pyramids, but because of a mind that existed before the pyramids, which was

able to grasp the knowledge of the universe, and apply it to further his welfare and that of his posterity.

TYCHO: That is a most interesting notion of posterity. But, continue to elaborate on these matters of geometry.

KEPLER: Well, are there geometric principles which, when employed, are the same on Earth as throughout the rest of the universe?

TYCHO: How should I know?

KEPLER: Well, should things in the universe be so inconsistent, that the Pythagorean Theorem would not work elsewhere, and yet be true in Athens?

TYCHO: No.

KEPLER: So, it should work in Athens as well as in any other place?

TYCHO: I can't see why not.

KEPLER: What about on the moon?

TYCHO: Inconceivable, although you must be correct.

KEPLER: So, in understanding these principles, can we know something that is truthful about the universe?

TYCHO: Yes, that these geometric principles are truthful.

KEPLER: When Eratosthenes measured the circumference of the Earth, did that prove we could know the nature of things?

TYCHO: It seems so.

KEPLER: Are there geometric relationships in the stars, however diverse?

TYCHO: Certainly.

KEPLER: Then, the diversity of the phenomena of nature is so great, and the treasures hidden in the heavens so rich, precisely so that the human mind should never be lacking in fresh nourishment—that nourishment being truth.

TYCHO: Hmmm. Is that what you spoke of when you wrote your book?

KEPLER: Yes, I began by trying to inscribe squares, hexagons, and other figures inside a circle, in order to find the ratios involving the successive distances between the planets. When this failed, suddenly it struck me. "What have plane figures to do with the celestial orbits?" I cried out. "Inscribe the regular solids." To represent the Earth, I used a sphere as the norm and measure of all; around it, I circumscribed a dodecahedron, a solid with 12 pentagonal sides, and put a

sphere around that for the orbit of Mars; around that, again, a tetrahedron, a solid defined by four equilateral triangles for sides, whose corners mark the sphere of the orbit of Jupiter; around that sphere, again, I placed a cube, for the orbit of Saturn.

TYCHO: And for Venus and Mercury?

KEPLER: I inscribed in the sphere of the Earth's orbit an icosahedron, a figure that has 20 equilateral triangles for sides; its sphere was for Venus. And inside that sphere, I placed an octahedron, with eight equilateral triangles for sides, and its respective sphere.

TYCHO: And what did you find?

KEPLER: The nature of the universe; God's motive and plan for creating it; God's source for the numbers; the law for such a great mass; the reason why there are six orbits; the spaces which fall between all the spheres; the cause of the great gap separating Jupiter and Mars, although they are not in the first spheres—here Pythagoras reveals all this to you by five figures. Clearly he has revealed by this example that we can be given a rebirth, after 2,000 years of error.

TYCHO: This seems truly profound, Johannes, but I must go, or I shall be late for dinner with the illustrious Peter Vok Ursinus Rozmberk. Farewell.

KEPLER: Yes, m'lord, you'd better hurry along. I think you have heard quite enough for one day.

The Underground Railroad

[A group of slaves gathered 'round.]

SLAVE 1: All right y'all, you gotta be quiet, for massa' come an find us out at any minute.

SLAVE 2: So, you say we'z gonta 'scape here?

SLAVE 1: Well, I was talkin' to a carpenter who stayed at massa's house, an he tol' me there's a railroad for us, but its under ground.

SLAVE 3: What's that mean?

SLAVE 1: Well, that there's a way to get outta here, there's folks up North who's tryin' to help us to freedom—

SLAVE 4: That'll never happn, James.

SLAVE 2: Would you jus' listen!

SLAVE 1: Look up dere, you see that thing there, that look like a sippin' gourd?

SLAVE 3: What?

SLAVE 1: A gourd, like a squash with a big bottom, but hollow fo to drink with.

SLAVE 3: That there looks like a chariot, and its just aswingin' low, kissin' de ground.

SLAVE 4: It's movin' 'round the North Star up there in a circle.

SLAVE 2: Yeah, I sees it up there.

SLAVE 1: Yeah, dis drinkin' gourd, if you look over, it's pointin' to 'notha star. Dat dere is de North Star.

SLAVE 4: Afore my momma was sold away, she told me

'bout dat star—it leads to God.

SLAVE 1: Well, to get to freedom, we have to meet dis man, "Peg-Leg Joe." He'll be up aways, but we gotta get up dere ta meet 'em.

SLAVE 2: How?

SLAVE 1: Well, first you gotta know when. Winta's the best time, cuz we got longer in de night, and de ribers is froze fo ta cross 'em.

SLAVE 3: How do we get dere?

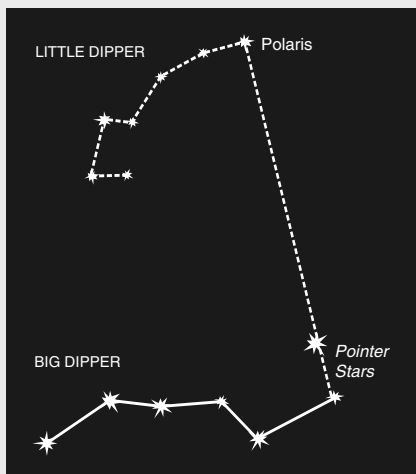
SLAVE 1: If you follow de drinkin' gourd, 'long de riber, just keep goin' till you see de dead trees. Keep on that riber, an not de others.

SLAVE 2: Fo how long?

'Follow the Drinking Gourd'

*When the sun comes back
And the first quail calls,
Follow the Drinking Gourd.
For the old man is a-waiting for
to carry you to freedom,
If you follow the Drinking Gourd.*

This haunting folk song, first sung by slaves in Alabama and Mississippi before the Civil War, was rediscovered in 1912 by folklorist



Finding the North Star using the Big Dipper.

H.B. Parks, who overheard an African-American man in North Carolina singing it. The words were a puzzle, but the singer flatly refused to explain their meaning. A year later, Parks heard the song again in Louisville, Kentucky—but again, the singer kept mum. It was only after 1918 that he learned from a Black man in Texas, that the lyrics gave escaping slaves directions to find their way north to freedom. They would always travel under the cover of night. By finding the "Drinking Gourd" in the sky—the constellation we call the Big Dipper, which points to the North Star, Polaris—they would follow a route north (described in "code" in the song), along first the Tombigbee River, then the Tennessee, and finally crossing



Harriet Tubman

the Ohio River into the free state of Illinois.

The idea of using the vast, unfettered expanse of the starry heavens to find one's way to freedom, became more than just a navigational "trick," but a metaphor for the quest for freedom. Frederick Douglass, the great

leader of the movement to free the slaves, named his newspaper *The North Star*. He understood profoundly that science means the liberation of man; only if your oppressors can keep you ignorant, can they control you.

As most people know, the slaves were helped along their way by the "Underground Railroad" of people who would feed and safehouse them, and direct them on to the next "station." The most famous

SLAVE 1: Well, when ya come on de end of de riber, wid two hills, keep wid de drinkin' gourd and you'll see a meetin' of two riber on de otha side. That's where you meet Joe, to take you up North onta freedom.

SLAVE 4: Oh no, here come massa.

[All sing "Swing Low Sweet Chariot," first verse]

MASTER: What in hell! What y'all doin' here, justa singin'? You niggers are dumber'n I thought, out here in the cold dark. Why arn't y'all in the shed, justa drinkin' and screwin' and havin' yo fun, like good fellas? Lookin' at the stars, heh? Well, I c'n tell ya, ya won't see nothin' up dere? I seed the same shit fo thirty years. Now, git yer asses insides, 'fore y'all git sick and can't work. Git! Git. . . .

[Exits]

SLAVE 1: Alright now, massa's gone. Here's de plan, remember dis . . .

[All sing "Follow the Drinkin' Gourd"]

[Fade . . . tones . . . ambient sounds of a Dark Age . . . hip hop, Age of Aquarius, radio sounds . . . WWII . . .]

Epilogue

[Silver Girl, Bronze Guy, Random Guy, Visitors]

SILVER GIRL: Let's turn the music down for a minute! I'm trying to find Steve. I think we nodded off for a minute, and I'm afraid that since he took his own car up here, he just got sick of how buzzed we were getting, and decided to try to catch the end of another one of those LaRouche meetings. Everyone says they run really late on Saturdays.

BRONZE GUY: I just hope we still have a future—ya know, there's no jobs out there anymore.

SILVER GIRL: The last thing I remember Steve talking about, was some kind of Dark Age that we were in now. I don't know. [calling out] Steve, are you still here somewhere? We're ready to talk politics.

[Enter Myra Boomer]

"conductor" on the "railroad" was Harriet Tubman, known as the Moses of her people. Frederick Douglass wrote to her in 1868: "I have had the applause of the crowd and the satisfaction that comes of being approved by the multitude, while the most you have done has been witnessed by a few trembling, scared, and foot-sore bondsmen and women, whom you have led out of the house of bondage, and whose heartfelt 'God bless you' has been your only reward. The midnight sky and the silent stars have been the witnesses of your devotion to freedom and your heroism."

Tubman, herself a slave in Maryland,

had escaped to freedom at the age of 28, with only the North Star to guide her. She then helped more than 300 others to do the same, telling them: "Children, if you are tired, keep going; if you are scared, keep going; if you are hungry; keep going; if you want to taste freedom, keep going."



Helping slaves to freedom on the "Underground Railroad."

She kept a six-shooter under her skirt, to provide a little encouragement to anyone who fearfully complained that he could not take another step. Tubman summed up her life's work: "On my Underground Railroad I nebbber run my train off de track and I nebbber los' a passenger"—a quote which was inscribed on a plaque in her honor by the citizens of Auburn, New York, at the courthouse in Cayuga County, where she died in 1913.

Prints and Photographs Division, Library of Congress

—Susan Welsh

MYRA BOOMER: Oh, I used to be political. Are you guys up here talkin' about astro—logy?

BRONZE GUY: Um, not exactly.

MYRA BOOMER: That's really great. I'm Myra Boomer. You know, I was up here meditating on some healing crystals, and I could feel some youthful spirits. Your energy chakras were radiating so much, that I just had to come over to see if you were real, or signs from Muktasal.

SILVER GIRL: Who?

MYRA BOOMER: You have an interesting aura. What's your birthdate?

SILVER GIRL: Uhhh, June 13th.

MYRA BOOMER: Ahhh . . . [*takes deep breath*] Taurus! You are modest, and often rather quiet or shy. You are a person who is content to be in the background, or to serve as an assistant, in the supporting role rather than in the lead. You are quite humble in your own assessment of yourself, and you have a very strong, perfectionistic attitude, with a tendency to be overly self-critical. Often, you will simply refuse to attempt something, because you feel you cannot meet your own high standards.

SILVER GIRL: Actually, my sign is Cancer.

MYRA BOOMER: That's what I said, right? . . . I forgot . . . [*takes deep breaths*] . . .

BRONZE GUY: She's creepin' me out!

RANDOM GUY: Hey Myra, I just lost my job, and my kids need food and diapers, and all I got is bucks. Should I get an herbal body saran wrapping, or can you tell me my lucky lottery numbers?

MYRA BOOMER: Well, I've summoned my Mother Earth powers of Venus, and can tell you . . . that your sign is ruled by Mars, which rules the natural seventh house. When a planet or house cusp contains Libra, it will show where one will strive for harmony, creativity, and balance, as indicated in the natal chart. Your numbers are 2, 4, 6, 8, and 10.

RANDOM GUY: Thanks!

BRONZE GUY: Do you really believe this?

MYRA BOOMER: You must conform to my prophecies! Do you feel it happening? Huh? Do you feel it? Here take some acid, it will help.

BRONZE GUY: Huh? What?

MYRA BOOMER: Just take it. If you start now, you'll

ascend to truth in about 12 hours. . . .

SILVER GIRL: This lady is gone!

BRONZE GUY: Just don't pay attention to her, she feeds off it.

MYRA BOOMER: Wow, I can see the Eyes of Love, they're staring at me. My soul is being lifted to the final act. . . . [*starts singing the Beatles' "Here Comes the Sun"*]

[*Exit Myra*]

SILVER GIRL: Man, that lady was fucking nuts!

BRONZE GUY: Uhh, was that my mom?

SILVER GIRL: I don't know, but I think I here someone else coming.

[*Enter Nerds*]

NERD 1: . . . and if my calculations are correct, this is exactly where Hawking made his revolutionary discovery . . .

NERD 2: Man, this is almost as exciting as Christmas, when I got an Isaac Asimov book, *The Mummy II*, and a textbook on mathematical physics.

BRONZE GUY: Man! What the hell! I hope we can ignore these guys—they definitely don't fit our chosen style of personality.

NERD 2: Oh, and what do we have here?

NERD 1: I would hypothesize that we are dealing with some very amateur astronomers.

NERD 2: If they are doing astronomy, then where are their computers?

NERD 1: Did I say "very amateur"? Perhaps, I should have said "very, very amateur."

BRONZE GUY: Uhh, what are those computers for?

NERD 1: Please hold, I will respond to you in approximately 37.8 seconds . . .

NERD 2: The reason is this, that the greatest physicist and scientist of our time will soon dwindle your appearance, Sir Stephen Hawking. And by the way, it is elementary what these cpu's are for.

BRONZE GUY: What?

NERD 2: Starry Night version 4.0 Pro Edition.

BRONZE GUY: Oh, I don't know, is it some kind of astronomy software?

NERD 2: What?! I'm more than a little surprised that you have never heard of it?! . . . [*pause, then, demean-*

ingly] It's been out for about two years. Hmm?

BRONZE GUY: Oh.

NERD 2: Silence! Prepare to have your appearance dwindled.

[*Enter Hawking*]

STEPHEN HAWKING: Hello, boys!

NERDS [*in unison*]: Awesome!

SILVER GIRL: Hey, Mr. Hawking, I'm just waiting for Steve to get back here, but as long as you're here, uhh . . . , we were just talking about the history of astronomy, and the requirement of knowledge for sustainability of humanity on the planet. Do you know anything about that?

STEPHEN HAWKING: I would like to discuss whether time itself has a beginning, and whether it will have an end. All the evidence seems to indicate that the universe has not existed forever, but that it had a beginning, about 15 billion years ago. We are not yet certain whether the universe will have an end.

BRONZE GUY: That makes me want to cry.

[*Exit Nerds and Hawking*]

SILVER GIRL: Wow, that was crazy too!

BRONZE GUY: Oh no, another one this way comes.

[*Enter Alien Guy*]

ALIEN GUY: Hello guys, you better watch out on this mountain, you may find it troublesome.

SILVER GIRL: What do you mean?

BRONZE GUY: Aliens!

SILVER GIRL: Okay?!

ALIEN GUY: The specific encounter I am describing was not my first. But, I would not like to remember my previous abductions, but to describe one specific abduction that occurred when I was 17.

SILVER GIRL: I was just thinking this!

ALIEN GUY: I was on my way home from military training. About that time, I noticed a glowing object. The time was approximately 8:30 p.m. As this wasn't my first encounter, I assumed it was a UFO. As I was staring at it from my car, I suddenly got out to view it. I was viewing the object for quite some time, until I saw it drop down and land somewhere in the woods. I was about to walk down the road, when I saw four or five

figures emerging from the woods. I was shocked and frightened. I did nothing but stare at the figures as they came closer, until they came in my car and took me in their ship. Inside, it was pitch black, and there was a screen on one wall, and a chair right in front of it. They placed me in the chair, and put some sort of drill in my nose, and then checked my eyes with some sort of a metallic device that had a blue light. I became aware of what seemed to be a slender probe that had been pushed up inside me and was gently vibrating against my prostate. I wondered what in the world was going on, and then I felt small, child-like hands—

BRONZE GUY: Man, you are disgusting!

ALIEN GUY: Well, nobody believes us, because there's no proof. But, look how crazy I am—that's proof enough!

SILVER GIRL: Who did this to you?

ALIEN GUY: THE GOVERNMENT!

BRONZE GUY: Okay, what do you want us to do?

ALIEN GUY: I got some drugs from the aliens.

SILVER GIRL: You got drugs from aliens?

ALIEN GUY: [*Exiting*] It's all on the Internet! The truth exists somewhere on the Internet!!!

BRONZE GUY: [*to Silver Girl*] That's where the hippie guy from econ class gets his drugs! [*calls to Alien Guy*] Do you know a guy named Javier?

[*Alien Guy exits*]

SILVER GIRL: Whoa, slow down. I really think Steve went back to reality.

BRONZE GUY: Well, that's just more non-reality for us, anyways.

SILVER GIRL: Oh, geez, I'm getting tired . . .

BRONZE GUY: Me too . . .

[*They doze, wake up*]

SILVER GIRL: Where are we?

BRONZE GUY: I don't know. There's sand everywhere.

SILVER GIRL: It reminds me of this movie, *Stargate*. Maybe those alien drugs put us here.

BRONZE GUY: Wait, what does that sign say? . . . It says, ABU GHRAIB!

[*In unison*]: We've been drafted!

END